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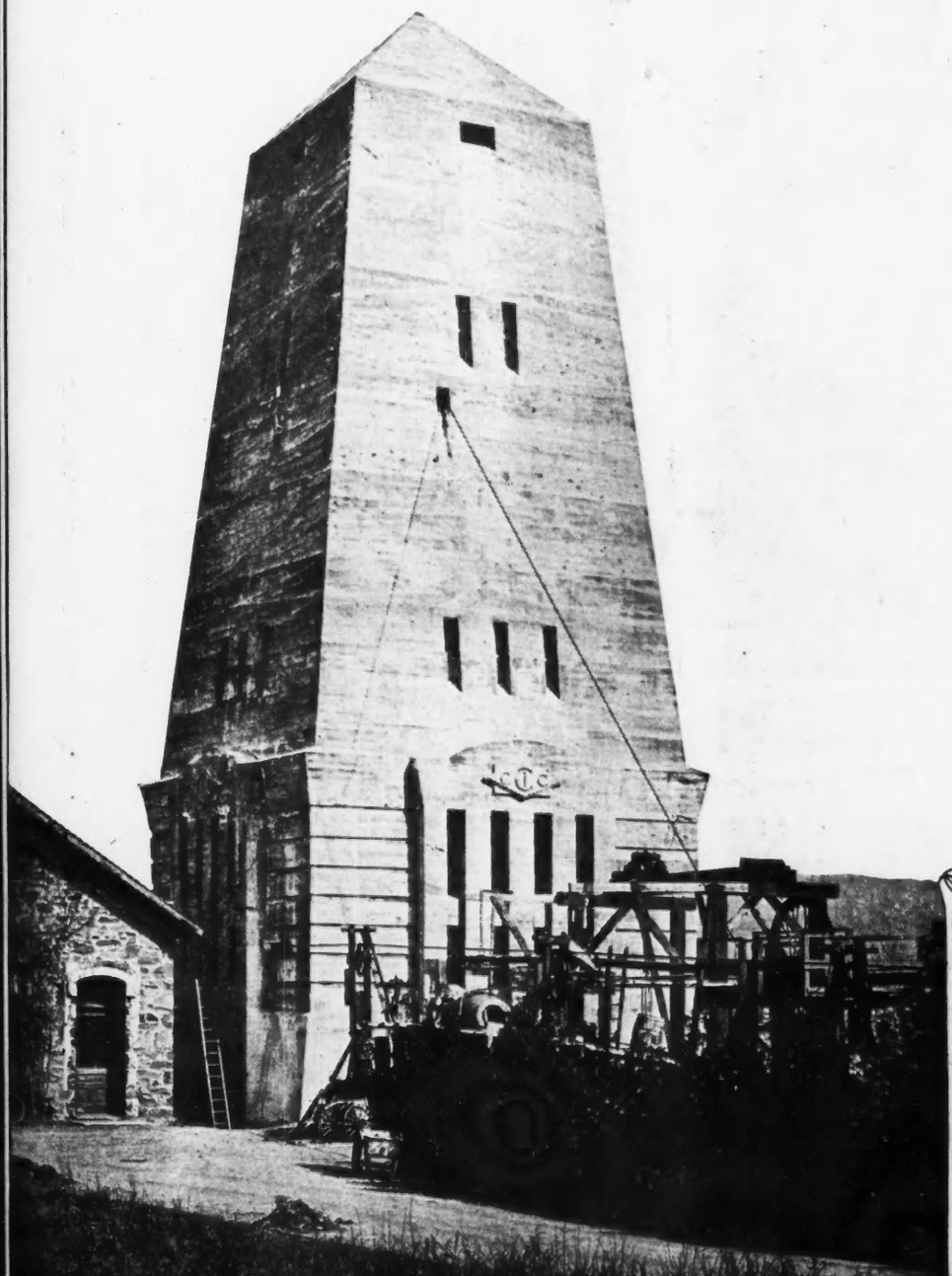

The Modern Obelisk

Concrete-Protected Headframe at Cliffs Shaft of the Cleveland-Cliffs Iron Co., Ishpeming, Mich.

Rules for Engineering and Mining Journal Shaft-Sinking Medal

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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Consulting Editors

Volume 110 New York, August 21, 1920 *Number* 8

Are We at War With Russia?

UNDER the above title we commented editorially on the Bolshevist menace in our issue of Jan. 24, 1920. In this editorial we observed:

Every now and then some Congressman gets up in the House and puts the above question, demanding that our engineers and their guards be withdrawn from Siberia. Similar protestations against the trade embargo against Russia are urged by various kindly and fatuous groups of lovers of all mankind.

We should be interested in psychological tests made on these Congressmen.

Very recently we hear less from these people—since the Russian-bred revolutionary plot in this country has been unearthed.

We *are* at war with Russia. Russia—a murderous outlaw—is making war on us, and winning—not here, but abroad.

Will we take as long to wake up as we did in the case of Germany? A firm and prompt policy now will save untold misery.

If there were anything in spiritualism, do you think all the powers of the air could keep Roosevelt from talking to us in this crisis?

We have been unable since then to note a statement of the relations of the United States to the Bolshevist government quite so bald and forcible till the letter of Frank H. Simonds on "The Polish Question," published by the McClure Syndicate on Aug. 12. Mr. Simonds (perhaps the clearest of analysts of current events) says: "The present hour is as critical for our civilization as that six years ago this month, when the German hosts, victorious in the battles of the frontiers in France and Belgium, rushed down toward the Marne. If it is not faced we shall lose the larger benefit of the Marne victory, and presently be forced to fight at a great disadvantage, *for fight we shall have to, in the end. Willy-nilly, we are again at war, the United States quite as much as France or Britain.*"

We are at war with Bolshevistic Russia: what are we doing? Ostrich-like, we have been hiding the fact from our vision for a year, until the smell of the powder is under our noses. The war is between the Western system of democracy and liberty, which it has taken our forefathers, since Magna Charta, seven hundred years to painfully attain, and the new and unprincipled despotism which drives forward the semi-barbarous Slavonic hordes of the East. The frontiers of American democracy and liberty lie east of Warsaw. During the Great War, it was remarked at times that our middle states showed less concern than our eastern states, as being secure from invasion; and we are suffering from precisely the same stupidity if we unintelligently watch unmoved the foe driving his frontiers nearer and nearer Washington.

The strange genius who rules in the White House, who has so often disappointed the American people, has unexpectedly sounded a true and firm note in his announcement of unchangeable hostility to the autocratic government of Russia (which has so long boldly declared its warfare on us), but friendship to the Russian people. The announcement is culpably late in coming, as was our announcement of our attitude in the Great War; but it is a sane one. Just such a conception and announcement in the case of Germany, and especially Austria, as we may recall, hastened immeasurably the débâcle of the Central Powers. It is especially heartening as against the sorry spectacle and plight of Britain, who, with the Russian tyrants' revolver at her head and traitors in her house, throws up her hands and grins a sickly friendship at an enemy that she knows has no honor. France, however, the indomitable, sounds the same true and sturdy note as America; and thus the two most advanced democracies of the world confront the latest hideous menace to their liberties.

The Shaft-Sinking Medal Of the Engineering and Mining Journal

IN OUR ISSUE of May 15 it was announced that *Engineering and Mining Journal* would present a gold medal to the crew breaking the world's shaft-sinking record, which at that time was stated to be 310 ft., this distance having been made in thirty-one days by the Crown Mines, Ltd., Johannesburg, South Africa, during July, 1919. In addition to the gold medal award, a silver medal is to be presented to each qualified member of the sinking crew. It was further announced that rules governing the award would be published at a later date.

Members of the committee who have been appointed to judge such records are as follows: George S. Rice, William Young Westervelt, and D. E. A. Charlton, these men having been designated by the Director of the Bureau of Mines, the Secretary of the American Mining Congress, and the Editor of the *Engineering and Mining Journal*, respectively.

It will be appreciated that any attempt to specify conditions as to cross-section area or shape of shaft, hardness of ground, number of men employed, or any other condition which would have bearing on the progress made in shaft sinking, would introduce complications in the judging of the contest, and such complications would undoubtedly prove to be a source of discussion and difference of opinion, to say nothing of probable dissatisfaction on the part of the contestants with the final decision of the judges. In the formulation of the rules the question of specifying weighted values to certain conditions and making the award on the greatest number of points seemed to have possibilities, but after due consideration it was deemed best to hold strictly to the first announcement in its simplest interpretation, i.e., that the medal be awarded to the crew breaking the record in footage within the time limit specified.

In order to obviate any ambiguity which may exist in view of the first announcement made, it was necessary to make a definite ruling with respect to the following consideration: Is the medal to be given to the crew sinking more than 310 ft. in thirty-one days, the distance being made (*a*) at any date; (*b*) only if subsequent to July, 1919 (the time when the present record, which according to our figures is correct, was made); or (*c*) only if subsequent to May 15 (the date of the announcement)?

After due consideration it has been decided that the date of the announcement marks the opening of the contest, and inasmuch as the record announced at that time remains unchallenged to the present date, it is presumed that this is correct. In making the award, therefore, the committee will be guided only by the following rules:

1. The footage shall have been made during a period commencing on or after May 15, 1920.
2. The footage made must involve operations in which the sinking process is carried on at the bottom of the shaft during the entire period. It is understood that this performance shall be accomplished by manual labor, with the assistance of power drills and such other mechanical appliances as are necessary.
3. Shafts must be those pertaining to, or sunk in conjunction with, metal mines, and the slope shall be steeper than 45 degrees.
4. The measurement shall include the distance sunk during any consecutive thirty-one-day period, and shall be measured with a steel tape from well-established bench marks.
5. The measurements shall be made and sworn to by three witnesses, preferably the mine superintendent, the foreman in actual charge of the sinking, and a reputable engineer.
6. Records coming within one foot of each other shall be considered a tie, in order to allow for inevitable discrepancies in measuring to the irregular bottom of a shaft in process of being sunk. Therefore the committee will not consider less than 312 ft. as a new record.
7. The award is to be made to the crew whose reported figures, exceeding the record as stated and conforming to the conditions above mentioned, are first received at the *Engineering and Mining Journal* office. Telegraphic report stating the shaft, company, distance sunk, and date will be accepted as reported at the time of the receipt by the *Engineering and Mining Journal* of such telegram, provided the rules are in due course complied with through the mails or otherwise.

The Increased Freight Rates
A Benefit to Industry

BETWEEN 50 and 60 per cent of the total tonnage carried by the railroads of this country is said to be the product of our mineral industry. Mining interests should, therefore, be particularly concerned in the increased rates awarded to the railroads by the Interstate Commerce Commission. Briefly, freight rates in the so-called Western group of roads will be increased 35 per cent; on the Mountain-Pacific group, 25 per cent; on the Southern group, 25 per cent; and on the Eastern roads, 40 per cent. Passenger fares will be increased 20 per cent, and Pullman fares, 50 per cent. The present fare from New York to San Francisco, including sleeper, is $120; this will be increased to about $157.

Fair-minded persons know that the railroads deserve this increase. No industry has been more closely controlled by the Government than that of interstate commerce, a special commission for its regulation having been established over thirty years ago. The reluctance of the Interstate Commerce Commission to advance rates to accord with increased costs is well known. With general commodity and labor costs at least double the pre-war figures, freight and passenger rates have probably not averaged more than a 35 per cent advance.

We see no reason why the increases which have been granted should cause more than a temporary increase in the cost of living; in a few months they should have just the opposite effect. One reason why prices have kept up this year is that transportation conditions have been demoralized. With an increased income, suitable equipment can be provided, and delays, uncertainties, special expensive forms of transportation, carrying charges on goods in transit, and like expenses, should be materially reduced. Furthermore, the railroads have been subsidized to the extent of about $75,000,000 monthly by Government guarantees, which expire at the end of this month. This expense to the taxpayer will be eliminated, thereby partially offsetting the increased rates.

We have heard little criticism of the commission's ruling, and we believe that time will prove it just. When the cost of operation is materially reduced, as we hope will be the case in two or three years, the rates can be revised downward. This may be something which the next administration will seek to do, in order to have good campaign arguments four years hence.

The Progress of Ore Deposition Theory

ACTIONS and reactions, ebb and flow, upswings and downswings, are characteristic of many other things than the stock market. It is true of political life, of history, of our individual goings and comings. Even it is true of science. Geology—as, for example, the geology of ore deposits—first dealt in theories of abrupt action—things done with a bang.

To him who gets up in the morning and goes to bed at night, without using overmuch of observation and deduction, the most impressive thing, amid the scurry of animal life, and the rustling activity of plant life, is the immovability of the hills, the "eternal sameness" of the rocks. "Rock of Ages," sings the hymn. What more graphic symbol of unchange? When we note that the earth has been rent and torn, the primitive conclusion is that it is due to one of the catastrophes of nature—like violent storms, earthquakes, floods, hurricanes, lightning-bolts; or we imagine others of like character, of which we have no knowledge, and so conceive of as still more violent. The first geological essay is possibly in Genesis, where it is written that God created the earth in six days, and rested from His labors on the seventh.

In common conception, in fiction or travel writing, and in movie captions, we find that a canyon is commonly ascribed to "some tremendous convulsion of nature," and even a glacial moraine or a talus slope will be laid to the "sport of nature in prehistoric times."

Our early geologists followed this natural trend of thought. So also, in course of time, when geologists began to study ore deposits specially, did they ascribe similar catastrophic explanations to mineral deposits, especially to the phenomena of vulcanism.

With the growth of geologic knowledge, it became convincingly plain, little by little, that the processes which carve rocks like putty, which mix rocks like dough, are not by any means dead—that they are working today, but very, very slowly; so that the stupendous work accomplished must have gone on for an inconceivable length of time. It became clear that the rocks were not made in seven days, nor in seven thousand years, nor yet in seven million years: that erosion, uplift, and metamorphism are going on during the quietest days in June, when the rocks seem most eternal; and that the natural catastrophes, like volcanic outbursts, landslides, and tidal waves, so far from being the cause of all geologic phenomena, are only the slips and starts of an ordinarily well-oiled and effective machinery.

This discovery was applied to mineral veins. The finding out that waters in the soil and rocks were capable of dissolving and redeposition, and the proof of the efficacy of these processes, led naturally to the thought that all, or most, mineral deposits have been so formed. The formation of iron and manganese deposits in this way seemed fairly clear; and later there was demonstrated the formation of rich copper deposits out of very lean ones.

The uniformitarian theory, again, has spent its force. It went too far, as the early catastrophic theory did. Nature, it appears, in her rock work is not so much of a humdrum plodder as we thought. She has fits and starts, periods of quiescence and of relatively great activity. So in the last few decades the relation of many ore deposits to igneous rocks has been narrowly observed; next, their relation to certain phases of igneous activity. This study is furnishing an accumulating fund of more and more accurate knowledge.

Human thought on a subject like this is like a pendulum, which, on being released, swings first to one side and then to the other, far past the true direction of gravity, but tends finally to find the true position of the earth's center and to remain fixed in that discovery.

Experimenting on the Olfactory Nerves of Miners

THAT the use of volatile ill-smelling compounds is preferable to electric bells as a warning to miners of unsafe conditions such as mine fires we do not doubt. The Bureau of Mines has recently been testing the idea and has just issued a report on the subject. Electric bells cannot be heard far and are likely to get out of order. A telephone system is better, but has obvious drawbacks. Sometimes cutting off the compressed-air supply has been used as a warning, but this may bring miners to the surface when they are not wanted. Or, water may be put in the air line, and when the driller gets drenched he is supposed to give up his work and demand an explanation at the surface.

Some time ago the Butte & Superior company tried the experiment of introducing a little valeric acid into the intake of the air compressor. This is the substance we used while in the chemical laboratory at college when the devilish instinct got the better of our normal cultivated angelic character. As we remember it, the *iso* variety smells like the concentrated extract of the choicest old cheese; that is, choicest to the cheese hound. But other and more effective odors have been found by the Bureau, such as ethyl and butyl mercaptan, butyric acid, and amyl acetate. The mercaptans are organic sulphur compounds. We do not remember ever having been in the path of their fragrance, but the effect of sulphur on such inoffensive elements as hydrogen is well known and if butyric acid be used in the compound the effect can be imagined; or rather, it can't be. Butyric acid is what makes rancid butter rancid, to speak as kindly of it as possible. Amyl acetate has the odor of bananas and is pleasant to most people, and so is frowned upon by the Bureau, which says that a more disagreeable odor makes a more suitable warning.

However, the use of amyl acetate suggests to us another field for investigation. Why not surcharge the mine with pleasant odors and make working conditions there more bearable, thereby promoting the efficiency of the miners? The burning of incense near the compressor intake should be particularly efficacious in spurring Chinese miners to an honest day's work. To give European workers the proper enthusiasm, we suggest a spray of allyl sulphide, this being the business principle of garlic.

