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# ENGINEERING AND MINING JOURNAL

A Weekly Journal of the Mining and Mineral Industries

July 23, 1921

## Standardized Mine Cost Statements

By H. J. C. Mac Donald



## A Sagebrush Silver Producer

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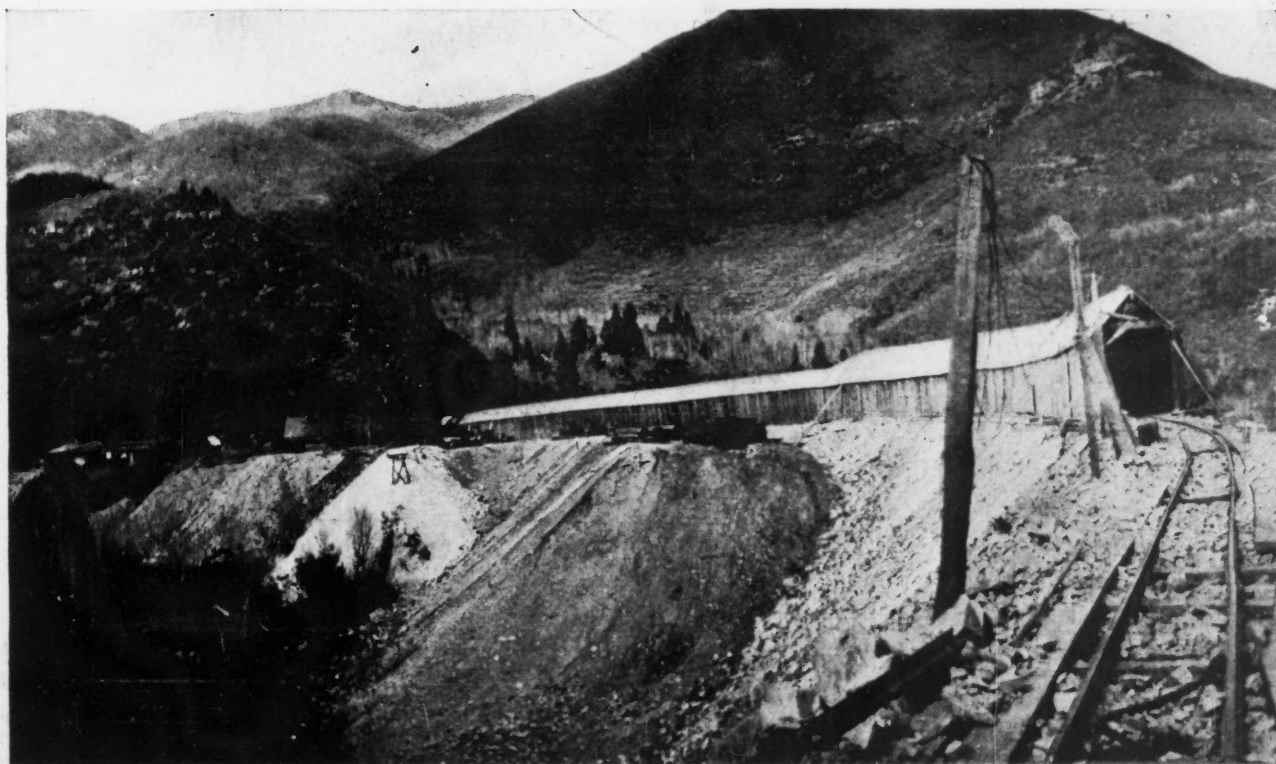


## Deep Oil Wells in Texas

By Albert J. Wolf

Walter Fitch, Jr., Co. is shaft sinking at Eureka, Utah. The Company will try to win the Gold Medal for the *World's Shaft Sinking Record* offered by Engineering and Mining Journal.

In a letter to the mining industry, in this issue, Mr. Lee O. Kellogg invites discussion on the advisability of a *Profit-Sharing Plan in Mining*. What alternative have you to offer?



Portal and Snowsheds at Snake Creek Tunnel of the Judge Mining & Smelting Co.  
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# Engineering and Mining Journal

*A Weekly Journal of the Mining and Mineral Industries*

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## Confusion Over Assessment Work

WHEN the law granting six months' grace for the performance of 1920 assessment work on mining claims was signed on Dec. 31 last by President Wilson, its meaning seemed perfectly clear. Yet twice within the last week we have been informed by our correspondents at Wallace, Idaho, and at Pioche, Nevada, that much confusion has arisen in their districts over conflicting relocations since June 30. The law reads:

That the period within which work may be performed or improvements made for the year 1920 upon mining claims as required under Section 2,324 of the Revised Statutes of the United States is hereby extended to and including the first day of July, 1921, so that work done or improvements made upon any mining claim in the United States or Alaska on or before July 1, 1921, shall have the same effect as if the same had been performed within the calendar year of 1920. Provided that this act shall not in any way change or modify the requirements of existing laws as to the work to be done or improvements made upon mining claims for the year 1921.

This extension of time and all the discussions in Congress pertaining to it were given the widest publicity in the press throughout the country. Yet many apparently made relocations as soon as 12 o'clock midnight on June 30 had struck, apparently taking it for granted that the claims were open to such relocation beginning July 1. Under the law quoted above, however, the old locations were valid up to and including July 1, so that relocations made before July 2 on claims benefiting by the period of grace were invalid. Hence the conflict and the confusion arising when many claims, illegally relocated on July 1, were again relocated with perfect legality on the following day by different locators. The law is clear on this point, however, and apparently there is no chance at litigation for those who were first to relocate.

Besides such cases there are those where claims were relocated on July 2, where the original locator was doing his assessment work when the time limit expired, but was unable to finish it. The question here is whether the claim holder may remain in possession, under Section 2,324 of the Revised Statutes, provided he continues his work without interruption until completed. As to this our Wallace correspondent says:

"The impression seems to be quite general that the law extending the time carries this provision also, and it is believed that many claim owners have acted upon that assumption and were engaged in doing assessment work when the extended time expired. It will perhaps require a court decision to determine the intent of the law, but the wording of the act indicates that it was the intent of Congress to require all assessment work to be completed on or before July 1. Following the provision quoted above, the law says, 'so that work done or improvements made upon any mining claim in the United States or Alaska on or before July 1, 1921, shall have the same effect as if the same had been performed within the calendar year of 1920.' There is nothing

there to indicate that Congress contemplated the doing of assessment work after the expiration of the period of extension."

## Economy in Washington

IN WASHINGTON, plans are on hand to effect economy in the administration of the executive departments in a more businesslike way than ever before attempted. Some time ago we editorially stated that the executive departments were a complicated business, without any business head, and that the President should appoint an assistant who should have the business administration of the executive departments under his charge, and should handle this end of it while the President fulfilled his own special task of guiding the Ship of State. Substantially, this seems to have been accomplished in the appointment of the Director of the Budget, who apparently is going to carry out much of the function outlined. He evidently has authority in matters of business administration, not only over bureau chiefs, but over department heads—members of the Cabinet. It is commented in Washington that it is not so much the executive departments that he will have to combat, but Congress, which makes appropriations for political and patronage purposes to a large extent, and derives much of its influence therefrom. In other words, it will be the efficiency engineer against the pork barrel—and what chance will the efficiency expert have?

Our Government is ruinously extravagant; but its extravagance is mainly in one direction—war. Past wars and their result; present maintenance for war; preparations for future wars, with army and navy, pensions, war risk, and the whole train, is what burdens the taxpayer of America, and is bowing the back of the world. What is spent in the really constructive departments at Washington is a trifle, not to be considered by comparison. Your business manager, your efficiency expert, is very necessary, but the man who can show how the great nations of the earth can progress without occasionally cutting each other's throats, or assassinating with poison gases, is the man who is going to save the billions and lift from our shoulders the taxes for destruction, the fund for murder, the tribute for hate and devilry. We hope that President Harding may find him too, or be that man.

Meanwhile, the present movement for economy will not affect very much the bureaus with which the mining industry is concerned. They are efficient and economical as it is. The more recently created bureaus were, some of them, wildly inefficient. The War Risk Bureau for example: we know of a young ex-soldier who was given a job with this bureau, and the service to which he was detailed was the supervision of the laying out of a tennis court, directing the workmen. Clerks got in each other's way. Another case, reported to us, was of a lady who, to pass the time, knitted all day, between 9 o'clock and the welcome signal for closing.

### Applying the Cost Sheet to Mine Operation

WE CAN RECALL quite clearly our first impressions when we noted in the list of subjects included in our college curriculum that course known as "Mine Management and Accounts." The first part seemed most essential to the embryo engineer, but, as for "accounts," there surely must be some mistake. We were being fitted for mining engineers, for mine superintendents, for managers, even mine-company presidents—surely not bookkeepers. Single-entry and double-entry bookkeeping had been hammered into us during our high-school course, but now we were quite beyond that sort of thing.

Later on we were somewhat abashed when we were offered a job as timekeeper at a mine. We did take it, condescendingly of course, viewing enviously the while the mine surveyor with his transit, the mine chemist and his laboratory, and the rest of the men who had the "real" jobs. It was somewhat of a shock a little later (in the meantime we had graduated to transit pushing) when we learned that the chief clerk had been promoted to superintendent at one of the company's neighboring properties. He had started as a timekeeper. From that time on we have had the greatest respect for timekeepers, bookkeepers, and cost sheets; not only on account of this awakening, but because subsequent experience brought the realization that unless we knew the cost of doing things, all of our scientific knowledge, formulæ, and the rest would be of little use.

It is doubtful if any of the several branches of mine operation requires closer attention than that of the proper collection, distribution, and allotment of costs. The cost sheet serves as the barometer of the mine operation; without a suitable system of costs, comparisons are, of course, impossible, and the business of the mine is conducted in a haphazard fashion. We have at different times taken our fling at the inadequacy of the mine reports made by certain companies. There is the possibility, of course, that some of the information is purposely withheld, and we would venture the guess that in most instances a complete system of cost accounting is strictly followed.

Regardless of the particular system used in the distribution of mine costs, there are certain fundamentals that must be kept in mind if the mine manager is to be properly advised of the expense of operation. These points, we feel, have been well covered by Mr. MacDonald in his article, "A Standard Mine Cost Statement," appearing in this issue. There will no doubt be some discussion as to the correct distribution of production and development expense, and at most mines there is considerable overlap in these particular items. But an arbitrary agreement can always be reached, and so long as a consistent division is maintained between the two, a correct basis for comparison can be had.

We are told that the ore at the Blank mine, let us say, costs \$2 per ton, the figure supposedly covering all mining expense. Another mine in the same district produces ore for \$2.50 a ton, although our general, perhaps close, inspection of actual operations leads us to believe that the latter is operated along more efficient lines. The difference—oh, yes, the superintendent at the Blank mine has not included royalties, taxes, depreciation, and other overhead expenses in his figures; but surely he does not exclude such items in his final statements for the year. Perhaps the distribution of the miscellaneous expense is difficult on a daily or monthly cost account and may be regarded as unimportant, but if the cost

figures are to be used in estimating future work it is quite essential that they include *all* items of expense that may be incurred.

In general, an accounting system from which monthly, or, better still, daily cost records can be obtained is invaluable to the mine manager. It enables him to judge his operation in a far better way than is indicated by tonnage or footage figures, and also provides the knowledge that he is either making or not making "the grade." The practice is merely the application of business principles to his work.

### To What Information Is the Stockholder Entitled?

NO DOUBT the reader, during the last year, has been periodically deluged with stock brokers' literature entreating him to buy in the market and to take advantage of unusually low copper-stock prices. Attractive and often comprehensive prospectuses have been prepared analyzing the status of certain copper producers, valuable not only for their financial data but also as interesting historical digests. We have in mind, particularly, a folder prepared by Hayden, Stone & Co., which shows in great detail the comparative operating and financial statistics of the four porphyry coppers, Utah, Nevada, Ray, and Chino. Anyone desiring to investigate the advisability of purchasing any of these stocks has a wealth of information available which he can readily supplement by reference to the individual company reports. These prospectuses can only be prepared when mining companies believe in freedom in supplying financial information, which is an almost invariable characteristic of copper-mining companies in the United States.

Some copper companies are exceptions to the general rule of liberality in financial details of operation, and among these exceptions the Anaconda Copper Mining Co. is outstanding. The paucity of information given stockholders of this gigantic mining organization (\$116,562,500 capital stock and \$50,000,000 bonded indebtedness) is amazing. If you were an intending purchaser of Anaconda stock, or any other mining stock for that matter, what questions would you ask about the affairs of the company? Wouldn't it be well to know what ore reserves the company has? What it has cost to produce copper, lead, and zinc? How profitable or unprofitable some of the manifold subsidiary activities of the company have been? What policies the directors have pursued in the development of the company's activities? One can search in vain through the few pages of Anaconda's report for a clue to an answer to any of these questions. Page follows page, giving such information as "No. 2 air shaft was sunk an additional 120 ft."; "a new roof was placed in the Main Hoist house of the West Colusa Mine"; that "the sawmills cut 92,865,620 ft. of lumber and purchased 358,115 ft., of which 38,185,389 ft. were shipped"; that "the survey of the proposed pipe line (Andes Copper Mining Co.) was finished in May, 1920."

The really essential matters, the relation of the various units of Anaconda's operations to the whole, are omitted, and the intending stock purchaser will find naught to guide him in making an intelligent deduction about the company's activities.

Is a report such as Anaconda's the heritage of a lack of public education in financial matters? Contrasted to the thoroughness in British mining reports, South African and otherwise, and some excellent American

reports, the Anaconda jumble cuts a sorry figure. Is a report such as Anaconda's the wish of a board of directors who seriously believe giving information to the owners of the company will result detrimentally to the company's interests? Only the directors can answer. Surely they do not believe that informing the public whether it costs Anaconda 15c. or 25c. to produce a pound of copper, or whether zinc-mining operations were unprofitable, will jeopardize the interests of the stockholder and competitors. On the contrary, the policy of financial reticence lends itself admirably to speculative manipulation of stock on the wildest and often unfounded rumors.

The Anaconda Copper Mining Co.'s report is not up to the standard set by its technical operations. Its meagerness and cloudiness and the evident unwillingness of its directors to allow the light to flood the financial details of its operations are not calculated to create the utmost confidence in the company's financial condition or record.

### Optimism and Foreign Trade

THE SPEECH of Herbert Hoover in Boston on July 12, summarized briefly in our issue of last week, points out the importance of our foreign trade; and that our exports, though they cover only a small percentage of our total production, do make up a large proportion of certain industries—for example, normally 20 per cent of our wheat, 60 per cent of our cotton, and 75 per cent of our copper. He proceeds then to point out that the present depression came from Europe, and that our foreign trade can increase only with the prosperity of our customers.

He points out our recently increased surplus production of food and manufactures; and that we are shipping mainly food and raw materials to Europe, our manufactured goods mainly to countries outside of Europe. He points out that Germany must make her stipulated reparations payments mainly in the form of the credit produced by the sale of manufactured goods abroad, but that European increase in the amount of manufactures will favorably affect our market for the raw materials we supply, such as cotton and copper; but that, take it all in all, the consuming power of Europe for manufactured goods will be for some time less than before the war.

Mr. Hoover believes, apparently, that Europe will produce these manufactured goods at lower costs than before the war. "It seems to me that it was inevitable that the balance of the forces at work in Europe would improve their ability in competitive manufactured goods. Their production costs were bound to be low, both by better organized industry and by lower standards of living." However, he sees a chance for two classes of our manufactures—those where we can obtain lower production costs than Europe through our quantity production, and those in which we especially excel, like shoes. Of such classes of manufactures he believes we can recover and hold our pre-war share of business.

But as to manufactures containing a large element of labor cost, Mr. Hoover says we must get our production costs down if we are to compete in foreign markets. Increased efficiency is the answer. There must, he says, be smaller margins of profit; lower transportation rates; better foreign marketing agencies; the elimination of the wastes in industry; the super-power power

plan; tax reform; reduction of armament; more efficient management of the Shipping Board; and the payment to the railways of moneys due them from the Government. "It means that we must extend scientific research into the problems of waste, the perfection of processes and the simplification of methods that are beyond the ability of one manufacturer acting alone". . . . "I am confident we can hold our markets, our higher standards of living, and our wage if we will all put our backs into it."

Carefully considering Mr. Hoover's words, we do not altogether share his optimism. He skirts the main immediate problem of the day—the tariff—very cautiously. As a member of the Cabinet, he could not well do otherwise. We see no signs on the horizon that would justify us in cajoling ourselves into the conviction that we were going to secure the most remunerative of trades—a foreign market for our manufactures—to a greater extent than before the war, if as great. The tariff program is one of the signs that we have not adopted any new economic plan to match the changed times. Nor do we believe that with higher wages and higher standards of living we are going to compete in foreign countries with manufactured goods into which the element of labor enters largely. We will be efficient and eliminate waste, to the best of our ability, but other countries have always been our leaders in this respect and will continue to be at least our equals.

Even as regards the special quality manufactures that we sold abroad during the war, we shall have difficulty, if reports are true, in regaining our trade. The Guaranty Trust Company reports, "The post-war market for American agricultural machines in Germany is not so good as formerly, because many German factories which were engaged in the manufacture of war munitions are now turning out agricultural machinery on a large scale. Take the case of tractors. A certain small American tractor costs about 52,000 marks f.o.b. New York. A similar machine can be manufactured and sold in Germany for 25,000 marks, which is less than the cost of a span of horses."

One result of this condition is that these American industries are considering the establishment of plants in Germany. "The German government is favorably disposed toward these American plants, provided at least 50 per cent of their output is exported to other countries. One large American cash register company has already begun to manufacture in Germany, and other firms are about to follow its example."

The transfer of American plants to Germany or other countries where costs are lower is not going to help American prosperity, but the reverse. Altogether, far from seeing much promise, in the light of our present policy, of retaining the immense foreign trade forced on us by the war, it would seem that we would have to fight hard to retain even our pre-war position. Unbounded optimism, so highly rated as an economic factor by the optimist, is actually of no cash value whatever, when it comes to a showdown and to business competition.

The tariff policy of the present Congress is in effect a renunciation of the battle for foreign trade in manufactures, and an announcement of a defensive instead of an offensive program. We shut ourselves up within the walls of our tariff fortress, and trade with each other undisturbed; and we leave to our less fleshy antagonists the ranging of the fertile field and forest outside.

## WHAT OTHERS THINK

### Profit Sharing in Mining

I am addressing this letter to you in the hope that it may be published and elicit some correspondence on the subject of profit sharing in mining. Profit sharing is an interesting and important phase of industrial relations, and no mining problem today equals in importance that of the relations existing between the men who put their money into mines and the men who put their time and their energy into them.

There is a fairly extensive literature devoted to the principles and the results of profit sharing in general industry, but when we began to discuss the advisability of introducing a profit-sharing system to apply to the staff employees at our gold property in South America, we at once discovered that the inherent economic factors of the mining industry, and especially those obtaining in gold mining, greatly diminish the value of any data obtainable from experience in other industries. May I enumerate some of the questions that arose in our investigation of the problem?

In the first place, the selling department of most metal-mining enterprises is of minor consequence as compared with that responsible for production, distinctly the opposite of the conditions prevailing in most manufacturing or distributing businesses. This is overwhelmingly true in gold mining, where the price of the ultimate product is fixed. Such being the fact, should not the producing department of the organization, the mine and mill and shops, as chiefly responsible for the profit made, receive a larger proportion of those profits in any equitable distribution? Is there in general any formula deducible on which to base the distribution of profits among the management, the heads of departments, the bosses in the departments, and the body of workmen?

As the efforts of most of the employees of a mine have nothing whatever to do with the selling price of the metal produced, the custom of the copper companies, followed until recently at least, of varying their wage scale with the price of copper, though in effect a sharing of profits, cannot be considered a logical or a typical profit-sharing system, which should be based on the assumption that there is a relation between the efforts of the employees and the profits secured. Obviously, too, a gold mine cannot share profits by varying its wage scale with the price at which it sells its product.

In most metal mines, those in charge of operation have a considerable variety of raw material on which to draw, and it is usually considered good policy not to consume the best of this as rapidly as possible but to maintain a certain average; gutting a mine is poor business. Yet an employee working for a percentage of a year's profits, and uncertain whether he will have a chance at the profits of future years, might further his own interests more if he deliberately gutted the mine in his charge.

Similar considerations apply to the necessary current development, which most mines have to maintain and which is particularly important in considering the small or medium-size precious-metal mine. One year's profits can be materially increased if no development

work be done, but a year or two later all profits may disappear. In the same way immediate profits can be swelled by neglecting maintenance work underground and on the surface, or by installing a mining system temporarily cheap but entailing expense and difficulties later, or by arbitrarily cutting wages and showing lowered costs for a while until rising discontent reflects itself in heavy expenses or disaster. Clearly, to offer an extra remuneration contingent on profits only, without limiting conditions, would tend to encourage poor mining and might wreck an otherwise successful enterprise. The stockholder shares profits with his employees in the hope of making his own share greater through stimulating economies in operation, but he certainly does not want to increase his immediate profits by jeopardizing those of future years.

How, then, can profits be shared and at the same time protection be secured against gutting, neglect of development, neglect of maintenance, and short-sighted policies in general? Especially when ore reserves are small and development of ore for the future is fully as important as current profits, what sort of a sharing of profits will stimulate vigorous search for new ore?

Finally, can any rational basis be established for determining the percentage of the profits to be segregated for distribution to the employee?

I should be glad to hear the testimony of mine managers on their success or failure with profit sharing in general and how they have met some of the problems I have outlined, especially where the principal product of the mine is gold. And I propound these queries fully alive to the probability that the general satiric answer will be to the effect that today's problem in mining is not how to share profits, but how in thunder to make any.

L. O. KELLOGG.

Carmel, Cal.

### He Made Gold Before Dr. Davis Did

I have been reading Dr. Davis article on changing base metal gold or silver or platinum. I have done the same thing for the last three years, first silver then gold and last platinum now you say that it might be so if a man is a mining engineer or some geologist. I am not one of the above but I can make these mettles out of several base mettles and know all about the birth of the nugget. Not of those mining men seems to know every citty is full of gold all you want to get some one to point it out to you. It seems to be as the President of the Pulman Collage in Wash he told the people if they would eat more meat they would get more brains and would know more they claim gass makes gold and in that way it would take several years to make gold. I can take raw material and in forty-eight hours change it to gold and silver about one of silver and three oz. of gould to the tun. A man can mak his own ore and in that way can make it as rich as he wants to. Gold mines are so getting so lowgrade that it does not pay to work them there is one here that assay nine dollar a tun and it cost \$8.50 to mine it. it use to pay at \$5 per tun, some have spent \$10,000 and only sunk 195 ft. of shaft. I have 75 quartz ledges that carry gold silver and copper now would pay to work and they are in a rich gold country the owners of the Cour D'Alene mines got one third of all they mine. I use to locate cole land in Pa. & I know more than men with book or geologist did.

JOHN HIRTMAN.

Rathdrum, Idaho.

## The Mining and Smelting Situation In Colorado

The mining and smelting industries in Colorado face a peculiar situation. The ordinary lead smelting practice in Colorado demands certain ore reserves, which are being rapidly depleted. Direct smelting of crude lead sulphide and lead carbonate ores is the exception rather than the rule. Iron ores are plentiful, but the majority of these carry very little gold or silver. Galena concentrates are available from the Joplin district, but the present price of lead, combined with high freight and the subsequent higher treatment charges, makes this source of lead prohibitive.

The lead smelters naturally refuse to accept ore which they cannot smelt at a profit. Such ore is principally a highly siliceous, dry silver ore of medium grade. "Dry" means with little or no lead. The mine owner cannot afford to do extensive development work to furnish the ore he can ship and at the same time leave good ore untouched because there is no market.

The Cripple Creek district has a satisfactory method in use; most ores in this district yield to cyanidation. Some pyrite concentrates are shipped direct to the lead smelters. Large bodies of good-grade copper sulphide have been opened up in this state, and an outlet for these ores would develop more.

The way out of this dilemma is the semi-pyritic blast furnace or copper matte furnace. A copper matte furnace can be run very nicely with a slag running 10 per cent higher in silica than a lead furnace slag, less iron is required, and lime rock can be utilized if iron is too low. The copper matte furnace requires less coke on the charge, as the heat of combustion of the raw sulphides replaces it.

Processes employing preliminary chloridizing and sulphatizing roasts are being perfected. Electrostatic methods of separating zinc from complex ores have made a marked saving of this metal, which heretofore was lost in the lead smelting practice.

Colorado has a bright future when the processes in use will treat the ores in sight instead of efforts being made to find the ores to meet the process. A large tonnage of ore susceptible to the semi-pyritic treatment is now opened up and awaiting.

A. S. WALTER.

Denver, Col.

## The Mining Engineer's Education

I have read the editorial, "Successful Engineers Need Not Apply," commenting upon a letter in "What Others Think" of the June 18 issue. This is interesting to me, and I am eligible. I had previously read in the *Atlantic Monthly* an open letter to the graduates of an eastern school by a graduate of thirty-five years ago. The night before I read your editorial I was discussing modern education with a successful banker, the head of two banks, and himself a graduate engineer. He has never followed engineering, but he has been the means of building up many businesses where engineering education has been helpful. This banker said: "I wish all of my important heads of departments had been educated as engineers." He holds that a knowledge of science and good English is essential in business today. The old classical education is fine when the student can afford the expense, but this must be regarded as additional education, and not primary.

One opinion held by many engineers is wrong. That is, that as a last resource any one can sell. If you cannot be a successful mining engineer, go into business. I am in favor of some education to change this view among mining engineers. A mining engineering education is a fine foundation for business success, and a general education, as given in a mining course, is broad and always useful. Why limit the number of mining engineers or talk about an oversupply of them? There are many business men who would pay cash for a good mining education.

You mention some engineers who have followed other work. I can contribute some information along that line. I know a mining engineer successfully running a bond house and one a paint factory; an electrical engineer is manager of a well-advertised brand of silk hosiery (all puns deleted). During the last year, I have had an opportunity to view many of the industries in the Middle West and the East. I find that at the present time in any business of this sort a broad engineering education is needed, and mining engineering seems to fulfill the requirements better than most of the other courses.

I would not recommend the automobile business, but an automobile is a high-priced machine and a technical engineering product. I wonder how many salesmen in the automobile business really are competent? I know that many machines of other kinds would be sold only by engineer salesmen.

An engineer is specializing in Chicago on advertising for engineering firms and is successful. Which would you prefer, a regular advertising man or an engineer with advertising experience to write the ads in the *Engineering and Mining Journal*?

It seems to me we should not worry about an oversupply of mining engineers; they have an education that will fit them for so many other things if they will only go into business. We cannot all be consulting engineers and managers, but we can find both honor and profit in many ways that the engineers of the last generation did not consider worthy. We will never have too much education.

COMMERCIANTE.

## Depths of Molybdenum Ores

In *Engineering and Mining Journal* of June 18, Dr. Otto Falkenburg, in his article "Molybdenum Mines in Norway," states, "The downward continuation of the deposits is of course a question of the utmost interest. Experience seems to have shown that the extent of a molybdenum deposit is relatively limited compared with deposits of iron ore, pyrite, and other ores which occur in great quantities, usually with 30 to 40 per cent and more iron and sulphur. The downward dimension seems also to be quite limited, and there is probably no molybdenum mine over 100 ft. deep."

In regard to molybdenum reaching great depths, the Gold & Copper Deep Tunnel Mining & Milling Co. of Elizabethtown, N. M., has crossed several veins of molybdenum ore at 4,500 ft. in from the portal of the company's tunnel and at over 1,100 ft. vertical depth. The veins are from 3 in. to 2 ft. wide and carry up to 50 per cent molybdenum. This ore occurs in a diorite formation and has a strong outcropping on the top of the mountain above the timber line. Picked specimens at this great depth show very high-grade mineral.

Elizabethtown, N. M.

W. P. MCINTYRE

## A Standard Mine Cost Statement

Stoping and Development Expenses May Be So Recorded as To Give Clear Insight Into Past and Current Operations and To Indicate Future Economies—Basic Principles Common to All Mines

BY H. J. C. MACDONALD

Written for *Engineering and Mining Journal*

**A** SUMMARY STATEMENT of mining costs, clearly and concisely displaying the usual cycle of work, is of first importance in compiling mine reports. A comparison of these cost records for consecutive periods shows the outgrowth of changes in methods, regulation, and supervision; suggests further beneficial innovations; and aids directly in the elimination of unnecessary expense. Clear-cut records of mining cost also render a basic service when preparing a budget of future expenditures, or an estimation in justification of some alteration or extension to reduce costs.

Where mining costs at two or more mines, not under one administration, are studied, a mystifying diversity of items will generally be found. A standard cost statement, applicable to all mines, would aid in a clear recognition of natural obstacles encountered at different properties; of the relative efficiency of various types of organization and of personnel; and of the effectiveness of alternate mining methods. The outcome would be a general and increasing use of the more economic ways and means.

### SEGREGATING STOPING AND DEVELOPMENT EXPENSE

The outstanding feature of mine work is its separation into dual spheres of activity—stopping and development—although the separate steps in breaking and handling rock in both of these provinces are similar. Development is from 10 to 20 per cent of the total mining expense; the rest belongs to stopping, and, being many times greater, will be investigated first. Stopping expenses group themselves into five divisions which will be found applicable to all mines. These five primary divisions are:

*Breaking*—Includes the cost of all efforts in the removal of the ore from place through drilling and blasting, but excludes money expended on the ore beyond a point where deposited by the initial blasting and bulldozing.

*Handling*—Includes the cost of all efforts aiding the movement of broken ore until such time as the ore shall be loaded for shipment.

*Timbering*—Includes the cost of all timber brought into the mine and the expense of placing it.

*Stope Filling*—Includes the cost of material either broken or handled, used to give support to the stopes.

*Expense*—Includes all costs which cannot be placed on the ore at any particular stage in its movement.

The breaking division represents the cost of breaking ore in the stopes. The ore broken will remain in the stopes a length of time, and in a volume, dependent upon the mining system or on the mine supervision. These pools of broken ore become the sources of ore streams that move forward over lines of transport to fill the shipment bins, but with the likelihood of further delay in some storage pocket along the route. Therefore, ore may not be shipped, or even leave the stopes, at the time

when it is broken; hence three distinct figures can be recorded—the tons of ore broken, tons handled, and tons shipped, during any one period.