A possibility also exists of evading the Eighteenth Amendment, for we understand the law does not cover the inhaling of alcohol for commercial purposes. Think how a properly impregnated mine air would stimulate production! The only reward that we ask for this suggestion is that we be given a job as shift boss in the mine in which the experiments are made.

New York Buys Radium

THE recent purchase of two and one-quarter grams of radium by the State of New York for use in cancer research is noteworthy. All the radium produced should be reserved for this purpose until a more essential one is found, if that be conceivable. Such radium as has been recovered has not been put to the beneficent use in which it finds its most important application. Much of it, if not most of it, seems doomed to be wasted in the manufacture of luminous paint. Wasted it certainly is, for not only is such use non-essential, but the paint itself has a very short life.

The Federal Government could well improve on the step New York has taken by either purchasing the existing supply of this substance or, as we have suggested before, by placing the control of its distribution in the hands of some Federal agency, such as the Bureau of Mines, in the public interest.

Porcelain Coins—What Next?

GERMANY is using porcelain coins. After unloading upon the world large quantities of silver coins in an effort to sell the remaining vestige of tangible and maketable wealth, and contributing to the decline in the price of silver, Germany is compelled to resort to the use of "siliceous" coinage—our own classification for this type of currency. No doubt it will be easier to keep in circulation coins with negligible intrinsic value, such as copper and porcelain, than precious-metal pieces. The disappearance of silver from circulation has caused much confusion and trouble to European governments, but Germany has offered one solution.

However rife speculation may be regarding the effect of this step, we are reminded of an admonition which a waggish acquaintance was frequently wont to use as a parting shot on leaving us, and which is peculiarly appropriate for the present trend in the reorganization of some of the world's currency systems. We give it for what it is worth: "Don't take any wooden money."

WHAT OTHERS THINK

The Licensing of Engineers

Through ignorance of political engineering, and perhaps by not doing our utmost everywhere, we engineers failed to secure the nomination of our candidate for President, notwithstanding the great advantage that he was probably also the popular choice. The regular politicians would not permit it.

Unless signs fail we will soon be again lifting our voices in lamentation, this time over the passage of as many different laws relating to licensing engineers as there are states in the Union. A good start at the confusion has already been made by the passage of such laws in eleven states, mostly without the serious attention of the engineers concerned, and in some cases apparently without their knowledge.

We should be grateful for the fine work of the committee of Engineering Council on licensing engineers, but being grateful will not be enough. That particular "George" is not going to finish the job. We must do it ourselves by agreeing definitely on what we want and then going after it through our organizations.

In Los Angeles we have a joint committee of the local sections of seven national societies at work on the problem, and it is to be hoped that similar action is taking place generally and that agreement will be quickly reached on the fundamentals of a licensing law.

It seems to me that the draft of the committee of Engineering Council is the nearest approach to a law upon which we could unite, but that it has the defect of dodging a definition of the matter it proposes to regulate, that is, professional engineering.

Most proposals (and some of the laws passed) have undertaken to define the term "professional engineering" by specifying every possible activity relating to engineering of every kind, and prohibiting the practice of any of them without a license. This has come so near to a *reductio ad absurdum* that the difference is scarcely noticeable.

There is a simpler plan which I wish to urge, and upon which I think we can all unite and carry through. The simpler laws are, the better. Therefore it is suggested that a licensing law should be simply a prohibition against *advertising*, *claiming* or *representing* oneself to be a professional engineer of *any branch* without a license, rather than a prohibition against practicing.

In effect it is proposed to provide a means by which engineers can be licensed or registered if they want to call themselves engineers, which licensing or registration would be subject to conditions to be specified in the law (and which could well be identical with those in the Engineering Council draft), and would give licensed engineers just as much state endorsement as they are entitled to, and the public just as much protection as any law could do. The public will demand evidence of licensing as a condition of employment when it is known that such a law is in effect, and if it considers it as a protection.

This would eliminate the impossible feat of so defining the activities of an engineer as to permit other proper and necessary activities so closely bordering on and interwoven with engineering as to preclude the possibility of a sharp line of division. The licensed engineers would immediately become a "blue ribbon" class, outside of which no engineer of consequence could afford to be.

Such a law would be a preliminary skeleton, to which could afterward be added such further conditions as experience might show to be desirable.

Los Angeles, Cal. W. F. STAUNTON.

Engineering and Mining Journal Lead Quotations

As corroders of lead purchased chiefly on average price contracts based on *Engineering and Mining Journal* quotations of prices, we urge that you should continue your quotations.

Steadiness of supply of raw materials and minimum fluctuations in price afford the best conditions of production in any manufacturing business, and strongly tend toward stabilization of prices of the finished product. In the white-lead business an interval of some weeks frequently occurs between the asking of prices and the placing of orders to fill contracts for painting, during which it is desirable that prices should change very little, if at all, to prevent the evils of options or of price protection, with their consequent tendency toward speculation. Both the sellers and the buyers of white lead appreciate the benefit of the existing price policy of few changes, based on the long-swing movements of the price of pig lead, but recognize that this policy is feasible only in the absence of erratic, speculative changes in the price of pig lead.

We believe that your independent, unbiased estimate of prices is of high value in steadying the market.

Scranton, Pa. EUSTON PROCESS CO.,
Edwin Euston, President.

The Arkansas Miner

It is with considerable astonishment, not unmixed with awe, that I read the communication of George Allen, of Little Rock, Ark., captioned "Making Miners Out of Farmers," which appears in the *Engineering and Mining Journal* of July 24. My astonishment is about equally divided between the *Journal* and the Mr. Roderick mentioned—at the *Journal* for publishing such misinformation and the Mr. Roderick for his truly marvelous performance at such an advanced age. Mr. Roderick, having introduced underground mining to Arkansas, must be well over ninety years old.

I am not sure when the first mine was opened in the State of Arkansas, but in 1888 Dr. T. B. Comstock visited the Confederate shaft, and states on page five of the Annual Report of the Arkansas Geological Survey for 1888: "The history of exploration in this place (Confederate shaft), according to apparently authentic traditions, dates back more than forty years." Therefore, the Confederate shaft workings must be today

approximately seventy-two years old, and taking the child labor laws into consideration, Mr. Roderick was probably at least eighteen years old at the time he introduced underground mining at this place, which, for sake of argument, we will assume was the first underground mining in the state.

I can imagine the astonishment of our friends mining coal and zinc in the state to learn that their workings are all on the surface, in spite of the fact that they have sunk shafts to reach their deposits.

With regard to the Arkansas farmer—he is no different from the farmer of any other state. I have introduced many farmers to both underground and surface mining, and have found no greater proportion of Arkansans averse to underground mining than those of any other state.

I have no statistical information at hand, but it is probably true that the mining industry draws more extensively on the farming class than any other for its supply of miners.

The attention of the Carnegie Hero Committee should surely be drawn to this case. Because of Mr. Roderick's advanced age, he will probably not be with us much longer, and it might be well to give this tip to the directors of the Hall of Fame.

As to Mr. Allen, he seems to have made the common mistake of taking in too much territory.

Bauxite, Ark. JOHN T. FULLER.

Aids to Cyanide Plant Recoveries

A perusal of the interesting article "A Cyanide Plant Without Frills," by Leroy A. Palmer, in your issue of June 5, 1920, suggests that the low recovery of gold and of mercury may possibly be increased by agitation of the sand residues in a puddler on their way to the dump. If the use of the tube mill were continued a liner of the South African type would also probably recover much amalgam. Both these methods proved of service in South Africa. WEST COUNTRY MINER.

London, England.

Boosting the Gold Assay

The article "Stories From the Laboratory," by A. R. Ledoux, in *Engineering and Mining Journal* of July 24, reminds me of a story told by the late Prof. P. de P. Ricketts to his class in assaying at the Columbia School of Mines some thirty years ago.

A man came to him and in perfect honesty claimed that he had discovered a method of assaying for gold which gave higher returns than the usual method of fire assaying. His method was to add a definite weight of trichloride of gold, $AuCl_3$, to the charge, run the assay in the usual way, and, after weighing the parted gold, to deduct the gold added in the trichloride.

Tests made in Prof. Ricketts' laboratory showed that things worked out as the man had claimed, and the returns were higher than when no trichloride was added.

Then an investigation followed as to why. The trichloride used was suspected, so a fresh supply of c.p. trichloride was purchased and used, but still the returns were higher. Finally a definite weight of pure gold was dissolved in aqua regia and the whole amount of the resulting gold chloride was added to a charge, the assay run, and the weight of the gold used in making the chloride was deducted from the weight of the parted gold obtained. The corrected weight agreed exactly with a parallel fire assay made without the addition of chloride of gold, showing that the trichloride of gold, even the c.p. brand, contained more gold than its formula, $AuCl_3$, would indicate, due probably to the presence of lower chlorides. E. B. DURHAM.

Canonsburg, Pa.

Lead and Automobiles

In common with the production of gasoline, which is now at the point of limiting the manufacture of internal-combustion machinery, the production of lead must be considered. Gasoline and oil shortages are also the limiting factors in the design of a cheap machine for city transportation work.

To relieve congestion in cities, for the poor and other populations, so that one can easily enjoy life in the suburbs, with cheaper living conditions, some cheap invention is necessary, that will make the transportation of great populations inexpensive and practicable. In the *Popular Science Monthly* of July, 1920, occurs a description of a cheap automobile, employing electric drive, that is a step in the right direction.

This uses the storage battery, which can be easily recharged and stored, and is good for thirty miles under almost any condition of weather and service.

The battery is made mostly of lead. Edison's battery made of nickel and cobalt will do, but the first cost is treble that of lead, though with longer serviceability. Cobalt and nickel are rare in occurrence. Experts believe that lead will be the storage-battery metal for the future, for auto and isolated lighting sets. Already the consumption of lead for automobile work is alarming those who know intimately the facts of production. It begins to look as if street railways in cities are doomed to greatly curtailed operation under the competition of gasoline automobiles, and their outlet from present competitive conditions may lie through conversion to charging centers for the use of electric-current autos. Streets are due to be cleared of rails, cars, and other impediments and given up to the use of electric and other automobiles.

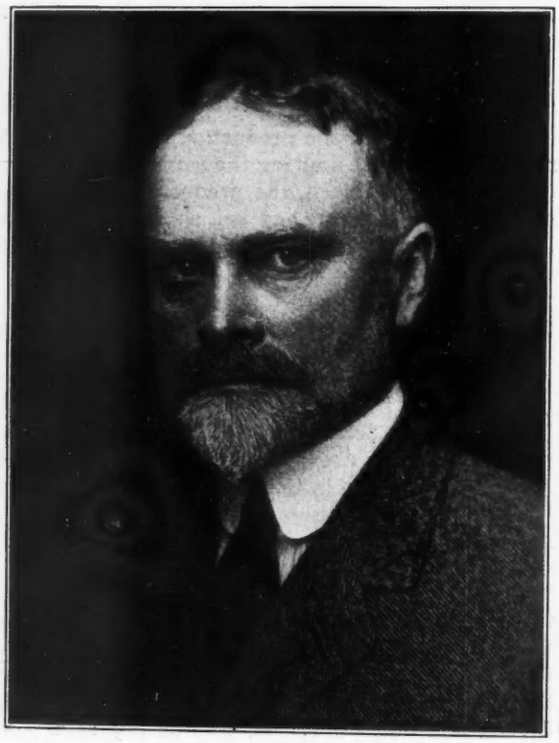
We know from study that lead production in the United States is in a bad way for the future. It could be easily and quickly overtaken by an inflated demand, due to an invention satisfying the popular need, which is precisely what the use of automobile and truck has done for the gasoline industry. The present prices of lead are indicative of the short supply, and the lack of fresh shippers for years, producing in sufficient volume to take the place of old dug-out mines, confirms the suspicion of shortage.

We have had a high tariff fence around lead, particularly in its raw form as ore, since the Windom Decision of 1882, inside of which we have depleted our supplies with great rapidity. The war pushed production to the point of exhaustion of every old dump, stope, and tailing pile, with no increase of new tonnage; coupling with this, the fact of an almost complete stoppage of development work.

We would be greatly embarrassed should a sudden popular demand occur in connection with the automobile industry, as lately befell the production of gasoline and oil. GEORGE HUSTON.

Mullan, Idaho.

Arrangements Committee in Charge of the



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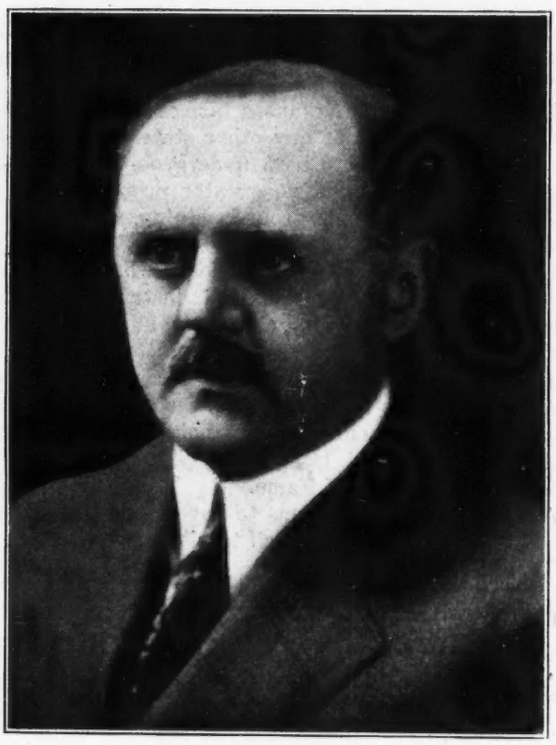
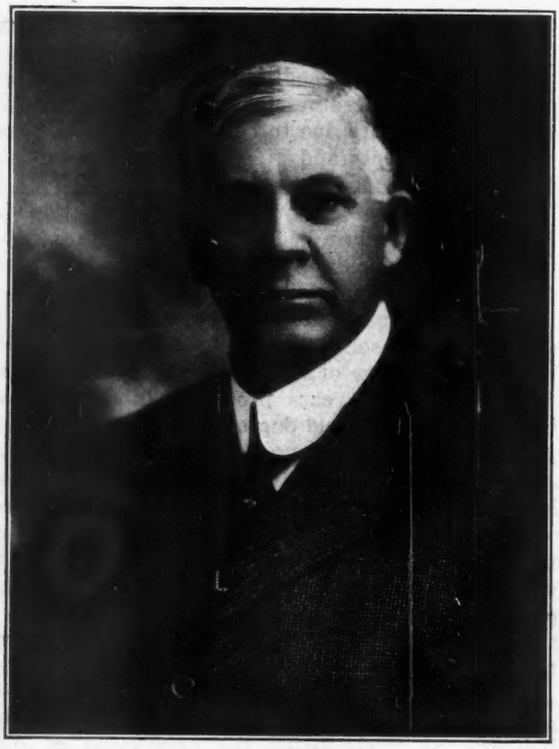
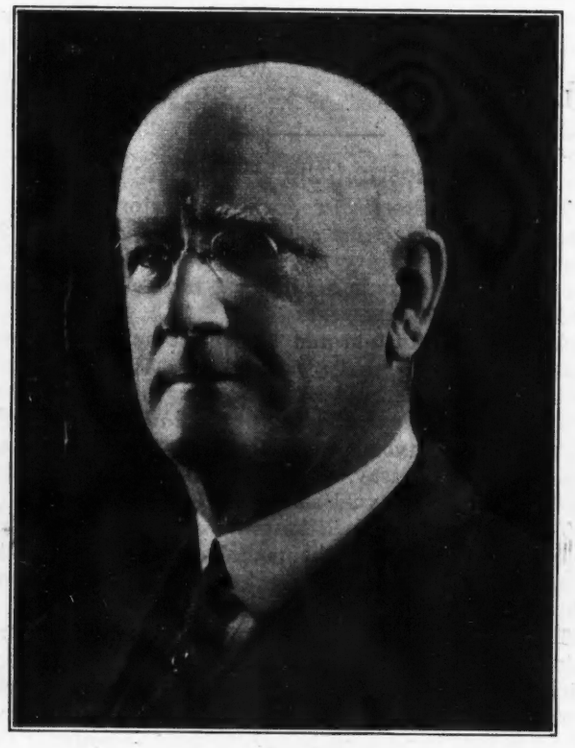


JOHN KNOX



O. C. DAVIDSON



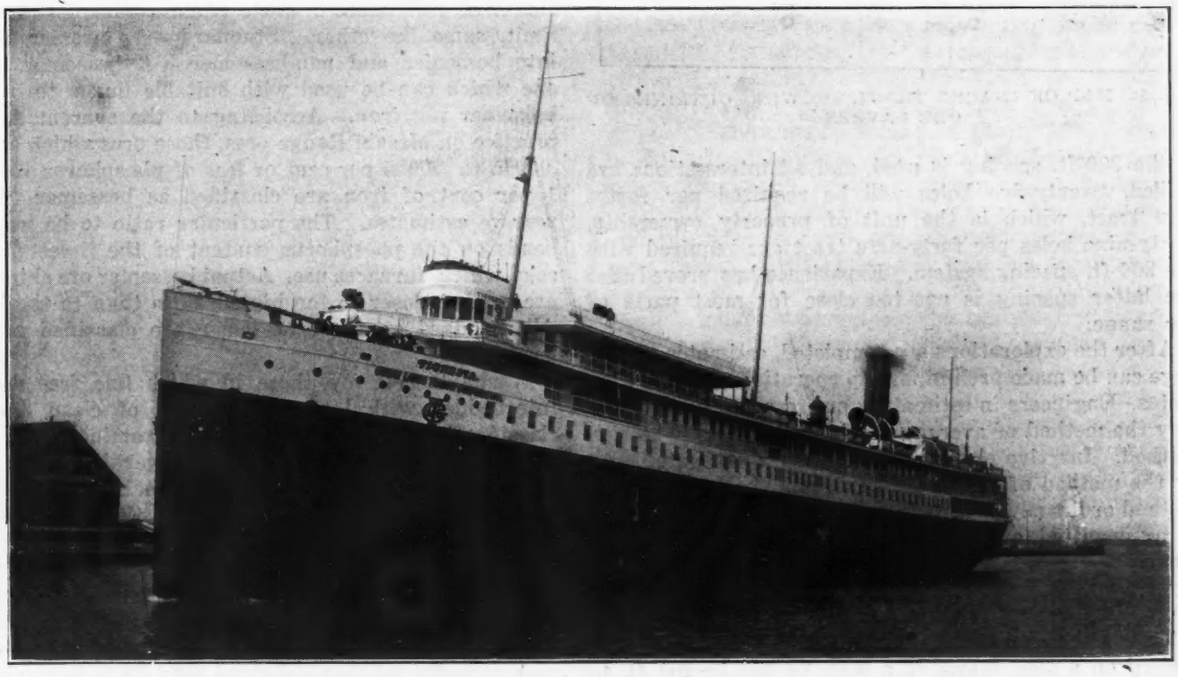
WILLIAM KELLY

Lake Superior Meeting of the A. I. M. E.