### ADVISABILITY OF KEEPING SEPARATE COSTS FOR BROKEN AND SHIPPED ORE

All mine costs being referred to the shipments, a disagreement between this tonnage and the coeval mine tonnages will, if large enough, disguise the real costs per ton for the breaking and handling of ore. In this contingency, there must be an adjustment. The common way overlooks the usual small difference between tons handled and tons shipped, then reconciles the broken ore with shipped ore through opening a suspense account to take in all of the breaking expenditures, and from which to charge these out to operation as the ore is shipped. Office accounts of this type are a compromise between actual expenditures and estimated tonnages, here of broken ore in stopes, so there should be a conservative attitude toward the introduction of such accounts. Keeping separate costs for broken and shipped ore will always be well advised where the tons of ore stoped and shipped differ widely; where a large broken-ore reserve exists in stope storage, as in shrinkage stoping; or where the mine, stoping continuously, is shipping intermittently.

The active breaking and handling divisions have a closer relation to mine tonnages that have timbering, stope filling, and expense, for the greater part of the expenses in breaking and handling are per-ton charges which increase or decrease in direct proportion to the number of tons broken or moved. At open-stope mines, the breaking expenses will average 50 per cent and the handling expenses 25 per cent, or a total of 75 per cent of all mine expenses. However, as more timber and filling are used in support of the stopes, the timbering and stope-filling divisions will comprise a larger share of the mine expenditures.

### VALUE OF ACCURATE TIMBER COST KEEPING

Timbering is measured best, not by the usual tons of rock, but by the kind and amount of timber framed and placed. The timbering operation demands, as do the other cardinal branches of mine work, ample accessory reports in extension of the necessarily abridged data on the main cost statement. Even where timber is extensively utilized within the stopes, the costs of this division can be readily assembled in detail. The timber requirement is controlled by the physical character and shape of the orebody and surrounding rock. The conditions that determine the stoping system also determine the auxiliary use of timber. The need of support for the rock while stoping, and the resulting practice and expense of timbering, being in this manner related to the nature of the mineral deposit, and thereby local to a mine, the costs of this division are one of the best indexes for comparison among mines.



Waste rock is broken partly because it cannot be avoided in mining ore, and in part with intent when it is needed as a material for stope filling. A normal burden of waste must always be accepted in the same spirit that is evinced toward the other conditions imposed by the nature of a mineral deposit. Of the waste rock some may be useful for stope filling; a quantity may be useless and be discarded; and a third part may become so thoroughly mixed with and so dilute the ore that sorting must separate the two. This continual load will increase the expenditures in most operating accounts in amounts always known and recorded by a careful operator. Unless the tonnage of waste is abnormal, however, there is direct representation on the cost sheet only in the expenses for sorting and stope filling. Of waste broken for the express purpose of filling and supporting the stopes, a small tonnage may have to be transferred, but the greater amount can be mined to fall directly into the stopes. The cost of all such waste rock, or of other material used for this purpose, becomes a positive expense for separate record in the stope-filling division only where a greater expense to the mine has been incurred than would otherwise have been the case. The expense of stope filling, being peculiar to each mine, affords a second pertinent figure to contrast mines with one another.

#### DEFINITION OF EXPENSE DIVISION

The expense division contains those expenditures which fall as blanket charges upon the shipments. Several periodic time charges are here found, as the salaries of accountants and engineers. Month to month, these are more or less unchangeable. Also, a number of arbitrarily fixed ton and time charges are included, which are placed in equal adjudged allotments on each ton, or on each month, from some subsidiary account of deferred charges to operation; for example, cost of stripping the surface at mines. These expenses have been so collected, and are thus distributed: because of their character, as taxes, royalties, insurance, and head office expense; because of their large size, as some costly machine advisable to charge to operating account; perhaps because of their unexpected occurrence and size, as legal suits and unforeseen mine caves and fires. Such expense cannot fall at hazard upon the operating costs without spoiling the record of the active mine work. In general, these are obligations which the operating department must still account for, but which the mining company has paid for, and are distinctively an office division of overhead expense and indirect charges in whose absorption the accountant will have to take considerable care not to mask the operating costs. Subject to a one-time disposition rather than to continual regulation, these expense accounts require only a small portion of a mine operator's time and attention.

#### THE SELECTION OF OPERATING ACCOUNTS

The selection of accounts within each major division which will render the greatest aid in the guidance of mine affairs should be made by the man who sees most clearly the structure of the work. This person will be the superintendent or an operating engineer. An accountant records without so critical a dependence upon a clear idea of the relation of the cost to the work as an engineer, who is constantly called on to use his deductions therefrom as the basis of much future action. Accurate operating costs show where a smaller expense

of labor and supplies, or any utility, could have accomplished in the past the same useful work and end. This finding becomes a criterion of all present and future work and costs. The superintendent should segregate the operating costs and select the accounts personally, piloted by the following principles:

#### PREFERRED PRACTICE IN MINE ACCOUNTING

1. Recognize the well-marked minor operations distinctive to, and necessary for, the mining of ore, and under representative titles group all cost items into accounts to coincide with these operations.

2. Always include in each account the two natural parts, labor and supplies, to the complete absorption of all labor and supplies used in the mine.

3. List the accounts so as to follow, in so far as possible and practicable, the movement of the ore from stopes and headings to mill and smelter bins.

4. At the end of the list add all accounts that cannot be placed in the regular order, but which are important from their size and character, or are chargeable to the entire mine operation.

In the selection of accounts, the existing sequence of operations will be the first consideration. Then the size of a mine, as shown by the daily output, limits the amount of beneficial subdivision.

The work at a typical mine producing 1,500 to 2,000 tons of ore per day can be grouped under the five major divisions, and arranged in the following schedule of accounts. With significant omission or addition of a few minor accounts, and with a slight rearrangement for local routine, this schedule will have a general application to all mines.

STOPING ACCOUNTS	
Each Giving Labor, Supplies and Total	
Breaking	
Drilling	
Drill power	
Steel sharpening	
Drill repairs	
Drill pipe lines	
Explosives and blasting	
Handling	
Shoveling	
Mine train loading	
Haulage or tramping	
Car and locomotive repair	
Track maintenance	
Hoisting	
Crushing	
Sorting	
Aerial tram	
Mill or smelter train loading	
Repairs and extensions	
Timbering	
Framing	
Placing	
Stope filling	
Breaking	
Drilling	
Explosives	
Handling	
Shoveling	
Loading	
Haulage	
Expense	
Office and warehouse	
Survey, sampling and assay	
Superintendence	
Lighting: candle and carbide	
Lighting: electric	
Pumping	
Overburden	
General expense	

A proper account title at once brings to mind the costs ordinarily included, yet a sure method must be devised to prevent these cost items being charged into one account today and into another tomorrow. For the disposal of current charges a clerical force cannot wholly be relied upon. In the best practice an up-to-date typed list enumerating the charges in each account is retained constantly on file at the mine office. The correct contents of every account, and the proper placing of any

charge, can then be referred to at a glance. By this means absolute dependence is not placed upon the familiarity of office men with the work, or on their memory of the verbal decisions and precedents made by officials. Below is a specimen, the make-up for the main account in the drilling group, of what such a list should be:

#### DRILLING ACCOUNT

Labor: Miners, barmen and a proportionate part of the time of shift bosses.

Supplies: Bars, picks, hammers, shovels, scrapers, blow pipes, oil, oil bottles, pails, rope, wrenches, wedges, column parts, tripod parts, air and water hose with fittings.

All cost items occurring in the accounts can be placed in one of four groups: Ton, Time, Fixed-ton, and Fixed-time charges. As indicators of current mining costs, these rank in the order given. The several accounts are tempered by the character of the charges in the admixture, assuming in the main the characteristics of the predominating type. In this way arise the Ton accounts, varying from those reflective of a small number of tons, representing numerous workmen aided by tools, supplies, and the simpler machines, to those accounts which represent a few workmen directing machines of a power and capacity to handle large tonnages as a unit, such as locomotives, hoists, and crushers. The Time accounts, dependent on elapsing time, represent selected employees using their skill and training to the advantage of a greater part or the entire mine. The Fixed accounts represent obligations occurring in such a manner that the relation to present time or tons of ore has to be restored through set installments. Turning from Ton, to Time, to Fixed accounts, these are gradually transformed from active into passive guides for mine regulation, the expenses recorded in each account, compared to the changing volume of mine output, indicating less and less the efficiency of present mining.

#### APPORTIONING DEVELOPMENT EXPENSE

To complete the record of mine work, there must be added to the stoping expense, now grouped into accounts, the development expense. Owing to the multiple difference in the cost of breaking rock in the two provinces, notwithstanding similar routine work in each, there can be no intermixture of these two sets of cost figures with the preservation of comparative operating costs. It is immaterial whether a strict separation of the two results in a low or a high cost record for either: it is the sole manner by which clear-cut operating costs are retained. Stopping being in reality the breaking of rock in large openings or stopes, is referable to volume and the ton; development, the breaking of rock in restricted spaces or headings, is referable to cross section and the foot.

According to its threefold object—to gain access to, to expose, and to stope the orebodies—mine development can be placed in three groups.

Development of access includes those main haulage, drainage, and ventilation ways that are essential to secure and guarantee the uninterrupted succession of the desired daily shipments. The greater part of this type of development takes place just prior to the shipping days at the mine. The bulk of mine output issues forth along these working roads, so that their construction cannot be charged to a part of the ore reserves or to periodic shipments therefrom. Inasmuch as something is here created which will generally be of use throughout the life of the mine, this particular expendi-

ture is charged to capital account. Thus, not being identified with the operating costs, development of access can be dismissed with the note that the expenditure for this work is not an asset, in full amount, after the utility of such development has been impaired or in part destroyed.

Exploratory development is carried out in at least partial ignorance of the locations, shapes, and extensions of the ore shoots and bodies, and the lengths thus driven may be so ill placed that limited sections alone become of service in later exploitation. This work is highly speculative, usually creates no working or permanent ways, and indicates, rather than utilizes, ore reserves. A similar objective is shown in churn and diamond drilling. The cost of all development of this nature driven prior to the time of shipments can be absorbed in an account of deferred charges for later distribution to operating costs. Where, through continual search for erratic ore shoots, sporadic orebodies, or the ramifications of known ore shoots and bodies, exploratory development extends in serious amount into the operating life of the mine, the uncertainty ingrained in it makes this expense an awkward figure in the costs. Should it not turn out well, such development will be lost; if successful it can become a part of the working development of the mine; and for this reason the expenditure may have to be retained in an office account until the result of such work has become evident. In any event, a suspense account must be maintained in cases where exploratory development occurs in considerable amount and without normal correspondence with the current shipments.

#### IMPORTANCE OF STOPPING DEVELOPMENT ACCOUNT

Stopping development has an important duty in the breaking of ore, because it opens up, and keeps open, by-roads to the points of attack in the orebodies. Before the start of mine operation, costs are incurred through cutting the orebodies at enough points, and along sufficient lines, to enable the mine to begin shipping. This expense should be entered in a suspense account for later distribution to operating costs as that ore is shipped which this development makes available. Unless a large footage has been driven, such past-work accounts will be wiped out during the first few years of operation.

When the mine begins to stope and ship ore, development of this nature becomes the ruling type, and is in fact the chief concern of the producing establishment. Always having a definite relation to the tons of ore mined, this expense is especially and most clearly seen at those mines with a uniform system of stoping. Consequently, the factor of linear feet of stoping development to tons of stoped ore, normal to each mine, can be calculated. After a mine is running smoothly, stoping development comes more and more into step with the rest of the mine work. Where the amount done each month becomes stabilized at or near that figure normal for the mine, the cost can well be placed upon current shipments; where it does not, a suspense account will have to be maintained to protect the operating costs.

Therefore, when a great deal of past development has to be accounted for, or when the relation between current stoping and development is abnormal, the development costs must be figured to apply to the tons of ore shipped. This procedure calls for a calculation at each mine of the numerical relation between stoping and

development which is there normal. A general check on all accounting office and book dispositions of development exists in the fact that the costs of the several lengths must be charged off to expense or depreciation by the time these particular lengths have become useless.

Some of the smaller mines, however, are so uncertain in control and operation that obligations must be settled as incurred, and a final accounting made at the same time. Besides, in most well-established mines an opportunity exists—which can be taken advantage of by a discerning manager who looks well ahead of the present—to execute each month a predetermined foot-

ligible. Determine the difference between the factor for the year and the normal mine factor—feet development to tons shipped—and study the effect of the difference found on the record of operating costs and upon the cost of a ton of shipped ore. Where a thorough examination shows this effect to be not too great, the development expense can well be borne by the current shipments.

A twin member of mine work upholding the shipment of ore, development has to assume not only the obvious cost of its drilling, explosives, shoveling, and like expense, but also the implied cost in proportion with footage driven, holes or feet drilled, or tons broken or handled, of all mine expenditures. No phase of the basic relation can be ignored. A single item withdrawn from development costs and added by some sleight-of-hand to stoping costs results in the equal impairment of both.

DENOTING DEVELOPMENT COSTS

Development is given the following delineation on the cost sheets: First, a summary is affixed below the stoping expenses upon the mining cost statement, showing development under three headings, Drifting, Sinking, and Raising; second, in closer examination, three separate cost sheets show the details. Upon these three sheets development will be in accounts identical in construction with those used in stoping, but, stope-filling being absent, there are only four major divisions: Breaking, Handling, Timbering, and Expense. The summary below shows this disposition:

ON MAIN COST STATEMENT

Drifting	Labor
Sinking	Supplies
Raising	Total
Churn or Diamond Drilling,	
Labor, Supplies and Total	

ON THREE SEPARATE SHEETS

Drifting, Sinking and Raising	
Breaking	All usual accounts
Handling	Labor
Timbering	Supplies
Expense	Total

THE MINE COST STATEMENT

An active record of mine work should appear on the operating cost statements, reporting each month the bulk of expense for the stoping and development carried out during the month, and avoiding unnecessary use of suspense accounts for broken ore and development. The interdependence between stoping and development is so great that it is inadvisable to do otherwise. Through a reasonable local adjustment, the current work at each mine can be fully shown; the stoping and development costs for the month combined into an accurate figure of expense per ton of shipment. No small part in the value of mine operating reports consists in depicting actual work done, in order that the mine will be well regulated and its future safeguarded.

The accounts into which mine work has been grouped are arranged on a Mining Cost Statement (Fig. 1); printed, ruled, and spaced so that it can be filled in with a typewriter; compact, legible, and convenient in size (8 x 10 in.) for filing, reference, and for mailing. Every account has an ordinal number to facilitate ready reference between offices and officials of the mining company. Even design cannot be slighted in a form that is a concrete expression of the entire mine work. These statements are compiled and issued at or near the first of each month to include the costs of the preceding month, an interval of familiar length and

ACCOUNT	MINING COSTS					
	TOTAL	PER TON	LABOR	PER TON	SUPPLIES	PER TON
BREAKING (000)						
110 Drilling						
120 Drill Power						
130 Steel						
140 Drill Repairs						
150 Drill Pipe Lines						
160 Explosives						
HANDLING (000)						
210 Shoveling						
220 Mine Train Loading						
230 Haulage						
231 Car Maintenance						
232 Track						
240 Hoisting						
250 Crushing						
260 Sorting						
270 Aerial Tram						
280 Smaller Train Loading						
290 Repairs						
300 Timbering						
EXPENSE (000)						
400 Stope Filling						
410 Breaking						
420 Handling						
DEVELOPMENT (000)						
510 Office and Warehouse						
520 Survey and Sampling						
530 Superintendence						
540 Lighting, Cables, Candles						
550 Lighting, Electric						
560 Pumping						
570 Overburden						
580 General Expense						
SUMMARY						
610 Drifting						
620 Sinking						
630 Raising						
640 Diamond Drilling						
TOTAL EXPENSE						
Breaking Ore						
Handling Ore						
Timbering						
Stope Filling						
General Min. Expense						
Total Stoping						
Development						
Total Expense						

FIG. 1. FORM FOR MINING COSTS FOR ONE MONTH

age, calculated so near the normal burden that its cost will blend into current mine expense. In this instance, the mine cost statement reports the cost of all development actually done, combined into a true expense of the shipments.

METHOD OF DETERMINING PREFERRED ACCOUNTING SYSTEM

The following method indicates whether or not such a course will be feasible: Estimate the entire development needed to ship the known ore reserves, and calculate from this the factor, tons of stoped ore per foot of development, normal for the mine. Whatever the disposal of development expense, this figure will be the foundation. Decide upon that development footage which must be driven during the ensuing year, and examine this footage in relation to the shipments that are budgeted for the year. Incidentally, note the effect of the mixture of the limited tonnage of byproduct ore broken in the course of development with the mass of the stoped ore: in large-tonnage mines it will be neg-

with an obvious seasonal variation which often affects the cost of operation. As a statement to distant officials, who must possess confidence in the local superintendent, this offers sufficient repetition of the detailed costs. Yet the superintendent, to obtain an average mining cost for the current month, will need daily and weekly cost summaries, with, at times, supplementary details, to keep him constantly informed as to the current cost of production.

ACCOUNTING ROUTINE PRACTICE

The mine office staff must issue the mine expenditures in the set division of accounts, promptly at the stated times. This implies a proper daily labor distribution through time books and payrolls, and a proper daily supply distribution through a well-organized mine warehouse; it also implies that all other charges which cannot be absorbed directly into expense come from Suspense and Distribution Accounts created in independent form to receive and allocate these. In office practice, the Operating Accounts are separated rigorously from Capital Accounts for Mineral and Other Lands, Development of Access, Headworks, Buildings, Machinery, Equipment, Surface, Construction, and other similar accounts; they are fed by Distributing Accounts such as Machine, Carpenter and Blacksmith Shops, and Power each month; and are protected by Suspense Accounts such as Overburden, Exploratory Development, Stopping Development, and Broken Ore in Mine whenever there is occasion. This is the domain of an accountant, with whom the engineer should actively co-operate without undue sacrifice of his valuable time.

The statement on the mining cost sheet and the control which it gives through analysis are essentials to successful operation. The figures given enumerate the labor cost, supply cost, and total cost—in dollars and cents, and per ton of shipped ore—for each of the divisions and subdivisions. The main divisions are summarized at the bottom of the sheet in a manner to contrast stoping and development. The large number of figures on the page makes month to month comparisons difficult, so, with the assistance of a second form (Fig. 2), the detail of each account is spread out for the current year. At the top is a list of the account expenditures, copied from the mining sheets of the several months. Running down these columns the expenditures for consecutive months pass in review; at the bottom, a plot assembles graphically the cost per ton for the same account, period to period, in such a manner that fluctuations with the progress of time are brought forcibly to the operator's attention. This flashes light on a low or a high cost, and turns the glare of investigation about the plant upon the circumstances, perhaps overlooked in the supervision, that have bred this abnormal cost.

Retention on the final sheets of the labor and supply costs for all operating accounts makes a sound structural feature in this particular method of report. Without increased work for the office staff, as both costs are directly transcribed from the two daily distributions, a much greater insight is given into the costs. A real advantage is apparent in bringing forward the wage paid a workman alongside the expense for supplies that he has used, or which are directed to the same end as his efforts.

As labor expense usually averages about two-thirds of the total mine expenditures, a longer time is permis-

MINING COSTS

MINE	ACCOUNT Drilling No. 110						YEAR
	TOTAL		LABOR		SUPPLIES		
	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	
January	\$12,402.74	0.221	\$12,009.89	0.214	\$392.85	0.007	
February	12,587.80	0.209	12,106.03	0.201	481.83	0.008	
March	11,344.90	0.190	10,747.80	0.180	597.10	0.010	
April	14,013.03	0.227	13,271.31	0.215	741.72	0.012	
May	11,593.85	0.180	11,014.11	0.171	579.69	0.009	
June	11,075.63	0.225	11,603.05	0.218	372.58	0.007	
July	8,359.28	0.178	8,134.11	0.173	225.09	0.005	
August	10,327.80	0.180	9,810.70	0.170	517.10	0.010	
September	13,815.70	0.204	13,138.46	0.194	677.24	0.010	
October	13,138.77	0.203	12,491.54	0.193	647.23	0.010	
November	15,656.87	0.235	14,687.50	0.220	969.38	0.015	
December	10,845.61	0.227	10,272.27	0.215	573.34	0.012	
TOTAL YEAR	146,131.91	0.207	139,256.76	0.197	6,875.15	0.010	

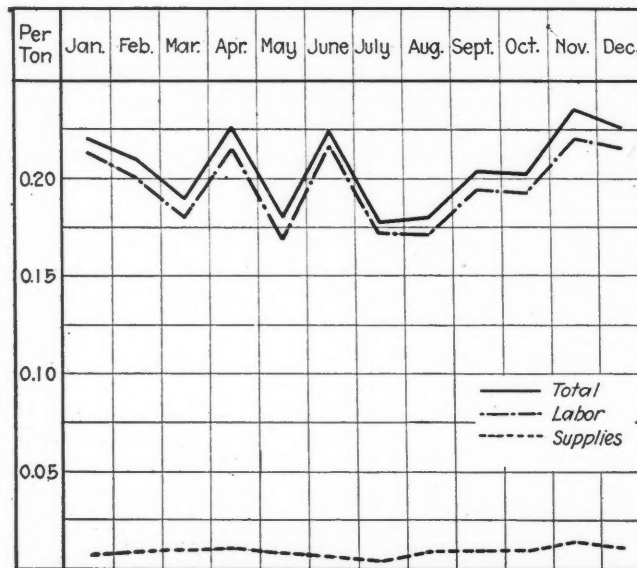


FIG. 2. FORM FOR SUBDIVIDED MONTHLY MINING COSTS FOR A YEAR

sible for its investigation. A list of mine workmen by occupation, customary and general in application to the mining industry, with numbers employed, wage, and total hours worked at the mine in each pursuit, accompanies the cost report. Also, a similar classification stating the numbers and occupations of the men engaged in each mine operation which is represented by an operative account. Increase or decrease in the numbers at the several tasks, and in the specific occupations, will be uncovered, revealing whether or not changes in labor efficiency have taken place. Further, to labor belongs a large share in the responsibility for the remaining third of mine expense, the cost of supplies, as the workmen are answerable for conservation in their use. A supply classification in a few well-defined groups, to apply to all mines, with the costs and quantities absorbed during the month, must also accompany the operating cost statement.

WHAT A COST SHEET MUST CONTAIN

Certain tonnage factors must be at hand, both in those amounts normal to the mine and in those recorded each month, to obtain an adequate conception of the operating costs when these are based upon the current shipments. These tonnage factors are indicated by the following composite statement of the ideal conditions that give absolute comparison of costs month to month. The stoping and development remain in normal relation; the mine handles and ships exclusively the ore broken during the month; the tons of ore to tons of waste in stoping, and the same in development, remain as two constant ratios throughout the months; further-

more, the tons of ore derived from these two provinces remain in constant proportion in the shipments. Therefore, there must at least be stated on the cost sheet, or upon companion tonnage reports, the following six figures: (1) Tons of ore and (2) tons of waste broken in stoping; (3) tons of ore and (4) tons of waste broken in development; (5) tons of ore shipped from stoping; and (6) tons of ore shipped from development.

Periodic investigations that utilize the record of past and current costs operate to cut down the mining expenditures and counteract their unceasing tendency to rise. In these investigations the general cost and tonnage figures for the month will be first observed; then the relation, and the expense shared, between stoping and development. Next, the nature of the charges will be considered, to find if the several types of cost items occur in normal amounts, and more carefully to canvass the relative disbursements through Ton, Time, and Fixed accounts. The dual participation of labor and supplies can now be traced through the work.

Turning at last to the meter of mine work, tonnage, one must investigate painstakingly all phases of this, the most vital and intricate aspect of the subject. Thereafter, aided by detail plots and tables, the accounts are probed into, one by one, and all those that parade an excessive outlay on a ton of shipped ore will be marked, and the precise reason for the excess and wasteful margin sought after. A diligent search for all those elements that deform the economy of mine work will unfold the more evident defects in operation and organization, and awaken a keen interest in the origin and elimination of even the smaller hidden flaws.

Through recurrent investigations of mining costs, occupying at most three or four office days out of each month, the operator competent in cost analysis can ascribe a great part of the result to his personal skill should he succeed in reducing expenditures satisfactorily. In any case, he has become a sound critic of his own mining costs, and knows what the desired lowest operating cost possible will be. Supervision is a mixture of physical overseeing with technical directing, each having its advocates; without concurrence with either side, it is certain that mine work can better be inspected through the tonnage costs if these are clear and accurate. And true and telling representation is easy to attain through an orderly and methodical arrangement of the mining accounts that presents faithfully the everyday features and routine common to all mine work. In fact, mining costs can be standardized by simply permitting the cost records at all mines to show the general, the universal structures, of mining.

### Hunting for Mechanical Trouble

Trouble hunting is the particular job of the repair mechanic. Although careful listening is of service in finding the general location of faults in operation in a machine, the taking down of the parts and visual examination are the important methods generally used to ascertain the specific source of difficulty. Good light is of the greatest service, and there is nothing handier to the repair man than a portable lamp on a cable of sufficient length to give access to the principal machines in operation. A portable lamp with attached cable permanently installed at a central point should always be at hand, so that the repair man will not have to hunt around to get it when called upon to help a "sick" machine.

### South African Diamond Mining in 1920

The estimated value of the diamonds produced in the Union of South Africa during 1920 constituted a record for the industry, according to *Commerce Reports*. The value of the mined, alluvial, and debris-washed diamonds totaled for the year the sum of £14,762,899. The bulk of this amount, or £12,289,602, came from the mines, £2,441,440 was won from alluvial mining, and £31,857 from debris washings. The previous record year was 1919, the output being valued at £11,734,495. Prior to 1918 the high mark was 1913, when diamonds were produced to the value of £11,389,807.

The last year's output aggregated 2,545,017.47 carats, of which 2,312,436.55 came from regular mines and 221,460.17 from alluvial mining; 11,120.75 carats were recovered from debris washings. It is to be noticed that production in the last six years has been practically constant, except for 1914, which was an abnormal year. The year 1917 was the high mark in this period, with 2,902,416.51 carats, and 1916 the lowest with 2,346,330.21. In the last three years production has fluctuated approximately by only 50,000 carats. The year 1910 is still the record by volume for the industry, 5,456,558 carats being taken in that twelvemonth.

Though production value constituted a record, the sales of diamonds in 1920 fell below the total of 1919 by £3,411,257—from £13,739,662 to £10,328,405. This decrease is accounted for by the large drop in the volume sales, which were only 1,765,993.82 carats, as compared with 1919 sales of 2,648,931 carats. The sales total would have been even less in value except for the increase in the price realized, which was 117s. in 1920, against the 1919 figure of 101s. per carat. This high figure reflects the effect of abnormal conditions on prices, as the price realized per carat in 1917 was 51s. 1d. and in 1918 was 54s. 9d. That these high prices stimulated production is evident in that there were nineteen mines producing in the Union in 1920, compared with sixteen in 1918 and eleven in 1917.

The fluctuating character of the diamond industry is indicated by the fact that though the value of diamonds from mines rose from 75s. 9d. in 1919 to 106s. 3d. per carat in 1920, the value of alluvial diamonds declined from 261s. 6d. to 220s. 6d. On the other hand, when the increase in the value of the alluvial output between 1918 and 1919 was from 134s. 6d. to 261s. 6d. mine output increased only from 51s. 5d. to 75s. 9d.

Because of the special manner in which diamonds are marketed through the Diamond Syndicate, it is interesting to note the difference between the production and sales figures. In 1920, sales by volume were 779,024.65 carats under production. In 1919 sales were 60,813.95 and in 1918, 104,572.45 carats above the output. In 1917 the position was reversed and production exceeded sales by 586,206.90 carats, whereas in 1916 such excess was 54,383.33. Taking this five-year period, the total production of diamonds exceeded the total sales by 1,254,228.48 carats. During this same period the value of output exceeded realization value by £4,114,968.

The production within the Union is divided, in order of importance, among the Cape, the Transvaal, and the Orange Free State. The Cape contributed 1,364,706.25 carats, of which 1,258,129 were from the Kimberley mines. The Transvaal production was 905,297.05 carats. The share of the Orange Free State was 275,014.17 carats, of which 269,178 carats were from the nine mines situated in that district.



THE KELLY MINE, AT RANDSBURG, CAL., WITH GRADY SHAFT AT LEFT

## A Sagebrush Silver Producer

Kelly Mine, at Randsburg, Cal., Establishes Enviably Record for Steady Output Of High-Grade Silver Sulphide Ore—Main Shaft 580 Feet Deep and Mine Opened Up to 350 Level—Adjoining Grady Lease Shows Interesting Ore Occurrences

BY JAY A. CARPENTER

Written for *Engineering and Mining Journal*

THE KELLY MINE has been described<sup>1</sup> as a mine that started at the sagebrush roots. To a depth of 50 ft. no dump was maintained, everything mined being shipped to the smelter and yielding \$96,000 in dividends. At the time of my stay in Randsburg in the late fall of 1919, having come directly from the Divide district in Nevada, I was mentally comparing the two new silver mines, the Kelly and the Tonopah Divide, as both possessed remarkable bodies of oxidized silver-bearing ore, with the possibility of developing sulphide orebodies with depth.

### A SPECULATOR'S PARADISE

Around the Divide mine the country was dotted with large headframes and with hoist houses filled with expensive prospecting equipment. In the town of Tonopah the many stockbrokers' offices were jammed with speculators scanning the blackboard for the latest sales of their favorite Divide promotion, and who sought the latest "dope" from their friends, be they promoters, superintendents, or miners.

In Randsburg a few lessees were to be seen slowly windlassing from as deep as 50 ft. to 75 ft. The more capitalistic lessees had low tripods and noisy little hoists. In the town, the people refused to be excited by this freak occurrence of silver in an old-established gold camp, and the only crowd on the street was that in front of the postoffice on the tri-weekly mail days.

In February and March of this year (1921) I visited both districts again. In the Divide district the cold winter winds were whistling unheard amid the many deserted headframes, and in Tonopah the minds of the people were so dazed by the meteoric descent of their hopes, as registered in the stock board, that they failed to realize in their gloom that the Divide is a steady shipper of oxidized milling-grade ore, and that the camp of Tonopah is one of the most fortunate and one of the busiest camps in the West.

In Randsburg the people are beginning to speak of the Kelly mine with pride, but they proceed on the even

tenor of their way, and all the lessees except one have abandoned the windlass for a lease in the Yellow Astor, for a chair by the stove near the soft-drink bar, or at the round card table near by. Meanwhile the one lucky lessee has three shifts a day working to get out the ore in sight before the lease expires, and the Kelly mine is going steadily along shipping a car a day of high-grade silver sulphide ore and paying extra dividends on top of monthly dividends. Such is the contrasting psychology of the two camps under the same stimulus of the finding of a new mine and its development.

In contrast with the rapid development of the Divide properties, the Kelly mine has been opened up by crosscuts and drifts on the different levels to only the 350 level, but the main shaft has now reached a depth of 580 ft. with main east crosscuts being advanced on the 450 and 550 levels. In addition, the Grady lease is mining ore on its 315 and 360 levels, and has intersected the vein at 415 ft. in its vertical shaft, and in a crosscut from the bottom 450 level. Though the mine has been opened up by drifts on the veins only to the 350 level, this work has disclosed a remarkable change in the nature of the ore and in its occurrence.

### ORE OCCURS IN FLAT, SLIGHTLY DIPPING LAYERS

The occurrence of the ore near the surface has been described as follows:

"The shaft more nearly resembles a glory hole, being about 20 ft. wide and 30 ft. long, the length being along the N. 10 deg. E. line of the bucket skids, and coincides with the approximate strike of the reef. The most noticeable feature on going down the shaft is that the ore lies in nearly flat layers. The layers are very distinct and are horizontal north and south, but dip from 5 deg. to 20 deg. to the east. They vary from hard blue quartz to oxidized soft quartz, all carrying silver, but the richest are the softer layers, which are spotted with horn silver. This appearance of the ore lying so flat led many to believe at the start that the ore was a shallow surface deposit, or more of a blanket vein. However, the bucket skids to the 50 level rest on

<sup>1</sup>*Engineering and Mining Journal*, Dec. 27, 1919.

a well-defined slip striking N. 30 deg. E. and dipping 78 deg. to the east, both dip and strike being the same as the main reef.

"A careful scrutiny of the sides of the shaft shows vertical stringers of quartz cutting in a continuous line through the flat layers. The stringers are parallel and have the same strike and dip as the foot-wall slip. A crosscut to the east shows one of these stringers 30 ft. away from the foot wall. It has a width of nearly 2 ft., assays high in silver, and could be called a vein by itself. From the above observations it is reasonable to form the hypothesis that the mineralizing solutions ascended along fissuring within and parallel to the dike, and that these solutions also spread out horizontally along the horizontal fracturing in the rhyolite. If this hypothesis be tangible, then there is excellent possibility of finding ore at depth along the strike of the reef."

The above description was written in October, 1919. The history of the development of the mine since that time I have obtained from an excellent report by M. B. Parker, consulting engineer during 1920, and from a personal observation and study of the mine.

Subsequent development work on the 50 level showed that ore of shipping grade extended for 220 ft. along

On the 150 level drifting on the shaft fracture gave practically no ore, although that on the north-south fracture gave shipping ore for 100 ft. in length. At 110 ft. east from the stope a cross fracture with a northeast-southwest course was encountered, and drifting disclosed considerable ore of milling grade. A crosscut to the west for 90 ft. back of the shaft fracture in the foot wall disclosed nothing but altered schist until it encountered another silicified parallel fracture plane. The work on this level was disappointing after finding such remarkable orebodies on the 90 level, and apparently confirmed the predictions of the many who compared the orebodies with the enriched bodies of silver chloride ore that had been found at Calico and other deserted camps of San Bernardino County.

Also, the work on the 90 and 150 levels had indicated that the veins did not persist far to the north, east or south, owing to their encountering a fan-shaped fault plane.

The fault plane on this level has an average dip of 45 deg., and is marked by a band of black clay containing pyrite. Back of the latter the country rock is soft and greatly altered, folded, and twisted. It appears



ANOTHER VIEW OF THE KELLY MINE (AT LEFT), SHOWING DUMP. GRADY SHAFT AT RIGHT OF PICTURE

this shaft-fracture plane. The ore on the south side of the shaft down to the 50 level still remains unbroken, and 14 ft. in width averages \$329 a ton. The 2-ft. vein of rich quartz ore already mentioned proved to have a north-south course, and for 100 ft. to the south it is known now as the Meroney stope, and its intersection with the shaft fracture to the north made the wide orebody in the Kehoe stope.

#### RICHEST ORE AT VEIN INTERSECTIONS

On the 90 level, 400 ft. of drifting was done along the shaft fracture. The first 125 ft. north from the shaft was in shipping ore, a good part of it averaging \$250 to the ton, with the remaining 100 ft. of the drift of a fair milling grade. The richest ore was along the intersection with the north-south vein, producing the rich Parker stope. For a distance of 168 ft. south of the shaft spotted values were in evidence, but all of this was of milling grade for 85 ft., and the remainder showed low values only. The north-south vein was stoped for 100 ft. south of its juncture with the shaft fracture, and was known as the Treasure Box stope. One car of forty-two tons from this stope had a gross value of \$52,000. Shorter parallel stopes were opened up on each side, but these with depth merged with the center one, thus showing the tendency of the ore to form along the parallel fracturing in the schist.

to be the same granitic schist, but the horizontal bedding planes are not in evidence, and it lacks the silicification of the ore-bearing schist. From its appearance it became locally known as the "mud wall," and little prospecting work was carried on in this formation, as it was the same that the unsuccessful surrounding lessees to the north, east, and south had encountered in the shafts.

#### DEPTH OF SILICIFICATION DETERMINED BY FOOT-WALL CROSSCUT

Crosscuts that were driven in the foot wall of the shaft fracture to the west under the big dike failed to find ore, and also determined the fact that the silicification of the reef at the surface did not go down, but partakes more of the nature of a crest. There is no acceptable evidence that the reef is a dike of silicified intrusive rock, parallel to many rhyolite dikes to be found in this district, but, rather, it appears to mark a fault scarf along which there was considerable movement and silicification. The crosscut from the shaft showed the country rock to be the granitic schist so common to the Randsburg district, although altered and silicified by the same intense fissuring and silicification that produced the reef. Frank L. Hess, of the U. S. Geological Survey, terms this schist a mica-albite schist of probable sedimentary origin and speaks of stratas

of quartzite 6 in. to 6 ft. wide interbedded with the schist.

With the limits of the persistency of ore found in all lateral directions and a diminution of values on the 150 level, the development of the 200 level was watched with apprehension. The shaft fracture was barren, and the fracture vein that yielded the rich ore on the 90 level was also barren. However, the first good ore was encountered at 120 ft. in the northwest-southeast cross vein, and at 140 ft. a new north-south vein was drifted on and the ore shipped for a distance of 135 ft. The stope on this ore is known as the Harrell stope, and it does not connect with the Jameson stope above or any known orebody on that level. A raise on this vein at the south end showed the vein to have the same dip to the east as the shaft fracture, but at 30 ft. it encountered the mud wall lying at a flat angle, and the vein stops. On the upper levels where the mud wall with a steep pitch intersects the veins there is naturally ore along the mud wall, but where the pitch is flatter mineralization has not occurred along this so-called mud wall. The crosscut was continued beyond this high-grade north-south vein, and at 30 ft. drifting was begun on another north-south mineralized fracture. An east crosscut from this drift connects with the west crosscut on the 190 level of the shaft of the Grady lease. The mud wall cuts across the west drift at a flat angle and through the Grady shift at about 200 ft. in depth.

The ore on the 200 level was mainly sulphide ore, and though the sulphide found in the oxidized ore was principally stibnite, the 200 level showed more pyrite and argentite.

#### VERTICAL QUARTZ VEIN REGARDED AS PRIMARY

On the 250 level the crosscut from the shaft at a distance of 112 ft. struck a vertical quartz vein from 6 in. to 1 ft. wide assaying 200 oz. in silver. The quartz was close-grained with the silver sulphide minerals and pyrite apparently deposited concurrently with the silica, which Mr. Parker terms primary ore. At 144 ft. another nearly vertical vein was encountered, and this has been opened up as a continuous stope of shipping ore for 150 ft. to the Grady lease line. This stope is known as the Hughes stope, and connects with the Harrell stope above. The vein found at 112 ft. joins this vein 60 ft. to the east, and the stope over this distance is known as the 112 stope. The main crosscut also encountered another mineralized north-south fracture at 220 ft. out, but in a distance of 260 ft. to the east the mud wall was not encountered, probably because it lies in a blanket formation above.

On the 300 level the crosscut from the main 74-deg. inclined shaft picked up the north-south vein, and for a distance of 100 ft. to the Grady lease line this is being stoped 6 ft. wide as the 614 stope. The vein here has a strike of a few degrees east of south, with a dip of 80 ft. to the east. The end of the stope against the Grady lease line shows a beautiful band of nearly solid black sulphides from 6 in. to 12 ft. in width, with streaks of sulphides into both irregular walls.

At 180 ft. in the crosscut another parallel vein has been drifted on for 70 ft., giving considerable shipping ore. The peculiarity of this vein or fracture is that, contrary to all the others, it has a dip of about 55 deg. to the west. It apparently shows up on the No. 5 level as the mineralized fracture at 220 ft. out from the shaft. The main east crosscut on the 300 level has

been extended 280 ft. with the chance of picking up more north and south veins in the silicified schist.

On the 350 level a north-south vein containing good ore is being drifted on; on the 450 level a drift at 115 ft. on the crosscut gave mill ore, and the crosscut on the 550 level unexpectedly encountered shipping ore 4 ft. in width at only 80 ft. out, with 15 ft. of milling ore just beyond the shipping ore.

The development work on these three lower levels is necessarily north of the Grady lease line, though the rake of the ore shoots indicates that the best ore would be found in the Grady lease. However, the 550 level is below the depth limit of the lease, and a south drift on the vein will be carried out under the lease for a future connection. The east-dipping vein of stope 614 on the 300 level has been opened up at greater depth by the Grady lease from a vertical shaft sunk at a point 300 ft. S. 52 deg. E. from the main Kelly shaft.

The lessees on the projected outcrop of the Juanita vein just west of the Kelly shaft found no ore, and the workings in the Kelly mine show no vein with this strike, but a line through the center of the rich ore shoots takes the same course. The main shaft on the lease started in wash and then entered the same altered schist that characterized the formation beyond the mud wall in the Kelly mine. At about 200 ft. the shaft entered the siliceous schist, the dividing line in the shaft being shown to visitors as a black band striking across the shaft nearly horizontally at the same flat dip assumed by the bedding planes of the siliceous schist.

Below this point in the shaft the first silver values were obtained in narrow seams, striking northerly and southerly. On the extension of the time of the lease the disputed question of apex was dropped, but the lease was limited to a block of ground 120 ft. square, with the new shaft as a center, and to a vertical depth of 450 ft.

#### SHIPPING ORE PRESENT IN GOOD QUANTITY

The east drift from the 310 level of this shaft encountered rich ore, which has been drifted on north and south to the limits of the lease block, and a 25-ft. raise at the north face connects with the face of the south drift of the company's workings under the 615 stope, thus giving a continuous shoot of shipping ore 200 ft. long, with the southern limit still undetermined. This same rich vein has been drifted on for 40 ft. on the 360 level of the lease, but the drift is more like a room, as it produced shipping ore for considerable width. The shaft at 415 ft. cut through the vein, giving 12 ft. in its depth of shipping ore, and the crosscut on the 450 level has disclosed good ore below, which the company will mine at a later date. Meanwhile, the fortunate lessee has three shifts developing and extracting ore, with the lease to run until January of next year.

The ore as disclosed on the 300 level drift of the company workings and the 315-ft. and 360-ft. drifts on the Grady lease occurs in what would generally be termed a quartz vein. This vein does not have a consistent width or sharp walls, or any width of clay gouge. However, on one side or the other of the ore there is usually a well-marked slip, with a slickened clay or talc the width of a knife blade. Apparently it follows a fracture plane that in passing through the nearly horizontal schist made a ragged break. The vein filling is a dark quartz carrying pyrite and silver sul-



phide minerals, all finely crystallized. Where there is quartz there are sulphides also, but often for a few feet both vertically and horizontally the ore appears to the eye as nearly solid sulphides for a width of 6 in. to 18 in., and has a specific gravity of 5.0. A composite sample from 180 sacks of this sulphide assayed over 2,400 oz. in silver.

A few engineers believe that the sulphide ore of the 300 level, and that on the levels below on the Grady lease, are of secondary origin, but the general opinion of the engineers is that it is a primary ore. The soft black argentite and native silver are both absent from this ore. In fact, native silver, which is always presumed to be secondary, is not found in the ore in the Kelly mine. One engineer stated that he had seen small flakes of native silver in rich ore on the 150 level. The ore from the 150 level and upward carries the silver as the black soft sulphide and the flaky chloride of silver. If the present rich sulphide ore should prove to be partly secondary, its continuation to at least the 550 level has been assured by the present development work, which gives shipping ore for many months to come.

#### MINING COMPLICATED BY ENRICHED VERTICAL CROSS FRACTURES

The veins containing the sulphide ore have so far disclosed ore shoots over 200 ft. long, but at the end of some of these the veins dwindle down to a mere but persistent seam or fracture in the schist, and may open up later into pay ore. In addition to the rich sulphide ore so easily traced by the eye as a distinct vein inclosed by country rock, this rock shows fine veinlets of sulphides parallel to or branching out vertically from the main vein. Thus the veins as finally mined for milling ore will have assay walls only, and this problem of mining is further complicated by enriched vertical cross fractures between the general north-south veins and by the fact that where the milling values play out on the north-south fracture they may come in on another one a few feet away.

The company owns the ground for several hundred feet to the south and north along the projected course of the sulphide veins, and also the ground for 500 ft. to the east beyond the Grady shaft, in which there is the chance to encounter parallel veins similar to those found in the present development to the east from the Kelly shaft. On the lower levels the mud wall has not been encountered, and it is probable that the mud-wall formation does not extend to this depth.

#### SURFACE ENRICHMENT THEORY DISPELLED

Those who prophesied that the ore was just a surface enrichment in the softer schist above the harder unaltered granite of the district have seen the ore change from a silver chloride ore in a blanket or pancake formation to a silver sulphide ore in nearly vertical quartz veins, and they have yet to see the granite. It would appear that the silver-bearing solutions followed upward along the nearly vertical fractures in the horizontally bedded schist. Near the surface either the mineralizing solutions have penetrated horizontally into the softer layers of the schist or else the decomposition of the original minerals due to weathering resulted in the redeposition of the silver values as chloride and sulphide in the oxidized and altered horizontal layers of the schist.

M. B. Parker, the consulting engineer, in August,

1920, estimated the ore reserves above the 250 level to be about 19,000 tons of \$100 shipping ore and 70,000 tons of \$20 milling ore. After a careful sampling of the mine in narrow-width samples in August, and considering the new development work on the 300 level, he raised his estimate of shipping ore to about 18,000 tons of \$180 ore.

The tonnage of milling ore has been difficult to estimate, for there has been no attempt to block it out, as development so far has been confined to the more profitable work of finding and blocking out shipping ore. Meantime, the management announces, "investigation has been begun in contemplation of the erection of a mill as against the return of pre-war prices of silver around 50c., and through which the management looks for continued if lessened profits," but "for the present the policy of the management will be to market every possible ton of shipping ore."

The mine was discovered in April, 1919, and by January, 1920, a dividend of \$99,500 had been declared. Since that date, fourteen regular monthly 2c. dividends have been paid, amounting to \$358,400. In addition, two special dividends of 10c. each have been disbursed, or an extra \$256,000, giving a grand total of \$713,900 in dividends. This amount, together with money in the treasury, March shipments, and March royalties, will give a million dollars in profits on the mine's second birthday, with ore reserves and possibilities of shipping ore that should give an equal profit in the next two years.

#### Ontario's Gold Production Recovering

Although there was a decline in Ontario's gold production for the first quarter of 1921, as compared with the first quarter of 1920, this situation will undoubtedly be reversed for the first half of the year, according to the Ontario Department of Mines, the falling off being due to hydro-electric power shortage. Since early in April an ample supply of power has been available, and the Hollinger mine is treating 3,300 tons of ore daily. The following table shows the output for the quarter:

Source	Ore Milled, Tons	Gold Recovery— Ounces	Value	Silver Recovery— Ounces	Value
Porcupine.....	241,353	100,477	\$2,077,048	17,935	\$10,568
Kirkland Lake.....	23,719	10,576	218,612	1,168	675
Total.....	265,072	111,053	\$2,295,660	19,103	\$11,243

In addition, 43 oz. of gold, worth \$862, was recovered from nickel-copper refining operations. Gold mining companies received further a total of \$331,356 by way of exchange premium, or as earnings on credit balances in the United States. Gold shipments go to the Canadian mint and are paid for by check on New York. Three mines at Porcupine—Hollinger, Dome and McIntyre—were producing, and at Kirkland Lake Lake Shore, Teck-Hughes and Tough-Oakes. In May the Wright-Hargreaves, at Kirkland Lake, commenced milling operations.

#### Electric Vibration Applied to Gyratory Crusher

A new type of gyratory crusher is attracting much favorable comment from mining engineers around New York who have seen the working model. The central shaft is electrically vibrated by a device similar to that used in the Mitchell screen. Much smoother operation and greatly increased capacity are expected to result. The new machine is not yet on the market.

# The New Price Levels in Chilean Nitrate

The Country's Prosperity Greatly Dependent on Local Nitrate Industry—Decline In Prices Has Caused Economies To Be Introduced—Chilean Government Is Participating in Solution of Marketing Problems—American Machinery Used

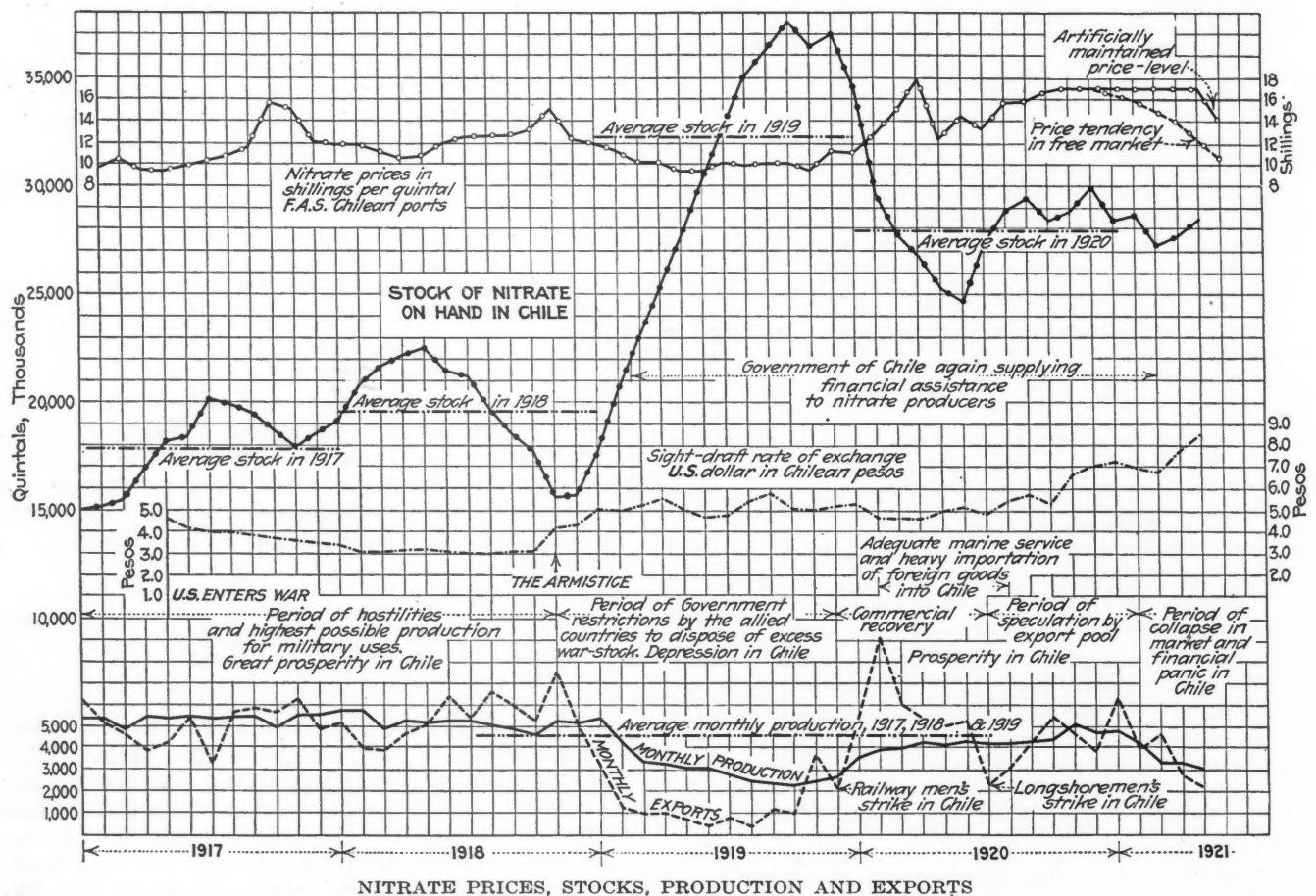
BY DONALD F. IRVIN

Written for *Engineering and Mining Journal*

**I**N COMMON with all regions that depend upon a single basic industry for their support, Chile has suffered greatly by the recent rapid collapse in prices and abstention from buying by the world at large. It is generally known that the nitrate industry normally furnishes employment for from 50,000 to 60,000 workers in the Chilean nitrate area, thus creating a demand for large amounts of staples to supply their needs. At the same time, the profits derived from an export tax on Chilean nitrate, set at 2s. 4d.

business bulks large in Chilean affairs, from any point of view.

The government bases its annual budget chiefly upon an estimated annual sale of Chilean nitrate in other countries for the fiscal year, and this budgetary estimate involves the interests of the governmental organization, the military establishment (army and navy), the civil employees, including the government railway, as the latter is not self-supporting, but has been the source of an enormous deficit annually in recent



per quintal of 101.4 lb., have provided the larger part of the Chilean government's annual revenue, and have exceeded usually the equivalent of \$35,000,000, United States currency, in recent years.

The profits from the operation of the many stock companies engaged in the production of sodium nitrate in Chile have furnished large totals, which during 1920 reached as much as 19,500,000 pesos, Chilean, for one of the three larger nitrate organizations—a sum approximating \$4,000,000 in United States currency at ordinary rates of exchange. Bearing in mind the scanty population of Chile, which is now claimed to be about 3,800,000, it is easily realized that the nitrate

years, and the foreign holders of Chile's external obligations.

In the agricultural regions of Chile, the sale of beef cattle, flour, beans, and general farm produce depends greatly upon the purchasing power of the inhabitants of the nitrate region in the north of Chile, and the investing public looks to nitrate company shares to provide an income from invested capital, both foreign and Chilean in origin. Coastwise traffic in Chile has grown up from the needs of the several "nitrate ports," and the employment of unskilled labor in the nitrate fields has become of such importance in Chile that the degree of employment, or the lack of

it therein, has become an accurate barometer of Chilean commercial conditions generally. This brief statement suffices to show the gravity of the situation caused in Chile, when nitrate sales fail to materialize at the expected season, which situation developed almost coincidentally with the downward slide in prices in the late fall and winter of 1920.

It should be noted that for over a year the "Association of Nitrate Producers" has regulated the selling price of nitrate in Chile, and hence natural tendencies were not duly reflected in the nitrate market, as is usual with those commodities marketed in free competition.

#### NITRATE PRICES SHOW A LARGE DECLINE

The accompanying graphs, compiled from official statistics, show that an immediate slump in nitrate sales followed the cessation of hostilities in 1918, and for many months afterward depression ruled in Chile. In the late fall of 1919 active buying was resumed, and the market quickly took on a "boom" character, the price running up to excessive figures. At this time speculation undoubtedly began in future sales of nitrate. Speculative interests in nitrate obtained a rigid price guarantee from the "Association of Nitrate Producers," covering the winter of 1920 and spring of 1921, during which period their venture should have culminated.

The enormous stock of nitrate which had accumulated in Chile during the post-Armistice slump was exported in large part, but the nitrate plants continued to produce at high capacity in 1920, and so kept the stock on the Chilean coast at a continuously high figure.

It had been customary to expect nitrate inquiries and sales for fertilizer use in the fall months, culminating in heavy shipments at the end of the calendar year, and this expectation prevailed in Chile in 1920, as in previous years. Coincidentally with the collapse of commodity prices at about that time, it was soon found that the cotton, sugar, and grain growers were not in the market for fertilizer, as their own products were not in the customary demand, and immense quantities of 1920 crops were being carried over into 1921, perforce. This condition left an unwieldy stock of unsold nitrate lying in the warehouses of the northern hemisphere, which was to have been sold in the fall and winter of 1920, but which instead remained to be a drag upon the already excessive stock lying unsold on the Chilean coast. Hope was still felt that sales for spring fertilizer could be made in January, February, and March of 1921, but commercial distress began to be felt in Chile at the end of 1920, and when March, 1921, was passed without sales, it was evident that stoppage of nitrate production was imperative, in order to work off existing stocks and avoid a general crash.

#### REPARATIONS AND SYNTHETIC NITRATE IMPORTANT CONSIDERATIONS

Closely linked with the industry is the economic well-being of the Central European countries. The form of reparations payable by Germany is of great importance to Chile, as the purchasing power of Central European farmers governs the sale of nitrate to Chile's greatest single pre-war consumer of nitrate—the sugar-beet growers of Germany, Austria, and Poland. Of great significance also is the attitude which may be

taken by the German government toward adoption of a protective tariff for the stimulation and maintenance of the synthetic nitrate plants now operating in Germany, apart from the automatic restriction exercised upon imports into Germany by the unfavorable international exchange.

The Chilean producers of nitrate now find themselves facing a market temporarily oversupplied, and a compulsory stoppage of the industry, or most favorably, a very low rate of production, as compared with normal. At the same time, cessation of exports has developed a dislocation in foreign exchange, whereby the Chilean peso is now (May, 1921,) worth approximately \$0.11, United States currency, instead of its usual value of \$0.20, United States currency, and likewise there is widespread unemployment in nitrate and metal-mining districts.

For those nitrate companies whose direction has been conservative enough to maintain adequate reserves, and which amortize their investments heavily during the good years, the present era will prove to be an excellent opportunity to undertake mine development, owing to the cheapness of the Chilean peso, and a consideration of future competition (both among the Chilean companies and against their common competitor abroad, the synthetic nitrate) will show the pressing need of embracing every possible means for reducing the unit cost of nitrate.

#### CHILEAN GOVERNMENT TAKES A HAND

A radical step has been advanced this month, emanating from the present Chilean Administration circles, which contemplates the assumption by the government of all privileges of exportation and sale of nitrate, and the fixation of prices at such a point as would insure successful competition with artificial nitrate abroad. Payment for nitrate by the government to the producer would be made by issue of 4 per cent gold bonds, redeemable after conclusion of sales of nitrate abroad, and any profit derived by the operation of the industry would be divided equally between the government and the producers. Even though the provisions of this scheme include the abolition of the export duty, as such, it does not appear that this proposal is being welcomed by the producers as desirable, as government operation of the Chilean state railways has been blamed generally for the financial troubles in the country's railroad development and management.

The proposal for a governmental sales bureau having obtained so unfavorable a reception, the following counter proposal was evoked, and seems likely to be adopted as the means to remedy the existing situation:

First, the holders of the speculative stock of nitrate in Europe, which amounts to about one million tons, agree to reduce their asking price to £14 per ton, representing a cut of 33½ per cent in its reported cost, f.o.b. European ports.

Second, the nitrate producers in Chile are to sell one million tons of their own product at a price that will permit its sale at £14 in Europe. It is said that this will require a selling price of 6s. per quintal in Chile.

The loss of about £7,000,000, caused by the reduction in the asking price in Europe on the speculative stock, is to be shared between the speculators and the producers, in some manner to be agreed upon. It is stated that the proportion would be about 65 per cent by the holders of the European stock, and 35 per cent by the producers in Chile.

Third, the one million tons to be sold by the producers shall be exported from Chile, beginning in September next, at the rate of 150,000 to 200,000 quintals per month.

Fourth, this exportation will enable the Chilean government to count upon the export duty from a definite exportation, even though the exportation should not occur in response to actual purchases abroad. Furthermore, renewal of nitrate operations would at once provide employment for the great mass of idle workmen in the nitrate business.

Fifth, it is claimed that the price thus set, £14 per ton in Europe, will undercut the competition of ammonium sulphate and other artificial competitors for fertilizing. Whether this be so or not, it is known that in recent weeks sodium nitrate has been offered without finding a market, at less than £14 per ton in North American distributing centers.

Sixth, the Chilean government, in consideration of the foregoing, is to agree that export duties may be payable at a fixed rate, thus waiving its existing privilege of collecting a super charge on the normal duty of 2s. 4d., which not infrequently reached a total of 3s., for that reason.

#### ECONOMIES IN MINING ARE NECESSARY

In view of the contemplated necessity of selling at the low price of 6s. per quintal in Chile, due to the requirement of absorbing a part of the loss on the speculative stock in Europe and of meeting a price of £14 per ton in Europe, at this time, it now remains for the nitrate producers to introduce economies within their own control, which would naturally occur in the present mining, transportation, and treatment processes. Such steps are essential for the success of future operations if prices are now entering upon a long period of low average levels.

There is persistent advocacy of the policy of "free sale" and abolition of the price-fixing policy adopted by the Association of Nitrate Producers, which has been blamed by many for the present situation. The adoption of such a step will depend entirely upon the success of the plan that has just been outlined, and whether it is carried out fully. If, and when, freedom of sales again exists, those plants in condition to produce at lowest cost will survive the era of depression and difficulties into which the nitrate industry has entered, and those not so situated will have the alternative of suspension or liquidation.

The graph of prices shows that some nitrate sales made outside of the association during the last four months have been closed at prices which are rapidly dropping below the official quotations of the association.

An example of foresight and preparation is shown by a number of large nitrate plants controlled by the Jugo-Slav financial group in Chile, in having their properties overhauled and remodeled on a basis of scientific economy, beginning about two years ago. These oficinas, as a result, have demonstrated a reduction in operating costs, and will be in an excellent technical position, after alterations are completed, to meet cut-price competition, whether local or foreign.