COL. F. A. POPE

H. V. WINCHELL

[It is regretted that photographs of John E. Hodge and A. Tancig, committee members from Minneapolis, and Chisholm, Minn., did not reach us in time for publication.—EDITOR.]



THE STEAMER "TIONESTA," WHICH CARRIED VISITING A. I. M. E. MEMBERS TO THE LAKE SUPERIOR DISTRICTS

Estimates of Mesabi Range Orebodies

All Factors Which Influence the Determination of Mining Methods Are Given Consideration, Preliminary to the Development of Minnesota Open-Pit Mines—Cross-Section Method Of Estimation Permits Accurate Interpretation of Available Data

Written for *Engineering and Mining Journal*

THE initial exploration of the iron orebodies of the Mesabi Range, in Minnesota, is done with churn and diamond drills. Different systems of locating the drill holes are employed by the companies operating, depending somewhat on the part of the range to be explored and on other local conditions. A common system is to locate holes at intersections of north and south and east and west co-ordinates, spaced either 200 ft. or 300 ft. apart. Intermediate holes between these are drilled also, if necessary, to determine more accurately the outline and structure of the orebody.

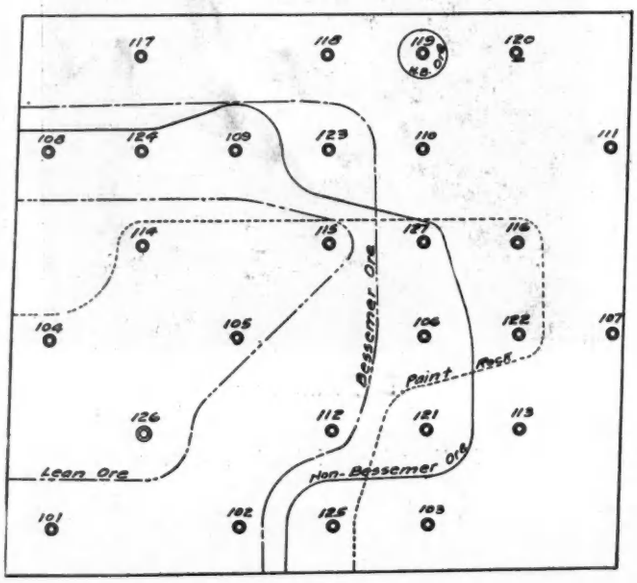


FIG. 1. MAP OF 40-ACRE TRACT, SHOWING OUTLINES OF ORE LAYERS

If the 300-ft. spacing is used, and all intersections are drilled, twenty-five holes will be required per forty-acre tract, which is the unit of property ownership. Forty-nine holes per forty-acre tract are required with the 200-ft. spacing system. Experience has proved that the latter spacing is not too close for most parts of the range.

After the explorations are completed, estimates of tonnage can be made preliminary to operating plans or estimates. Engineers in estimating ore reserves usually employ the method of average depths and the cross-section method. Inactive properties usually are estimated first by the method of average depths, and the cross-section method ordinarily is used in estimating mines which are being operated, or for which operating plans are being made.

AVERAGE-DEPTH METHOD IN ORE ESTIMATION

To use the average-depth method, the drill holes are platted on a map drawn to a scale of 100 to 200 ft. to the inch. On this map the area of the deposit is outlined by drawing a line inclosing all the drill holes containing ore. A frequent method used to locate such a line is as follows: Draw arcs on the outside of all outside ore holes, using the holes as centers, and connect the arcs of adjoining holes with straight lines tangent to the arcs. The radii of the arcs depend on the thickness of the ore in the holes. If the ore is 50 ft. or more thick, a 100-ft. radius is used; if between 25 ft. and 50 ft. thick, a 50-ft. radius, and if less than 25 ft. thick, a 25-ft. radius is used. This method is purely empirical but has proved fairly conservative, and is acceptable for ordinary reserve estimating purposes. However, if the ore samples from the drill holes are properly classified as to structural subdivisions, and if structural cross sections of the orebody are prepared, intermediate holes being drilled to determine the structure accurately if necessary, it is possible to determine the limits of the orebody between drill holes on the surface map and cross sections with a considerable degree of accuracy, much more accurately than by the use of the above-described empirical method.

LIMITS OF ORE ANALYSIS DIFFER WITH VARIOUS COMPANIES

The most common classifications of Mesabi iron ores are the following:

1. Standard ores (most of which are of merchantable grade and can be shipped direct to docks).
2. Washable ores.
3. Lean, non-washable ores.

All ores analyzing above 49 or 50 per cent dry iron are classified as standard ores. Some companies use one limit, some the other. Standard ores are subdivided into bessemer and non-bessemer. A bessemer ore is one which can be used with suitable fluxes to make a bessemer pig iron. According to the current furnace practice on Mesabi Range ores, those ores which contain .00075 to .00085 per cent or less of phosphorus for each 1 per cent of iron are classified as bessemer in ore-reserve estimates. The particular ratio to be used depends on the phosphorus content of the limestone and coke which furnaces use. Actual bessemer ore shipments are graded closer to the higher ratio than to the lower. All standard ores not bessemer are classified as non-bessemer.

Washable ores are those in which fine free sand is interbedded with lenses and layers of clean ore, the classifications being made from an examination of samples, the texture and structure governing more than the iron analysis. Lean, non-washable ores are all churn-drilled material analyzing less than 49 or 50 per cent dry iron and over 35 or 40 per cent. It is the general practice to classify all the diamond-drilled material analyzing less than 49 or 50 per cent dry iron as taconite, the local name for the iron-formation rock.

From the classification and analyses of ore samples, each orebody should be divided into its structural subdivisions or layers on the cross sections (described in the following), and such layers further divided into

FIG. 2. ESTIMATE SHEET FOR ORE RESERVE AND OPERATING ESTIMATES

No. of Pit or Drill Hole		Depth of Surface		Depth of Ore	Percentages				Foot-Units				Computations and Remarks
Grade	From	To			Iron	Phos.	Silica	Mn.	Alum.	Iron	Phos.	Silica	Mn.	Alum.	
N.B.	18	370	390	.....	20	....	....	....	....	121,960	1,340	6,575	1,990	3,660	Scale of Map:
N.B.	19	345	365	.....	20	....	....	....	....	121,470	1,485	9,095	2,145	3,645	Average depth of surface in feet: 20.00
N.B.	20	317	337	.....	20	....	....	....	....	113,555	1,505	15,735	2,845	4,265	Planimeter-area in square inches: 6.46. Average depth of ore in feet: 14.80
					60	59.50	.072	5.23	1.16	1.93	356,985	4,330	31,405	6,980	11,570	
															$\frac{6.46 \times 200 \times 200 \times 20.00}{14.80} = 349,189$ tons.
Bess	18	390	425	.....	35	.....	....	....	....	.....	211,370	1,325	29,855	670	2,835	
Bess	19	365	400	.....	35	.....	....	....	....	.....	213,100	1,235	27,370	755	3,600	$\frac{4.81 \times 200 \times 200 \times 35.00}{16.00} = 420,875$ tons.
					70	60.64	.037	8.18	.20	.92	424,470	2,560	57,225	1,425	6,435	

RECAPITULATION

Ore Layer	Tons	Percentages					Ton-Units				References:
		Iron	Phos.	Silica	Mn.	Alum.	Iron	Phos.	Silica	Mn.	Alum	
Non-Bessemer	349,189	59.50	0.072	5.23	1.16	1.93	20,776,746	25,142	1,826,258	405,059	673,935	
Bessemer	420,875	60.64	0.037	8.18	0.20	0.92	25,521,860	15,572	3,442,758	84,175	387,205	
Total Bessemer and non-Bess.	770,064	60.12	0.053	6.84	0.64	1.38	46,298,606	40,714	5,269,016	489,234	1,061,140	

FIG. 4. SUMMARY SHEET FOR OPERATING ESTIMATES

Description				Open Pit Ore							Underlying					Cu. Ft. per Ton	Total Reserve			
				Steam Shovel				Milling and Scram			Underground Ore		Low Grade Ore		Stockpiles					
Sub-Div.	S.	T.	R.	Layer	Class	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.	Remarks
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

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Oliver Iron Mining Co.

Mining Engineering Department.

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bessemer, non-bessemer, and lean-ore layers. Areas of such layers can be shown on the plan map also. Most orebodies contain a layer of low-grade ore material, which is the alteration product of an interbedded slate layer. It is called the intermediate paint-rock layer and is not merchantable, because of its high moisture and consequent low natural-iron content. It is desirable to outline this layer separate from the ores above 49 or 50 per cent iron on the cross sections, for structural reasons.

Average-Depth Methods—The tonnage of ore in the main body is obtained by multiplying the planimeter area reduced to square feet by the average depth of the layer and dividing by the factor for cubic feet per ton. If a drill hole shows an isolated ore area surrounded by rock, a circle is drawn around this hole having a radius of 25 or 50 ft., and this volume is estimated as a cylinder. The average analysis of each layer is found by adding the foot units of all the drill holes in the layer and dividing by the total depth of ore in the holes. The several layers of ore being estimated separately, the tonnages and also ton-units of the layers of standard ore are combined. The total ton-units divided by the total tonnage gives the average analysis of the whole deposit. A map illustrating the outline of an orebody is shown in Fig. 1, and an estimate sheet in Fig. 2.

Cross Section Method—Standard cross sections are made on a natural scale of 30, 40 or 50 ft. to the inch. A convenient size of these cross sections is 18 x 42 in. for a 40-acre tract, using a scale of 40 ft. per in. They are made on plain tracing cloth and are ruled one inch vertically, and horizontally to show 100-ft. intervals. Thus, a sheet will include a distance of 1,400 of 1,500 ft. horizontally and 520 ft. vertically, drawn to a 40-ft. to 1-in. scale. They are made looking either north or west, depending on the trend of the orebody, and are taken on the north and south or east and west co-ordinates 50 or 100 ft. apart. If the strike of the orebody is not approximately north and south or east and west, the cross sections may be taken at right angles to a line parallel to the strike. On the tracings are platted profiles of the natural surface, top of ore, and annual profiles of the open pit, if the property is being operated as such. The top of ore may be shown by a dotted line to distinguish it from the other profiles. If there are any underground workings, the drifts and stopes are platted on the sections. The stopes are cross-hatched and the level numbers are given corresponding to the level maps. Drill holes and analyses of samples are shown also.

All companies have iron and phosphorus determinations made of drill samples. Some have silica and manganese analyses made also, and some add alumina. The structure of the ore body obtained from a classification of the drill samples is shown by lines drawn on the backs of the tracings. These lines mark the top of the upper slaty, upper cherty, lower slaty and lower cherty horizons and the top of quartzite and several minor subdivisions of the major ore horizons. All of these horizons do not occur in all orebodies. Their presence depends on the location of the orebody on the iron formation outcrop and the amount of erosion which has occurred from the top of the orebody.[1]

[1]The structure of the Mesabi ore deposits is described by J. F. Wolff in *Engineering and Mining Journal* in a series of articles beginning July 17, 1915, and in *Transactions* of the A. I. M. E., February, 1917.