#### MODERN AMERICAN EQUIPMENT BEING INSTALLED

It is interesting to note that the cost-cutting equipment and methods that the Jugo-Slav group has installed embody in many instances the standard types of American industrial and metallurgical machinery.

Electric power is used wherever feasible, employing "G.E." and Westinghouse material. An extensive conveyor system, supplied by the "Robins" company, handles the crushed caliche, or raw nitrate material, and a continuous tandem-filtration plant using "Oliver" filters has been selected for treatment of the clayey portion of the raw material.

It is a matter of common conviction that the era of huge profits in nitrate exploitation has passed, and that the basis of business hereafter will be founded on a regime of thrifty operation. The search for the utmost in economy, which was neglected during the frenzied period of war prices and unnatural stimulation of production, can now be scientifically undertaken. This economy can be sought in three directions: First, in a relief from external costs, such as export duty, railway freight, and handling charges; second, reduced mining and transport charges, by possibly applying large-scale earth-moving machinery, and third, better treatment plans, with a reduction in the losses of soluble nitrate now thrown away in the slimy tailings, and which saving has led to the erection of the "Oliver" tandem filtration plant, previously mentioned. Handling larger amounts of raw material implies lower grade in nitrate content, and therefore demands a modified treatment plan. Another factor demanding economy in nitrate treatment is presented in the item of fuel consumption, caused in the boiling of the raw material. This item is usually computed to be 50 per cent of the treatment cost.

From the foregoing sketch of conditions it is plain that a period of forced economy has arrived in the Chilean nitrate industry, and that it is becoming generally realized that those who have provided low-cost possibilities for their nitrate plants, by economical modern equipment, will be in position to affect sales. Low price levels and scanty sales make this an inevitable result, and for the technical improvement of the industry it is a helpful condition.

### Italian Sulphur Production Declining

BY HENRY L. GEISSEL

Written for *Engineering and Mining Journal*

For the last few years production in, as well as exportation of, sulphur from Italy have largely decreased. This is shown by the following official figures:

	Production	Exports
	— In Metric Tons —	Tons —
1913.....	406,406	351,339
1914.....	403,558	260,333
1915.....	380,240	393,908
1916.....	287,965	326,435
1917.....	230,074	118,340
1918.....	253,390	192,227
1919.....	255,316	119,888
1920 (8 months).....	225,249	120,551

The sulphur deposits on the Island of Sicily are still being exploited in the most primitive manner. The cost of production during the war and the following years was fivefold as high as in pre-war times. The high cost of living was, to a large extent, responsible for this increase. In 1914 the cost of production was 80 to 85 lire per ton; in 1920, however, 420 to 430 lire. The selling price at Sicilian ports rose from 110 to 115 lire in 1914 to 650 lire in 1920. As will be seen from the accompanying table, production and exports in 1920 increased somewhat. Great efforts are now being made further to increase production. Thousands of children are still employed in the Sicilian sulphur mines.

## BY THE WAY

### Addendum

To resume our exposé of the subject of cable addresses and the like, which we entered upon two weeks ago, we note with interest on the letterhead of W. J. Loring, president of the American Mining Congress, that his cable address is "Wantoness." And our consulting specialist in nomenclature didn't have a darned thing to do with it either.

### Justice at Last

A grave injustice is about to be rectified; perhaps it already has been straightened out. All it needs is a signature, a flourish of the pen—that of President Harding. For countless ages the State of Colorado has been furnishing without charge 60 per cent of the water in the Colorado River that further along its course has carved out the Grand Canyon and then helped fill the Gulf of California, which might otherwise have been a desert basin full of horned toads, rattlesnakes and scorpions. But Colorado hasn't been getting full credit for this, in a way. That is, it hasn't been advertised as widely and extensively as all advertisers should advertise. This Colorado River, instead of being known as the Colorado right up to its principal source, has long been dubbed by the map-making dubs at Washington and elsewhere as the Grand River wherever it flows in Colorado and over part of its course in Utah. But now Congress has set it all straight and has passed a bill making it the "Colorado" from start to finish, hence forevermore. This is enough to make Colorado stay Republican. If Mr. Harding vetoes this important measure it will be simply surprising.

### More About Water

Just think of Colorado furnishing all that water for so many ages! Water is a mineral, though not always mineral water, and Colorado is one of the most mineralized sections of the country. Nevertheless, Colorado has long been a dry state, and this is not the only paradox in Colorado. But it is positively painful to think of all that water going to waste. As Professor Remsen says, "Water is H<sub>2</sub>O." Further, much of the carbonaceous material carried in suspension is largely C, combined or uncombined. Here, therefore, we have all the ingredients for a first-class brand of ethyl hooch. The reader, if there be one, is here reminded that the ethyl variety, which vivifies, is C<sub>2</sub>H<sub>5</sub>OH; and that the methyl kind, which petrifies, is CH<sub>3</sub>OH. To distinguish between the two, therefore, it is only necessary to take three fingers of each and look at the samples through a magnifying glass and note how the molecules are arranged. One of the advantages of such preliminary inspection with a magnifying glass is that three fingers are made to look like five or six or even more. This helps stimulate the imagination. The samples themselves will complete the process of stimulation. But this is a digression. To return to the Colorado again, the waste that has been and still is going on is something for the proposed Federal Industrial Waste Commission to look into. On the other hand, to be fair, there is such a thing as having too much water, as people in Pueblo and elsewhere will admit, so that the only question in such cases is how the excess shall be dis-

posed of. To repeat, as at the start, water is mineral. We're glad of this, for otherwise we would not feel at liberty to enter into a deep discussion of it here. It is also a great space filler, as the cattle on a thousand hills and a thousand brokers on stock exchanges will testify.

### A Mystery

Friedensville, Pa., has its mystery, without a clew, of course. The body of a well-dressed man was found in an abandoned mine there on July 2. Is it suicide or murder? The *Philadelphia Record* says: "The suicide idea is scouted because the man wore a silk shirt and hose and had \$29.60 in his clothes." Agreed, say we. With life so full as it must be for one who owns a silk shirt and sox, to say nothing of \$29.60, the suicide theory is untenable. Mining companies and other readers of the *Engineering and Mining Journal* may expect to receive soon a questionnaire on the subject of the "Prevalency of the Silk Shirt in Industry." The data thus obtained will be very valuable if we are asked, as we hope to be asked, to prepare for the fall meeting of the Institute a paper on "Silk as an Index of Industrial Conditions." This probably will be in the non-metallic section of the program. We shall put this up to Secretary Sharpless at the first opportunity.

### A Matter of Doubt

"A chap's pretty safe takin' a ride on tha cage these days, m'son," said Cap'n Dick; "for tha rope 'olds, tha bale usually is in fair shape, an' tha 'oistin h'engineer mus' naw w'ot 'ee's doin'. 'Tain't much like tha h'old days w'en mos' places didn't 'ave moor'n bucket an' a rope. W'ich remin's me o' one time back long we. A party o' these 'ere college professors come h'out to 'ave a geek 'baout tha place I wuz workin'. Daown they gaws in tha bal, an' comin' h'out we 'ad to 'oist two o' they at one time in tha bucket. Finally tha last chap wuz comin' h'out with Jimmie Trebilcock, an' 'ee noticed tha bloody rope looked a bit frail. "Ow often," sez 'ee to Jimmie, 'does 'ee change these ropes?' 'Baout once h'every three months,' sez Jimmie, 'an' we changes this one tomorrow—h'if we get h'up safe.'"

### The Desert Prospector

BY M. M. ST. CLAIR

Bent was his form, with its load of years,  
Sparse his hair, and streaked with gray;  
Dim were his eyes with sun that sears  
And winter storms that chill and flay.

But his heart was stout and his mind was keen  
And his soul minded not heat nor cold, I ween,  
As he gallantly trudged with his laden jack  
His hard-earned grubstake in its canvas pack.  
"We'll strike it this time," he cheerily calls,  
As they slowly climb the canyon walls;  
"We'll come back rich, Jack and I";  
But the patient burro makes no reply.

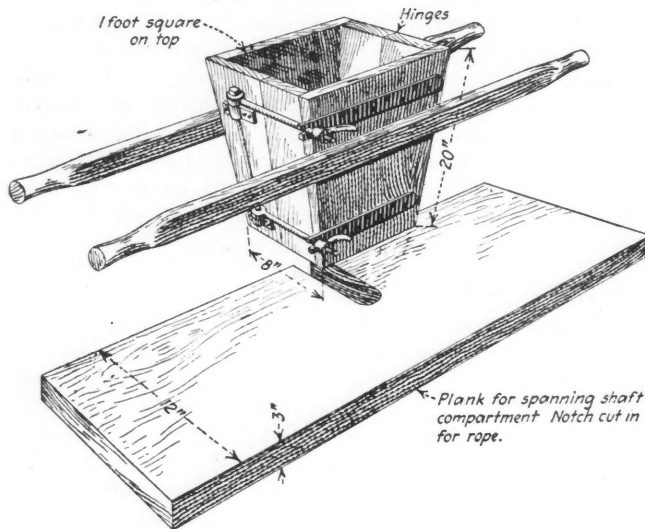
Alone in the night, when his work is done,  
And the desert stars show one by one,  
Sometimes he wonders, in the shadows dim,  
Just where he'll go when he "cashes in."  
Half-hearted he hopes that the preacher's wrong  
About the streets of gold and the heavenly song.  
No heaven for him in gold ready-found,  
But hidden deep in the stony ground,  
To be searched and toiled and perhaps uncovered  
In some Eldorado by him discovered.  
No heavenly song to him as sweet,  
As when steel and quartz in "contact" meet.

# HANDY KNOWLEDGE

## Applying Rope Compounds

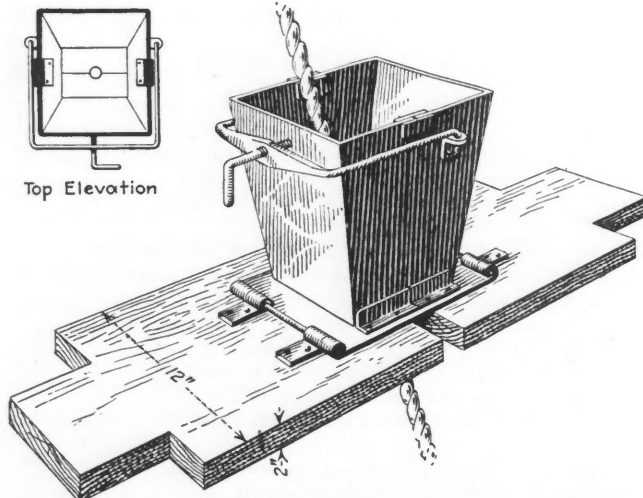
Written for *Engineering and Mining Journal*

Compounds for lubricating hoisting ropes and preventing corrosion by keeping the wires from getting wet are used at all mines where hoisting is necessary. Many methods for conveniently applying the compound to the rope have been devised. Two appliances used at two mines on the Mother Lode in California, the South



LUBRICATING DEVICE USED AT SOUTH EUREKA MINE, CALIFORNIA

Eureka and the Central Eureka, are shown in the accompanying sketches. Both are similar in principle, but one is constructed of steel and the other of wood.



LUBRICATING HOISTING ROPE AT CENTRAL EUREKA MINE, CALIFORNIA

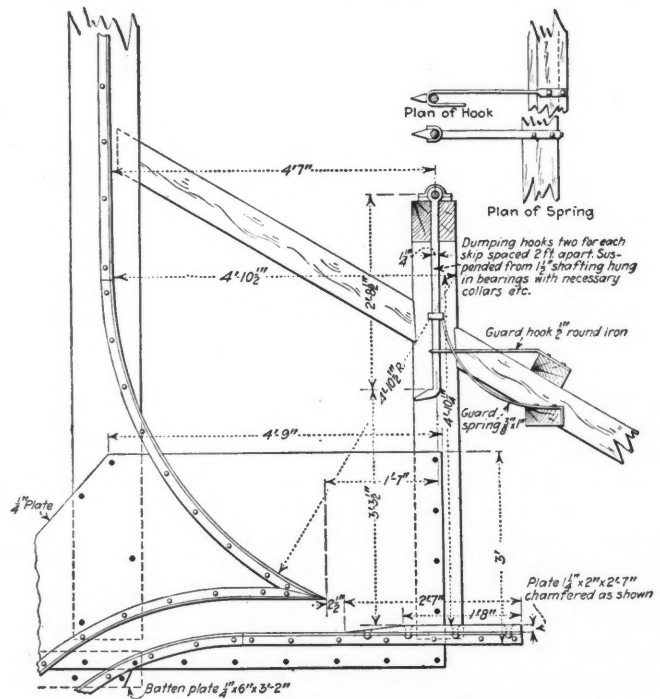
The device consists of a hinged hopper with an opening in the bottom of sufficient diameter to permit the hoisting rope to pass. At both of these mines the shafts are inclined at a steep angle. In "tarring" the rope, the rope compound is heated in a kettle in cold weather, and on hot days is used directly from the drum.

The board shown in the sketch is placed over the compartment and additional planks to serve as a working platform are laid down. The hopper is adjusted in position. A piece of worn hemp rope (or rags) is put in the bottom of the hopper about the rope and tamped down by means of a stick. The compound is then poured in and the hoisting rope lowered so that it passes through the sticky fluid. The mass of hemp or rags is kept packed down by the stick and prevents leakage and at the same time wipes the rope free from excess.

## Skip Dumping Irons

Written for *Engineering and Mining Journal*

In the use of vertical skips, dumping irons to track the skip wheels properly are necessary. In many installations these consist of two iron prongs on the front of the skip which bear upon a cross timber placed in a suitable position. At the main shaft of the Plymouth Consolidated Mining Co., Ltd., Plymouth, Cal., a different arrangement has been in use for some time, and has given satisfaction. The device consists of a pair of hooks suspended from a short length of shafting sup-



DETAIL OF SKIP DUMPING IRONS AT PLYMOUTH MINE, CALIFORNIA

ported by the bin structure. The hooks are prevented from swinging forward toward the shaft by guard hooks and are returned to their vertical position by springs, which are shown in the sketch. The arrangement was necessitated by the fact that the skips used in this shaft are designed for a vertical as well as for an inclined shaft. The Plymouth shaft is vertical in its upper and inclined in its lower part. The top of the skip is consequently cut on an angle, instead of normal to the length of the skip, as customary in vertical shafts.

# THE PETROLEUM INDUSTRY

## Deep Oil Wells in Texas

BY ALBERT G. WOLF

Written for *Engineering and Mining Journal*

**M**ORE OFTEN than not in describing a well the writer will refer to it as a "deep" well or a "shallow" well. A well of a certain depth would be a deep well in one field and a shallow well in another, so that those unacquainted with the field under discussion might wonder what constituted a "deep" well. The terms are merely relative.

In Texas, however, there are many wells, producing and dry, which would be considered as deep in any district. The deepest producing oil well in the state is the No. 2 Arnold well of the Texas Co., in Young County, which was completed in 1919 at a depth of 4,664 ft., making an initial production of 115 bbl. In February, 1921, this well was still pumping 15 bbl. daily. As a matter of comparison it might be added that the deepest producing oil well in the world is believed to be in Sicily and is 4,950 ft. deep. In Young County, the Texas Co. also operates No. 1 Arnold, which is making a small production from below a depth of 4,000 ft., and the Southwestern Miami Oil & Development Co. has No. 1 McKeen well, which came in in October, 1920, making about 100 bbl. of oil and four million cubic feet of gas from a depth of 4,010 ft. There are several other deep wells in this field, all having a small production but a fairly long life.

The first discovery of oil in the coastal or salt-dome oil fields was made on top of a dome in what is now considered a shallow well. This was at Spindle Top, in 1901. Oil in the same relative stratigraphic location was found in other domes drilled immediately thereafter, as at Sour Lake, Hardin County, and Big Hill, Matagorda County. It was not until later that the punctured and uptilted sediments lying around the peripheries of the salt cores of the coastal domes were tested by deep drilling and in many instances were also found to be productive.

The deepest producing well in any of the coastal fields was completed at Goose Creek, Harris County, on Feb. 9, 1921, by the Crown Oil & Refining Co. and the Gulf Coast Oil Corporation jointly. This well was called the Gaillard No. 31, and came in at 4,508 ft., flowing 2,500 bbl. of clean oil through a 1/2-in. choker. This is not only the deepest producing oil well on the Gulf Coast, but is probably the best well of that depth ever completed in the United States, at least so far as initial production is concerned.

### SALT CORE NOT YET FOUND AT GOOSE CREEK

Goose Creek also boasts of several other producing wells over 4,000 ft. deep. In fact, Goose Creek is essentially a deep field, the salt core never having been found. In January, 1921, the Gulf Production Co. completed its No. 20 Hoffman-Gaillard well at a depth of 4,200 ft., making 55 bbl.; and the Humble Oil & Refining Co. completed a 250-bbl. well at 4,195 ft.

In December, 1920, E. F. Simms & Co. completed its No. 33 Ashbel Smith well at 4,103 ft., making some oil and gas. Later the well went to water, but in January of the following year a screen and packer were set, and the well then made 150 bbl. of oil daily. On Oct. 31, 1920, the Gulf Production Co. completed its Beaumont State Land well at 3,700 ft., making a flush production of 5,000 bbl. of pipe-line oil daily.

Another group of deep wells is to be found at Sour Lake, Hardin County, the second oldest field in the salt-dome area. Attention was first called to this field by gas seeps and a salt lake or swamp, and shallow wells were brought in. Successive drillings in certain directions farther and farther from the dome have resulted in the completion of deeper and deeper wells. In the southwestern part of this field the Yount-Lee Oil Co. completed its No. 6A Merchant well in July, 1918, at 4,000 ft., the well flowing 12,000 bbl. daily, initial production. Later, this same company completed another well at 4,200 ft. making 1,600 bbl. flush production, and a third at 3,930 ft., flowing 1,700 bbl. daily. When the price of crude oil again warrants, deeper wells undoubtedly will be drilled.

### DEEP WELLS EXPECTED AT HULL

At Hull, Liberty County, very deep wells will probably be drilled when circumstances warrant doing so. In September, 1920, the Sun Oil & Refining Co. and the Texas Co. jointly drilled a well on the Carr homestead tract to 4,070 ft. Later the casing was pulled back, the screen set from 3,570 to 3,680 ft., and the well produced 300 to 400 bbl. of oil, with much water. Other wells in the southern part of this field have been drilled by the Higgings Oil & Fuel Co. and the Empire Gas & Fuel Co., making, in the Barngrover section, fair production from much over 3,500 ft.

In February, 1921, the Gulf Production Co. brought in its No. 2 Taylor at Pierce Junction, Harris County, making from two to two and one-half million cubic feet of gas from a depth of 3,940 ft. Since its completion it has been making a little oil, which has been gradually increasing in quantity. During the twelve or fifteen years previous to drilling this well many holes were put down, all over the top of this dome, but without finding more than traces of oil and gas. In June, 1921, the Texas Exploration Co.'s No. 1 Ritter tested salt water at 4,580 ft. and was abandoned. It did, however, have a small showing of oil. Provided a deep oil-bearing area exists here, it is hardly to be doubted that it will some day be found.

West Columbia, in Brazoria County, the largest producing coastal field at present, has had no producing well completed to date that is as deep as 4,000 ft., although there are a number of producers approximately 3,500 ft. deep. So far as I am able to determine, the

deepest oil well in the field is the No. 1 W. C. Hogg, of the Gulf Production Co., which came in making 2,000 bbl. from 3,720 ft. One of the largest deep wells in this field, No. 28 Japhet, was brought in Sept. 25, 1920, by the Humble Oil & Refining Co., producing between 15,000 and 18,000 bbl. daily, estimated production at the flush period, from 3,400 ft. The largest producing well in this field, No. 1 Abrams, of Texas Co., which came in making 15,000 bbl. daily and later increased to a maximum of about 26,000 bbl. daily at a time when coastal crude oil was selling at \$3 per bbl., flowed from a depth of only 2,780 ft.

#### DEEPEST TEXAS BORE FINISHES A "DUSTER"

Several deep wells have been drilled in Texas, wild-cat and otherwise, which did not prove to be producers, but are nevertheless of interest. The deepest bore hole in Texas was drilled on the Roy Henderson ranch, in Crockett County, by the Ryan Petroleum Co., of New York. The well reached a total depth of 5,908 ft., and was finished a "duster." The work was done with a cable-tool rig, and cost over \$150,000. It was started on Sept. 9, 1919, and finished in December, 1920. The diameter at the top was 22 in. and at the bottom 5½ in. This is said to be the fifth deepest well in the world.

The second deepest well in the state is probably the Texas Co. well on the Wheeler & Pickens lease at Humble, Harris County, a salt-dome oil field. The salt core of the dome was encountered between 2,000 ft. and 3,000 ft., and the hole was still in salt when drilling was stopped at 5,410 ft. The W. W. Silk well on the Scott tract, Archer County, was abandoned at 5,004 ft.

A well that may yet be the deepest on the Gulf Coast or even in Texas is the No. 1 Mitchell of the Wichita Petroleum Co., situated about seven miles southeast of the West Columbia field. On June 18, 1921, 6-in. casing was being set at 5,030 ft., 8-in. casing having been set at 2,200 ft. The well is in good condition, and deeper drilling will be done, possibly to 6,000 ft.

Other wells in Texas that have been drilled to a depth of over 4,000 ft. and abandoned are too numerous to mention. Suffice it to say that today a well is not considered a really deep test in the coastal fields unless it has reached a depth of at least 3,000 ft.

### Standardization Committee Considers Proposed Changes in Petroleum Specifications

#### WASHINGTON CORRESPONDENCE

The Technical Committee on Standardization of Petroleum Specifications at a meeting in Washington, D. C., on July 12 took under consideration a number of proposed changes in the text of Bulletin 5 of the committee which contains the specifications used by the Government for the purchase of gasoline, kerosene, fuel, and lubricating oils. N. A. C. Smith, petroleum chemist of the Bureau of Mines, and chairman of the Technical Committee, presided.

The committee discussed the proposition of adopting a number of new methods for testing various petroleum products which have recently been sanctioned by the American Society for Testing Materials. These relate to the following tests: Corrosion; flash; distillation; sulphur; cloud and pour; saponification in place of fatty oil; water and sediment; precipitation; viscosity, and melting point. The general sentiment of the meeting was that the new A. S. T. M. methods should be adopted, though it was pointed out that the

new methods were still in the tentative stage and that the committee would do well to give careful study to each method before adopting it.

The Committee on Standardization of Petroleum Specifications, frequently known as the Presidential Committee, was a war-time committee originally under the direction of the Fuel Administrator, but later transferred to the Bureau of Mines. Bulletin 5 was its last official publication, and contained all of the committee's testing methods and specifications in their latest revised form. This committee went out of existence on Jan. 18, 1921, when the President authorized the Secretary of the Interior to form a new inter-department Committee on Standardization of Petroleum Specifications.

### Important Developments in Coastal Oil Fields

#### SPECIAL CORRESPONDENCE

Recently the No. 1 Bissonnet well of the Texas Production Co. at Humble field, Harris County, Tex., came in at 4,150 ft. making about 2,000 bbl. per day. The well soon sanded, but later on came in again, making a greater flow than before. The well is under control. It is of great importance, as it is by far the deepest well in the field.

Snowden & Sweeney's No. 1 Kane well, at Pierce Junction, blew in at 3,010 ft., the gas pressure throwing oil over the derrick. The well soon sanded, but it is believed that deeper drilling will not be necessary to complete it. This well is about 1,200 ft. east of the Gulf Production Co.'s No. 2 Taylor, which came in several months ago as a gasser, later turned to oil, and is now making about 100 bbl. per day. This well is the second in this field which has made any appreciable quantity of oil, and it now appears certain that the oil pool of this salt dome, for which drilling has been carried on for a period of twelve or fifteen years, has at last been located.

### Oil Placed on Fordney Tariff Free List

By a vote of 196 to 86, the House of Representatives on July 18, sitting as a committee of the whole, voted to amend the Fordney tariff bill by removing crude petroleum and fuel oil from the dutiable list and placing them upon the free list. A record vote will be taken on the question in the House proper, but it is practically certain that the vote in the committee of the whole will be sustained.

The crude petroleum item proved to be even more of a storm center than was the dye schedule. An unusual situation was presented in that the return of petroleum to the free list was urged by the Governor of Massachusetts, while the Governor of Louisiana used his influence in an effort to retain it on the dutiable list. This is typical of the departure from party alignments. Representative Treadway, of Massachusetts, advocated free petroleum in his speech. The reply was made by Representative Blanton, from Texas, who pleaded for the full amount of duty recommended by the committee for petroleum and fuel oil. His argument was to the effect that producers of Mexican oil, notably the Standard Oil Co., without duty and under present labor conditions there, could afford to reduce petroleum prices so that profitable production by independent companies operating in Texas would be impossible.



## Technical Papers

**Copper Specifications**—The American Engineering Standards Committee has recently approved four copper specifications submitted by the American Society for Testing Materials, as follows:

9-1921—Soft or annealed copper wire.

10-1921 — Lake copper wire-bars, cakes, slabs, billets, ingots, and ingot bars.

11-1921 — Electrolytic copper wire-bars, cakes, slabs, billets, ingots, and ingot bars.

12-1921—Battery assay of copper.

These standards may be obtained for 25c. each on application to the American Engineering Standards Committee, 29 West 39th St., New York, N. Y.

**Ferro-alloys**—The U. S. Tariff Commission has issued a 160-page pamphlet, giving tariff information surveys of the ferro-alloy industries. The following subjects are discussed for each alloy: Description, Raw Material, Equipment and Method of Production, Geographical Distribution and Organization, Domestic Production and Consumption, Foreign Production, Prices, Imports and Exports, Competitive Conditions, and Tariff Considerations. The book may be obtained from the Superintendent of Documents, Washington, D. C., for 15c.

**Manganese**—The latest bulletin of the Imperial Mineral Resources Bureau is on the subject of manganese and consists of 151 pages. It is a digest of statistical and technical information relative to the production, consumption, and value of manganese in the British Empire and foreign countries during the war period, 1913 to 1919. Copies may be obtained for 3s. 8d. from H. M. Stationery Office, Imperial House, Kingsway, London, W.C.2, England.

**Asbestos**—"Past and Present Methods of Mining Asbestos" are discussed in the June issue of *Asbestos* (Secretarial Service, 721 Bulletin Building, Philadelphia; price, 20c.). Milling methods will be discussed in the July number.

**Gases From Fire Extinguishers.**—The U. S. Bureau of Mines, Washington, D. C., in its *Reports of Investigations*, No. 2,262, describes some tests with carbon tetrachloride and Foamite Fire-foam extinguishers which were made chiefly to determine the amount of poisonous gases which would be the result under normal conditions of use in putting out mine fires. The report is free.

**U. S. Mineral Resources**—A preliminary report on the mineral production of the United States for 1920 compared with preceding years has been issued by the U. S. Geological Survey, Washington, D. C. Some figures are also given for foreign countries. The 123-page book may be obtained on request to the Survey.

**Oil Shale**—"Nature of Shale Oil Obtained From Oil-Shale Assay Retort Used by the Bureau of Mines," by Martin J. Gavin and Lewis C. Carrick, is the title of a paper appearing in *Reports of Investigations*, June, 1921, issued by the U. S. Bureau of Mines. A brief description of the method used for the distillation analyses of shale oils is given, and the results obtained from different products are tabulated.

**Microscopic Mineral Determination**—In *Reports of Investigations* No. 2,257, the U. S. Bureau of Mines describes the quantitative microscopic determination of chalcopyrite, chalcocite, bornite, and pyrite in a porphyry ore. The five-page bulletin may be obtained on request to the Bureau at Washington.

**Alaska Mining Activities**—The annual report of the territorial mine inspector for 1920 is now available from the Governor of Alaska, Juneau, Alaska. The bulletin is of seventy-two pages and describes briefly mining conditions on various properties in that territory. Thirty pages are devoted to the accident record.

## Book Reviews

**The Salt and Gypsum Deposits of South Australia.** By R. Lockhart Jack. Bull. No. 8, Geol. Surv. of South Australia, Department of Mines. Paper; 6 x 9½; pp. 118, 7 plates, 3 maps, several regional sketch maps. Adelaide, 1921.

The author's study of the origin of the South Australian salt deposits indicates that they are somewhat unique, having resulted from accumulation of "salt dust" transported from the ocean by the wind, and carried down by rain. Evaporation from the salt areas is sufficient to prevent return of the salt to the ocean by surface drainage, and the salt accumulates in deposits of commercial size. Thus every year new supplies are added to the lake salt beds. South Australia can readily supply the whole continent with its requirements. A minor part of present production is from solar evaporation of sea-water, and conditions are favorable for a considerable extension of this branch of the industry. Detailed descriptions of the saline areas occupy thirty-six pages.

South Australia produced over 25,000 tons of gypsum in 1919. Since 1914, practically the entire domestic requirements have been supplied, and a small export trade has been developed. The deposits are extensive, but, except for local use, those close to seaports are the only ones that can be exploited profitably. A discussion of the origin, types of deposits, uses, and the probable future of the industry is followed by a detailed description of the various deposits, with many analyses. The importance of the salt and gypsum industries of South Australia justifies the issuance of a bulletin, and the author handles the subject matter in a comprehensive and interesting way.

O. B.

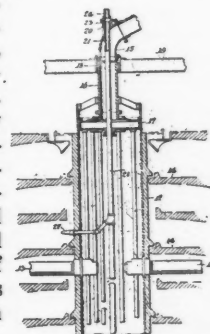
## Recent Patents

**Hydro-metallurgy of Zinc**—No. 1,380,712. A. E. Hall, Omaha, Neb., assignor to American Smelting & Refining Co., New York. A method of electrolyzing a zinc-salt solution whereby the zinc is deposited and the acid radical liberated; adding a solution of iron to the acidic solution in amount equal to about 0.044 lb. of ferric sulphate per gallon of solution; treating an excess of zinc-bearing material with the solution, which dissolves the zinc, neutralizes the acid, and precipitates any antimony present; and returning the solution for electrolysis. Patent No. 1,380,711, also issued to Mr. Hall, is on the same subject.

**Flotation Machine**—No. 1,380,650. J. Hebbard, Broken Hill, New South Wales, assignor to Minerals Separation North American Corporation, New York. A froth flotation apparatus in which the agitation and aeration are effected by the hydraulic action of a gravity flow of the ore pulp through successive separating vessels.

**Flotation**—No. 1,380,665. F. J. Lyster, Broken Hill, New South Wales, assignor to Minerals Separation North American Corporation, New York. A new design of separating box for flotation purposes.

**Method of Firing a Roaster**—No. 1,380,529. H. A. Clark and J. F. Hill, Douglas, Ariz., and A. G. McGregor, Warren, Ariz. In a mechanically rabbled, multiple-hearth roasting furnace, the oil burners are introduced through the central shaft instead of from the outside, as is the common practice.



**Smelting**—No. 1,376,479. Bradley Stoughton, New York, N. Y. A method of heating the blast supplied to a smelting furnace and so varying its temperature that the temperature of the furnace products may be controlled.

**Amalgamating Sluice Box**—No. 1,381,159. J. P. Beaupre, Butte, Mont., assignor of one-half to G. E. Smiley, La Junta, Col. An arrangement of amalgamating plates and baffles in a sluice box.

**Concentrating Table**—No. 1,381,862. Emil Deister, Fort Wayne, Ind., assignor to Deister Machine Co., Fort Wayne, Ind. A concentrating table made up of sections with different inclinations. Patent No. 1,382,275, also issued to Mr. Deister, relates to a riffing system in which the riffles are broad and the side of each riffle facing the feed side of the table is higher than the other side.

# ECHOES FROM THE FRATERNITY

## SOCIETIES, ADDRESSES, AND REPORTS

### Nicholson Bill Recommended by American Mining Congress

A great many reasons, says the *Mining Congress Journal*, may be assigned in favor of, but none can be advanced against, the creation of a Department of Mines to be presided over by a member of the Cabinet, the Secretary of Mines, as contemplated in the bill introduced by Senator Samuel D. Nicholson, of Colorado. Among all the measures providing for reorganization and regrouping of Government activities, this stands out as pre-eminently proper and the most timely.

The miners, speaking through their national chamber of commerce, known as the American Mining Congress, went on record a decade ago in favor of the establishment of a Department of Mines. During most of the period which has since elapsed they, in common with other business men, devoted their energies to the winning of the war and to reconstruction, allowing their own recommendation to remain in abeyance, but they have never receded from their position. Their recommendation stands today with every reason of economy and efficiency to back it up and with a much larger number of constructive business men behind it than at the time it was first made.

Mining is one of the two great basic industries of the country and decidedly the bigger of the two. It furnishes two-thirds of all railroad tonnage, without which the transportation of the other third would be impossible. Its manufactured products alone pay nearly one-third of all the corporation taxes collected by the Government, or seventy-five times as much as incorporated manufacturers of agricultural products. Forty states depend upon it in more or less degree for employment for sizable portions of their population and all states look to it to contribute a hundred thousand times more permanent wealth than all other industries combined. No wisdom can be seen in cluttering up the administration of this, the country's greatest industry, any longer with the administration of hospitals, institutions for the deaf, public buildings and playgrounds in the capital, Indian disputes and governmental affairs in distant Hawaii.

The Interior Department will not lose either in prestige or in the amount and importance of its work through the loss of its mining bureaus. With the retention of its other existing bureaus and the addition of a score or twoscore of independent bodies which by all odds ought to be made directly accountable to one of the executive departments, it will probably expand its influence and its usefulness. The mining industry

will appreciate and make the best use of the richly deserved recognition and assistance which the establishment of a Department of Mines will afford, but the country as a whole will be the greatest gainer, for it is only when the mines are prosperous that the nation is prosperous.

Senator Nicholson is to be congratulated. The miners are with him to a man.

### Cornishmen Asked To Aid Residents in Old Country

A striking appeal to newspapers in mining centers where Cornishmen are employed in mining has been made by the Central Relief Committee of Camborne, Cornwall. The letter states that mining there has been virtually extinguished as a result of the war, and paints a dark picture of conditions among the people. The following are excerpts from the appeal:

"If you could imagine yourself in the old towns of Camborne and Redruth and look to the north and south, the arrested toil would both pain and surprise you. Only here and there an engine works, and that only to keep the mine from being flooded.

"At the present time every 'bal' in the old country stands idle! These are terrible facts and require some courage to state them. It is not always pleasant to tell grim truths. What does this state of collapse mean? It means no work and no money; no money means the wolf at the door."

The letter states that between the years 1851 to 1891, about 170,759 Cornishmen left for other lands and that many thousands have left since the latter date. Each of these or their descendants is asked to do something for the old district in its great distress.

### First Congress of the Rumanian Association of Mining Engineers

On June 3, 4, and 5, 1921, the first congress of the Rumanian Association of Mining Engineers was held at Ploesti, Rumania, which is the center of the oil industry in that country. More than two hundred members of the association attended; also delegates sent to the ministers of industry and labor. Among the various subjects of mining interest papers on the following were discussed: "The Exportation of Oil Products," by Mr. Birkenenthal; "Ore Deposits and Metallurgy in Transylvania and the Banat," by Mr. Andrea; "The Participation of the State in the Exploitation of the Oil Fields," by Mr. Ficinescu; "New Opinions on the Oil Deposits," by Dr.

Murgoci; "The Exploitation of the Salt Beds in Rumania," by Mr. Popescu; "The Industry of Coal in Rumania," by Mr. Damaschin; "Natural Gas in Transylvania," by Messrs. Damaschin and Lazar; "Professional and Technical Teaching for Mining Engineers," by Mr. Filipescu; "Mining Legislation," by Mr. Gheorghiadu, and "The Participation in the Benefits," by Mr. Dacu.

The meeting brought out the fact that the development of the mining industry in Rumania cannot be put upon a solid basis, until (1) the state retains the ownership of the subsoil for the oil fields as it has done for other mineral deposits; (2) the professional and technical teaching is sufficiently developed; (3) a wide participation and co-operation of foreign capital is brought about without a spirit of domination, and (4) a participation of profit is assured to all workers who help to increase the production.

### Mining Engineering Finds a Place in Princeton's New School

Princeton has given an undergraduate course in civil engineering and a graduate course in electrical engineering for many years. In the fall of 1922 undergraduate courses in mining, chemical, mechanical and electrical engineering will be added to the curriculum. A four-year course will lead to the degree of bachelor of science in engineering, and is designed to meet the needs of the student who does not expect to practice, but wishes engineering training to fit him for business or manufacturing. For those who decide to follow engineering as a profession, an additional year of special work in the chosen branch will bring the engineer's degree.

This enlargement of the Princeton School of Engineering will be coincident with the inauguration of Prof. Arthur M. Greene, Jr., of Rensselaer Polytechnic Institute, who has accepted the call of the Trustees of Princeton University to become dean of the engineering school and professor of mechanical engineering.

Nine new members have been added to the American Engineering Council's Committee on Foreign Relations, to complete the personnel of the committee, of which Lewis B. Stillwell, of New York, is chairman. Dugal C. Jackson, of Boston; Louis S. Cates, of Salt Lake City; Nelson P. Lewis, J. Parke Channing, C. O. Mailloux, and John W. Lieb, of New York; T. A. Rickard, of San Francisco; B. J. Arnold, of Chicago, and M. O. Leighton, Washington, are the appointees approved by the board.

## MEN YOU SHOULD KNOW ABOUT

C. E. Chaffin left for Bolivia on July 13.

J. M. Callow is returning to Salt Lake City after six weeks in New York.

Louis A. Wright is spending two months in Spain on professional business.

H. W. Hardinge has returned to New York from a trip to the Lake Superior iron and copper districts.

W. W. Cowan has recently taken a position as mining engineer with the Thomas Iron Co., Wharton, N. J.

Herbert G. Officer, recently with the Anaconda Copper Mining Co., at Pوترillos, Chile, is now in New York.

C. J. Garvin, mining engineer, who has been managing magnesite mining enterprises in Washington, is in New York.

S. Ford Eaton, engineer and resident manager of the Dardanelles Mining Co., Chloride, Ariz., left recently on an extended auto tour.

Thomas H. Allan, mining engineer, who has been mining in the Yukon during the last year, was in New York recently on his way to Colorado.

A. E. Moynahan, mining engineer, who examined mining properties in Colorado and Arizona recently, is in New York on professional business.

C. H. Palmer, Jr., has been elected vice-president of the United Eastern Mining Co. to fill the place left vacant by the late Frank A. Keith.

N. O. Lawton, mining engineer, will be in Salt Lake City, Utah, on professional business from July 20 to Aug. 15. His address will be care of the Alta Club.

M. R. Hull, designing engineer for the Chile Exploration Co., has returned to New York from a three months' trip to the company's South American properties.

Alex Richardson, principal of the School of Metalliferous Mining, Cornwall, England, is visiting mines and mining schools in the United States and Canada.

Charles Y. Clayton, professor of metallurgy at the Missouri School of Mines, will be at Dr. Howe's laboratory at Bedford Hills, N. Y., during the summer.

Charles Trezona, general superintendent of mines on the Vermilion Range for the Oliver Iron Mining Co., has gone to the Presbyterian Hospital, Chicago, for treatment.

Lewis C. Chapman has just completed a six months' exploration trip in the southern part of South America and will be at Maracaibo, Venezuela, for several months.

Stuart B. Marshall, consulting engineer, Washington, D. C., was recently elected president of the Virginia Military Institute Alumni of the District of Columbia.

Dr. G. J. Fink, formerly with the Hooker Electrochemical Co., has joined the technical staff of the Chemical Department of the National Lime Association, Washington, D. C.

R. V. Whetsel, mining engineer, with Henry L. Doherty & Co., at Tampico, Mexico, is in New York on professional business. Following a visit in Colorado, he will return to Mexico.

F. W. Denton has been appointed by Governor Groesbeck to succeed James MacNaughton as a member of the Board of Control of the Michigan College of Mines at Houghton, Mich.

L. D. T. Geery, superintendent of the electrolytic tank house of the Chile Exploration Co., Chuquicamata, Chile, spent a few days recently at the plant of the New Cornelia Copper Co., Ajo, Ariz.

P. R. Hines has opened an office in Portland, Ore., for consulting work on crushing and ore-dressing plants. He will also represent the Stephens-Adamson Manufacturing Co. in the Northwest.

E. F. Burchard, of the U. S. Geological Survey, is examining deposits of magnesite in Cranberry, N. C. Later, in company with Joseph Hyde Pratt, state geologist of North Carolina, he will make a general inspection of the iron-ore districts of North Carolina.

A. D. Chisholm, Gogebic Range manager for the Steel & Tube Co. of America, has been elected vice-president of the Rogers Brown Ore Co. and will spend most of the summer on the Cuyuna Range in charge of the Kennedy and Meacham mines of the latter company.

Weld, Liddell & Lazenby announce the dissolution of the firm. C. Minot Weld and Donald M. Liddell will continue to practice as consulting engineers, under the name of Weld & Liddell, at 2 Rector St., New York. Paul H. Lazenby will continue his practice independently at 2 Rector St., New York.

W. W. Odell, fuels engineer of the Bureau of Mines, is now in North Dakota, where he will co-operate with Professor Babcock, of the University of North Dakota, on an extended series of tests of lignite carbonization. The experimental work will be done in the small lignite coking plant of the university as a part of the co-operative work of the Bureau of Mines and the university.

Mining engineers and metallurgists recently in New York City included: G. W. Prince, Clemenceau, Ariz.; E. H. Dickenson, Calcutta, India; Thayer Lindsley, Peterboro, N. H.; J. W. Mather, Pacific Grove, Cal.; W. H. Seamen, Jr., Sherwood, Md., and C. A. Filteau, Cobalt, Ont.

## SOCIETY MEETINGS ANNOUNCED

No local section meetings of the American Society of Mechanical Engineers will be held during the summer.

American Chemical Society will have its headquarters at the Waldorf-Astoria Hotel during the society meeting, Sept. 6 to 10.

The seventh National Chemical Exposition will be held in the Eighth Coast Artillery Armory, New York City, during the week of Sept. 12. The exposition will follow the meeting of the American Chemical Society and the Society of Chemical Industry.

The Michigan College of Mines Alumni Association has selected Aug. 5 and 6 as reunion dates. Committees have been appointed, and the following program has been decided upon: Aug. 5, registration, business meeting of association, reception by president and Mrs. McNair, smoker and night-shirt parade; Aug. 6, trips about the Copper Country, lunch at Eagle Harbor, and dance at the college gymnasium in evening.

Preparations are under way for the entertainment of members of the Columbia Section, A. I. M. E., at Cranbrook, B. C., for three days beginning Aug. 21. The program is being arranged by the Cranbrook Board of Trade, and the East Kootenay division of the British Columbia Prospectors' Association, and includes an inspection by the visitors of the Sullivan mine of the Consolidated Mining & Smelting Co. at Kimberley. It is likely that several other mining projects of the district will be visited. Dr. Schofield, of the Dominion Geological Survey, is scheduled to deliver an address, "The Rocky Mountain Uplift as Applied to East Kootenay."

## OBITUARY

J. H. Miles, of Oroville, Cal., a builder and operator of gold dredges, died on June 30 while returning from Nome, Alaska.

H. B. S. Randall died at Brownsville, Texas, July 7, 1921. He was a graduate of the Michigan College of Mines and was interested in mining in Mexico for many years.

Albert Taylor, manager, North Atlantic district of the Electric Storage Battery Co., died on July 6 in New York City. Mr. Taylor became suddenly ill in his office, 23 West 43d St., and was taken to a local hospital, where he died a few hours later.

# THE MINING NEWS

## LEADING EVENTS

### Honduras Rosario Mines Shut Down

Closing Reported To Have Serious Effect on Internal Conditions

Tegucigalpa, June 27—The Rosario and Sabanagrande mines of the New York & Honduras Rosario Mining Co. have been flooded, and it will probably be many months before they are reopened. All the native employees except about fifty watchmen and powerhouse assistants have been dismissed, and many members of the foreign staffs have left. This is the largest industry in Honduras save the United Fruit, and the effect of its closing has produced an almost panic condition in the country. Honduras has no money of its own and very few banknotes. The Rosario mine imported American gold and banknotes monthly, which provided the standard medium of exchange in Tegucigalpa and southern Honduras.

There is some possibility that operations on a large scale will be started in December in the placer district near Juticalpa, Department of Olancho. The United Central American Corporation has acquired control of eleven square miles of placer ground, which the corporation purposes working with a dredge. Tests have shown satisfactory results.

The Honduras Petroleum Co. has opened offices in Tegucigalpa, and looks forward to the active exploration of its zones. This company, of which 52 per cent of the stock is held in London and 48 per cent in the United States, has acquired valuable concessions from the Honduran government, by which it obtains the exclusive right to drill for oil in three departments of Honduras for a period of fifty years. In return the company is required to build an automobile road from Comayagua to the Lake of Yojoa and keep it in repair during the life of the concession. This road is now being constructed and will be completed early next year, thus making the trip from Tegucigalpa to the United States much quicker and more comfortable.

Some work is being done in the Mura district of Nicaragua, where the Meyers properties are being electrically equipped.

#### OPERATIONS CURTAILED IN EL SALVADOR

The Divisadero and Monte Mayor groups of the El Salvador Mines Co. are closed down, and nearly all the foreign employees have left. Frank Estes, the new general manager, is making some explorations in the Monte Mayor group, and some assaying is being done.

The San Sebastian Mines (Charles Butters interests) are also closed and partly dismantled.

#### WEEKLY RÉSUMÉ

*Thus far at Washington, in the discussion of the new Tariff bill, little reference has been made to the metal schedule. Representative Arentz has introduced a bill which practically embodies the report of the Ingalls committee on the proposed revision of the United States Mining Law. Copies of this bill are now available for distribution. Secretary Fall has finally made certain recommendations in regard to the liberalization of War Minerals Relief legislation.*

*At Eureka, Utah, at the Chief Consolidated mine, a shaft-sinking contractor has announced that he will seek to break the world's record for shaft sinking. Industrial conditions are practically unchanged from last week, in particular at Tonopah. Another mine on the Mother Lode in California, the Central Eureka, has made a cut in wages. Word comes from Central America that the New York & Honduras Rosario mines have shut down, seriously affecting conditions in Honduras. The Honduras Petroleum Co. has secured a concession for drilling in three departments. In the Coeur d'Alene district in Idaho steps are being taken to rebuild the Prichard Creek railroad. From Wilmington, Del., it is announced that Minerals Separation North American Corporation has been admitted as party plaintiff to the Miami Copper Co. suit.*

### Minerals Separation North American Corporation Made Plaintiff in Miami Suit

Judge Morris Hands Decision Down at Wilmington—Minerals Separation, Ltd., Still Has Rights in Patents

Through the granting of their petition by Judge Morris in the U. S. District Court at Wilmington, Del., on July 15, Minerals Separation North American Corporation has become a party to the suit of Minerals Separation, Ltd., vs. Miami Copper Co.

The granting of this petition was opposed by the Miami company on the ground that the evidence which was adduced by Minerals Separation North American Corporation showed that Minerals Separation, Ltd., had disposed of its legal interest in its patents on July 8, 1913, more than a year before it had brought suit against the Miami Copper Co. Had the court so found, the effect of the decision would have been to vitiate the Miami suit. Judge Morris, however, did not so find, but, on the contrary, ruled that Minerals Separation, Ltd., had not disposed of its legal rights in its patents in the transaction of July 8, 1913, as noted above.

### Out for Shaft Sinking Record

Walter Fitch, Jr., Co. Starts Work of Deepening Water Lily Shaft at Eureka, Utah

An attempt to break the world's record in shaft sinking, now held by the Crown Mines in South Africa, was started on July 15 at Eureka, Utah, by the Walter Fitch, Jr., Co., which began the work of deepening the Water Lily shaft of the Chief Consolidated Mining Co. The start was made at 8 o'clock in the morning, at which time the measurement from collar to bottom, made by certified engineers, was 115.5 ft.

### Ford Willing To Finish Nitrate Plant at Muscle Shoals

Henry Ford has offered to take over and operate the Government nitrate plant at Muscle Shoals, Ala., on which \$80,000,000 has been spent. Secretary Hoover has transmitted the proposal to the Secretary of War. Mr. Ford has made the following four proposals:

First. He will take a 100 years' lease upon the Wilson Dam and No. 3 Dam and electric installation when completed. This work is estimated to cost \$28,000,000. After a short preliminary period, Mr. Ford proposes to pay interest at the rate of 6 per cent on the sum of \$28,000,000 and to amortize not only this sum but the entire cost of both dams over a period of 100 years.

Second. To purchase all the nitrate plant and equipment, lands, steam plant, and appurtenances, for \$5,000,000.

Third. To convert and operate the large nitrate plant (No. 2) for the production of fertilizer compounds and as a stand-by for Government explosives in case of war, and to keep it up to date in both lines.

Fourth. To limit the profits of the fertilizer plant to 8 per cent, an independent board embodying representatives of the American Farm Bureau and the National Grange and the Farmers' Union to certify to this maximum.

The Tennessee River will be rendered navigable to Chattanooga by the completion of this project.

### To Rebuild Prichard Creek Railroad in Coeur d'Alenes

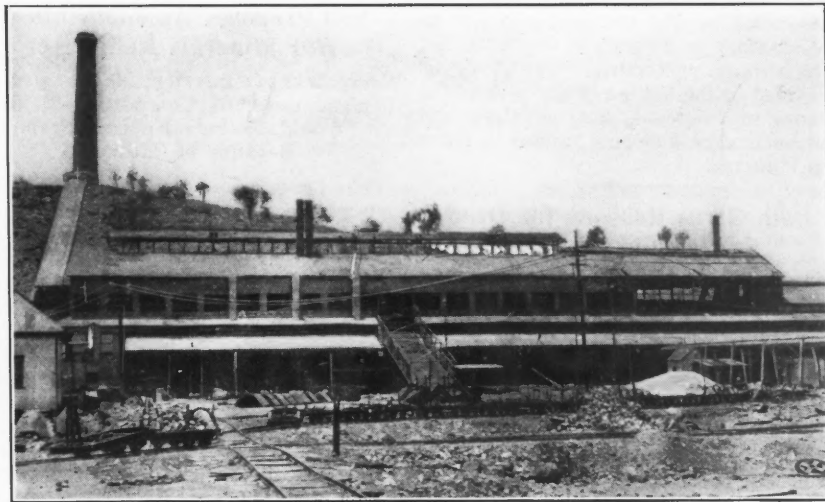
What is commonly known as the North Side section of the Coeur d'Alene district in northern Idaho has been without a railroad since December, 1917, when high water washed out the track of the O.-W. R. & N. Co. along Prichard Creek for about fourteen miles. It is now announced that Patrick Burke, president of the Bear Creek

Mining Co., operating on Prichard Creek, has contracted to purchase the right of way, rails, and all other equipment along the line for \$35,000, payable in four annual installments. Mr. Burke will undertake to rebuild and operate the line, and expects to be joined by other mining companies which will be served through the restoration of the line. The O.-W. R. & N. Co. agrees to lease Mr. Burke a locomotive and necessary cars and will receive and deliver tonnage at the Prichard terminal at the established rates. The railroad company also reserves the right to repurchase the Prichard Creek line if it should find it desirable to do so.

### Events in Progress of State Mining in Queensland

#### Minister To Try Experiment in Re-opening Chillagoe Smelter and Holding Bullion

Brisbane, June 4—It has just been announced that both the copper and lead furnaces of the state smelters at Chillagoe have been re-started. The Minister for Mines, who has control of this company, asserts that he will give at Chillagoe a practical demonstration of the feasibility of his suggestion (reported on p. 111 of the issue of July 16) regarding Mount Morgan, and hold the copper, silver, and lead produced at the state smelters until a remunerative price can be got for it. What will



CHILLAGOE STATE SMELTER, QUEENSLAND, AUSTRALIA

be the ultimate result, from a commercial point of view, time will tell.

The Minister of Mines is having trouble with another of the state mining enterprises. At the private coal mines of Queensland the owners pay their men a hewing rate, but to true Laborites all piecework is objectionable, and at the Baralba state coal mine colliers have been paid a high wage per shift, irrespective of the quantity of coal produced per man. In return for this wage, it seems, these men have been working only until "crib time," occupying the remaining

half of the shift in getting ready for the next one. As a result of this "go slow" foolery it has cost 17/6 to produce each ton of coal, and the coal having been sold to the railways at 14/9 per ton, the same price which they had been paying to a private company that had made a profit on the business, the government has been losing 2/9 per ton. The minister has now decided that he will have no more of this, insists upon the men in future working at a hewing rate, and has closed down the colliery until they see fit to accept this method of payment.

## NEWS FROM WASHINGTON

By PAUL WOOTON  
Special Correspondent

### Metal Schedule Ignored So Far in Discussing Tariff

#### Tilson Alone Makes Reference to It—Duty on Potash To Be Strongly Opposed

An unusual feature of the discussion in the House of Representatives on the tariff is the absence of reference to the metal schedule. This is due largely to the fact that no amendment to that schedule is permitted under the rule under which the House is operating. Representative Tilson, of Connecticut, the chairman of the subcommittee which compiled the metals schedule, made a statement in regard to that schedule, but it provoked no discussion. He said in part:

"During the war, not only such old mining industries as lead, zinc, and quicksilver underwent unusual development, but a considerable number of new industries were undertaken and to a considerable extent developed. Under Government stimulus, mining was encouraged to a very marked degree. Rare metals used as alloys for steel, such as chrome, tungsten, molybdenum, and others, were eagerly sought for. The mining of manganese ore was

especially encouraged and reached a production of more than 40 per cent of the total domestic consumption in 1918. Many of these newer enterprises have suffered seriously since the close of the war. In some cases, such as tungsten, molybdenum, and manganese, it is here attempted by protective duties to preserve the industries. Others like chrome, also encouraged by the Government and now destined to lose what has been invested unless recouped by the Government, the committee has deemed it unwise to attempt to save, because the results of the war development do not seem to warrant the belief that an economical industry can be built up in this country, and, if not, then the duty imposed would prove a needless burden upon the entire steel industry.

"In the metal schedule, as throughout the bill, specific, rather than ad valorem, duties have been imposed wherever possible; first, because they are more readily determined, and second, because they furnish a greater degree of protection in a falling market when protection is needed most. In comparing the rates in this bill with those contained in previous laws it should be borne in mind that by reason of the war production costs have been generally increased, but nowhere to the same

extent as in the United States, which means that a specific rate now furnishes a less degree of protection than was furnished by the same specific rate when the value of the article was less. In view of the well-grounded belief that it will be a long time before production costs in this country again approach normal, it has been found necessary in fixing rates to take these changed conditions into account."

It is evident that great difficulty will be experienced in retaining the potash item in the tariff bill. Allegations that this duty will cost the farmers \$6,000,000 or more will be accepted by many members of Congress who represent large agricultural constituencies. Unusual interest is being taken in the matter by the representatives of the farmers, as most farmers have allowed their lands to become under-fertilized and have reached the point where they must make much larger purchases next year. To have anything interfere with possible declines in price brings forth loud complaint.

On the other hand, the representatives of the domestic potash producers point out that the duty in the form

prescribed by the committee is not as satisfactory as a straight 50c. duty, for which they contended. The duty as provided in the bill may take care of the plants in existence, but certainly will not encourage any new capital to enter the industry.

### Bain Gives Reasons for Drop in Demand for Zinc

Director Returns From Visit to Tri-State Field—Stocks at Plants Equal to Quarter-Year's Consumption

After a personal visit to the Tri-State zinc district, H. Foster Bain, the Director of the U. S. Bureau of Mines, has returned to Washington with some clear-cut impressions as to the zinc situation. In summing up what he saw and heard during his visit, he said:

"The industry is selling zinc at a price which it has not had to face since 1897. Stocks of spelter at plants are at least 25 per cent of the normal year's consumption. This is a heavy load to carry, and the industry is staggering under it. Zinc is worse hit than oil. Oil is in trouble enough, but the petroleum interest can dispose of current production, whereas the zinc interest cannot.

"Another serious phase of the situation is the very large substitution of black sheets for galvanized sheets and the development of various forms of protective coverings as an alternative for galvanization. It is going to require unusual effort on the part of the zinc industry to win back this loss of market, which had its inception during the war period. The galvanizing trade prior to the war absorbed some 50 per cent of the output. The increased use of black sheets can be blamed in part on the increased tendency, particularly during the war, of certain manufacturers of galvanized wire and galvanized sheets to use too thin a coating of zinc. The finished product looked as good as the better quality, but the early failure of this material has brought galvanized products into a certain amount of disrepute, especially among the smaller buyers who are not in a position to make close determinations of quality. This, combined with the fact that the steel interests, which also do the galvanizing, are more interested in pushing their ungalvanized product, has made a very material difference in the demand for spelter.

"The zinc industry is one of those activities which feels a general business depression with peculiar intensity. In addition to the business depression there have been a number of minor factors which in the aggregate have affected the industry adversely. Important among these may be mentioned the reimportation of zinc sold abroad."

### First Quarter Shipments Slump to Less Than Half

Shipments of products of mines slumped decidedly during the first quarter of 1921, according to figures just made public by the Interstate Commerce Commission. The average shipments of products of mines, during 1920, were around 300,000,000 tons per quarter. For the first quarter of 1921, mines contributed only 115,836,502 tons to the tonnage hauled by rail.

### Fall Proposes Amendments to War Minerals Relief Act

Secretary of Interior Makes Recommendations to Committee—Raker Would Exclude No One From Benefits of Measure

The Secretary of the Interior has submitted to the House Committee on Mines and Mining drafts of the amendments to the War Minerals Relief Act which he would like to see enacted. These amendments reflect the policy of the new administration of the Interior Department and of the new War Minerals Relief Commissioner. The matter has been the subject of extended conferences between the Secretary, the War Minerals Relief Commissioner, and the chairman of the House Committee on Mines and Mining. Pending the presentation to the committee of these amendments, they are not being made public.

The extent to which some members of Congress would liberalize the law is reflected in an amendment introduced by Representative Raker, of California. His amendment would extend relief to all those who responded to "any personal, written, or public request, demand, solicitation, or appeal from any of the Government agencies mentioned in the act." The much controverted "request and demand" feature of the law would be expanded by Representative Raker so as to indemnify those who responded "to such request, demand, solicitation, or appeal." Claimants are to be reimbursed for "such net losses as they may be found to have incurred and are in justice and equity entitled to."

So that no claimants may be barred from reconsideration proceedings, Mr. Raker includes the following proviso in his amendment:

"The Secretary of the Interior is authorized to review and reconsider for an award claims in the settlement of which arithmetical errors have been made and all claims wherein decisions have been determined by rulings contrary to the provisions of this amendment, and to ascertain as a matter of fact if such claims are raised upon a request and to ascertain as a matter of fact if such claims are based upon a request, demand, solicitation or appeal as provided by this amendment, and that the unexpended balance of the appropriation carried in said act be continued available for the purposes set forth above until all such claims shall be fully settled or disposed of."

The latter part of Mr. Raker's amendment doubtless is inspired by the inquiry from the Director of the Budget as to whether or not the balance of the War Minerals Relief Appropriation now remaining should not be turned into the Treasury.

### Government's Silver Purchases

Purchases of silver under the Pittman Act during the week ended July 16 totaled 1,135,000 fine ounces. This brings the total purchases to date under that act to 62,551,816 fine ounces.

### Bureau To Reorganize Work in Alaska

Territory Is To Be Divided Into Four Districts, Each in Charge of an Engineer

With the purpose of fostering a more rapid and better development of the mining industry in Alaska, the U. S. Bureau of Mines is reorganizing its work in that territory. D. A. Lyon and George S. Rice are now in Alaska on a tour of inspection to determine how the bureau can best assist the industry. It is proposed to divide the territory into four districts, each being in direct charge of a Bureau of Mines engineer. A supervising mining engineer will be in general charge of the four district engineers. The experiment station at Fairbanks will be headquarters. District 1 has been assigned to Bert W. Dyer, who will also continue to discharge his duties of Federal Mine Inspector of Alaska. This district embraces the south coast, including the Matanuska, Kenai, and Bering River coal fields, the Copper River basin, and, for the present, the Katalla oil fields and southeastern Alaska. The special duty of this district engineer will be in connection with coal, copper, and lode gold.

J. A. Davis will continue as superintendent of the Fairbanks station and, in addition, will be in charge of District 2, which consists of the territory tributary to the Government railroad from Seward to Fairbanks. This area includes the Nenana lignite field.