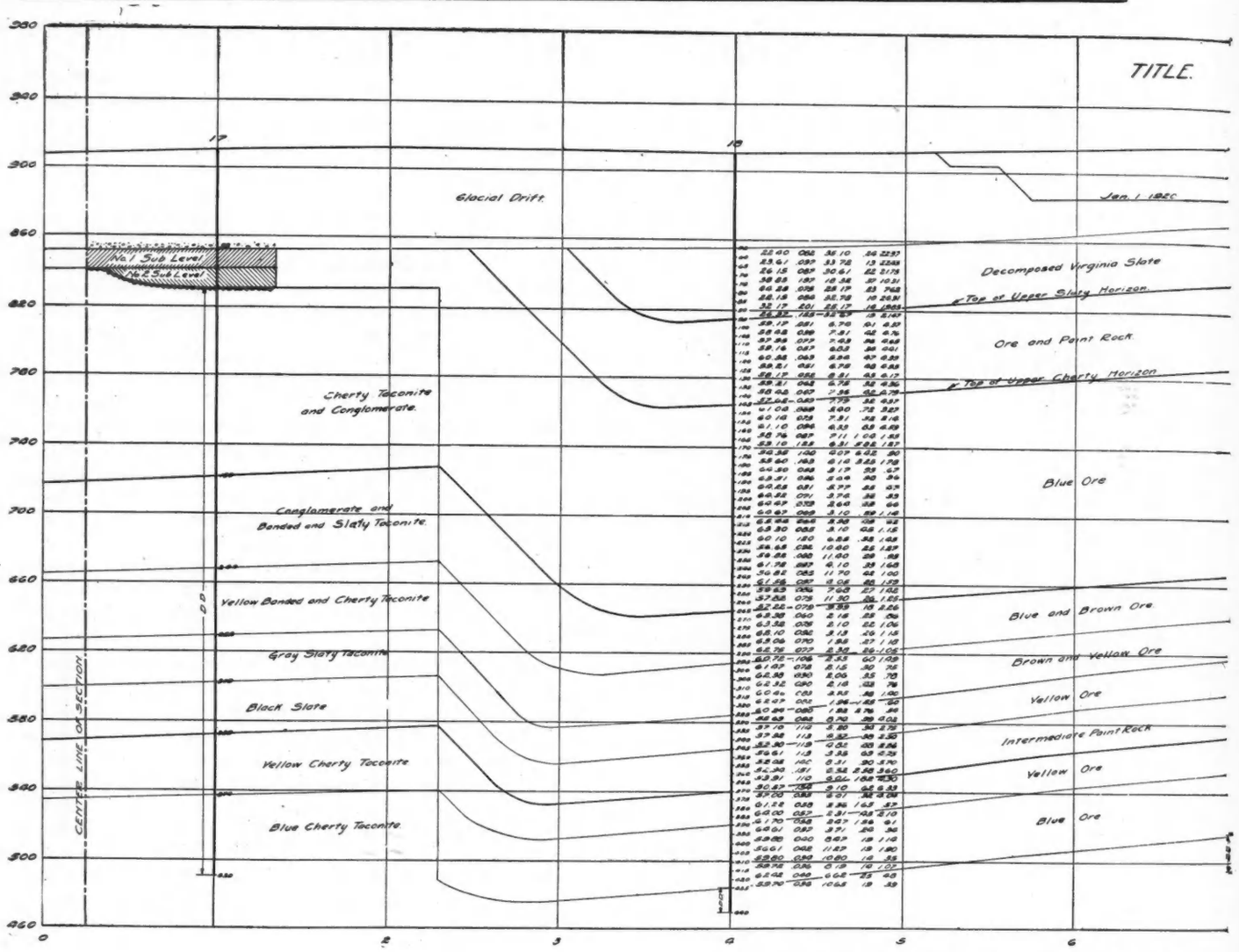
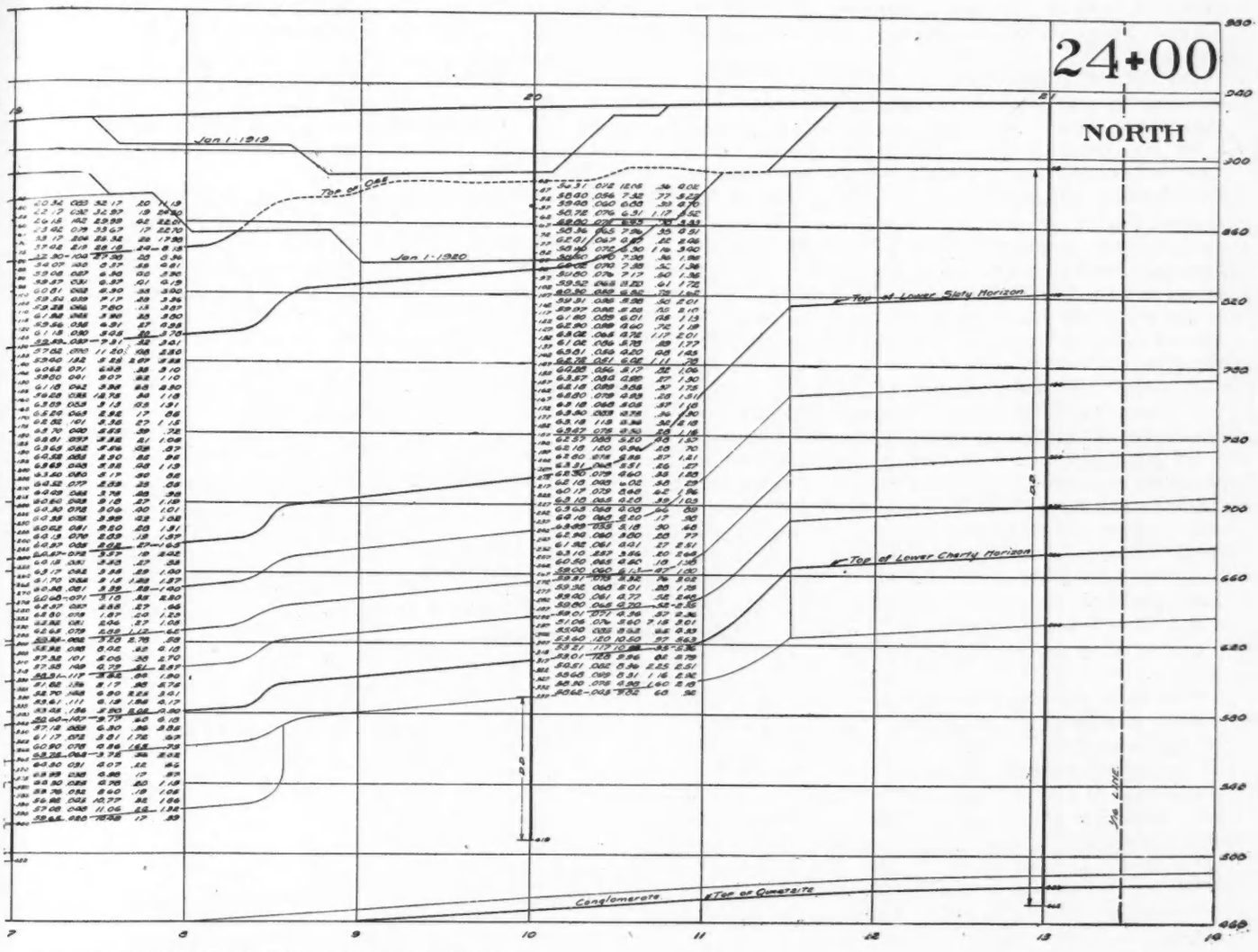


FIG. 3. TYPICAL CROSS-SECTION OF OREBODY

For purposes of determining the number of cubic feet per ton to use in the estimates, density tests are made as follows, wherever possible: A box without top or bottom is made out of steel sheeting, three-sixteenths of an inch thick. The sides of the box are held together by angle-iron pieces, to which they are bolted and should be reinforced by a narrow strip around the top. A convenient size to use is 2 ft. 6 in. square by 2 ft. deep, and this has a capacity of 12.5 cu.ft. The floor of the open pit, drift, or stope is leveled off, care being taken that no loose ore remains and the box is driven down into the ore layer to be tested until the top is flush with surface of ore. As the driving progresses the ore is dug out with a pick and shovel and weighed. If it is not possible to drive the box flush, the depth of the void can be obtained by measuring down from the top of the box. The volume of the ore in cubic feet multiplied by 2,240 and divided by the weight of the ore in pounds gives the number of cubic feet per ton. Such tests should be made in as many different horizons and parts of the orebody as possible, because the density will vary in different layers and positions in an orebody. In properties that are undeveloped, a tonnage curve is used.

Three methods of mining are used commonly on the Mesabi Range, namely, open pit, steam shovel and locomotive method; open-pit milling method; and underground mining method. Operating estimates are made to determine the best method of mining the ore on a basis of cost per ton. When part of the ore can be mined more cheaply by the open-pit method, there is usually an area around the edges which must be mined by underground methods on account of the thickness of the overburden as compared with the depth of the ore and because of the occurrence of the ore layers in taconite walls. Sometimes part of the ore is too deep to be hauled out of an open pit with locomotives and must be milled down to haulage drifts near the bottom of the orebody and hoisted through a shaft. The ore remaining under open-pit tracks must be mined by this method also. The ore in slopes of the open pit is mined by the underground or open-stope method. The ore reserve, therefore, is to be divided among steam shovel, milling and underground ore.

To outline the proposed open pit the following interpretation is placed on the data secured from each drill hole: A unit area of 27 sq.ft. is taken around each hole so that each foot in depth will then contain one cubic yard. A cubic yard of ore may be considered as equal to two tons. The cost of mining the ore under each unit area is computed by open-pit and by underground methods. Assume the following prices in making a comparison of cost by each method:



ON MESABI, SHOWING ROCK AND ORE LAYERS

Stripping surface	$ .60	per cubic yard
Stripping broken rock	1.20	per cubic yard
Stripping solid rock	1.80	per cubic yard
Steam shovel ore	.40	per ton or .80 per cu.yd.
Milling ore	.80	per ton or 1.60 per cu.yd.
Underground ore	2.50	per ton or 5.00 per cu.yd.

As an example, assume a drill hole with surface 60 ft., solid rock 22 ft. and ore 30 ft.

Stripping 60 ft. of surface at	$ .60	$36.00
Stripping 22 ft. of solid rock at	1.80	39.60
Steam shovel ore 30 ft. at	.80	24.00
Total		$99.60
Underground ore, 30 ft. at	5.00	150.00
Difference in favor of open-pit mining		50.40 = $.84 per ton

The above costs represent neither average nor any specific Mesabi Range costs, but are assumed for purpose of illustration. The engineer uses such costs as in his judgment will be incurred in each specific case.

After determining which holes are to be included in an open-pit area, an outline of the proposed pit is drawn on a map of the property on the scale of 1 in. = 100 ft. The cross-sections are used in determining such an outline, and the crest of the ore pit is located so as to include in the pit all ore for which the open-pit mining cost does not exceed the underground mining cost. In determining such a division the same comparative test can be applied at any point on the cross section which was applied to all the drill holes as above described. Attention must be given, of course, to making the shape of the open pit such as can be operated by ordinary steam-shovel and locomotive methods. Some ore may have to be excluded from the open-pit area because of inaccessibility to steam shovels and locomotives in the general operating plan which is most advantageous for the maximum tonnage in the orebody.

Outside of the crest of ore line a berm of 25 ft. is allowed to the toe of the proposed surface stripping slope. In ordinary glacial drift, composed of clay, boulders and gravel, a slope of 1 to 1 is allowed up from the toe of slope located as described. If the surface is known to be composed of gravel and sand only, and is very deep, flatter slopes up to 1½ to 1 should be used. A proper approach to the pit should be noted on the map, its location being made with regard to maximum tonnage possible to mine by steam shovel and locomotive haul, location of stripping dumps, general topography of surface, surface plant, and minimum yardage necessary to remove for such approach. A track system is planned in the ore pit next, using the map and cross sections

jointly in locating the track alignment. A map showing contours of top and bottom of ore is preferable for such use.

The following specifications are used generally in establishing track locations and grades and slopes of ore banks: For the ultimate track plan maximum grades of 3 per cent compensated on curves are allowed. Maximum curves of 15 deg. on main-line tracks are used. For final clean-up switchback tracks much steeper grades and sharper curves are and have been used. Grades as steep as 7 or 8 per cent and curves as sharp as 30 deg. have been used in actual operations. Where the depth of ore is less than 100 ft. a slope of 1 to 1 is allowed in the ore on the track side of the pit. A slope of ½ to 1 may be used in ore on the other sides of the pit, unless there be a structural rock wall of the orebody on such other sides, and in this case all of the ore up to such walls and to the limit of locomotive operations in depth is included in the "steam shovel and locomotive ore."

On ore banks higher than 100 ft. the allowed slopes should be increased to 1½ to 1 and 1 to 1 respectively. For milling pits a slope of ½ to 1 is used where the ore banks are less than 100 ft. high, and 1 to 1 where they much exceed 100 ft. If structural rock walls bound the orebody the milling ore should include all ore up to such walls, the above-mentioned slopes being used only where a wall of ore will be left exposed, such as at a property line where the orebody continues on to an adjoining idle property.

The character of material in the bank and the natural dips of ore layers in the orebody must be considered in determining slopes. Where the structural cross sections indicate marked dip of ore layers into the main ore trough, of course flatter slopes than those specified must be used to guard against slides of ore which would ruin a track system and seriously interfere with mining operations. The location and dip of the paint-rock layer, which is soft and yields easily, must be regarded with special care in locating tracks and establishing slopes.

Consideration of Wall Slopes

If the structural rock walls of the orebody are high, and any considerable thickness of them exists above the so-called "intermediate slate" layer, which is at the base of the Lower Slaty horizon, this thickness may have to be trimmed off to a slope of ¼ to 1 down to the bottom of the slate layer so as to eliminate the danger of slides of rock into the open pit from the walls above the slate as the ore is being removed from the pit. This feature should be provided for in drawing up the stripping plans so that the surface may be removed far enough back either in the first stripping work or in subsequent stripping extensions. Where something is known as to character of rock walls from operations on adjoining properties such wall-sloping can be anticipated. Walls which are somewhat decomposed, or contain fissures extending into them, must be sloped. One rock wall of some orebodies may overhang somewhat, and such walls must be sloped also. In most instances the rock walls of the Lower Cherty horizon (below the "intermediate slate" layer) are so solid that they do not require sloping.

Using the specifications and precautions given, the engineer denotes track alignments and ore slopes on both map and cross sections. On the latter the orebody is thus naturally divided according to the mining method to be applied to its different parts, i.e., (1) locomotive and steam-shovel ore: (2) milling ore, and (3) underground ore. The last classification may be divided in some cases into (a) ore which can be dumped into an open pit and hauled out by locomotives, and (b) ore which must be hoisted through a shaft.

Average areas of surface stripping, steam shovel, milling and underground ore of the several grades can be platted on the map also.

The quantities of stripping and ore, subdivided as noted, then can be estimated from the cross sections or from the map, using the method of average depths. The engineer can judge from the conditions, such as shape of orebody and open pit, which method will be more accurate. One method may be used for part of the estimate and the other for the remainder if greatest accuracy is obtained thereby. A convenient summary sheet for such an operating estimate is shown in Fig. 4.

British Columbia Mineral Production Decreased

The monetary value of the mineral output of British Columbia for the year 1919 was $33,296,313, as compared with $41,782,474 for 1918, according to official figures given in the Annual Report of the Minister of Mines, which has just been issued and now is available for distribution.

The decrease, though considerable, is not serious when placed against the greater decline in mineral production shown by returns from the various states south of the line where the mining industry is an important factor. In fact from this point of view it is indicated that British Columbia did not experience to the same extent the falling off in demand for metals following the cessation of war.

An interesting comparative table is published which, in part, follows:

QUANTITIES AND VALUE OF MINERAL PRODUCTS FOR 1918 AND 1919

	1918		1919	
	Quantity	Value	Quantity	Value
Gold, placer, oz.	16,000	$320,000	14,325	$286,500
Gold, lode, oz.	164,674	3,403,812	152,426	3,150,645
Silver, oz.	3,498,172	3,215,870	3,403,119	3,592,673
Lead, lb.	43,899,661	2,928,107	29,475,968	1,526,855
Copper, lb.	61,483,754	15,143,449	42,459,339	7,939,896
Zinc, lb.	41,772,916	2,899,040	56,737,651	3,540,429
Coal, 2,240 lb.	2,302,245	11,511,225	2,267,541	11,337,705
Coke, 2,240 lb.	188,967	1,322,769	91,138	637,966
Miscellaneous products	.....	1,038,202	.....	1,283,644
Totals	.....	$41,782,474	.....	$33,296,313

One interesting feature of the above is the increase shown in silver production, reflecting the increased quotations for the metal and, to some extent, the opening up of promising northern fields. Another worthy of note, but not of such an encouraging nature, especially from an industrial standpoint, is the marked decline in coke manufacture.

The report includes the usual detailed accounts of mining activity during the year in the several districts of the province by the resident mining engineers.

Quicksilver and Tin Mining in Bolivia

The central office of the important Bolivian silver and tin mining company, the Cia. Gallofa-Consolidada de Colquechaca, is in Sucre, says a report issued by the Department of Commerce, where most of the stock is held. A "junta consultativa," or subdirectorate, of the Chilean "Cia. Minera y Agricula Oploca de Bolivia" also has its offices in Sucre.

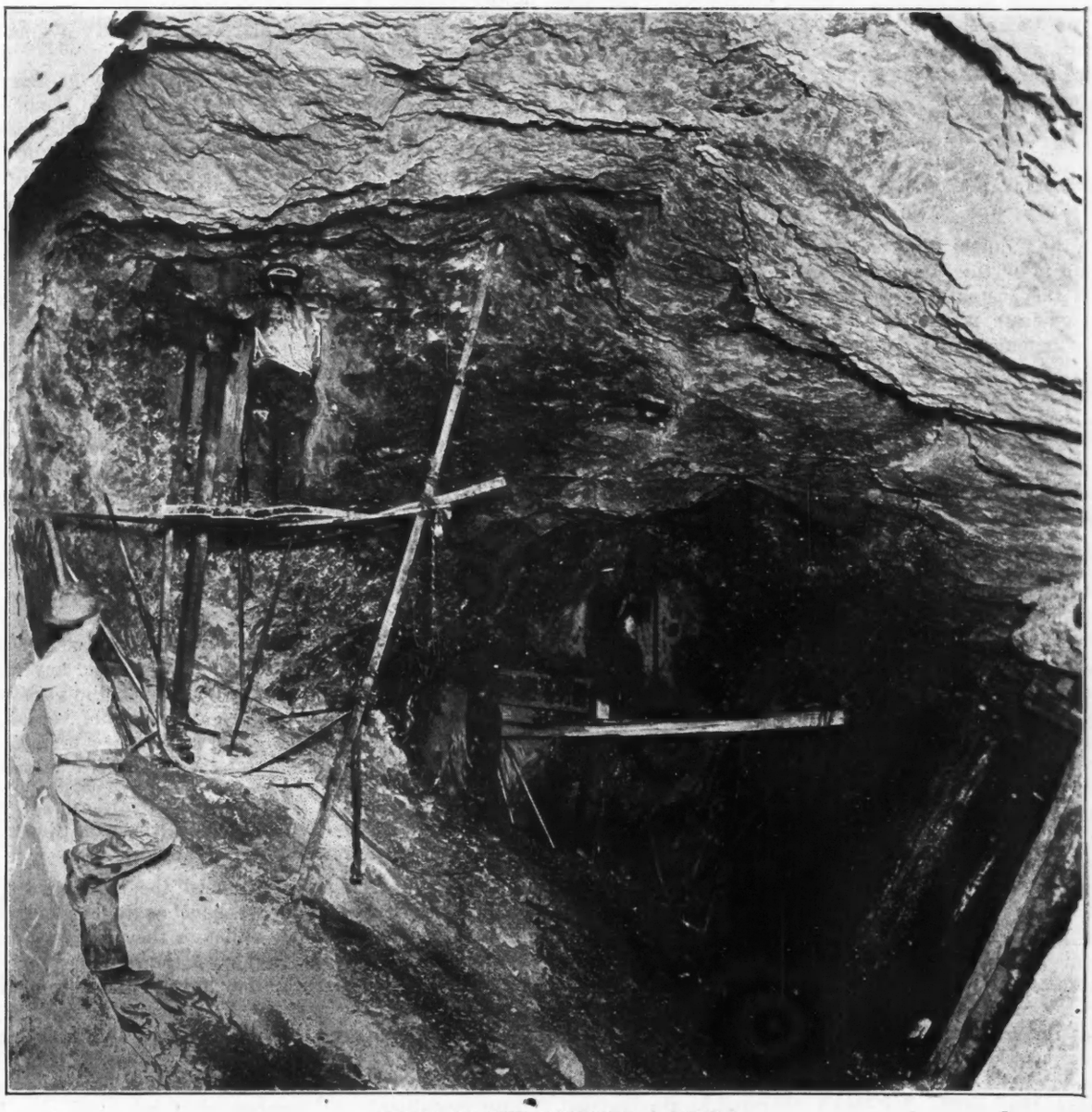
The Copper Ores of Lake Superior

Conglomerates and Basaltic Flows Afforded Zones for the Circulation of Powerful Ascending Mineral-Bearing Solutions During a Period of Great Volcanic Activity—Depth Of Mineralization Shows Deep-Seated Origin

BY J. E. SPURR

Written for *Engineering and Mining Journal*

THE copper deposits of the Keweenaw Peninsula, in northern Michigan, have been mined for fifty years on an important scale, and show no signs of exhaustion, although several of the mines have reached a vertical depth of over 5,000 ft. These ores as described by Pumpelly and Irving, together with their associated rocks, have long formed one of the classics of economic geology; and many writers have followed in the footsteps of the early masters. I shall not attempt to summarize the voluminous literature, but will unconventionally begin by stating my own notes, taken in the course of a few days' visit to the district, in which I was guided and enlightened as to local geological conditions by Prof. A. E. Seaman, of the Michigan College of Mines. It should be made clear that my visit was a hasty one to parts of only two mines of an extensive district; and, therefore, these preliminary notes do not pretend to the dignity of an article, and are presented with all apologies for inevitable stortcomings and inaccuracies.