District 3 consists of interior Alaska, comprising the Yukon and Tanana basins. This district has been assigned to K. T. Sparks, assistant mining engineer. District 4 is the Seward Peninsula. No assignment of an engineer for this district has been made as yet. It is believed, however, that the best way to assist the mining industry in this district lies in the development of a practical and economic method of cold-water thawing. Charles Janin, consulting engineer of the bureau, is now compiling and studying the results of experiments made by various companies, preparatory to investigation by the bureau.

Co-operation will be arranged and maintained with the Geological Survey and with the Territorial Government.

### Copies of Proposed Mining Act Ready for Distribution

As a result of the action of Representative Arentz, of Nevada, in introducing as a bill the proposed revision of the mining laws, printed copies of that measure now are available for distribution. Copies of the bill may be obtained upon application to the Washington office of *Engineering and Mining Journal*, 610 and 611 Colorado Building, Washington, D. C. Mr. Arentz and the committee on Mines and Mining of both the Senate and of the House are anxious to receive comment on the proposed changes in the existing mining law.

## NEWS BY MINING DISTRICTS

### London Letter

#### Bantjes Consolidated May Be Liquidated—Conditions Improving at Randfontein—South Crofty and East Pool Agree on Pumping

London, July 4—It would almost appear that the Bantjes Consolidated Mines, which has been in a parlous condition for a long time, will go out of existence at about the end of the current year. Nature has not favored this company, and though work by its own labor force has stopped, a forlorn hope attempt was made to prove the property by means of an arrangement with its eastern neighbor, the Consolidated Main Reef. The idea was to test the ground at a lower level than the mine workings by driving from the Consolidated Main Reef. In the early stages indications were quite encouraging, 270 ft. sampled giving an average value of the Leader and Main Reef of 6.7 dwt., over a reef width of 62 in. This portion of the ground, 1,000 ft. along the strike and 2,000 ft. on the dip, was leased to the Consolidated Main Reef. As the drive westward progressed, values became less satisfactory, and the Consolidated Main Reef decided to discontinue development of this area. Work for the Bantjes continued, but a dike 285 ft. wide seems to have disturbed conditions, for unpayable ground continues. Another 300 or 400 ft. are to be driven, when, should results still prove of a negative character, steps will be taken to liquidate the company. This part of the Western Rand has proved particularly unfortunate.

At Randfontein, which forms the major portion of the western boundary of the gold field, conditions appear to be looking up. The financial position of the Randfontein Estates & Central has been considerably eased by the payment which the court decided Sir Joseph Robinson was to make for past transactions in which the company was interested. Underground work is progressing at the Central, and it is hoped that before long the ambitious program mapped out may be put into execution. One of the troubles with the Randfontein companies is over-capitalization. If this matter could be remedied the prospects of shareholders would improve. At present there is little chance of a return upon the shares. In connection with the two Randfonteins, a disadvantage of bearer warrants makes itself felt. The companies were to be amalgamated to reduce the capital, but the holders of the Randfontein Estates debentures cannot be reached by communication because their addresses are not known. Consequently the scheme has had to be abandoned.

The rich strike made on the 5th level of the Descubridora vein in the

Esperanza mine has proved to be what mining men generally expected—a small and erratic orebody. The indications are encouraging on account of the fact that there is a long run of unexplored ground on the course of that orebody. For the shareholders' meeting, the latest development results were cabled, and the few feet accomplished were satisfactory, 4 ft. in No. 8 winze showing a width of 27 in. assaying 7.74 oz. gold and 100 oz. silver. These were the high values, however.

Though, of course, with tin at its present price, and the enormous stocks that have yet to be consumed, there is no possibility of any revival of activity in Cornish mining, every step is being taken to keep the mines in the Duchy free from water and ready to resume operations immediately the statistical and financial position will permit. Some time ago I remarked on the divergence of opinion between the directors of South Crofty Co. and those of the East Pool & Agar, as to who should bear the expense of keeping the mine free of water. I now learn that the directors have together agreed upon a scheme. The two mines are connected at various points, and according to the arrangement some of the water from East Pool will be conveyed to and pumped by the Cornish engine at South Crofty. This will greatly benefit the East Pool, which has more water than the Crofty.

### CANADA

#### British Columbia

##### Dissolution of British Columbia Chamber of Mines Averted

Alice Arm—It is reported that 3,000 tons of ore is to be shipped from the Dolly Varden mine. The railroad also is to resume operations. No definite announcement, however, has been made regarding the resumption of continuous work at the mine.

The Copper Group on the Upper Kitsault River is to be developed by the Homestake Mining & Development Co. G. H. Garhardi is in charge. He plans completing the trail, installing a compressor, and driving a tunnel that is expected to strike the surface lead at 200 ft. depth.

Trail work is under way by the provincial government along the Illiance River. This is a promising mineral district hitherto handicapped because of transportation difficulty.

Hope—Work on the Emancipation Group continues. The richness of comparatively small shoots off the main vein persists, and the outlook is about the same as at the time William Fleet Robertson, provincial mineralogist, made his report. The large body of ore, carrying uniform values, has yet to be proven.

Vancouver—The threatened dissolution of the British Columbia Chamber of Mines, at Vancouver, B. C., has been avoided. A substantial grant has been promised by the government, and the members have responded to an appeal to advance the additional funds necessary to permit the continuance of the work of the organization.

Nelson—A car of high-grade ore is being mined at the Silver Reef group, Anderson Creek.

Trout Lake—Mill machinery from the long inactive mill of Ferguson Mines, Ltd., owning Silver Cup, Nettie L. and Ajax mines, near Ferguson, has been hauled down and shipped. Another deal is reported as pending for disposal of the Silver Cup mine, which has been under lease all winter.

Smithers—Development work is to be resumed on the Babine Bonanza group, in the Babine Mountains, by James Cronin. Last year he ran a long adit that tapped the vein about 350 ft. below his former workings and over 1,000 ft. below the apex of the hill.

Greenwood—Morrison & McGillis, owners of the Tam O'Shanter property, in Deadwood camp, in sinking a winze from the main tunnel, encountered the vein at a point where it contained a shoot of ore carrying grey copper and native silver. This is the first time native silver has been found in any place on the south side of Boundary Creek.

Trail—Ore shipments received at the Consolidated company's smelter for the week ended July 7 totaled 6,969 tons, of which 57 came from the Surprise mine at Republic, Wash., and the rest from the company's mines.

#### Alberta

Edmonton—The gold rush into the Peace River district has proved to be a "false alarm." The stamperers did not obtain results warranting undue enthusiasm.

#### Ontario

##### Price of Powder Dropping Gradually—Wasapika Expects To Build Mill

During the past few months the mines of Northern Ontario have benefited by several cuts in the price of powder. The third and largest cut was made a few days ago, when the price was lowered from \$19.50 to \$17 per 100 lb.

Cobalt—During June the Lake Shore mine, in Kirkland Lake, treated 1,656 tons of ore and recovered \$52,539, or an average of \$31.75 per ton, which constitutes a record in the history of the company. This is more than double the grade of the previous four months. Most of this ore came from development faces. The Lake Shore, as well

as other mines in the district, has been hampered by frequent occurrences of power shortage, so that the mill ran only 76 per cent of the possible running time.

It is officially stated that the mill heads of the Kirkland Lake Gold are running from \$9 to \$10 per ton. The average for the last fiscal year was slightly over \$6.

Work has been resumed on the Granby-Kirkland property, preliminary to sinking a shaft.

On the old Buffalo property, now owned by the Mining Corporation, a winze has been sunk 40 ft. on a new vein, which shows an average of 2½ in. of high-grade ore.

During June the Nipissing mined ore of an estimated net value of \$162,824, and shipped bullion from its own mine and customs ores of an estimated net value of \$208,526. The value of the silver production is estimated at 59½c. per oz. This production is higher than that for any other month of the current year.

The Kerr Lake mine has recently made two shipments of high-grade ore, which were obtained from the development and exploration work carried on since the property closed down last winter.

**Gowganda**—The equipment is being installed in the small hydro-electric plant at Hanging Stone Falls, in Gowganda. As the company has no immediate market for power, however, installation is not being energetically pushed.

**Swastika**—During the recent bush fires the plant of the Bourkes mine, in the Swastika district, was destroyed by fire.

The Miller Independence, in the Swastika district, which recently floated a bond issue of \$50,000, has let a contract for diamond drilling to be carried on from the 500-ft. level.

The Kirk Gold Mines, in Western Ontario, has arranged to buy the mill of the Havilah company, and expects to have it in operation by the first of next year.

**West Shining Tree**—In the West Shining Tree district, the Wasapika is taking a large quantity of supplies and machinery into the property. It is expected that this company will start the construction of a 150-ton mill.

The White Rock mine, in the same district, recently resumed operations, and has begun to sink a new shaft.

#### NEW CALEDONIA

##### Nickel and Chrome Ore Mining Undergoes Serious Decline—Shipping Laid Off

The *Bulletin du Commerce* of Nouméa, New Caledonia, for May 13, discusses among many other adverse experiences now visiting that French colony, the serious situation in its mining industry.

The situation affects chiefly and seriously la Société des Hauts Fourmeaux de Nouméa, which has deferred the evil day as long as possible, but at last

has had to reduce activities because of closed markets. Development work has stopped at the Téné mines, Bourail, and ore extraction has been cut to the minimum at other properties. On May 15 came the first reduction in the force, affecting 130 laborers and skilled workmen, and further reductions in personnel were then confidently expected. Imported Javanese and Tonkinais were being retained however. The effect of the depression also strikes the shipping, a large proportion being in the ore-carrying traffic. There have been 7,200 tons (ten steamers) released or laid up, and 312 ship hands are said to be affected.

The effect on the chrome-ore industry is not yet evident in full. However, the Tiébaghi chrome mine will ship only half the tonnage of last year; and the chrome mines of the Coulée district are already both cutting output and discharging all but the Asiatics and the *canaques* of their forces. As for la Société le Nickel, at the date of writing it was held certain that it would not reduce production; and there was also reason to expect the work on construction of the Yaté hydro-electric plant to continue.

#### KOREA

##### Mine Fire at Oriental Consolidated Property Believed To Be Out

Unsan—The Oriental Con. Mining Co.'s cleanup for June was \$94,000, practically the same as in May. The mine fire is probably out. It was hoped that the Tabowie mill would be running at full capacity by the end of June.

#### MEXICO

##### Coahuila

##### Peso Assessment Levied by La Perlita y Anexas

Torreón—The Mexico department of transportation of the American Smelting & Refining Co. has announced a new arrangement with the National Railways of Mexico for better freight service. Ore shipments and mining supplies will be handled more promptly and at a reduction in rates.

Saltillo—La Perlita y Anexas mining company, with offices in this city, has called for an assessment of 1 peso per share on its second issue of stock, payable during July. Work at the company's mines in the state is to be pushed with more vigor, so as to have them in condition for the regular shipment of ore as soon as conditions improve and the smelters resume operations.

Recently a number of new zinc properties have been located in the State of Coahuila. At Monclova, near the old Tsan Yi Yan mines, a new location has been filed on by Attorney Alvino Espinosa, from which property some fine zinc ores have been extracted. The San Juan group in this same region is producing good zinc ore which carries silver, lead, and copper also. Contiguous to this group lie the Maria, Juana, and Perla mines, which have produced high-grade zinc ores.

#### Zacatecas

##### San Manuel y Anexas Levies Assessment

Zacatecas—The Cia. Minera San Manuel y Anexas has levied an assessment of 1 peso per share, payable at the office of the company either in Mexico City or Zacatecas. Henry Barnhof, formerly of Mapimi, is president. The company is developing some valuable properties in Zacatecas.

Edward Palmer has recently added a number of new claims to his extensive mineral holdings in this state, having applied for patent to La Perla, a group of copper mines in the La Parroquia Mountains, near Zacatecas City.

#### Chihuahua

##### Scattered Holdings of Pedro Alvarado Taken Over by New Company

Parral—The Mexican Natural Resources Co. was recently organized at San Antonio, Tex., for the purpose of taking over about fifty properties in Chihuahua, Sonora, and Durango belonging to Pedro Alvarado. A party of engineers is said to be reporting on these properties, which are scattered, with a more or less unknown value. The properties are not to be confused with those of the Alvarado Mining & Milling Co., in the Parral district.

#### ARIZONA

##### Big Ledge Copper Co. Offers Further New Stock

Globe—H. D. Brackman, a chemist, formerly with the Inspiration Consolidated, after some experimental work, is reported to have perfected a leaching process by which, with a makeshift equipment, he is said to have succeeded in saving 95 per cent of the assay value of silver ores from Richmond Basin and Rambo district. He is starting on the erection of a ten-ton plant in Globe.

Additional bin capacity has been provided at the International smelter at Miami for storing concentrates from the Miami mill, which are being received at the rate of five carloads a day. It is understood that payment for the concentrates is being made in copper at the refinery in New Jersey.

Inspiration is reported to be negotiating for the purchase of the adjoining property of the Southwestern Miami Development Co.

Prescott—Only the tall stack is to be left in junking the plant of the Great Western Smelting Co., at Mayer. The smelter was erected about five years ago, and for a few months was operated in charge of Arthur Cole, who had been with the Cananea smelter. It was closed in June, 1917, a number of lawsuits being brought then. Heading the enterprise were Charles Batre, an Arizona promoter, and H. LaDuc, of St. Paul. The plant and property are now owned in New York, the purchasers being locally represented by Herman A. Wagner, manager of the Grey Eagle reduction plant, near Mayer.



Heavy machinery is being taken from the old Garford property in the Cherry Creek section to mines near Wickenburg, owned by L. N. Butler, of Phoenix. The Trinity mine, on Pine Flat, is being equipped with a hoist, compressor, and other machinery from mines on Turkey Creek.

Mayer—The Big Ledge Copper Co. is offering \$500,000 in 8 per cent preferred stock at par \$5 a share. The original capitalization was \$7,500,000, with shares at \$8. Late in 1917 this was increased to \$15,000,000, the new stock being offered at \$2. The corporation's property, near Mayer, includes the Butternut and Henrietta mines, both well-esteemed properties, but hardly worth \$15,000,000, and the old Treadwell smelter, a small plant not modernly equipped. The smelter in past years was the scene of a number of experiments in ore treatment, none of which appear to have been successful.

Jerome—Calumet & Arizona has just completed an arrangement whereby it is to secure control of the Verde Central property. It has an option on the majority of the shares of this company, which it can exercise after it is satisfied that the property is worth it. According to George A. Newett, a director of Calumet & Arizona, the shareholders of Verde Central are assured that the prospecting of their claim will be intelligently and fairly done, and if there is a mine the Calumet & Arizona will probably find it. There are 400,000 shares of stock of Verde Central issued. Prospecting has been under way for several months, and directors of Calumet & Arizona have been prominent in this work. James and Thomas Hoatson and Thomas Collins were attracted to this location, and have been aiding in prospecting that portion of the tract which has looked best to them. This point is not far distant from the old United Verde mine. Ore has been shown, and further opening of the formation, with drifts and shafts, will be undertaken.

Duncan—The Oro Plata Consolidated mines of New Mexico, which owns a number of gold and silver mines and prospects in the Mount Royal district, states that it will undertake work soon. It claims that it has secured the prior rights to the water of the district from the state. It plans to bring all to a central milling point. Financing is being arranged. Harold C. E. Spence is president.

#### NEW MEXICO

Lordsburg—The ore shipments from this district for June amounted to 29 cars of ores and concentrates, a total of 1,365 tons.

The Co-operative Mining Co. shipped three cars of silver-lead concentrates during June to the El Paso smelter.

Steins—Sam Houghton, of Fresno, N. M., formerly geologist with the Chino Copper Co., has taken a lease on the "66" claim. A strong vein of siliceous silver ore is exposed, which will be developed in the near future.

#### COLORADO

##### Golden Empire Resumes Development in Arvada Tunnel

Empire—Development has been resumed in the Arvada tunnel of the Golden Empire Co., which is about 3,000 ft. long, and will be advanced to explore veins in the Union district north of Empire. The scheme of development which the company has in view will involve the expenditure of about \$100,000. E. D. Payne is manager.

The Randolph Gold M. & M. Co. has started development work in the Empress tunnel. W. A. Snyder is president and manager.

Telluride—The shipments of concentrates during June were as follows: Smuggler-Union Mining Co., 71 cars; Tomboy Gold Mines Co., Ltd., 51; Liberty Bell Gold Mining Co., 11; total, 133.

#### CALIFORNIA

##### Central Eureka Cuts Wages 50c. Per Shift—U. S. Smelting Co. Asks for Reduction in Assessment

San Francisco—The present ocean freight rate on copper from San Francisco to Baltimore is \$8 per ton. Shippers are agitating for a reduction of \$2 per ton, and steamship companies have been considering such a reduction in view of competition with rail transportation. The recent special meeting held by the North Atlantic and Pacific Eastbound Conference in San Francisco failed to approve of the proposed reduction, and the present rate is likely to continue.

According to local newspapers, warrants have been issued in Oakland, Cal., for the arrest of George Graham Rice and others in connection with alleged stock deals in which employees of the California Cotton Mills of Oakland, Cal., were swindled in their endeavor to get rich in the Broken Hills promotion.

Jackson—The Volcano ditch has been cleaned preparatory to supplying the Elephant Deep hydraulic mine at Volcano, where plans are being made to operate several hydraulic giants in the fall. Production is being steadily increased at the Argonaut.

Sutter Creek—The Fremont and Bunker Hill mines, under the stimulus of lower wages and cost of materials, are developing their lower levels, with satisfactory results.

The Central Eureka posted notices announcing a wage reduction of 50c. per shift, effective from July 17.

Angels Camp—Fire is reported to have destroyed the surface plant of the Sultana Mining Co. near Angels. The mill escaped the fire, which destroyed the hoist, headframe, compressor, engine and boiler plant, and accessory buildings.

Bishop—The Darwin Silver Co., of which A. G. Kirby is superintendent, is opening three properties at Darwin. The Consolidated Wilshire Mining Co. has resumed operation of its flotation plant. Jack Albers is superintendent.

Kennett—The U. S. Smelting Co. has

petitioned the county officials for a reduction of its assessments from \$1,015,210 to \$230,371. The changes in assessment asked for are: Mammoth mine from \$448,720 to \$39,391; Sutro mine from \$59,160 to \$16,000; Keystone group from \$32,000 to \$13,200; workmen's cottages at Kennett from \$15,000 to \$6,720; smelting plant from \$435,330 to \$141,780.

Bridgeport—A gravel deposit containing gold is reported to have been discovered in Dog Creek Canyon. H. G. Beck and associates investigated the long-abandoned placers in this district and discovered an encouraging lead. Preparations are being made to begin work.

#### NEVADA

##### Strikers and Operators at Divide Holding Firm—Original Klondyke Lessees Start Shipping

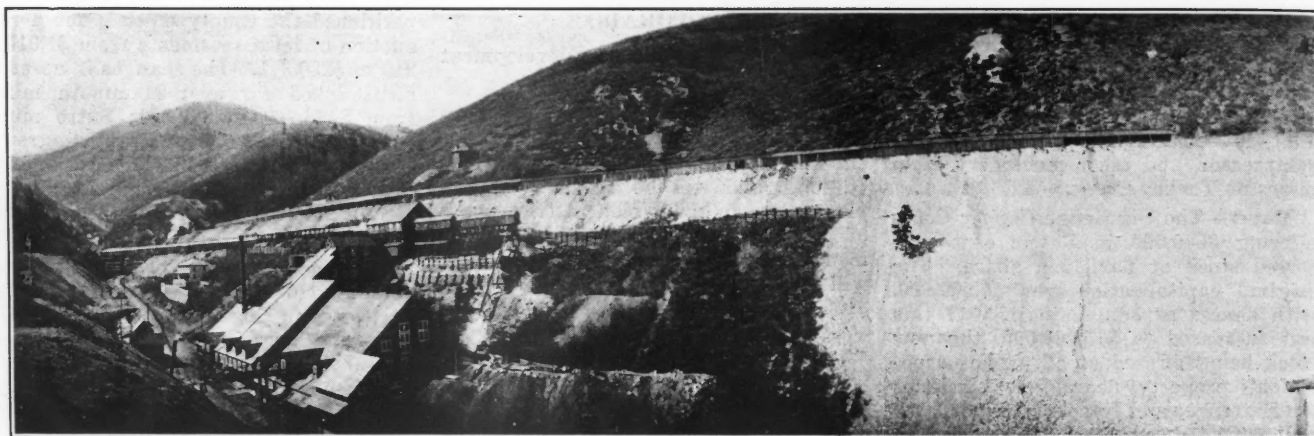
Virginia City—Active work is under way in the Con. Virginia, Ophir, and other mines on the Comstock Lode, with little developments of importance reported. Considering the optimistic reports on underground conditions in these mines, the recent assessment of 3c. per share on the increased capitalization of the Con. Virginia and Ophir would appear to be justly criticised.

At Gold Hill, the V. & T. railroad spur to the portal of the main haulage tunnel of the United Comstock Mines Co. has been completed, and building material is now being hauled to the proposed mill site. Excavation for the crushing plant and other necessary buildings is under way. About 300 men are employed.

Tonopah—No particular effort is apparently being made by either companies or strikers to effect a settlement of the wage controversy which has tied up practically all mining operations in the Tonopah and Divide districts since April 16. Both sides are standing pat, all the advantage being with the operators because the reduced wage scale is higher than that of other mining camps in the district. However, the strike committee continues in power, and even though it is generally conceded that the majority of the men are ready to return to work at the reduced wage, they are held in line by the leaders.

Lessees in the Montana, where several thousand tons of ore is broken and awaiting shipment, have refused to ship ore to custom mills paying the reduced scale of wages. As all the mills that accept custom ore, including the Tonopah Mining, Belmont and MacNamara, are all paying the reduced scale or not operating, no shipments will be made at present by lessees.

The Tonopah Belmont and Tonopah Extension now have about three-fourths of a normal crew and are running their 500 and 350-ton plants at 50 per cent capacity. Limited development work is being done, and mining operations as a whole are gradually being increased as new men are brought in. The Tonopah Extension on July 7 shipped \$12,500 worth of bullion, which



JUDGE MINING & SMELTING CO.'S CONCENTRATOR AND FLOTATION MILL, EMPIRE CANYON, PARK CITY, UTAH. DUMP IN BACKGROUND THAT OF SILVER HILL SHAFT OF SILVER KING COALITION MINES CO.

is the first since the shutdown. The West End, on July 3, shipped thirty-three bars of bullion with an estimated value of \$75,000.

**Goldfield**—The Donald and Giles lease in the Florence, with work being done from the 365 level, is showing up well, and the ore shoot bids fair to extend through to the surface. Two inches on the foot wall assays over \$11,000 per ton, and the average ore broken is said to average \$300 per ton.

**Klondyke**—Lessees on the Original Klondyke property began on July 6 to ship ore at the rate of fifty tons per day to the Belmont mill at Tonopah. The Knox Divide, controlling the Golden State mine, has not yet started shipping, although there is plenty of broken ore in the stopes and on the surface awaiting shipment. The Ben Hur Divide, which owns ground between the Original Klondyke and the Golden State, has sunk its vertical shaft to a depth of 110 ft. and started crosscutting from the bottom of the shaft to cut the vein at what appears to be the most favorable point as projected from the 60-ft. level.

**Rand**—Nevada Rand Mines Co. recently shipped 15½ tons of ore running 2.99 oz. in gold and 83.7 oz. in silver, or \$142.87 per ton, from its property seventeen miles northwest of Nolan at Walker Station. This ore was taken out by J. D. Walker. Two other shipments have been made running \$115 and \$294 respectively.

**Ely**—C. B. Lakenan, manager of the Nevada Consolidated Copper Co., recently stated in Ely that there was reasonable hope for the resumption of limited operations toward the end of this year. The new contact orebody in the Ruth mine, now being developed, continues to show copper ore of direct smelting grade, both in the northerly and southerly drifts on the contact, and has already been proven for a length of 450 ft. along the strike. The limits of this orebody are as yet unknown.

A number of discoveries of rich gold ore have recently been made in the Ely district, the most important being that of the Millick brothers in Spring Valley. The inclined shaft sunk on the

vein is now down 85 ft. Assays from the vein run \$150 in value, and a car-load is now on the dumps awaiting shipment.

The Mollie Gold Mining Co. has recently been formed to work valuable gold claims in the Osceola district. The discovery of rich ore by Tilford and Baird is responsible for much prospecting in this section.

#### UTAH

##### Output of Mines Expected To Drop Greatly This Year—Body of Miner Killed in Cave-in Recovered at Judge

**Salt Lake City**—Indications are that the 1921 output of metal by Utah mines will be far below normal. Operations at the smelting plants in Salt Lake Valley and vicinity are a fair index of conditions. The Murray plant of the American Smelting & Refining Co. has three out of eight lead furnaces in blast. The United States Smelting Co. at Midvale has four furnaces in blast, including one furnace on matte concentration; the International at Tooele has recently finished cleaning up, and on July 5 closed down its two lead furnaces.

Regarding the output of gold in Utah, this has steadily decreased since 1911, and will be notably less this year than in 1920 on account of the lessened output from copper ores and siliceous ores. Most of the gold comes from the lead ores and copper ores of Bingham Canyon and from the siliceous ores and lead ores of Tintic. Shipments from the Tintic district have been even less than in the first part of 1920, and the principal copper and lead mines of Bingham are closed. Gold-bearing ores in Piute and Box Elder counties continue to be mined.

Silver will probably be below normal also. Some of the producers of silver-lead ores at Park City have had difficulties over smelting contracts, and several mines in the Tintic district have been closed down on account of the expense and difficulty in marketing ores. The Chief Consolidated, the largest producer of silver in 1920, has, however, maintained shipments, and the

Tintic Standard, the second largest shipper of silver ores in Utah, has shipped more smelting ore in the first half of 1921 than in the corresponding period of 1920, and has completed and is operating a milling plant for the treatment of siliceous silver ore. The Vipont, in Box Elder County, has upheld its production of silver ore.

Regarding copper, the Utah Copper Co., which produces most of the copper of Utah, was active in January, February, and March, and produced nearly 24,000,000 lb. of copper, but the mine was closed in April. The Utah Consolidated, a producer of both copper and lead, closed its mine at Bingham in February. The Tintic district contributes a comparatively small part of the copper output of the state—less than 3 per cent of it in 1920.

The lead output was somewhat below normal in 1920, and will probably be far below normal in 1921. The United States Mining Co. at Bingham, the principal producer at present, has continued to ship lead ore, but the Utah Apex and Utah Consolidated mines, both large producers of lead, were closed. The mines at Ophir, in Tooele County, were closed in January, and the output of lead from Park City was less than in the first part of 1920. In Tintic, the Chief Consolidated and the Tintic Standard have shipped more lead-bearing ore than ever before, but the output from the other mines of the district has been much less.

Regarding zinc, little effort was made to produce this metal in Utah in 1921, on account of the unusually low price. The electrolytic zinc plant at Park City closed down because the rate for electric power was greatly increased, contrary to the agreement with the power company. Zinc concentrates from the ores of Bingham and from tailings at Midvale are not being marketed, and the Scranton mine, in Tooele, is closed.

**Eureka**—Shipments from the Tintic district for the week ended July 9 amounted to 156 cars. Production was as follows: Tintic Standard, 47; Chief Consolidated, 36; Grand Central, 12; Iron King, 9; Eagle & Blue Bell, 8; Victoria, 7; Iron Blossom, 11; Dragon, 6; Swansea, 8; Colorado, 8; Mammoth,



PORTAL AND SNOW SHEDS OF JUDGE MINING & SMELTING CO.'S SNAKE CREEK TUNNEL,  
LOOKING NORTHEAST TOWARD PARK CITY, UTAH

1; Yankee, 1; Eureka Hill, 2; total, 156 cars.

During the week the Horn Silver at Frisco shipped 28 cars of ore to the Tintic Milling Co. at Silver City.

The Chief Consolidated has declared a dividend of 5c. a share, or \$44,201, which will be paid Aug. 1, this being the regular quarterly dividend. The company has maintained production through difficult times, sending out chiefly higher-grade ores and holding back the lower, following the principle that a continuance of operation to preserve the organization is the better course in spite of some sacrifice entailed. The Grand Central has permitted a number of employees to lease old workings during the period of suspension, and considerable ore is being shipped from a clean-up of these workings. The Eagle & Blue Bell and the Victoria are making heavier shipments, and both properties are in excellent condition. The Tintic Standard announces that it will install two new roasters at its new mill, making a total of nine roasters, which together will have a capacity of 180 to 190 tons daily.

**Park City**—Shipments for the week ended July 9 amounted to 1,267 tons, as compared with 1,957 the week preceding, the lessened output being due to the Fourth of July holiday. Shippers were: Silver King Coalition, 598 tons; Judge allied companies, 388 tons; Ontario, 266 tons; Naildriver, 56 tons.

At the Judge mine, the body of Antonio Allegris, trapped in a cave-in early on the morning of June 21, has been recovered after considerable effort and risk on the part of the rescuers. Indications are that death was instantaneous.

The Spiro tunnel of the Silver King Consolidated is in 14,400 ft., and stringers of galena and gray copper have been cut.

**Bingham Canyon**—Operations at the Bingham-Galena continue. There has been some agitation in regard to the stock of this company, as Californians have been seeking the extradition of George Graham Rice, in connection with the promotion of the Broken Hills property in San Francisco and Reno. It appears that stock letters have ap-

peared in California sent to stockholders in the Broken Hills, offering them a chance to make good their losses through the Bingham Galena.

#### IDAHO

##### Coeur d'Alene District

##### Amazon-Dixie Crosscut Cuts Vein— Marsh Mines Stops Development— Nabob Consolidated Sued

**Wallace**—A crosscut from the main tunnel of the Amazon-Dixie has intersected the Leslie vein, showing it to be 20 ft. wide and carrying considerable lead and copper ore. With this accomplished, work has now been transferred to the shaft, which will be deepened from 400 to 800 ft. below the tunnel or 1,500 ft. from surface. The shaft is sunk from the main tunnel, and the vein has been explored from it at 200 and 400 levels, each having good ore showings and improving as depth is gained. The sinking will be done under contract. The company has complete modern equipment and takes electric power from the Montana Power Co. The Amazon-Dixie is at Sildix, Mont., on the Northern Pacific R.R. near the Idaho line.

The Marsh Mines Consolidated has suspended development and has made no announcement as to its future plans. Since the apex litigation with the Hecla was settled, a few men have been employed in drifting on the Russell vein, the apex of which was the issue in the litigation. It was announced some time ago that when this work was completed, deep development of the vein would be undertaken in the Marsh ground, either through the Gertie tunnel or No. 3 tunnel of the Hecla. The Gertie company has refused to make this concession, and why the other alternative is not being acted upon does not yet appear. The right to use Hecla No. 3 tunnel in the development of Marsh was one of the terms of the litigation settlement.

The directors of the Western Union, one of the new mines near Wallace, have issued a statement to the stockholders, in which it is stated that since November 19, 1920, the company has shipped 666 tons of ore having a gross value of \$54,454 and which gave a net smelter return of \$35,725. These ship-

ments averaged 40.86 oz. of silver per ton and 50 per cent lead. During this period the mine has been operated by lessees, the company receiving a royalty of 25 per cent on net smelter returns. The lease expires on Aug. 18, and before that date the directors will meet and decide whether they will take over the operation of the property or renew the lease, with the chances favorable to the former.

J. W. Codd, of Spokane, has filed an action in the district court in Wallace against the Nabob Consolidated Mining Co., in which he alleges that he is the owner of 1,450,000 shares of the stock of the company now standing in the name of the Stewart Mining Co. and asking for an order requiring the company to transfer the same to his name. The claim is made that Codd and his associates advanced about \$70,000 to the Nabob company, which is controlled by the Stewart Mining Co., and that they demand the delivery of this stock in order to put in their own directors at the annual meeting of stockholders at Kellogg on Aug. 25.

**Mullan**—Underground work has been stopped by the American-Commander M. & M. Co. Preparations are being made to install a compressor. It is expected that the plant will be in operation by Aug. 1. During the last year the company drove a crosscut 300 ft. to the vein and drifted 100 ft., the latter showing 3 to 6 ft. of low-grade carbonate and sulphide ore. This was in the nature of prospecting work, and will be followed as soon as the compressor is installed by crosscutting to the vein from No. 1 tunnel 400 ft. below and later by exploring the vein from No. 2 tunnel, 500 ft. below No. 1.

**Eagle** — An important strike was made recently by the Columbus Mining Co. The tunnel in following the Eagle vein cut what appears to be a new vein carrying gold, silver and lead. This has been followed about 40 ft., is 4 ft. thick and the ore has steadily improved. A face assay returned 0.4 oz. gold, 24.5 oz. silver and 18.7 per cent lead. A compressor has been ordered and is expected to be in operation by Aug. 15. Control of the Columbus company is held by E. P. Gallagher, of Philadelphia.

## MONTANA

**Anaconda Successful in Fighting Tramway Fire With Slimes**

Butte—Considerable "drag" ore is being found on the 1,600 level of the Main range mine of the Tuolumne, where a crosscut is being driven for the Spread Delight vein, carrying a comparatively higher silver than copper content, seemingly indicating the existence of ore at this depth. Cutting of the Spread Delight fissure is now looked for within two weeks.

Davis-Daly is averaging a daily output of about 330 tons from the Colorado mine.

The Anaconda company's success in fighting the fires in the region embraced by the Tramway, West Colusa, and Leonard mines, through pumping fine slimes from the slime pond of the Butte & Superior into the burning area, resulting in smothering the fire, continues to attract attention, particularly in view of the report that the corporation has succeeded in reclaiming two large stopes of good ore on the 2,000 level of the tramway.

Butte & Superior is expecting to cut within the next two weeks or so the so-called copper vein on the 2,200 level of the Black Rock mine. This is the fissure which was uncovered on the 2,050 level.

Neihart—A meeting of the stockholders of the Cascade Silver Mines & Milling Co. is scheduled for Aug. 24, in Butte, when it is expected plans will be considered for building a concentrator and possibly a smelter for treating the ores of the district.

Victor—Recording of a deed shows the transference of the old Curley mine near here, in Ravalli County, to W. R. Price, presumably representing New York parties, for \$125,000. The property was worked about twenty-five years ago. Plans are under way to reopen the mine.

De Borgia—Machinery is to be installed at the Silver Rock Mining Co.'s property, the first of which will be delivered within sixty days. An extensive program of development is planned, according to those interested.

Melrose—The Montana-Silver Copper Co. has opened a new vein which gives considerable promise, according to the management. Years ago this property was a fairly important producer of silver ore.

Trout Creek—A favorable gold ore showing is reported at the property of the Vermillion company, where upraising is in progress to reach a shoot disclosed on an upper level.

Libby—One shift has been put to work at the Lukens-Hazel mine and mill.

Lump Gulch—A new company is being formed to operate the old Liverpool mine, recently taken over by Detroit interests.

## WASHINGTON

**Washington Water Power Co. To Buy Granby's Kettle Falls Site**

Spokane—The Washington Water Power Co. has announced its intention to purchase the Kettle Falls power site near Marcus from the Granby Consolidated Mining, Smelting & Power Co., Ltd. The site has been held for years by the Granby company, but has not been developed. It is said to be the second largest potential source of hydroelectric power on the Columbia River, and can be developed to supply 150,000 hp. Application has been made to Federal authorities for permission to proceed with its development.

## MICHIGAN

**The Copper Country****Quincy To Modernize Another Furnace—Development Work Continues in Seneca**

Houghton—There is yet no indication of a reopening of mines now closed in the Lake Superior copper district, and the managements confess they are as much in the dark about it as anyone else. That the mines will be ready to stage a quick "come-back," so far as physical condition and plants are concerned, there is no question, for every advantage has been taken of the period of idleness to make repairs and changes to increase output and lower costs.

Copper continues to move out of the district. One steamer has just taken a cargo of 900,000 lb. of Calumet & Hecla, Copper Range, and Quincy metal, about an equal amount from each smelter. This shipment included 300,000 lb. of Calumet & Hecla copper for domestic buyers, previously reported.

Calumet & Hecla is preparing to fill orders for 600,000 lb., half of which will be for export to France and the remainder for domestic consumers.

At the Quincy smelter, preparations are being made to modernize No. 3 furnace. It will be enlarged to a capacity equal to that of No. 5, or 150,000 lb., which will give Quincy two of the largest and most modern furnace units in the district. No. 5 furnace is practically complete. It has been partially in operation for some time. Like No. 5, No. 3 will be served by automatic casting machines, electric cranes and a trolley dipping system.

At the Seneca property work is proceeding in the 4th level stope and in extending the drifts on the 3d, 5th, and 6th levels. Good ground continues to be developed in the stope. The 6th level drift, north, is now in poorer ground than usual. The average ground in the level is good milling "rock."

## Gogebic Range

**Oliver Company Shipping About 45,000 Tons Per Week**

Ironwood—The Townsite mine has started a steam shovel in its stockpile, and expects to ship it all before the season closes. The mines of the Oliver Iron Mining Co. are shipping about 45,000 tons a week.

## Gogebic Range in Wisconsin

**Montreal Mining Co. to Sink New Shaft**

Hamilton, Wis.—The Montreal Mining Co. is formulating plans for sinking a 2,000 or 3,000-ft. vertical shaft to be situated between the present No. 4 shaft of the Montreal mine and No. 6 shaft of the Ottawa mine. The site selected is near the top of the hill west of the Montreal River. Test borings, however, have shown that there is over 90 ft. of overburden at this point, and the shaft will probably have to be concreted through this soil. The shaft will be in the footwall slate and greenstone. It will be lined with steel sets built up of "H" sections and concrete may be used to complete the lining. The outside dimensions of sets are to be about 11 x 17½ ft. with a large cage road at one end, and two skip roads with ladder and pipe roads beside them. Hoisting will be done by electricity. The work of sinking the No. 6 shaft of the Ottawa mine is nearing completion. It has been sunk from the 17th level under a pentice, as the shaft was in use above that point for regular hoisting.

## MINNESOTA

## Cuyuna Range

**Meacham Mine Shuts Down With 50,000 Tons of High Grade Stocked**

Crosby—Mining operations have been discontinued for the present at the Meacham mine, of the Rogers, Brown Ore Co., and the surface force has been reduced to minimum. Steam power units formerly used for hoisting and pumping will be idle, but the mine will be kept unwatered by electric pump reserves. The Meacham has been developing ore on its 350 level with a small crew since last April, when active stoping was suspended. The mine has more than 50,000 tons of high-grade iron ore in stock piles.

## Mesabi Range

**Chester Surface Plant Being Dismantled—Shenango Gives Up Lease on Tioga Mine**

Chisholm—The surface plant at the Chester mine, a property formerly operated by the Oliver Iron Mining Co., is rapidly being dismantled, as the lease on the property has been given up by the Oliver company.

The lease on the Tioga mine has been relinquished by the Shenango Furnace Co. The surface equipment is being removed to other properties of the same company on the Mesabi Range.

Buhl—The removal of the shafthouse and other equipment at the Shiras mine is rapidly nearing completion. This property was operated by the Oliver Iron Mining Co., which gave up the lease several months ago.

## ALABAMA

Bessemer—The ore mines of the Tennessee Coal, Iron & Ry. Co. at Muscoda, with the exception of mine No. 4, closed down July 8.

# THE MARKET REPORT

## Daily Prices of Metals

July	Copper, N. Y., net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
14	12.375	27.125	28.00	4.40@4.45	4.30	4.25
15	12.375	26.75	27.75	4.40	4.25	4.25
16	12.25	26.50	27.50	4.40	4.25	4.25
18	12.25	26.375	27.25	4.35@4.40	4.25	4.20
19	12.00@12.25	26.00	27.00	4.35@4.40	4.20@4.25	4.20
20	12.00@12.25	25.75	26.50	4.35@4.40	4.20@4.25	4.15@4.20

\*These prices correspond to the following quotations for copper, "delivered": 12.625, 12.625, 12.50, 12.50, 12.25@12.50 and 12.25@12.50c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

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

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

than this. Added to this is the Chinese demand of approximately 1,500 tons per month, making about 3,000 tons monthly in the Far East, which must be satisfied by shipments from this country. English dealers continue to quote prices to consumers which American producers are not willing to meet. Sales have been made during the last few days in London at the equivalent of 12.20c., c.i.f., which is the equivalent of around 11.65c., New York.

### Lead

The American Smelting & Refining Co. continues to quote its official contract price of 4.40c.

By stretching the imagination, one might consider that the buying movement of two weeks ago is continuing, but no one will admit that he is participating in it. Sales have in general been limited to carload lots, and they have not been frequent at that. The one bright spot of the week was an order from the Remington company for 1,000 tons of July-August lead, which was sold for 4.40c. delivered Connecticut valley, according to reports in the trade. In the Middle West demand seems to be entirely absent, and St. Louis quotations are largely nominal. Chemical lead is bringing a premium of 5 to 10 points over the prices which we quote, and corroding lead from 10 to 15 points.

## London

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
14	71 <sup>3</sup> / <sub>8</sub>	71 <sup>3</sup> / <sub>8</sub>	76 <sup>1</sup> / <sub>2</sub>	166 <sup>1</sup> / <sub>2</sub>	168 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	26 <sup>1</sup> / <sub>2</sub>	27 <sup>1</sup> / <sub>2</sub>
15	70 <sup>7</sup> / <sub>8</sub>	71 <sup>3</sup> / <sub>8</sub>	75	165 <sup>1</sup> / <sub>2</sub>	167 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	26 <sup>1</sup> / <sub>2</sub>	27
16	...	...	...	...	...	...	...	...	...
18	70 <sup>1</sup> / <sub>2</sub>	70 <sup>7</sup> / <sub>8</sub>	74 <sup>1</sup> / <sub>2</sub>	164 <sup>1</sup> / <sub>2</sub>	166 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	26 <sup>1</sup> / <sub>2</sub>	27
19	70 <sup>1</sup> / <sub>2</sub>	70 <sup>1</sup> / <sub>2</sub>	74 <sup>1</sup> / <sub>2</sub>	161 <sup>1</sup> / <sub>2</sub>	164	23 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	26	26 <sup>3</sup> / <sub>8</sub>
20	70 <sup>1</sup> / <sub>2</sub>	70 <sup>3</sup> / <sub>4</sub>	74 <sup>1</sup> / <sub>2</sub>	160	162 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	23 <sup>1</sup> / <sub>2</sub>	26	26 <sup>3</sup> / <sub>8</sub>

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

## Silver and Sterling Exchange

July	Sterling Exchange "Checks"	Silver			July	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
14	363 <sup>3</sup> / <sub>4</sub>	99 <sup>1</sup> / <sub>2</sub>	60 <sup>3</sup> / <sub>4</sub>	37 <sup>3</sup> / <sub>4</sub>	18	360 <sup>3</sup> / <sub>4</sub>	99 <sup>1</sup> / <sub>2</sub>	59 <sup>5</sup> / <sub>8</sub>	37 <sup>3</sup> / <sub>4</sub>
15	361 <sup>3</sup> / <sub>4</sub>	99 <sup>1</sup> / <sub>2</sub>	60 <sup>3</sup> / <sub>4</sub>	37 <sup>3</sup> / <sub>4</sub>	19	358 <sup>1</sup> / <sub>2</sub>	99 <sup>1</sup> / <sub>2</sub>	59 <sup>5</sup> / <sub>8</sub>	37 <sup>3</sup> / <sub>4</sub>
16	361 <sup>3</sup> / <sub>4</sub>	99 <sup>1</sup> / <sub>2</sub>	60 <sup>3</sup> / <sub>4</sub>	37 <sup>3</sup> / <sub>4</sub>	20	359	99 <sup>1</sup> / <sub>2</sub>	59 <sup>5</sup> / <sub>8</sub>	37

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

## Metal Markets

### New York, July 20, 1921

Utter absence of consuming demand worthy of the name, coupled with the efforts of some weak interests to dispose of small lots of metal, has resulted in further recessions in the prices of all of the major metals during the last week.

### Copper

Not in weeks has the copper market been so devoid of actual business. Possible buyers do not seem to be interested at any price, and generally refuse even to make bids. Those who formerly bought in 500- or 1,000-ton lots now take 25, and would take even less probably except for the fact that they could not

get the carload rate on smaller lots. Yesterday over 200 tons of electrolytic wire bars were freely offered at 12.05c., New York warehouse, but, so far as we have been able to learn, were not marketed. Producers have sold practically nothing for domestic delivery, the little business being done going to second-hands. Producers are generally quoting 12.50@12.75c. delivered, and show no desire to meet the outside market except in the case of those producers who have a settled policy of selling current production.

Export sales through the Copper Export Association have been fair, chiefly to Japan. Present Japanese production is about 4,000 tons per month, with consumption possibly 1,500 tons greater

The market has yielded to further pressure, and sales have been reported at 4.20c., East St. Louis, early this week, although business was also summated on a 4.25c. basis. On Monday it is reported that zinc sold for 4.15c., but these sales have not been confirmed. Owing to the great increase in stocks since the first of the year, producers are seizing the only weapon in their possession, a further decrease of production, with the hope of holding off increases in stocks and possibly making some inroad in the accumulations. This attitude means complete curtailment of production on the part of some companies which have already cut production to the bone. European conditions are also unsatisfactory, and the Silesian zinc fields are reported in a state bordering on bolshevism. Some interest has been manifested in futures at a 5-point premium for each month. High-grade zinc is being sold at prices ranging from 5.5 to 6.25c. per lb.

### Tin

The reduced prices, brought about by weakness in London and sterling exchange, have resulted in some inquiry from consumers, but the business has not been heavy. Because of the enormous stocks in the Far East, prices are likely to show little strength for some time. Tin-plate interests are operating

at greatly reduced capacities, and in general have four or five months' supplies of tin on hand. About the only present demand is from solder and babbitt manufacturers and for general industrial purposes. Electrolytic is in fair demand at the same prices as for Straits. Futures are quoted the same as spot.

Arrivals of tin, in long tons: July 13th, London, 50; Straits, 5; 16th, Straits, 350; 18th, Straits, 425; 19th, Liverpool, 25.

#### Gold

Gold in London: July 14th, 113s. 2d.; 15th, 113s. 4d.; 18th, 113s. 9d.; 19th, 115s.; 20th, 114s.

General stock of money in the United States: July 1: Gold coin, \$3,223,351,-644; standard silver dollars, \$288,789,-326; subsidiary silver, \$271,108,323; United States notes, \$346,681,016; Federal Reserve notes, \$3,000,429,860; Federal Reserve Bank notes, \$150,772,400; National Bank notes, \$743,290,374; total, \$8,024,422,943. Money in circulation per capita, \$53.42.

#### Foreign Exchange

"Cables" are now quoted one-half cent higher than the "demand" figures given in the table on page 155. On Tuesday, July 19th, francs were 7.785c.; lire, 4.54c.; and marks, 1.3075c. New York funds in Montreal, 13½ per cent premium.

#### Silver

From July 13 to 16 the London price held steady at 37½d., but demand in the New York market from that quarter was slight and the Eastern exchange rates weakened, causing a falling off in the China inquiry. On the 18th and 19th London came 37½d. With these lower prices and the fall in sterling exchange, the New York market also declined. Sellers, however, were not inclined to meet the lower rates, with the result that business was nominal. Purchases by the Treasury Department under the Pittman Act amounted to 62,-201,816 oz. up to July 14.

Mexican Dollars—July 14th, 46½; 15th, 46½; 16th, 46½; 18th, 45½; 19th, 45½; 20th, 45½.

#### Other Metals

Quotations cover large wholesale lots unless otherwise specified

**Aluminum**—List prices of 24.5@25c. are nominal. Outside market, 21@23c. per lb.; 22½c. for imports, duty paid.

**Antimony**—Chinese and Japanese brands, 4½c.; market dull. W.C.C. brand, 5½@5¾c. per lb. Cookson's "C" grade, spot, 9@9¼c. Chinese needle antimony, lump, nominal at 4c. per lb. Standard powdered needle antimony (200 mesh), nominal at 6@6½c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb<sub>2</sub>O<sub>3</sub>, wholesale lots, 6½@7c.

**Bismuth**—\$1.50@1.55 per lb., 500-lb. lots.

**Cadmium**—Range \$1@1.10 per lb., in 1,000-lb. lots. Smaller quantities, \$1.10@1.25 per lb.

**Cobalt**—Metal, \$3@3.25 per lb.; black oxide, \$2.35 per lb. in bbls.

**Iridium**—Nominal, \$165@185 per oz.

**Molybdenum Metal**—In rod or wire form, 99.9 per cent pure, \$32@40 per lb., according to gage.

**Nickel**—Standard market, ingot, 41c.; shot, 41c.; electrolytic, 44c. Small ton-nages, spot, 35@40c.

**Monel Metal**—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

**Osmium**—\$70@80 per troy oz.

**Palladium**—\$60@65 per oz.

**Platinum**—\$72@75 per oz.

**Quicksilver**—Nominally, \$43.50@45 per 75-lb. flask. San Francisco wires \$46.

**Rhodium**—\$150 per troy oz.

**Selenium**—Black powdered, amorphous, 99.5 per cent pure, \$2@2.25 per lb.

**Thallium Metal**—Ingot, 99 per cent pure, \$20 per lb.

**Tungsten Metal**—Wire, \$35@60 per kilogram, according to purity and gage.

#### Metallic Ores

**Chrome Ore**—Ore analyzing 40@45 per cent Cr<sub>2</sub>O<sub>3</sub>, crude, \$20@25 per net ton; ground, \$30; analyzing 45@50 per cent Cr<sub>2</sub>O<sub>3</sub>, \$30; ground, \$35; f.o.b. Atlantic ports. Quotations are nominal.

**Iron Ore**—Lake Superior ores, per ton, Lower Lake ports: Old Range bessemer, 55 per cent iron, \$6.45; Mesabi bessemer, 55 per cent iron, \$6.20; Old Range non-bessemer, 51½ per cent iron, \$5.70; Mesabi non-bessemer, 51½ per cent iron, \$5.55.

**Magnetite Ore**—F.o.b. Port Henry. N. Y.: Old bed 21 furnace, \$4.85; old bed concentrates, 63 per cent, \$5.75; Harmony, cobbled, 63 per cent, \$5.75; new bed low phosphorus, 65 per cent, \$8.50.

**Manganese Ore**—22c. per unit, seaport; chemical ore (MnO<sub>2</sub>) \$50@55 per gross ton, lump; \$70@75 per net ton, powdered. Nominal.

**Molybdenum Ore**—85 per cent MoS<sub>2</sub>, 55@60c. per lb. of contained sulphide, New York.

**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 50c. per lb. in ton lots.

**Titanium Ores**—Ilmenite, 52 per cent TiO<sub>2</sub>, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO<sub>2</sub>, 12c. per lb. for ore, with concessions on large lots or contracts.

**Tungsten Ore**—Scheelite or wolframite, 60 per cent WO<sub>3</sub> and over, per unit of WO<sub>3</sub>, \$3@3.25, f.o.b. Atlantic ports.

**Uranium Ore (Carnotite)**—Ore containing 1½ per cent U<sub>3</sub>O<sub>8</sub> and 5 per cent V<sub>2</sub>O<sub>5</sub> sells for \$1.50 per lb. of U<sub>3</sub>O<sub>8</sub> and 75c. per lb. of V<sub>2</sub>O<sub>5</sub>; ore containing 2 per cent U<sub>3</sub>O<sub>8</sub> and 5 per cent V<sub>2</sub>O<sub>5</sub> sells for \$2.25 and 75c. per lb., respectively; higher U<sub>3</sub>O<sub>8</sub> and V<sub>2</sub>O<sub>5</sub> content commands proportionately higher prices.

**Vanadium Ore**—\$1 per lb. of V<sub>2</sub>O<sub>5</sub> (guaranteed minimum of 18 per cent V<sub>2</sub>O<sub>5</sub>), New York. Nominal.

**Zircon**—Washed, iron free, 3c. per lb.

<sup>1</sup>Furnished by Foote Mineral Co., Philadelphia, Pa.

**Zirkite**—According to conditions, \$70@90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at \$1.15 per lb. in ton lots.

#### Zinc and Lead Ore Markets

**Joplin, Mo., July 16**—Zinc Blende, per ton, high, \$24.20; basis 60 per cent zinc, Waco, \$22; Picher, \$21, premium; Prime Western, \$21@20; fines and slimes, no offerings; average settling prices, all grades of zinc, \$22.15.

Lead, high, \$54.50; basis 80 per cent lead, \$47.50@45; average settling price, all grades of lead, \$46.14 per ton.

Shipments for the week: Blende, 6,179; lead, 1,495 tons. Value, all ores the week, \$205,840.

The market on zinc ore slumped at the close, several buyers dropping to offerings of \$20 basis, the bulk of purchases being made early in the week on \$21 basis, Picher. The quotations: "Waco" and "Picher" cover the same grade of ore, but buyers figure one dollar higher at Waco, on account of a freight differential of 80c. and a 20c. lower hauling cost.

A few lots of lead sold late last week \$47.50 basis, with the highest offering this week reported at \$46 basis and the general market \$45.

**Platteville, Wis., July 16**—No market for zinc and lead ore. Shipments for the week, none. Shipments for the year: blende, 11,461; lead ore, 978 tons. Shipped during week to separating plant, 40 tons blende.

#### Non-Metallic Minerals

**Asbestos**—Crude, No. 1, \$1,700@2,000; No. 2, \$1,200@1,500; spinning fibers, \$400@800; magnesia and compressed sheet fibres, \$275@400; shingle stock, \$95@150; paper stock, \$60@75; cement stock, \$17.50@30; floats \$8.50@15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as export sales tax.

**Barytes**—Crude, 88 to 94 per cent barium content, \$10@12 per net ton: ground (white) \$24@30 in bags, carload lots; (off-color) \$22@26 in bags, carload lots; all f.o.b. South Carolina points. Foreign barytes, prime white material, \$25 per net ton, f.o.b. Atlantic seaports. Western grades are \$24.50. Crude quoted \$7@10 per long ton, f.o.b. Cartersville, Ga.

**Bauxite**—French bauxite, \$8@10 per metric ton, c.i.f. Atlantic ports. American bauxite, crushed and dried, \$8@10 per gross ton, f.o.b. shipping points; pulverized and dried, \$12@15 per gross ton, depending upon grade; calcined so as to remove most of the combined water, \$20 per gross ton, f.o.b. shipping point.

**Chalk**—English, extra light, 5c. Domestic light, 4½c.; heavy, 4c. per lb., all f.o.b. New York.

**China Clay (Kaolin)**—Crude, \$7@9; washed, \$9@10; powdered, \$13@20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, \$13@20, f.o.b. Virginia points. Imported lump, \$12@20, f.o.b. American ports; powdered, \$20@25, f.o.b. New York.

**Emery**—Turkish emery, 6@6½c. per lb., depending upon fineness. Inferior grades, 3½c., f.o.b. New England points.

**Feldspar**—No. 1 soap grade, \$7.50 per ton, f.o.b. North Carolina points; No. 1 pottery, \$6.50; No. 2, \$5. Market dull. Large stocks are available and quotations are nominal. Producers report cancellations of orders. No. 1, Canadian, ground, \$26@28, f.o.b. cars.

**Fluorspar**—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$20 per ton, f.o.b. Illinois and Kentucky mines; acid, glass, and enamel grades, \$40@55; ground, suitable for acid, chemical or enameling purposes, \$32@35; lump, \$13.50, f.o.b. Lordsburg, N. M. Ground acid grade, 97 per cent CaF<sub>2</sub>, \$30, New Mexico.

**Fuller's Earth**—16 to 30 mesh, \$21; 30 to 60 mesh, \$23; 60 to 100 mesh, \$19; 100 plus mesh, \$15, f.o.b. plants, Pennsylvania. California grades, \$15@25, f.o.b. mines. Imported, English, \$24@27, f.o.b. Atlantic ports.

**Graphite**—Ceylon lump, first quality, 7@8c. per lb.; chip, 5½@6c.; dust, 3@4½c. No. 1 flake, 6½@7c.; amorphous crude, ½@2½c. Market quiet.

**Gypsum**—Plaster of paris in carload lots sells for \$4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, \$3.50@4.50; calcined stucco, \$9; f.o.b. works, Illinois.

**Kaolin**—See China Clay.

**Limestone**—Crushed, New York State shipping points, ½ in. size, \$1.40@1.75 per net ton; 1½ in., \$1.35@1.70. Prices for other sizes practically the same. Agricultural limestone, \$2.50@4.50 per net ton, f.o.b. eastern shipping points, depending upon analysis.

**Magnesite, Calcined**—Crude, \$12@15 per ton. High-grade caustic calcined, lump form, \$30@40 per ton. Plastic calcined, \$56 in barrels, carload lots, f.o.b. California points. Atlantic seaboard, \$60.

**Dead-Burned**—\$33 per net ton, Chewelah, Wash.; \$58@64, Chester, Pa. Austrian grade, \$53.80 per ton, f.o.b., Chester, Pa. (Magnesite brick—See Refractories.)

**Mica**—India block mica, slightly stained, per lb.; No. 6, 35c.; No. 5, \$1.20; No. 4, \$2.50@3; No. 3, \$3.50@4; No. 2, \$4.50@6; No. 1, \$5.50@6.50. Clear block: No. 6, 50c.; No. 5, \$1.75; No. 4, \$3.25; No. 3, \$5; No. 2, \$6.50; No. 1, \$8; A1, \$6.50@8.50; extra large, \$25; ground, wallpaper grade, \$90@160 per ton (depending upon quantity); ground roofing mica, \$25@70, all f.o.b. New York.

**Monazite**—Minimum of 6 per cent thorium oxide, quoted \$30 per unit, duty paid.

**Phosphate Rock**—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$12.50; 75 per cent, \$11.50; 75@74 per cent, \$11; 70 per cent, \$6.75; 68 per cent, \$6.25; 68@66 per cent, \$6.

Footnote: Foote Mineral Co., Philadelphia, Pa.

**Pumice Stone**—Imported, lump, 3@40c. per lb.; domestic lump, 5c.; ground, 5@6c., all f.o.b. New York.

**Pyrites**—Spanish fines, per unit, 14c. c.i.f. Atlantic seaport; furnace size, 14c.; Spanish lump, 12@14c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

**Silica**—Glass sand, \$2.25 per ton; sand-blast material, \$2.25, both f.o.b. Indiana points. Amorphous or decomposed variety, soft silica, 250 to 500 mesh, \$16@30 per ton. Ganister, crude, \$2.50 per ton, f.o.b. Illinois points. Molding sand, building sand, glass sand, \$2.25@3, f.o.b. Pennsylvania points. Market reported dull.

**Sulphur**—\$16@18 per ton for domestic; \$18@20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

**Talc**—Paper making, \$11@20 per ton; roofing grades, \$8.50@13; rubber grades, \$11@18; all f.o.b. Vermont. California talc, \$16@35, talcum powder grade. Southern talc, powdered, carload lots, \$8@12 per ton; less than carload, \$25, f.o.b. cars. Imported, \$35@40; Canadian, \$20@40 per ton.

#### Mineral Products

**Arsenic**—White arsenic, 6½c. per lb. in carload lots.

**Sodium Nitrate**—\$2.85@3 per cwt. ex vessel, Atlantic ports.

**Sodium Sulphate**—For 95 per cent material, \$16@18 per ton, f.o.b. Western mines, spot and six months' contract; \$33@35 per ton, New York.

**Potassium Sulphate**—Powder, domestic, \$1.50@1.75 per unit, basis 90 per cent, f.o.b. New York.

#### Ferro-Alloys

**Ferrotitanium**—For 15 to 18 per cent material, \$200@225 per ton, f.o.b. Niagara Falls, N. Y.

**Ferrocerium**—Per lb., \$12@15.

**Ferrochrome**—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 14c. per lb. of chromium contained; 4 to 6 per cent carbon, 15c., f.o.b. works.

**Ferromanganese**—Domestic 76 to 80 per cent, \$70, f.o.b. furnace; resale, \$90, delivered; English, \$70, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, \$28@32, f.o.b. furnace.

**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, \$2.50 per lb. of contained metal, f.o.b. works. Imported material, \$1.70@2.

**Ferrosilicon**—For 10 to 15 per cent, per gross ton, f.o.b. works, \$40@42; 50 per cent, \$65@68; 75 per cent, \$135.

**Ferrotungsten**—Domestic, 70 to 80 per cent W, 50@55c. per lb. of contained tungsten, f.o.b. works. Foreign, 50c., duty paid, f.o.b. Atlantic ports.