STOPE IN THE CALUMET & HECLA

The copper-bearing formation is a thick series of intercalated conglomerates and thin flows of dense basic (basaltic) surface lavas. The upper part of each flow as a rule was vesicular, and hence by subsequent filling has become amygdaloidal. The conglomerates contain rounded pebbles of this basalt, including the amygdaloidal variety, as well as other rocks, like quartzite, siliceous igneous rocks, like quartz-porphyry, and denser (felsitic) igneous rocks. The upper surface of the basaltic flows was fissured and broken up, evidently from rapid contraction or cooling, at the surface, and sand sifted down and filled these fissures.

The copper ores occur as scales, shots, threads or masses of almost any size, of metallic copper, scattered through certain lode-like zones parallel to the upturned layers of beds of sandstone and conglomerate. The mineralized zone may be a conglomerate, as in the case of the Calumet & Hecla, or an amygdaloidal ancient basalt, as in the case of the Champion mine, both of which were visited. It is perfectly clear, therefore, that there is no special virtue in either rock—the ore is not native to either, and hence was introduced from foreign sources.

Mineralization in Conglomerate by Replacement and Impregnation

In the Calumet & Hecla, amygdaloidal basalt (I prefer to call it by this name, instead of "diabase" or "trap," as is the custom) in the foot wall of the ore-bearing conglomerate is barren; even amygdaloidal pebbles in the conglomerate itself are usually unaltered, and the amygdules (fillings of the original gas holes or vesicles by calcite and other minerals) are unreplaced by copper. One bed of conglomerate, varying in thickness from twelve feet or more down to less than one foot, has been especially mineralized, and there are many similar parallel barren conglomerates developed in the mine crosscuts. We must conclude that the lode is due to this conglomerate having afforded an especially open zone for circulating solutions—that it was either originally so (of which there is no evidence), or was made so by dynamic strain ofter becoming a part of the rock mass. Even of this latter, however, I found scant evidence.

The pebbles are not notably deformed or crushed except (according to Prof. Seaman) in certain zones where the crushing is quite marked. But that solutions passed freely through this lode-bed zone is shown by the irregular small dissolution cavities which are so common, and which are now filled with calcite and other minerals. They are often several inches long. The solutions must therefore have been powerful and they must have passed through the sandy matrix of the conglomerate while it was still open and porous; and as the dissolution cavities are mainly in this sandy matrix, they must have dissolved silica with ease.

The ore is entirely native copper, often with calcite as contemporaneous gangue. Native silver is common, and is contemporaneous, and of the same genesis. Besides impregnating and replacing the sandstone matrix of the conglomerate, it often occurs as a casing or shell around pebbles, of various sizes. In all instances which I saw the pebble had been thoroughly decomposed. Either the peripheries of certain kinds of pebbles created chemical reactions with the mineralizing solutions, which caused deposition, or the shrinkage of the pebbles during decomposition afforded a peripheral opening.

The mine workings inspected are at the vertical depth of a mile, or over 8,000 ft., on an average 34-37 deg. dip. Therefore, the mineralization was of deep-seated, and not of superficial, origin. It had nothing to do with surface water at any relatively recent period, as these lower workings are quite dry.

In the Champion mine, the lodes are parallel to the bedding, as in the Calumet & Hecla, but in a horizon hundreds of feet stratigraphically lower. In the Champion workings there is shown a series of numerous thin basaltic (diabase) flows, the average thickness of each being from 50 to 75 ft., and each flow being amygdaloidal in its upper portion. There are a number of parallel lodes, but the strongest and the only one inspected is the Baltic, which is from 25 to 30 ft. wide and is in basalt ("trap"). It is a zone of strain and fracturing generally parallel to the bedding, but not, in detail, regularly parallel. Where seen it was mainly in the dense or non-vesicular basalt, but it includes vesicular portions.

Owing, doubtless, to the greater rigidity of this rock over the conglomerate of the Calumet & Hecla, this basalt shows up the character of the Baltic lode as along a strain zone more clearly, by the frequent brecciation of the basalt and by thin, very straight, and persistent fissure veins of quartz, calcite, and other carbonates, and metallic minerals. These, where seen, were one inch or less thick. They strike parallel to the main lode, but in general dip more steeply, dipping 80-85 deg., though the lode is about 70 deg. This is, of course, a familiar type of lode. Nevertheless, relatively slight total dynamic action is indicated.

The effects of circulating waters are strongly marked, not only by the thin fissure seams, but by irregular dissolution cavities, never more than a few inches wide, especially around breccia fragments, as they are around the pebbles of the Calumet & Hecla conglomerate. These cavities are mainly filled with calcite. Solutions capable of dissolving silica and later precipitating calcite, or of replacing silica and other constituents by calcite, are indicated. The small amount of alteration of the rocks of the lode is, however, remarkable. The rock of the lode is apparently little more altered than are the wall rocks. Such rock, however, was pervious, as shown by the appearance of spots of copper away from any visible fracture. Much of the copper occurs in the rock without gangue. Where it occurs in the seam veinlets, it occupies the center, but here is intercrystallized and contemporaneous with the quartz and calcite, especially the former.

Evidences of Consecutive Deposition From Mineralizing Solutions

These thin veinlets are indeed the most direct and tangible evidence which we have as to the origin of the ore deposits; so that, although they are very minor quantitatively, as compared with the native copper impregnations in the rock, they merit special consideration. The metallic portion of the seams is generally in the center, and contains little gangue, in which quartz predominates. Chalcocite, often silver-bearing, and metallic copper are the chief minerals. They are found intercrystallized and contemporaneous, and are both plainly primary minerals.

Native silver is frequent. Other veinlets show contemporaneous bornite and chalcopyrite. Many of the veinlets show a white band of quartz (and calcite) on either side of the central metallic mineral, and the tendency to a fine comblike structure of the quartz, per-

pendicular to the wall, indicates that the crack stood open for a while, and that its walls became lined with quartz before the injection of the strong copper solutions. Elsewhere we find these seam-veinlets (mostly of native copper only) in the rock, without, or almost without, selvage or gangue. Essentially, therefore, the copper injection and deposition was without much accompanying gangue.

Besides the seam-veinlets in the Champion mine, which strike parallel to the lode, there are others at right angles to it. These have a tendency to widen the lode, and the lode is more productive where many of these parallel or cross-seams occur.

The observations in the Champion were at 1,300 ft., and here also the rocks are dry, the only water in the mine being surface water, which is caught above.

Others of these veinlets contain highly interesting minerals—domeykite (copper arsenide), smaltite-cloanthite (nickel-cobalt arsenide), with niccolite (nickel arsenide), all contemporaneous, with sparse quartz-calcite gangue.[1] What the paragenesis of these varied metallic minerals is I am unable to say. It could be decided largely by a study of the interesting collection in charge of Prof. Seaman, at Houghton; but essentially they are all part of one period, and the native copper is determined as a primary precipitation contemporaneous with the sulphides. Does not its intercrystallization with chalcocite indicate a scarcity of sulphur in the copper solution-magma? It will be noted that chalcocite has the least sulphur and the most copper of the copper sulphides—20 per cent sulphur and 80 per cent copper—while, referring to the bornite-chalcopyrite veinlet above described, bornite has 28 per cent sulphur, 55 per cent copper, and the remainder iron, and chalcopyrite contains 35 per cent sulphur, 35 per cent copper, and the rest iron. In general, therefore, it appears that the solutions contained, comparatively speaking, little sulphur or iron; that they were rich magma-solutions of copper, with a little arsenic, sulphur, cobalt, and nickel.

This preliminary examination has led me to infer an injection, at a definite period, of cupreous solution at depths which are demonstrated at present to be 8,000 ft., and which, at the time of deposition, were much greater,[2] and that the solutions therefore were presumably ascending.

The total amount of copper deposited was enormous. This has been for many years one of the most productive copper districts of the world. The attendant rocks are not thoroughly decomposed and leached; indeed, their alteration is noticeably less than we are accustomed to see in the neighborhood of ore deposits of plainly igneous-magma origin. Ground water is scanty or wanting in the deeper portions of the mines. The concentration of the copper gradually from the inclosing or surrounding rocks is an explanation so evidently unreasonable and inadequate as not to merit a second thought. The expectation, then, is that this deposit, like many others whose origin is better demonstrated, is of igneous-magma origin; and this seems plausible, as it followed such plentiful extrusions of basic rocks, and, as Irving and the other geologists have shown, both extrusions and intrusions of siliceous igneous rocks in the same great series, which is held to be about 25,000 ft. thick.

Siliceous porphyries, with and without quartz phenocrysts, are described as follows: Augite syenite, becoming granitic and granite, are found in large intrusive masses, apparently stocks or laccolites ("great irregular mountain masses," as Irving says) near the base of these Keweenawan basic rocks. There is a gradation between the granite, through the syenite to a gabbro—and the occurrence of augite, in all, even sparsely in the granite, where it has largely changed to hornblende, indicates the consanguinity of all. A magma which has differentiated in depth, of which the basalts and the intercalated siliceous rocks (rhyolites) may be considered complementary dense-textured surface eruptions, and the granite syenite and gabbro coarsely crystalline deep intrusive forms, is indicated. It is likely, by all analogy, that the ore deposition was one phase of this immense igneous activity.[3]

As to the age of this igneous activity, we only know that great series of surface volcanoes as Keweenawan, although they were formerly supposed to be pre-Cambrian, but now are considered by some as "more largely Cambrian than pre-Cambrian," as Lane says.[4] How much later the stock intrusions of granite and syenite rocks rose up into the buried base of the series we do not know, but they were in part, at least, in a rough way contemporaneous.[5] The formation of the lodes by strain —the rendering more permeable thereby, of certain beds —would appear to have been connected with the steep tilting which attended the formation of the great fault (Keweenaw fault) which limits on the east this copper-bearing zone. The fault itself is not known to be mineralized; therefore, the vein-formation followed the first slight movement in the growth of displacements, a history strikingly analogous with others described elsewhere.[6] The faulting continued, in successive stages, till after Devonian or later, according to Lane.

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[1]The following extract is from the News Section of *Engineering and Mining Journal* of July 3: "Copper arsenides have been found in a number of the Lake Superior copper mines. At present Ahmeek is producing varying quantities of algodonite, domeykite, and whitneyite, these three minerals occurring in rich pockets. In the Mohawk mine there are pockets of the same ores, and, in addition, a fourth arsenide, mohawkite. Algodonite carries 83 per cent copper and 16 per cent arsenic. It must be handled in lots that will give a smelter furnace a full charge. Domeykite ordinarily carries 71 per cent copper and 28 per cent arsenic. Whitneyite was found on surface at the old Pewabic property, at the Cliff, and at the Minnesota mine, in Ontonagon County, now the Michigan.

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

[2]The very narrow fissure fillings may indicate great pressure, and, therefore, great depth, although I believe that in one of the mines there is a fissure vein several feet wide, which has been mined.

[3]Diverse views as to the origin of the Lake Superior copper ores have been held in the past. Pumpelly originally regarded the copper as precipitated from sea water with the sedimentaries; afterwards, carried down in solution and coming in contact with the igneous rocks, metallic copper was precipitated by the ferrous oxide of the ferruginous silicates. By Irving they were supposed to have been due to leaching from the basaltic rocks during the ordinary processes of weathering. Lane considered that they were due to leaching by sea water, while still under the sea, and that there was still some fumarolic activity going on as an after-effect of the volcanism, which would explain some of the gangue minerals. Van Hise at first believed them due to ascending waters, but believed the waters not magmatic, but of atmospheric origin. In a later and more exhaustive analysis of the problem in a general monograph on the Lake Superior region (1911), Van Hise and Leith emphasized the magmatic source of the ore-bearing solutions, but did not entirely exclude the possible joint action of meteoric waters. Smythe believed that the waters were not only ascending, but of magmatic origin, and this view has also been held by Graton, although not published. Lewis, as a result of his study of allied deposits in the New Jersey traps (basalts), came to the conclusion that the copper there was of magmatic origin, and inferentially extended his conclusions to the Lake Superior country.

[4]Bull. Geol. Soc. Am., Vol. 27, 1916, pp. 93-100: "The Keweenaw Fault," by Alfred C. Lane.

[5]Irving, "The Copper-Bearing Rocks of Lake Superior," Monograph V, U. S. G. S., 1883, p. 112.

[6]"The Relation of Ore-Deposition to Faulting," J. E. Spurr, *Econ. Geol.*, Vol. 11, pp. 601-22, October, 1916.

Modern Coal-Pulverizing Plant at the United Verde

Jeffrey Breakers Followed by Ruggles Coles Driers and Raymond Pulverizers—Powdered Coal Carried to Smelter Bins by Screw Conveyors and Blown to Drier Burners With 40-lb. Air—A 750-ton Plant Cost $725,000

BY J. B. JOHNSON
Chief Engineer, United Verde Copper Co.
Written for *Engineering and Mining Journal*

EARLY in 1918 the United Verde Copper Co. decided to build a plant for the preparation of powdered coal, owing to the increasing prices of fuel oil used in reverberatory smelting. The year previous a report on the saving through the use of coal instead of oil had been prepared by the assistant smelter superintendent, C. R. Kuzell, and the estimated economy fully warranted the construction of a plant.

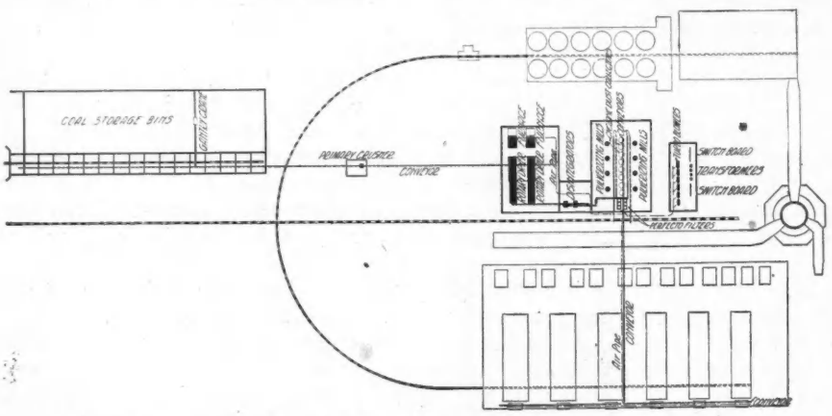

FIG. 1. GENERAL PLAN OF COAL-PULVERIZING PLANT

Two main types of plants were considered: the one in which the coal dust and air for burning are kept separate until mixed in the furnace burners, and the other type in which the air and coal dust are mixed in the coal plant and the mixture is conducted to the furnace burners in a manner similar to that employed in feeding gas. Of the two types the former was favored. The plant was designed by the local engineering department and actual construction began in November, 1918.