**Ferro-uranium**—35 to 50 per cent U, \$6 per lb. of U contained, f.o.b. works.

**Ferrovandium**—\$4.50@5 per lb. of V contained, according to analyses and quantity.

#### Metal Products

**Copper Sheets**—Current New York list price, 20½@21½c. per lb.; wire, 14½@14¾c.

**Lead Sheets**—Full lead sheets, 8.25c.; cut lead sheets, 8½c. in quantity, mill lots.

**Nickel Silver**—31½c. per lb. for 18 per cent nickel. Grade "A" sheets.

**Yellow Metal**—Dimension sheets, 16½c.; sheathing, 16½c.; rods, ½ to 3 in., 13½c.

**Zinc Sheets**—\$10 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter.

#### Refractories

**Bauxite Brick**—56 per cent alumina \$35@50 per ton, f.o.b. works.

**Chrome Cement**—40@45 per cent Cr<sub>2</sub>O<sub>3</sub>, \$30@32 per net ton, and \$31 in sacks, carload lots, f.o.b. eastern shipping points.

**Chrome Brick**—Straights, \$60@65 per net ton, shipping point; arches, keys, wedges, \$66; splits, soaps, \$84.

**Fire Brick**—First quality, 9-in. shapes, \$35@40 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, \$30@35.

**Magnesite Brick**—9-in. straights, \$70@75 per net ton; 9-in. arches, wedges and keys, \$77; soaps and splits, \$98, f.o.b. works.

**Silica Brick**—9-in., per 1,000: \$35@45 in carload lots, f.o.b. shipping points.

#### The Iron Trade

Pittsburgh, July 19, 1921

The long-continued decrease in demand for steel seems to have definitely ended, at a point where the demand was less than 20 per cent of capacity, and to have begun a definite though naturally slight improvement. In sheets, the increase in demand is distinctly marked, and is apparent with practically all classes of buyers. In bars, the most basic commodity of all, the demand may not have increased noticeably in point of total tonnage, but it has become much more widespread.

No increase in actual ultimate consumption of steel is observed nor is there any more cheerful feeling on the part of steel buyers, the development being rather that liquidation has proceeded far enough to require that more steel be shipped from mills.

Steel prices, long considered in some quarters the key to the situation, are not an important factor. Buyers are getting prompt shipment and are taking only such steel as they can promptly dispose of, so that they incur little risk.

**Pig Iron**—The market remains stagnant, but enough has developed to mark down prices 50c. more, the Valley market now standing in general at \$21 for bessemer, \$19.50 for basic, and \$20.50 for foundry.

#### Coke

Connellsville — Furnace, \$2.75@3; foundry, \$4@4.50.

## Zinc One of the Most Depressed Metals

Despite Curtailment of Production, Stocks Have Continued To Rise—Imports of Foreign Zinc Have Ceased—Depression May Result in Improving Mining and Smelting Practice—Recovery Depends on Iron and Steel Trade

### EDITORIAL MARKET STUDY

ASK A PRODUCER what ails the zinc market and you will get a variety of answers. Most producers, however, permit one outstanding deduction to be made. The zinc trade is so closely allied with the galvanizing business that improvement cannot be expected until a prior or simultaneous improvement takes place in the iron and steel trade.

The use of zinc as a handmaiden to iron, giving protection against corrosion in return for the greater strength and cheapness of iron, is not conducive to the freedom of the zinc market. Great trouble and much time and money have been spent in an effort to widen the uses of zinc, but the fact still remains that the zinc industry is rather firmly welded to the galvanizing industry. The manufacture of zinc roofing material, doorknobs, and other articles has small chance of changing this status. Nevertheless, the wish to expand the consumption of zinc in new channels is deserving of the greatest commendation, as new uses for this metal cannot fail to be beneficial to the industry.

Zinc companies have sharply curtailed production, so that at present the monthly output is not much over 18,000 tons, compared with a monthly output of 38,440 tons in 1920 and 25,850 tons in pre-war times. The question may well be asked, why, in view of the dearth of trade in zinc, production is not cut further? The answer is that most companies have shut down as far as it is possible to do so, without completely abandoning operations, and that, despite the extraordinarily low price of zinc, a few mines blessed with unusually rich ore are just about able to break even. Furthermore, leasing arrangements may preclude shutting down entirely.

Zinc mining, compared with the mining of its sister metals, copper and lead, is in several ways at a disadvantage. The copper and lead miner as a general rule receives some compensation for gold and silver recovered in the course of mining and reducing his product. Notable exceptions are the Michigan copper mines and the Missouri or Middle Western lead fields. Mining of strictly zinc ores, on the other hand, rarely results in the recovery of byproduct silver or gold.

Zinc mining is not practiced on the large scale customary with the copper companies or even the lead companies. The greatest zinc producers in the United States acquire their metal through the operation of many small mines; that is, small in comparison with the copper operations. Then again, zinc mining is hampered by leasing arrangements in Middle Western fields, which ordinarily have the grave disadvantage of not being conceived for the best working of the zinc mines, frequently leaving them "gutted," the best parts worked out, and development planned with little regard to the future working of the property.

Zinc production is also noted for the secrecy with which some of its operations, particularly the reduction of the metal, are veiled. This has resulted in much inefficiency

and the retention of inferior methods. It is only recently that a wholesome solidarity among the units of the industry has begun to appear, and a common ground for the solving of problems peculiar to the zinc business has been found—the American Zinc Institute.

Zinc producers have been much concerned since the first of the year with the importation of foreign zinc into the United States. The record of importations for the first five months of the year strikingly shows that a heavy volume of foreign zinc has been entering the country. Although this inflow ceased in May, during March and April of this year over 12,300,000 lb. of zinc was imported. When one considers that prior to the war importations were mainly in the form of ore from Mexico and Canada, to be smelted in this country, it is clear that the importation of such a heavy tonnage of finished zinc is bound to disturb the market. The incoming pigs or slabs were mainly of German origin—from the Silesian field—and although the imports have ceased, due more to political complications and the chaos in the status of the Upper-Silesian zinc mines than anything else, they are an indication of the strong competition that the American zinc industry must meet. Averaged over the five months of the year, however, the heavy European importations do not abnormally swell the total figure, which is still below the pre-war average of imports.

The figures given in the table show that exports are now practically nil.

Stocks of zinc have shown a disappointing rise, and are now at a record high figure, about 91,000 tons, compared with 71,040 tons on Jan. 1, 1921. In pre-war years, stocks at the beginning of the year averaged about 12,000 tons; after the war they were higher, around 40,000 to 50,000 tons, so that the present accumulation is abnormal. Although attempts have been made to cut into surplus stocks, efforts so far have not been successful, decreased production being met with a greater decrease in consumption.

Much reliance is being placed upon the passage of a tariff to relieve the zinc situation, but in view of the fact that no foreign zinc is now being imported in any great volume, and that prices are still very low, 4.25c. East St. Louis, is it not too much to expect that the tariff will cure the ailments of the industry? Could not some attention be paid to more efficient mining practices? Or removing objectionable features of the leasing system, or introducing a better spirit of "give and take" in the industry, so that technical processes may be improved?

We have in the United States some of the richest and highest grade zinc mines in the world, and it would be a pity if the bountifulness of nature were relied upon to make up for the introduction of the more efficient working of zinc properties. If some of the lessons to be learned from low prices of zinc are taken to heart, the losses of the industry with zinc around 4.25c. per lb. will be greatly ameliorated.

### MOVEMENTS OF ZINC TO AND FROM THE UNITED STATES

(In Pounds)

Class of Product	IMPORTS						
	Average Monthly Pre-War	Average Monthly, 1920	January, 1921	February, 1921	March, 1921	April, 1921	May, 1921
Ore.....	3,018,100	3,747,800	946,532	2,968,835	981,494	83,283	5,820
Blocks and pigs.....	716,500	2,400	86	909,777	6,162,061	6,269,176	.....
Other forms.....	395,160 (a)	2,700	.....	.....	.....	.....	.....
(a) In addition, about 458,300 lb. of zinc oxide and 433,300 lb. of lithopone were imported monthly.							
Class of Product	EXPORTS						
	.....	.....	.....	.....	.....	.....	.....
	Ore and dross.....	1,340,000	4,757,500	69,000	.....	7,340	.....
	Zinc produced from domestic ore.....	.....	12,344,200	2,580	263,460	174,106	115,840
Zinc produced from foreign ore.....	660,000	4,688,500	.....	.....	.....	.....	
Zinc rolled, sheets, etc.....	1,050,000	1,972,100	419,934	498,225	171,860	338,412	214,747



## COMPANY REPORTS

### Oroville Dredging Co.

Gold, Silver; United States and Colombia

A report of the operations of the Oroville Dredging Co., Ltd., for a year ending Sept. 30, 1920, states that dividends were received from the company's holding of shares in Nechi Mines (Colombia), Ltd., amounting to £28,348 8s. 6d., and in Pato Mines (Colombia), Ltd., to £88,186 3s. 6d., the other credits in the profit-and-loss account amounting to £2,235 11s. 6d. From the total credits of £118,770 3s. 6d., after debiting all charges in London, the balance to credit of profit-and-loss account for the year, carried to the balance sheet, is £111,829 5s. 10d., compared with £69,653 14s. 8d., for the previous year. Adding to this amount the credit balance from last year of £25,367 7s. 5d., a total is shown of £137,196 13s. 3d. Deducting from this one dividend of 6d. per share paid on Dec. 30, 1919, and three of 9d. per share on March 31, June 30, and Sept. 30, 1920, respectively, amounting to £94,398 19s. 6d., a balance of £42,797 13s. 9d. remained to the credit of profit-and-loss account as on Sept. 30, 1920, subject to excess-profits duty and corporation tax (if any).

The company controls the operations of Nechi Mines, Ltd., and Pato Mines, Ltd., and its American operations through the American Oroville Co. are being liquidated. The company is capitalized for £700,000, of which £686,538 has been issued in £1 shares. Holdings in other companies are 125,993 ordinary shares of 10s. each in Nechi Mines, Ltd.; 89,021 shares of £1 each in Pato Mines, Ltd.; 255,000 ordinary shares of £1 each, 5s. paid, in Colombian Corporation, Ltd.; and 10,291 shares of £1 each, 10s. paid, in National Mining Corporation, Ltd.

### Beaver Consolidated Surplus Decreases

Silver; Ontario

The fourteenth annual report of the Beaver Consolidated Mines Co. for year ended Feb. 28, 1921, states that 157,274.3 oz. of silver was produced. Mining account follows:

#### MINING ACCOUNT

Earnings			
Ore sales.....	\$140,245.26		
Interest and exchange.....	49,159.26		
Rents.....	498.02	\$189,902.54	
Charges			
Operation.....	\$176,205.29		
Administration.....	17,314.63		
Loss on operation—transferred to profit and loss account.....		3,617.38	
	\$193,519.92	\$193,519.92	

#### PROFIT AND LOSS ACCOUNT

Credit			
Balance at credit, Feb. 29, 1920.....		\$1,049,080.93	
Dividend No. 12, 3 per cent, paid May 31, 1920.....	\$60,000.00		
Additional depreciation for period ended Feb. 29, 1920.....	10,689.77		
Depreciation for period ended Feb. 28, 1921.....	21,518.27		
Transferred from mining account, Feb. 28, 1921.....	3,617.38	95,825.42	
Balance at credit.....		\$953,255.51	

One dividend of \$30,000 was paid on the \$2,000,000 capital stock (2,000,000 shares of \$1 par each).

### Silversmith Mines, Ltd.

Silver, Lead, Zinc; British Columbia

A report of operations of Silversmith Mines, Ltd., for the year ended May 31, 1921, states that \$260,404.54 was received from the sale of 2,195 tons of ore. Mining expenses, including depreciation and depletion, totaled \$240,297.93, which left a profit of \$20,106.61. Profit-and-loss account shows a balance of \$1,136.83 after the payment of dividend No. 1, amounting to \$25,000.

### North Butte Shows Large Deficit

Copper; Montana

A report of operations of North Butte Mining Co. for 1920 states that 16,666,819 lb. of copper, 693,633 oz. of silver, and 1,004 oz. of gold were produced. Cost of copper production was 17.638c. per lb., including all expenses and depreciation, but not depletion, and crediting value of gold and silver. There was sold 14,235,895 lb. of copper, at 18.719c. per lb., and 729,732 oz. silver at \$1.105 per oz. Income account follows:

#### INCOME

Gross income from copper, silver, and gold.....	\$3,101,404.36
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#### EXPENDITURES

Mining and development.....	\$2,506,649.39	
Freight on ore.....	53,153.16	
Concentrating, smelting, freight on bullion, refining and selling expense.....	997,668.55	
General and miscellaneous expense.....	117,339.93	
Copper purchased.....	2,826.51	\$3,677,637.54
Deficit.....		\$576,233.18

#### COSTS

Classification	Amount	Cost Per Pound
Mining and development.....	\$2,506,649.39	\$0.150398
Freight on ore.....	53,153.16	.003188
Concentrating, smelting, freight on bullion and selling expense.....	997,668.55	.059860
General and miscellaneous expense.....	117,339.93	.007040
Less value of silver and gold.....	\$3,674,811.03	\$0.220486
	735,151.74	.044108
	\$2,939,659.29	\$0.176378

Surplus account Jan. 1, 1920, was \$2,826,863.92. Subtracting deficit for the year, \$576,233.18, and depletion charges of \$500,004.57 leaves a balance of \$1,750,629.27. Capitalization, \$6,450,000.

### St. John del Rey Mining Co., Ltd.

Gold; Brazil

A report of operations of the St. John del Rey Mining Co., Ltd. (British), for the fiscal year ended March 1, 1921, states that 98,311.5 oz. of gold was produced and silver to the value of £4,888 recovered. The premium realized on the sale of gold amounted to £126,811. Income account follows:

#### INCOME

Morro Velho gold, twelve months to Feb. 28, 1921, at par value.....	£418,215
Morro Velho silver, twelve months to Feb. 28, 1921.....	4,888
Premium realized on sale of gold.....	£423,103
	126,811
Less government duties and transport charges.....	£549,914
	10,200
	£539,714
Working cost in Brazil.....	£352,097
Developments in the mine.....	6,119
London general expenses, including directors' percentage (less interest and transfer fees).....	13,749
	£371,965
Amount brought forward from last account.....	£167,749
Income tax returned.....	16,936
	21,619
	£206,304
10 per cent preference share dividends and tax.....	£14,286
Ordinary share dividends and tax.....	54,626
Balance of income tax and corporation profits tax.....	33,807
	£102,719
Transferred to capital works account.....	£85,000
Balance carried forward.....	18,585
	£103,585

This mine, the deepest in the world, has reached a vertical depth of 6,426 ft., and plans have been made for still deeper operations. Work is hindered by the extremely high rock temperature of the lower levels, which in places is over 117 deg. F. The lode is curved, and flattens out in depth.

# MINING STOCKS

Week Ended July 16, 1921

Stock	Exch.	High	Low	Last	Last Div.	Stock	Exch.	High	Low	Last	Last Div.		
<b>COPPER</b>						<b>GOLD</b>							
Ahmeek.....	Boston	50	48	48	Sept. '20, Q	\$0.50	Alaska Gold.....	New York	1 1/2	1 1/2	1 1/2	.....	
Alaska-Br. Col.....	N. Y. Curb	*49	*35	*37	.....	.....	Alaska Juneau.....	New York	1 1/2	1 1/2	1 1/2	.....	
Allouez.....	Boston	.....	.....	20	Mar. '19	1.00	Carson Hill.....	N. Y. Curb	.....	.....	1 1/2	.....	
Anaconda.....	New York	38 1/2	36 1/2	36 1/2	Nov. '20, Q	1.00	Cresson Consol. G.....	N. Y. Curb	1 1/2	1 1/2	1 1/2	June '20, Q	
Arcadian Consol.....	Boston	.....	.....	2 1/2	.....	.....	Dome Extension.....	Toronto	.....	.....	*75	.....	
Ariz. Com'l.....	Boston	8 1/2	8	8	Oct. '18, Q	.50	Dome Mines.....	New York	17 1/2	16 1/2	16 1/2	Apr. '21, Q	
Big Ledge.....	N. Y. Curb	*30	*17	*27	.....	.....	Florence Goldfield.....	N. Y. Curb	*33	*31	*32	.....	
Bingham Mines.....	Boston	.....	.....	9	Sept. '19, Q	.25	Golden Cycle.....	Colo. Springs	*70	*70	*70	June '21, Q	
Calumet & Arizona.....	Boston	45 1/2	45 1/2	45 1/2	June '21, Q	.50	Goldfield Consol.....	N. Y. Curb	*6	*6	*6	Dec. '19	
Calumet & Hecla.....	Boston	225	220	220	June '20, Q	5.00	Hollinger Consol.....	Toronto	7.15	7.00	7.00	July '21, M	
Canada Copper.....	N. Y. Curb	*26	*21	*21	.....	.....	Homestake Mining.....	New York	55 1/2	55 1/2	55 1/2	June '21, M	
Centennial.....	Boston	7 1/2	7 1/2	7 1/2	Dec. '18, SA	1.00	Kirkland Lake.....	Toronto	*53	*53	*53	.....	
Cerro de Pasco.....	New York	26	25 1/2	25 1/2	Mar. '21, Q	.50	Lake Shore.....	Toronto	1.19	1.17	1.17	Jan. '21, K	
Chile Copper.....	New York	10 1/2	10	10	.....	.....	Molybdeum-Porcupine.....	Toronto	1.88	1.85	1.86	May '21, K	
Chino.....	New York	23 1/2	22 1/2	22 1/2	Sept. '20, Q	.37 1/2	Porcupine Crown.....	Toronto	*12 1/2	*12 1/2	*12 1/2	July '17	
Columbus Rexall.....	Salt Lake	*32	*26 1/2	*30 1/2	.....	.....	Reorgan. Booth.....	Colo. Springs	52	52	52	Oct. '20, Q	
Con. Arizona.....	N. Y. Curb	*3	*3	*3	Dec. '18, Q	.05	Silver Pick.....	N. Y. Curb	*11	*9	*9	May '19	
Con. Copper Mines.....	N. Y. Curb	1 1/2	1 1/2	1 1/2	.....	.....	Teck Hughes.....	Toronto	*11	*10 1/2	*11	.....	
Copper Range.....	Boston	33 1/2	32 1/2	33	Sept. '20, Q	.50	Tom Reed.....	Los Angeles	2 1/2	2 1/2	2 1/2	Apr. '19	
Crystal Copper.....	Boston Curb	*35	*32	*32	.....	.....	United Eastern.....	N. Y. Curb	*2 1/2	*2 1/2	*2 1/2	Apr. '21, Q	
Davis-Daly.....	Boston	6	5 1/2	5 1/2	Mar. '20, Q	.25	Vindicator Consol.....	Colo. Springs	*27	*27	*27	Jan. '20, Q	
East Butte.....	Boston	8 1/2	7 1/2	8	Dec. '19, A	.50	West Dome Consol.....	Toronto	*6 1/2	*6 1/2	*6 1/2	.....	
First National.....	Boston Curb	*52	*50	*52	Feb. '19, SA	.15	White Caps Mining.....	N. Y. Curb	*8	*6	*6	.....	
Franklin.....	Boston	2 1/2	1 1/2	1 1/2	.....	.....	Yukon Gold.....	N. Y. Curb	*96	*90	*90	June '18	
Gadsden Copper.....	N. Y. Curb	.....	.....	*25	.....	.....	<b>SILVER</b>						
Granby Consol.....	New York	17 1/2	17 1/2	17 1/2	May '19, Q	1.25	Arizona Silver.....	Boston Curb	*19	*18	*19	Apr. '20, M	
Greene-Cananea.....	New York	21 1/2	20 1/2	20 1/2	Nov. '20, Q	.50	Batopilas Mining.....	New York	.....	.....	.....	Dec. '07, I	
Hancock.....	Boston	2 1/2	2	2	Jan. '21, Q	.05	Beaver Consol.....	Toronto	*28 1/2	*25 1/2	*25 1/2	May '20, K	
Inspiration Consol.....	New York	34 1/2	33 1/2	33 1/2	Oct. '20, Q	1.00	Caniagas.....	Toronto	1.70	1.68	1.68	May '21, Q	
Iron Cap.....	New York Curb	5 1/2	5 1/2	5 1/2	Sept. '20, K	.25	Crown Reserve.....	Toronto	.....	.....	*2 1/2	Jan. '17	
Isle Royale.....	Boston	20 1/2	20 1/2	20 1/2	Sept. '19, SA	.50	Kerr Lake.....	Boston	.....	.....	.....	Jan. '21, Q	
Kennebec.....	New York	20 1/2	19 1/2	19 1/2	Dec. '20, Q	.50	La Rose.....	Toronto	.....	.....	*20	Apr. '18	
Keweenaw.....	Boston	1 1/2	1 1/2	1 1/2	.....	.....	McKinley-Dar-Sav.....	Toronto	*15	*14	*14	Oct. '20, Q	
Lake Copper.....	Boston	2 1/2	2 1/2	2 1/2	.....	.....	Mining Corp. Can.....	Toronto	1.12	1.07	1.07	Sept. '20, Q	
La Salle.....	Boston	1 1/2	1 1/2	1 1/2	.....	.....	Nipissing.....	N. Y. Curb	4 1/2	4 1/2	4 1/2	Apr. '21, Q	
Magma Chief.....	N. Y. Curb	*4	*4	*4	.....	.....	Ontario Silver.....	New York	.....	.....	4	Jan. '19, Q	
Magma Copper.....	N. Y. Curb	20	6	6	Jan. '19, Q	.50	Ophir Silver.....	N. Y. Curb	*18	*17	*17	Jan. '12	
Majestic.....	Boston Curb	7	6	6	.....	.....	Peterson Lake.....	Toronto	.....	.....	*4 1/2	Jan. '17	
Mason Valley.....	Boston	1 1/2	1 1/2	1 1/2	Nov. '17, Q	1.00	Temiskaming.....	Toronto	*20 1/2	*20 1/2	*20 1/2	Jan. '20, K	
Mass Consolidated.....	Boston	2 1/2	2 1/2	2 1/2	May '21, Q	.50	Trethewey.....	Toronto	.....	.....	*12	Jan. '19	
Miami Copper.....	New York	21 1/2	20 1/2	20 1/2	.....	.....	<b>GOLD AND SILVER</b>						
Michigan.....	Boston	.....	.....	.....	.....	.....	Barnes-King.....	Butte	.....	.....	1.10	Aug. '20, Q	
Mohawk.....	Boston	48 1/2	48	48 1/2	Nov. '20, Q	1.00	Boston & Montana.....	N. Y. Curb	*60	*49	*60	.....	
Mother Lode Coa.....	N. Y. Curb	5 1/2	5 1/2	5 1/2	.....	.....	Cash Boy.....	N. Y. Curb	*25	*24	*24	.....	
Nevada Consol.....	New York	11	11	11	Sept. '20, Q	.25	Consol. Virginia.....	N. Y. Curb	*24	*24	*24	.....	
New Baltic.....	Boston Curb	.....	.....	.....	.....	.....	Dolores Esperanza.....	N. Y. Curb	2 1/2	2 1/2	2 1/2	.....	
New Cornelia.....	Boston	14 1/2	14 1/2	14 1/2	Aug. '20, K	.25	El Salvador.....	N. Y. Curb	*14	*12	*14	.....	
Nixon Nevada.....	N. Y. Curb	.....	.....	.....	.....	.....	Jim Butler.....	N. Y. Curb	*8	*8	*8	Aug. '18, SA	
North Butte.....	Boston	9 1/2	9 1/2	9 1/2	Oct. '18, Q	.25	Jumbo Extension.....	N. Y. Curb	*4	*4	*4	June '16	
North Lake.....	Boston	*25	*25	*25	.....	.....	Louisiana Con.....	N. Y. Curb	.....	.....	.....	.....	
Ohio Copper.....	N. Y. Curb	8	8	8	.....	.....	MacNamara M. & M.....	N. Y. Curb	*16	*13	*16	May '10	
Old Dominion.....	Boston	25 1/2	22	22	Dec. '18, Q	1.00	N. Y. Hond. Rosar.....	Open Mar.	.....	.....	.....	Jan. '21, Q	
Oseola.....	Boston	27	26	26	June '20, Q	.50	Tonopah-Belmont.....	N. Y. Curb	.....	.....	.....	Apr. '21, Q	
Phelps Dodge.....	Open Mar.	150	145	.....	July '21, Q	1.00	Tonopah-Divide.....	N. Y. Curb	*85	*80	*83	.....	
Quincy.....	Boston	.....	.....	37	Mar. '20, Q	1.00	Tonopah-Extension.....	N. Y. Curb	1 1/2	1 1/2	1 1/2	July '21, Q	
Ray Consolidated.....	New York	13	12 1/2	12 1/2	Dec. '20, Q	.25	Tonopah Mining.....	N. Y. Curb	1 1/2	1 1/2	1 1/2	Apr. '21, SA	
Ray Hercules.....	Boston Curb	.....	.....	*24	.....	.....	West End Consol.....	N. Y. Curb	*84	*80	*80	Dec. '19, SA	
St. Mary's Min. Ld.....	Boston	33	33	33	June '20, K	2.00	<b>SILVER-LEAD</b>						
Seneca Copper.....	Boston	.....	.....	14	.....	.....	Caledonia.....	N. Y. Curb	*10	*9	*9	Jan. '21, M	
Shannon.....	Boston	*90	*80	*90	Nov. '17, Q	.25	Cardiff M. & M.....	Salt Lake	1.20	1.07 1/2	1.20	Dec. '21	
Shattuck Arizona.....	New York	6 1/2	6 1/2	6 1/2	Jan. '20, Q	.25	Chief Consol.....	Boston Curb	.....	.....	2 1/2	May '21, Q	
South Lake.....	Boston	1 1/2	1 1/2	1 1/2	.....	.....	Consol. M. & S.....	Montreal	13 1/2	13	.....	Oct. '20, Q	
Superior Copper.....	Boston	3 1/2	3	3	Apr. '17	1.00	Daly Mining.....	Salt Lake	12 1/2	.....	.....	July '20, Q	
Superior & Boston.....	Boston	1 1/2	1 1/2	1 1/2	.....	.....	Day-West.....	Boston	2 1/2	2 1/2	2 1/2	Dec. '20, Q	
Tenn. C. & C. cfs.....	New York	7 1/2	7 1/2	7 1/2	May '18, I	1.00	Eagle & Blue Bell.....	Boston Curb	.....	.....	2	Apr. '21, K	
Tuolumne.....	Boston	.....	.....	*55	May '13	.10	Electric Point.....	Spokane	*3	*3	*3	May '20, SA	
United Verde Ex.....	Boston Curb	25	23 1/2	25	May '21, Q	.25	Eureka-Croesus.....	N. Y. Curb	*32	*29	*30	.....	
Utah Consol.....	Boston	14	12 1/2	.....	Sept. '18	.25	Federal M. & S.....	New York	7	7	7	Jan. '09	
Utah Copper.....	New York	50 1/2	47 1/2	47 1/2	June '21, Q	.50	Federal M. & S., pfd	New York	22	22	22	June '21, Q	
Utah Metal & T.....	Boston	1 1/2	1 1/2	1 1/2	Dec. '17	.30	Florence Silver.....	Spokane	*5	*5	*5	Apr. '19	
Victoria.....	Boston	1 1/2	1 1/2	1 1/2	.....	.....	Grand Central.....	Salt Lake	*45	*35	.....	June '20, K	
Winona.....	Boston	.....	.....	*50	.....	.....	Hecla Mining.....	N. Y. Curb	4	3 1/2	3 1/2	June '21, Q	
Wolverine.....	Boston	11	10	11	.....	.....	Iron Blossom.....	N. Y. Curb	.....	.....	*18	Apr. '21, Q	
<b>NICKEL-COPPER</b>						<b>VANADIUM</b>							
Internat. Nickel.....	New York	14 1/2	13 1/2	13 1/2	Mar. '19	.50	Vanadium Corp.....	New York	29 1/2	27 1/2	28 1/2	Jan. '21, Q	
Internat. Nickel, pf.....	New York	84	84	84	May '21, Q	1.50	<b>ASBESTOS</b>						
<b>LEAD</b>						Asbestos Corp..... Montreal							
National Lead.....	New York	75 1/2	75 1/2	75 1/2	June '21, Q	1.50	.....	.....	.....	46	Apr. '21, Q		
National Lead, pfd.....	New York	1.01	1.01	1.01	June '21, Q	1.75	Asbestos Corp., pfd.....	Montreal	.....	.....	76 1/2	Apr. '21, Q	
St. Joseph Lead.....	New York	11 1/2	11 1/2	11 1/2	June '21, Q	.25	<b>MINING, SMELTING AND REFINING</b>						
<b>QUICKSILVER</b>						Amer. Sm. & Ref..... New York							
New Idria.....	Boston	.....	.....	*50	.....	.....	.....	.....	.....	38	37	37 1/2	Mar. '21, Q
<b>ZINC</b>						Amer. Sm. & Ref. pf New York							
Am. Z. L. & S.....	New York	8 1/2	8 1/2	8 1/2	May '20	1.00	.....	.....	.....	72	71	72	June '21, Q
Am. Z. L. & S., pfd.....	New York	.....	.....	24	Nov. '20, Q	1.50	Am. Sm. pf. A.....	New York	67 1/2	67	67 1/2	July '21, Q	
Butte C. & Z.....	New York	4 1/2	4	4	June '18	.50	U. S. Sm. R. & M.....	New York	30	30	30	Jan. '21, Q	
Butte & Superior.....	New York	12 1/2	12	12	Sept. '20	1.25	U. S. Sm. R. & M. pf.....	Boston	.....	.....	39	July '21, Q	
Callahan Zn-Ld.....	New York	4 1/2	4 1/2	4 1/2	Dec. '20, Q	.50	<b>* Cents per share. † Bid or asked. ‡ Quotations missing. Q, Quarterly. SA, Semi-annually. BM, Bi-monthly. K, Irregular. I, Initial. X, Includes extra.</b>						
New Jersey Zn.....	N. Y. Curb	111 1/2	111 1/2	111 1/2	May '21, Q	2.00							
Success.....	N. Y. Curb	.....	.....	*23	July '16	.03							
Yellow Pine.....	Los Angeles	.....	.....	*55	Sept. '20, Q	.03							