In general the plant consists of a 14,000-ton storage plant, a Jeffrey primary coal breaker, two No. A-14 Ruggles Coles driers, two Jeffrey coal disintegrators, eight Raymond pulverizer mills, six General Electric centrifugal 15-oz. blowers, and accessory equipment. A general plan of the plant is shown in Fig. 1.

The storage plant is divided into two parts; the main division consists of large reinforced-concrete bunkers holding a total of 12,000 tons of either slack or run-of-mine coal. These bunkers were made watertight, so that coal can be stored under water to prevent spontaneous fires. The storing as well as reclaiming is done by a five-ton Alliance gantry-type crane, which spans the main bunkers and has an overhang reaching over the railroad track which serves the bunkers. Coal is shipped in gondola cars and can be dumped directly into the track bunkers which constitute the second division of the storage plant. These smaller bunkers hold 200 tons, and when full any excess of coal shipped above the current demand can be stored in the main bunkers, such excess coal being handled directly from the cars into the main storage space by means of the gantry crane and 2½-yd. bucket.

Underneath the track bunkers, which are also built of reinforced concrete, is a conveyor tunnel and 30-in. belt conveyor fed by a traveling feeder from gates in the bottom of the bunkers. The conveyor system carries the coal to the primary breaker, designed to crush all lumps down to 1-in. size. To date this crusher has been by-passed, owing to the fact that all coal received so far has been slack or has been crushed at the mine. From the breaker a 26-in. inclined belt conveyor takes the coal to the driers, delivering to bins holding 100 tons. Feeders at the bottom of these bins supply the driers. Powdered coal is used in the driers for fuel, the ratio of fuel to coal dried averaging about 1:40, with the coal dried from 15 to 3 per cent moisture. The maximum temperature in the gas uptake adjacent to the drier drum is 160 deg. F.

From the driers the dried coal is conveyed in 14-in. screw conveyors, of the Webster make, to the disintegrators and to the pulverizers in the main building. In Fig. 2 is shown an exterior view of the plant—the drier plant in the foreground and the main mill building behind it. These buildings are of steel and brick construction—steel sash windows and steel and concrete floors throughout. The drier uptakes are each connected up to two cyclone dust collectors mounted on top of the building and a stack 50 ft. high is built on

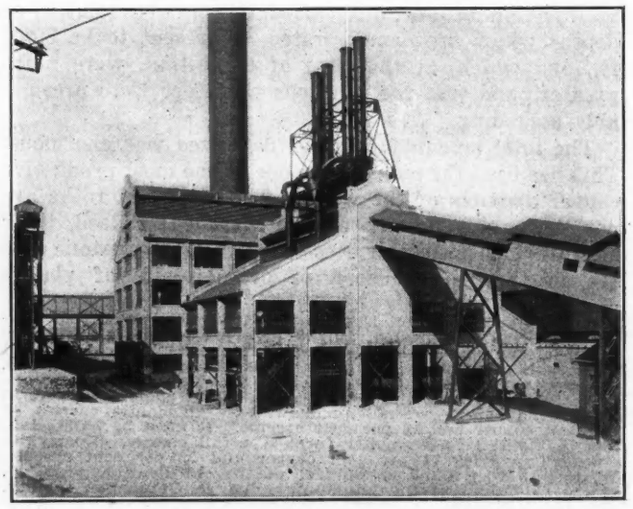

FIG. 2. THE DRIER PLANT IN THE FOREGROUND AND THE MILL BUILDING IN THE REAR

top of each collector. So efficient is this system in collecting the dust from the driers that scarcely any black smoke is visible from the stacks during the running of the driers.

The main mill building houses the eight Raymond pulverizers, exhausters, collectors, dust filter, blow tank,

FIG. 3. THE PULVERIZER MILL BUILDING. MAIN AISLE

and conveyors. Fig. 3 is a view of the main aisle, showing the pulverizer mills arranged four on each side. Fig. 4 shows the exhausters which are on the second floor of the building, one over each mill.

Each mill is driven by a 75-hp., 2,200-volt squirrel-cage motor, and each exhauster by a 40-hp., 440-volt motor of the same type. Each mill is connected through the exhauster to its own dust collector, the outlet of which is connected by means of a downcast duct to the mill, thus completing the return in the mill circuit. Each outlet is connected also to a small auxiliary cyclone collector 4 ft. in diameter, eight of these

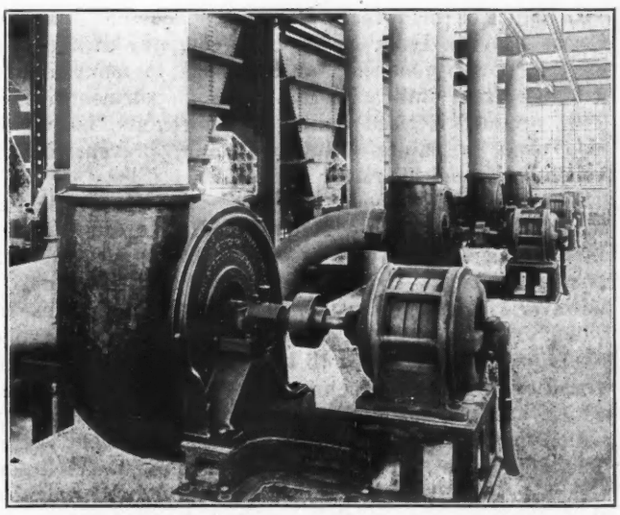

FIG. 4. THE EXHAUSTERS ON THE SECOND FLOOR

small collectors being inter-connected by means of a header which leads to the dust filter. This filter is a six-compartment muslin tube, automatic shaker type, supplied by the Dust Recovering & Conveying Co., of Cleveland. The tops of these filters are shown in Fig. 5.

An additional exhaust fan of 12,000 cu.ft. capacity at 4-oz. static pressure is installed beyond the filters, thus maintaining a slight vacuum in all of the mill circuits, which makes for an unusually clean building. The exhaust fan outlet connects directly with the main vent stack, and the efficiency of the filters so far is evidenced by the entire absence of black smoke from the vent stack. A 30-hp. motor drives the main exhaust fan. The dust collected by the filters is delivered into the main dust conveyor, and is thus utilized in the plant.

The conveying of dust into the smelter building is by means of 14-in. screw conveyors, direct connected to their respective motors through Poole turbo-gear speed reducers. This method of driving these conveyors has proved very successful, and the installation takes only a small amount of room and floor space as compared with chain drives and countershafts.

The conveying of coal dust to the driers is accomplished by means of a blow tank and transport pipe, as the tonnage involved is comparatively small. This blow tank is illustrated in Fig. 6, and was supplied by the Quigley Furnace Specialties Co. The air pressure used is 40 lb. and the tank capacity is three tons of dust. The tank is filled from a spout overhead, and

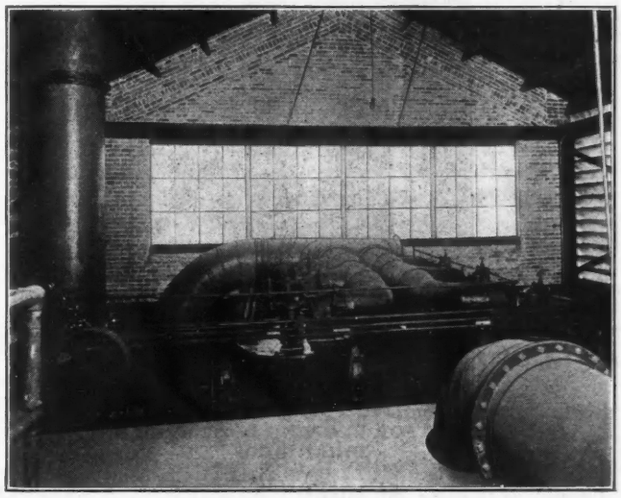

FIG. 5. TOPS OF COAL-DUST FILTERS

after the filling valve is closed the air is turned on, which shoots the dust through a 4-in. pipe to the two coal-dust bins at the driers. A specially constructed valve in this 4-in. line switches the load into either of the two bins. A cyclone air separator is mounted over each of these two bins which separates the air from the dust, allowing the dust to settle in the bins, the air being drawn through the air vent into the exhaust stacks of the driers. This transport system has given no trouble and is an excellent method of conveying coal dust. The capacity of the installation is about 10 tons per hour. With a larger tank the tonnage capacity could be increased. The feasible limits of transport distance and tonnage for this method of conveying dust are uncertain.

The coal dust as delivered to the reverberatory furnaces is pulverized to a fineness of 80 per cent through 200 mesh, and the moisture content is usually kept under 5 per cent. The burners were designed locally, and consist of the usual feed screw dropping the dust on to a jet of air supplied by the blowers.

The efficiency of the burners depends largely on that of the primary air jet in inducing sufficient secondary

air into the mixing chamber of the burner nearly to oxidize the coal during combustion. The remainder of the air required is drawn into the furnace through the furnace walls and ports. The burners were designed to feed an intimate mixture of coal dust and air into the furnaces. Several tests were conducted on burners, using different kinds of air nozzles, with a view to determining the relationship existing between different shapes of primary air nozzle and diverging air cone and to ascertain how these different factors affect efficiency. The conclusion is that the primary air pressure at the burners need not exceed 8 oz. per sq.in., and that the primary air volume (i.e. blower volume) need not exceed 25 per cent of the entire air volume necessary completely to oxidize the quantity of coal burned, provided the burners have properly designed air nozzles.

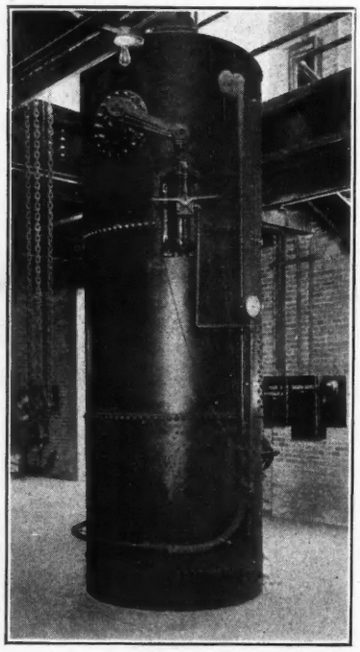

FIG. 6. TANK FOR BLOWING POWDERED COAL TO DRIER BINS

The air pressure is generated in the blower house by six General Electric turbo blowers, rated at 15 oz. per sq.in., and 10,000 cu.ft. per min. each. These blowers are Y-connected into a common header. Each blower is driven by a 75-hp. motor, direct-connected to the impeller through a solid shaft.

The capacity of the plant is 750 tons of coal dust per day, working three shifts. The dust bins at the reverberatory furnaces hold 65 tons each—enough for a maximum twelve-hour run for each furnace. The total cost of the plant, including storage plant, was approximately $725,000.

The fuel used at present is New Mexican coal from the Gallup district. This is classed as a lignitic bituminous coal, and has an average ash content of 8 per cent, and a maximum heat value of 11,300 B.t.u.

Gypsum in 1919

According to a preliminary estimate by the U. S. Geological Survey, 2,451,000 short tons of gypsum, valued at $16,000,000, was sold in 1919. This is an increase of 393,985 tons and of $4,529,146 compared with the sales in 1918.

Tin in the Malay Peninsula

The largest tin-smelting center of the world is Singapore, where the Straits Trading Co. and the Eastern Smelting Co., both British owned, and a Chinese-owned smelter, have a combined capacity of 58,000 metric tons of metal a year.

The backbone of the Malay Peninsula is composed of granite which is intrusive into limestone, shale, and quartzite. Tin has been found in place in practically all of the rock formations. Owing to the intense weathering and erosion of the tin-bearing formations, great accumulations of detritus, mixed with clay, all of which carry cassiterite, are found in almost all parts of the peninsula. The original deposits are so softened by weathering that they can be worked hydraulically.

Pahang, on the eastern side of the mountains, has many widely scattered tin deposits, both lodes and placers. The chief workings at present are in the mountains near the Selangor boundary, at Bentong, Tras and Machi. Some mining is also done at various places along the Kuantan River and its tributaries. Transportation is a serious item in working tin mines in Pahang.

The Kinta district, in the State of Perak, is the most important tin-producing area in the Federated States. A structural valley eroded in soft limestones between granite ridges is the location of most of the workings. The valley is filled with clays and boulder clays carrying tin, and the present stream channels are also stanniferous. Mining is in progress around fifteen or more settlements in this district. Most of the mining is by open cuts and dredges, but some lode mining is done on pipes in limestones. Next in importance to Kinta is the Larut district, northwest of the former. Placer deposits are the chief source of tin in the district, but lodes are worked at Selma and Blanda Mabok. In the south of Perak, at Bruseh, stockworks in schist are worked by hydraulicking, yielding about three-fourths of a pound to the cubic yard of material worked.[1]

Artificial Graphite

Graphite is manufactured by the Acheson Graphite Co. at Niagara Falls, N. Y. This company utilizes the electric power generated at the Falls to manufacture graphite from anthracite coal or from petroleum coke. This product is used mainly in lubricants, but it is also used in paints, foundry facing, preventives of boiler scale, and fillers for batteries.

Artificial graphite may be used for any purpose for which natural graphite is employed, according to the U. S. Geological Survey, except in the manufacture of large crucibles. Patents have been issued recently, however, for methods of manufacturing crucibles in which artificial graphite may be used. Artificial graphite is peculiarly adapted to the manufacture of certain graphite products, among them graphite electrodes, which are not made from natural graphite and for which the demand has greatly increased in recent years. The table below, published by permission of the Acheson Graphite Co., represents only the manufactured graphite that comes into competition with natural graphite.

GRAPHITE MANUFACTURED BY THE ACHESON GRAPHITE CO., 1915-1919

	Pounds
1915	5,084,000
1916	8,397,281
1917	10,474,649
1918	9,182,272
1919	8,163,177

[1]J. M. Hill in "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

Designing Mine Signal Systems

Safety, Reliability, and Maintenance Costs Should Be Considered in the Selection of Electrical Circuit Equipment—Installation and Operation Dependent Upon Existing Conditions—Expense Involved Commensurate With Service and Results Obtained

BY R. H. BACON*

Written for *Engineering and Mining Journal*

IMPORTANT as the mine-signal system is to continuous operation, safety, and speed of hoisting, it is rather peculiar that comparatively little attention has been given to the subject. Some of the newer installations might be termed modern, but for the most part the older and deeper shafts still remain dependent on the old, mechanical pull bell. Undoubtedly first cost and ultra conservatism have been the two main stumbling blocks to improved practice.

In the preliminary consideration of a system to be adopted, the first essential point in the design is to adapt it to the particular operating conditions. These vary at almost every property, and particularly in the different districts. If the shaft is a single compartment, two compartments, or one that has two hoisting compartments and a man, or "chippy" compartment, the electrical layout must be designed accordingly. By careful consultation with the operating men, the electrical department can lay out a system that will provide for every possible condition or emergency.

All systems should be designed with the following points in mind, given the weight of their numerical orders: (1) safety, (2) reliability, (3) speed of operation, (4) low maintenance cost, and (5) simplicity.

SAFETY PARAMOUNT IN SIGNAL DESIGN

Safety is placed first because this is one of the weightiest arguments in favor of the electric system. It is exceedingly simple, while designing the system, to arrange the bells, buzzers, or lights so that at any place in the shaft, shaft house, or engine house it will be possible to tell what is going on, and for the sender of a signal to know that the signal was received correctly. If this is not provided for in the design one of the important features is lost. Nothing gives a greater feeling of confidence and security than to hear a signal repeated back.

Numerous accidents and consequent fatalities have been traceable to the old pull bells. I know of several, of which the following is an instance: In a shaft using dumpers the men had signaled to be lowered to the next level and were standing on the skip. Due either to a wrong signal having been given or to a misunderstanding of the right one, the engineer hoisted as for ore. The men, being totally unprepared for the sudden start, were thrown from the bail, one going down the shaft, while the others luckily managed to recover their balance and escaped injury. There have been cases where men working in the shaft, between shifts, have been crushed by the cage, due to similar errors. Repeated signals practically remove this possibility. From a cold-blooded business standpoint it is evident that such compensation saved would go far toward the first cost of a complete safety system.

Reliability is self-explanatory. Without it the system loses the confidence of the men and is a serious handicap to production if time is lost in changing over to the pull bell. Reliability can be attained only through the careful planning of all details of the equipment, as will be pointed out.

Speed of operation is essential in a busy shaft, but safety or reliability should not be sacrificed to obtain it. As a rule signals can be sent on any electric system as fast as they can be interpreted.

RUGGED EQUIPMENT RECOMMENDED

Low maintenance cost is not necessarily an offshoot of reliability. Sometimes the latter is attained at the expense of high maintenance costs due to continuous inspection. To cut down the cost of maintenance a system should be so designed that reliability will be attained through rugged equipment and not by constantly going over the switches, buzzers, bells and other equipment to see that they are in good condition. Any system should operate a year without attention if properly designed and no unusual accidents, such as falling ground, occur. Maintenance costs can be reduced by laying out the system with a view of locating trouble quickly. No system will be entirely free from breakdowns, and with careful preliminary study it is possible to arrange for sectionalizing the main feeds and consequently reducing the time required to get the system back into service.

Simplicity is important because undue complications in the wiring make it hard for a new man on the job to follow. Consistent with the operating conditions to be met, a system should be as simple as possible to accomplish the purpose for which it is designed. Necessarily a wiring layout for a three-compartment shaft with two hoists is more complicated than a single-compartment shaft.

SELECTION OF THE CIRCUIT LAYOUT

As a typical example of how the circuit layout may be chosen, the work of the Copper Range Co. at Painesdale, Mich., with which I am familiar, is given. The work was begun in 1916 with an experimental installation in Champion No. 4, and five shafts were installed as rapidly as possible, varying in depth from 2,100 ft. to 3,500 ft. The systems were designed for 5,000 ft. of depth. The No. 4 shaft of the Champion Copper Co. at the time of the design was hoisting to practically absolute capacity, and any additional speed in signaling was therefore valuable.

In this district a lander is employed, and he does all signaling to the engineer. With the idea of relieving the lander of Sunday work it was desirable to design the system for dual operation, i.e., straight through from underground or through the lander. In each case, however, the signals were to be repeated back underground before starting the hoisting engine.

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Referring to Fig. 1 it will be seen that the underground circuit consists of three wires and a ground return. As the shaft is two compartment, with ringing for one side (i.e., to ring the north side up ring the south side down), there is one bell in the engine house and one for the lander. The wires therefore consist of a feed, a bell wire, and a buzzer wire, using the ground return for both the bell and the buzzer circuit.

With the double-throw switch, in the lander's station, in the down position the operation is as follows. On closing the level switch buzzers on every level buzz, the lander's bell rings, and a set of green lamps light up in the landers' station. A set of four green lamps in the engine house also light up, giving the engineer a preliminary signal. On receiving the signal the lander repeats the signal to the engineer, causing the bell to

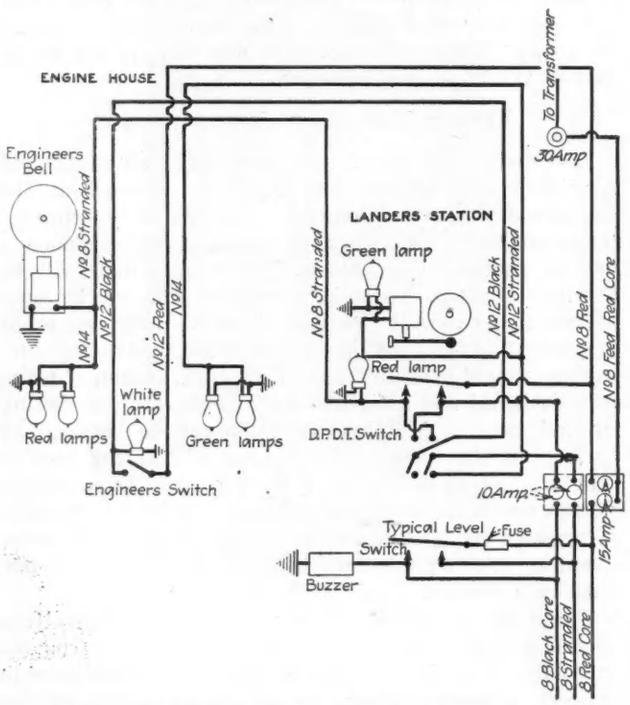


FIG. 1. DIAGRAM OF UNDERGROUND SIGNALING CONNECTIONS, CHAMPION COPPER CO.

ring and red lamps to light in the engine house. At the same time, however, the current flows back down the buzzer wire and all buzzers in the mine operate. As the lander rings the engineer's red lamps light in the lander's station, showing him that the signal system is operating correctly. The sender of the original signal knows that his signal has been correctly sent, as he hears the identical one sent to the engineer by the lander. The engineer has already had a duck signal on his green lamps, and if the signal from the lander should not agree the error would be evident. Three men are therefore on the job, and each knows what is going on. If by any chance the signal is not correct as repeated back the sender has an opportunity to stop the movement of the hoist, or if he is riding a skip he has an opportunity to jump off.

If it is desired to ring direct from underground to the engineer the double-throw switch in the lander station is thrown in the up position. In this case as soon as the switch at the level is closed the current flows up the bell wire directly to the engineer's bell, lighting the red lamp in the lander's station and also the red lamps in the engine house. It will be noted that in this contingency the green lamps are entirely cut off, as the circuit is open when the switch is thrown into the up position.

By following up the buzzer wire and passing through one pole of the switch it will be found that this wire also goes to the engine for a white light. As the buzzers operate underground this light illuminates, showing the engineer at once that the signal on his bell came directly from underground. By using the switch on his stand he repeats the signal back. While the engineer thus has definite knowledge that the system is operating direct from underground the lander always notifies him of the throwing of the switch making the change.

It might seem that there would be a loss of time in the repeating of signals, but in the handling of men a time interval must be allowed invariably, and in this case there is an actual saving of time, due to the fact that the men underground know exactly when their signal has been received. The engineer has been able to cut his time of waiting on that account. For hoisting ore there is a possible loss of time, but it is almost infinitesimal.

In this layout the telephone system has no part, as it is entirely independent. In some installations the telephones are a part of the circuit system, the wires running in the same conduit or cable. It is the belief of the electrical department of the Copper Range Co. that the two systems should be entirely independent and have no related functions. Though additional expense is involved in such a scheme it does away with the possibility of electrical troubles on the signal system, which might place the telephone service out of operation. In the telephone system of this company it is possible to talk from any surface location to about every third level in all shafts.

In the Butte district operations are carried out in a different way than in the Michigan copper country. A typical example of a more complicated system is shown in Fig. 2, which outlines the plan followed at the Pittsmont mine of the East Butte Copper Mining Co., Butte, Mont. There are in this case two distinct types of signals: (1) The signals that the station tenders use to connect with the hoisting engineer and top man, which none in the mine except the station tenders are supposed to use, and (2) a system of buzzer signals that are used by others in the mine for the purpose of getting the station tenders and in connection with the mine telephones.

As shown in the wiring diagram in Fig. 2 there are ten wires, as follows: East shaft compartment; west shaft compartment; "chippy" compartment; top man; telephone, (2); buzzer system, (3), and common return wire.

Each compartment of the shaft has a separate bell located in the engine house, and all pull switches operating in their respective compartments are in multiple. The buzzer system used for signaling station tenders and top men, and also as a call for the mine telephones, consists of one buzzer on each level, one at the surface, and one in the engine room. All buzzers operate when any buzzer switch is closed.

A system for a two-compartment shaft with a separate bell for each compartment is shown in Fig. 3. This system is in use at the Butte & Superior mine, Butte, Mont. From the sketch it will be seen that the general wiring scheme comprises one wire, No. 2, as a

common return wire, wires No. 1 and No. 3 as bell wires, and No. 4 and No. 5 taking care of the buzzer circuit. Pull switches are placed upon each level and in skip pockets within easy reach of the cage tenders. There is also a buzzer and push button on the engineer's stand. In case of a misunderstanding of signal the engineer can call for the signal to be repeated. The buzzers are independent of the hoist signals and are used for signaling cage tenders or by the engineer, as stated.

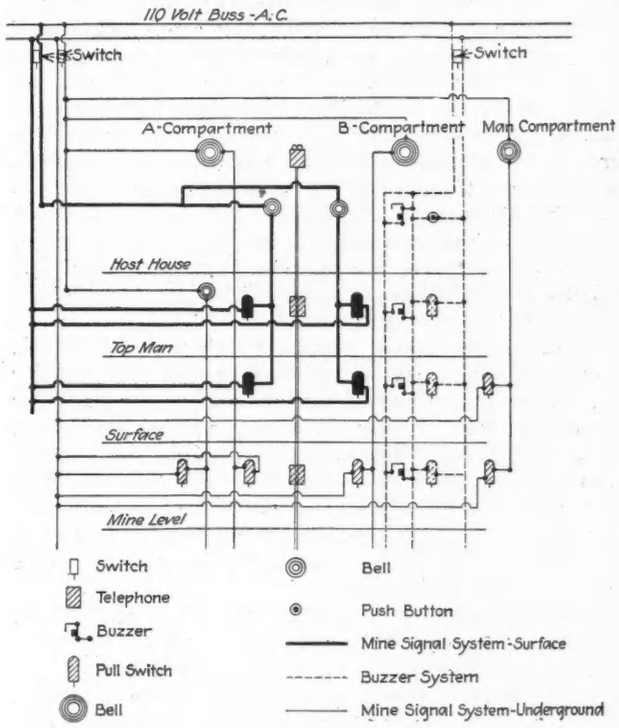


FIG. 2. DIAGRAM OF WIRING FOR MINE SIGNAL SYSTEM, EAST BUTTE COPPER MINING CO.

At the Ahmeek and Osceola mines of the Calumet & Hecla Mining Co. a system has been in use for a number of years that employs relays for the closing of the bell circuit. The system is operated on 220-volt direct current furnished by motor generator sets. The bell circuits are closed through relays, the shaft wires carrying only the current to operate the relays and the lamp in each switch box. These lamps, however, show only the flashes of the sending signal.

Having chosen the circuit layout, the most difficult part remains—that of selecting the equipment and the proper installation. Though designing the circuit on paper and determining what it is to do is important, the problem of meeting the severe operating conditions is the real stumbling block. The next logical step is the selection of the voltage and deciding whether alternating or direct current is to be used.

Numerous systems are operating on direct current through motor generator sets or storage batteries or both. There are some advantages to be gained, but on the whole the use of ordinary standard 60-cycle, 110-v. lighting current simplifies the problem. With the large systems electrified as they are, continuity of service is essential to other operations as well as to the signal system. This point may be dismissed as not so important as it might seem. Unless batteries are used, nothing is gained from the standpoint of service interruptions by using direct current. In mines that do not use the pull bell as a standby, but have an auxiliary electric system for emergency, the point should be considered more carefully. In such a case the system can be designed to operate on either current, storage batteries being used for emergency.

Single-stroke bells seem to be far more preferable to signaling work of this class than the vibrating type. The strokes being distinct and easily read, code signals with slight time intervals can be used. In the Michigan district the half bell is used extensively, in which case the hoist is moved slowly until the switch is released and the bell plunge or core drops back. The Copper Range Co. has developed a powerful engineer's bell of this single-stroke core type, with an 18-in. gong.

Reliability of bells is desirable and should not be left to guesswork. It is a simple matter to run a life test on a bell by devising a motor-driven circuit-closing apparatus. It is possible to produce in this way the effect of several years' operation in a week. The mechanical defects may then be corrected in the design, or the bell discarded entirely and another type tried. A bell should stand service for a year without repairs or inspection.

Buzzers suitable for mine use have been developed within recent years. They should be rugged and as near waterproof as possible. No adjustments should be required, and the life of the tongue should be as long as possible. The tone should not be unpleasant.

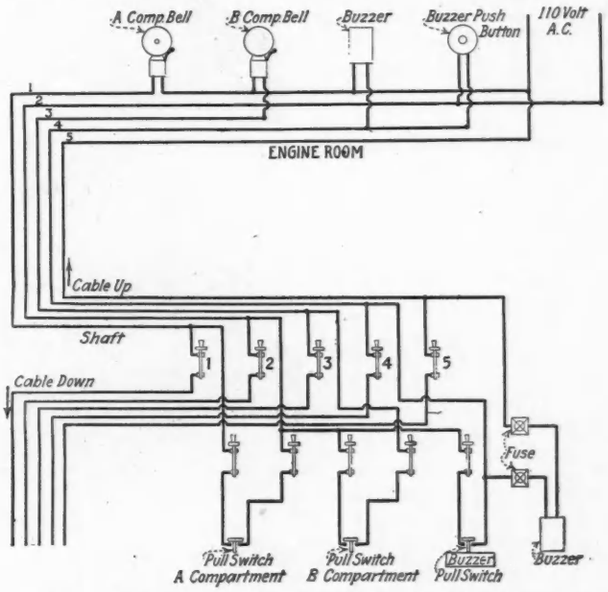


FIG. 3. WIRING DIAGRAM FOR TWO-COMPARTMENT SHAFT, SHOWING ONE METHOD OF LOOPING CABLE INTO JUNCTION BOX TO FACILITATE TROUBLE SHOOTING

Rugged types of switches for mine signal use have not been developed extensively. In the Butte district the switch developed by the Anaconda Copper Mining Co. has given good service. In the design of the Copper Range Co. a rugged oil switch has been built for this work. As shown in Fig. 4, this switch and the buzzer are mounted on a creosoted 2-in. plank as a standard station unit. The switch may be held in the closed position by means of the latch *A*. This is used by the dumpers to prevent the skip being rung away. While the switch is in the closed position all of the buzzers in the mine are sounding as a warning that the skip is being held. It would not be possible, however, to signal

the engineer by closing any other switch in the system.

Oil switches are used for several reasons. There is always a certain amount of arcing connected with breaking a solenoid circuit and in time this arcing burns through the contacts. The oil eliminates this source of possible trouble. The oil also lubricates the bearing surface of the plunger and prevents dust from making the switch sluggish. In case the switch is not operated for long periods the oil protects the contacts and spring from corrosion.

All of these items of equipment are important, and no thought should be spared in working out the design to obviate all possible defects. There will be breakdowns of various kinds, but if the mechanical details are

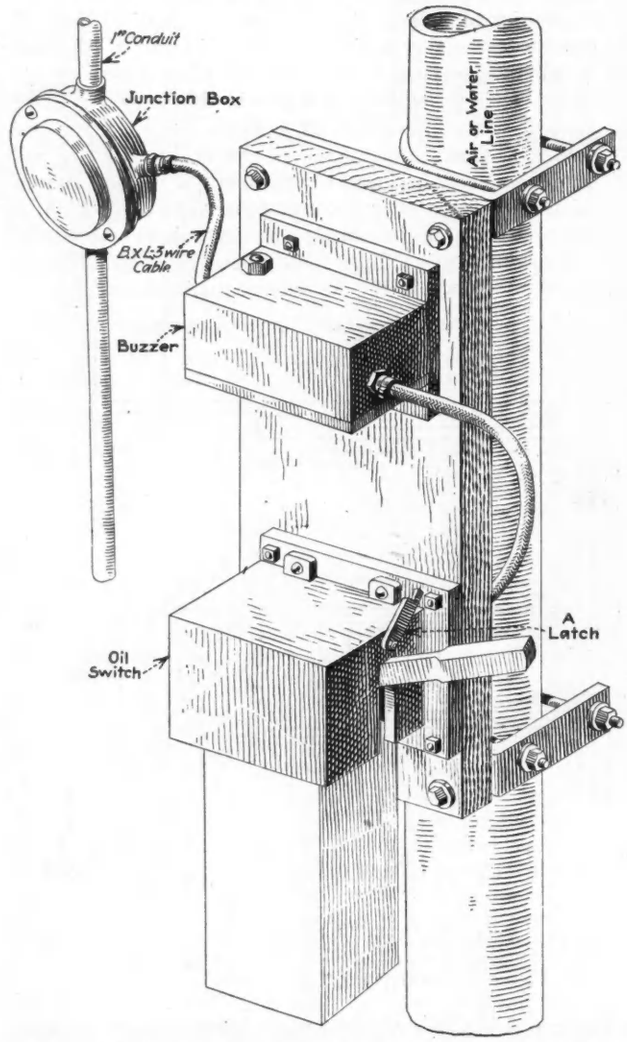


FIG. 4. GENERAL ARRANGEMENT OF OIL SWITCH AND BUZZER UNIT USED AT ALL LEVEL STATIONS AT MINES OF COPPER RANGE CO.

as perfect as possible the next source of trouble will be in the circuit.

Two methods of installation are in use for placing signal circuits in the shaft, one lead cable and the other conduit. In either case all wiring should be totally inclosed from the engine house to the last shaft station. Lead cable has the advantage of being waterproof, providing the entrances to junction boxes, buzzers, and switches are also watertight. Conduit circuits have given good service in many cases, and afford an easier method of pulling out a section for repairs. In the Butte district the practice has been to favor the lead cable for signal use. In the Michigan mines conduit is used. By placing junction boxes at every level with a conduit union above the box sections can be taken out easily in case of grounded circuits. Mechanical strength is essential, and partly for that reason No. 8 rubber-covered wire in one-inch conduit has been used in the system of the Copper Range Co.

To facilitate the location of troubles arrangement should be made for sectionalizing the line. In Fig. 3 this is done by the use of single-pole knife switches in the junction boxes. Each wire may be disconnected from the lower levels and by another switch from the circuit on the level. In Fig. 1 terminal lugs are used instead of switches for this purpose. In case of a ground on a wire in a 3,000-ft. shaft the line is opened at the 1,500-ft. level. If the trouble remains it is evident that the location of the ground is in the upper half. By repeating the sectionalizing the point may be located within a few levels, and by climbing the ladders and making an inspection of each station the trouble can usually be found quickly.

From an operating standpoint this is important. Cages and skips are for production use, and not for electricians to ride in looking for trouble on a signaling system. It is manifestly unreasonable to ask a wireman to climb several thousand feet looking for circuit troubles. By using the cage and sectionalizing half an hour is usually sufficient to locate the trouble within a comparatively short section. After this is done it is simple to climb the few hundred feet necessary to make the final examination.

Fuses should be so arranged that protection will be had on all parts of the circuit and in such a way that a blown fuse will indicate which wire is grounded.

First cost of a system is usually indicative of careful thought and may be the most economical expenditure in the course of time. The system of the Copper Range Co. showed a cost of approximately $1,985 for a 3,000-ft. shaft, including all possible items. All bells, buzzers, and switches were built in the shops of the company, and all materials were of the best. There has been practically no maintenance expense since the installation. The following table details the costs:

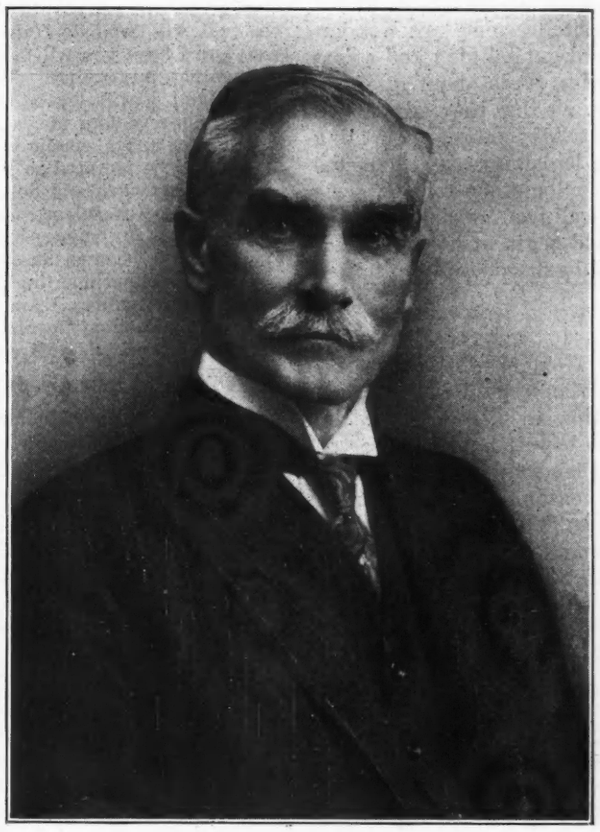
COST OF SIGNAL SYSTEM INSTALLATION FOR 3,000-FT. SHAFT

Underground Feed:		
3,000 ft. 1-in. conduit at $170 per 1,000	$510.00	
9,000 ft. No. 8 R.C. wire at $33 per 1,000	297.00	
30 PRX junction boxes at $3.48	104.40	
Fiber cleats, 30 at 20c	6.00	
Labor (timbermen on conduit and boxes), three men at $4.75, two shifts	28.50	
Labor (electrician pulling main feeds), three men at $4.25, two shifts	25.50	
		$971.40
Underground Stations:		
Switch and buzzer units, twenty-nine at $26	$754.00	
Labor of installing at $1.25 per unit	36.25	
		790.25
Lander's Station:		
Material (wire, small switches, and necessary equipment)	$3.00	
Signal switch (already installed)	12.00	
Lander's bell	25.00	
Labor, two men, two shifts, at $4	16.00	
		56.00
Engine House Wiring:		
100 ft. 1-in. conduit at $17	$17.00	
300 ft. No. 8 R.C. Wire at $3.30 per 100	9.90	
Signal switch	12.00	
Engineer's bell	30.00	
Material, miscellaneous	5.00	
Labor, two men, five shifts, at $4	40.00	
		113.90
Line Work Between Shaft House and Engine House:		
500 ft. No. 6 W.P. wire	$20.00	
2,000 ft. No. 8 iron wire	26.00	
Labor, two men one day at $4	8.00	
		54.00
Total		$1,985.55

Mining Engineers of Note

Robert Matthew Raymond

THE eminent professional standing of Robert Matthew Raymond is largely due to an unusually wide experience in mining and metallurgical matters and the rare personal qualities that are his. In the apt words of a close friend and a fellow engineer of Mr. Raymond's, "Whatever his task, whether directing practical mining operations, examining and reporting on mines, acting as managing director in a foreign country, or the expert adviser of boards of directors, his executive ability, resourcefulness, personal initiative, good sense and tact have brought him success and distinction." His career is an illustration of the globe-trotting exactions of the mining profession, and there is not a continent which has not been the scene of his activities at one time or other. South Carolina Montana, Arizona, Australia, South Africa, China, Mexico, London and New York indicate the wide range of his fields of activity and the mining conditions with which he is acquainted. Mr. Raymond was born in Norton, Province of New Brunswick, Canada, and educated at the University of New Brunswick and the Columbia University School of Mines, interspersing his education with practical mining work. In fact, it was due to several years' experience as assistant assayer in the assay office of the State of Maine, and four years at the Haile gold mines, in South Carolina, under the late E. Gybbon Spilsbury, after his graduation in New Brunswick, that a definite decision to make mining his life's work matured. Graduating from the School of Mines in 1889, he immediately, as an assayer, entered the service of the noted metallurgist, Anton Eilers, who had built the Montana Smelting Co. plant at Great Falls, Mont., afterward becoming assistant to Robert Sticht, superintendent of the company, receiving valuable training under the guidance of these two able metallurgists.



R. M. RAYMOND

From 1891 to 1894 he was superintendent of the Diamond R. Mining Co. in Neihart, Mont., and then for two years general manager of the Harquahald Gold Mining Co. in Arizona, operated by an English company, in whose interest he next traveled to West Australia. It was during his stay in Australia in 1898 that he was engaged by the Exploration Co., Ltd., of London, a successful and well-known British mining enterprise and a syndicate which has been identified with large mining operations in all parts of the world. This connection is still maintained. Leaving Australia, Mr. Raymond was sent to South Africa by the Exploration company, where he remained for two years engaged in deep mining upon the Rand. The next jump landed him in central and western China, where he made some important examinations for his company. In 1902 he became general manager of the El Oro Mining & Railway Co. of El Oro, Mexico, one of the largest gold-mining properties in Mexico and controlled by the Exploration company, where the first cyanide plant in Mexico was erected. This successful installation paved the way for the general introduction of the process throughout Mexico and in many other parts of the world. Mr. Raymond gives much of the credit for the success of this work to Mr. A. F. Main, later superintendent of the El Oro company. In 1918 Mr. Raymond was promoted to managing director of the El Oro company and the Exploration Co. of England and Mexico, a subsidiary of the parent company, to reside at Mexico City, where he exercised not only the functions of an engineer but also those of a diplomat in the troublous and dangerous revolutionary periods.

Were it not for the fact that strong representations were made upon Mr. Raymond to accept the chair of mining in Columbia University left vacant by Prof. H. S. Munroe in 1916, and had he not been allowed to retain his connection with the Exploration company, it is doubtful whether he would have accepted the professorship tendered him.

Professor Raymond is a vice-president of the A. I. M. E., a member of the Mining and Metallurgical Society of America and the Institution of Mining and Metallurgy of London. In his retiring way, he requested us not to consider him in any biographical sketch—which modesty seems to us to constitute all the more reason for our directing the limelight this week in his direction.

BY THE WAY

New Mexico

Residents of New Mexico have started another move, it is said, to change the name of the state so that Easterners may really be convinced that New Mexico is part of the United States and not situated south of the Rio Grande. The promoters of the scheme hope to carry it to the state legislature. This is really very foolish. Since Villa raided Columbus everybody knows where New Mexico is. Incidentally, some are wondering, now that Villa has gone and got religion and a coat of whitewash, what we are going to do about it. New Mexicans who really want to prove that they are Americans might introduce a bill at Albuquerque providing that the sessions of the state legislature be conducted only in the English language. Some one told us some time ago that Spanish is practically as "official" there as English. Just as charity should begin at home, Americanization movements may well begin in state capitols.

Mining in Petticoats

The Seven Sisters Mica & Gold Mining Co. is reported by the press to have been organized by seven women who desire incorporation in Alabama for the mining of gold. This project is based upon the reported discovery of bits of gold in Cleburne County. Those who scoff can give no good reason why the venture should not succeed. Many men have fallen down on "Southern gold"; the ladies cannot do worse. Perhaps some day a successful mine will be opened in one of the districts that has a black eye today. These ladies will not be the first of their sex to enter into mining. Chloride, Ariz., has a new company opening up a promising body of silver ore, which has been very successful in its brief existence to date. Its president is a woman. The radium-bearing ore recently discovered in the White Signal district of New Mexico is said to have been recognized as such largely through the work of a woman. It is mill operation to which we would like most to see the ladies turn. We imagine they would be perfectly at home in the midst of a slopover. Would they clean out the launder first or run for a scrubbing brush? During the war, when many women entered industry usually monopolized by males, it was reported from one camp that the "lady mill-workers" showed a great fondness for cleaning house. There is more than one mill so carelessly and slovenly managed that the employment of a woman operative or two might be of benefit.

He Can Locate Deposits Of Platinum or Whiskey

A correspondent who claims to have phenomenal powers that enable him to read earth's secrets writes us as follows:

I have made some small mistakes due more to my enthusiasm than anything else, but we all have to learn our lesson, and I have much yet to learn, but I have also learned much that others would give a great deal to know, and one most positive feature of my method is that I need waste no time studying the mineralogical or geological formations first, but I can very quickly determine whether there is anything there of value and be on my way.

I claim and am ready to prove that I can locate and determine platinum and most all minerals of value from platinum down; also coal, oil, and gas. The only doubt that I have in regard to oil is the possibility of getting oil shale, but conditions would go far toward a determination. Gas gave me much experimenting, but I succeeded and can prove it. I have a general coal locator and one each for anthracite and bituminous coal that have proved entirely satisfactory on coal of both kinds received and sold here by several coal dealers.

I find most positive evidence of what I think must be a great deposit of coal that probably extends from the central states across Massachusetts and on into the provinces. This coal changes from anthracite to bituminous near the Massachusetts coast.

I have attractors for diamonds and other precious stones, and if you are yet sceptical and consider that I am an imposter I will come to New York and demonstrate my system, and I hope you will have a few gems that you will put up against my ability. We will go to any metal-supply house, and I will locate the different metals and outline them from any floor above them. I also forgot to say that if you have any alcoholic liquor in your building to beware, as I might be tempted to get on the trail.

I can locate fire and determine the extent of it. This, I think, may be useful in case of fires in mines. I also have an attractor for sugar, but have not yet made an effort to determine between sugar and molasses.

I am now experimenting to determine both hard and soft deep water streams. I am very sure now that I am right, but I will thoroughly prove that I am right or not by testing several hard and soft water veins that have been driven into near Boston.

A human body I can locate anywhere, but it would be rather difficult to determine the body of a baby from any other animal body unless it was known that a baby was buried there, but I can get the shape or position of a body and in that way I can tell the difference between a human body and an animal body.

All deep water streams run a few degrees east of north and a few degrees west of south. Do you know in which direction they flow?

I find two substances in connection with coal and oil and three substances in connection with coal and gas. Who knows what they are?

Also I would like nothing better than to meet a few of the best mining engineers that the country can produce and we will each be allowed one-half hour to find any faulted vein that you may know of, and if a reward can be offered let the one who finds it within the time limit take it (of course I mean the reward and not the vein).

No chance of passing a lead quarter on this gentleman, and as for gold bricks the gilt would not deceive him for a minute. Like all others of his kind, however, he keeps his secret to himself.

Municipal Oil Wells

It is reported that two oil wells were opened in Los Angeles in the last week in July by one of the minor earthquakes that have recently been disturbing the peace of mind of that city's inhabitants. Both of them, fortunately for the municipality, are on city property. One is said to be gushing great quantities of oil over the paved roadway, though the number of barrels produced per day is not mentioned. If this would happen more often earthquakes might lose some of their ill repute. There would also be something else to boost and boast about to visitors. With every shock, too, the secretary of the Chamber of Commerce or the Chamber of Mines can now be heard, no doubt, to murmur, "Another fault fissure opened," and then seen to rush his optimism into print in predictions of the city's future greatness. The skeptic might ridicule, but that would never affect the right kind of a secretary of a chamber of mines and commerce.

CONSULTATION

Delivered-Copper Quotations

"As operators selling our metals subject to quotations we would appreciate information on the change you have made in quoting copper prices. In your market report of April 10, 1920, under the subject of 'Metal Markets,' and under heading of 'Copper Markets,' you say: 'The prices obtained for actual large sales were fairly uniform at around 19c. delivered, or 18.80@18.85 net refinery, which we quote.' We presume this was the basis of quotations from April 1 to April 7 inclusive. On the first of this year we made selling arrangements for our copper for which we receive settlement as per terms and prices made by you at that time. We understand your quotations since April 1, or at least since April 10, are calculated at 0.15c. per lb. less than those of January; in other words, operators selling under the terms of your January quotations would be underpaid 0.15c. per lb. for April, May, June and July when settled on quotations given since April 10. In your Market Report of May 8, 1920, you mention 'delivered price.' Where is copper required to be delivered to receive this price and from what points or refineries are prices 0.15c. less than the New York delivered price?"

In the issue of April 3 the explanation of the deduction of 0.15c. from the average delivered price of copper as reported to us by the producers was first made. This deduction had been made before that; in fact, has always been made in making up the *Engineering and Mining Journal* quotations, and the matter was only explained so that those who followed these quotations would understand that the price was not the delivered price. Copper is usually sold nowadays by the producers on a "delivered" basis. Also, the price charged to the consumer is the same, regardless of the distance of the consumer from the producer's refinery; that is, a buyer in New York would be charged the same price for copper as a buyer in Massachusetts, although the former had his plant right alongside of the refinery. It is assumed that this delivery charge amounts to 0.15c. on the average, and this deduction is made to arrive at the net price which the producer receives. The confusion in the interpretation of the significance of the price arises solely out of the mistaken premise that the *Engineering and Mining Journal* has changed the basis upon which the copper quotations are recorded. This assumption is not true.

Zinc Oxide Literature

"Can you let me know where I can obtain some information on the subject of zinc oxide? A cursory examination has not enabled me to find any literature on the subject. Do you know of any book treating its occurrence, production and market? It does not appear to be quoted in the section of the *Engineering and Mining Journal* dealing with such subjects. If you can give me any brief general information as to its price, markets and distribution this would be much appreciated."

An extensive and authoritative article on zinc oxide appeared in the *Transactions* of the American Institute of Mining Engineers, Vol. 57, 1917, entitled "Zinc Oxide," by George C. Stone. This is the most valuable contribution to the technology of the subject of which we know. The U. S. Geological Survey records statistics of production and consumption and a communication addressed to that body will elicit information in that regard. The *Engineering and Mining Journal* does not quote prices for zinc oxide, as it is a chemical product. Furnishing such information would also involve quoting upon very many other chemical products in the same category. Although zinc oxide is commonly supposed to be used chiefly in paints, rubber compounds consume the largest quantity. Thus in 1919 about 60 per cent of the consumption was used in rubber manufacture, or about 71,000 short tons. There was sold 117,639 tons, in 1919, an increase of 17,363 tons from 1918, due to the larger demand from the rubber-tire industry. Present prices of zinc oxide are between 17c. and 25c. per lb. in carload lots.

The Ferromolybdenum Market

"I am anxious to get some up-to-date information on the present status of the ferromolybdenum industry. Any assistance you can give me as to the sources of information will be much appreciated."

Quietness characterizes the situation in the ferromolybdenum industry at present. This is due, according to one of the leading producers, to the slowness with which the alloy is finding application in steel manufacture—not to any shortcomings in the physical properties of molybdenum steel but rather to the newness of the introduction. It will take some time, according to this producer, before the use of molybdenum steel becomes more general. Substantial improvement in the near future is not looked for; instead, a gradual betterment and wider application in the use of molybdenum steel is anticipated. Comparison of this situation is likened with that when chrome and vanadium steels were introduced—an introduction that took many years before it could be called commercially successful and which required time for the alloy steel consumers, such as automobile manufacturers, through their own experimental work, to become thoroughly familiar with these two special steels so as to be able to use them to advantage. Although many exaggerated claims have been made regarding the properties of molybdenum steel, some of which no doubt have done more harm than good to the industry, this alloy steel has more than measured up to expectations.

The Climax Molybdenum Co., of 61 Broadway, New York, has issued a valuable booklet upon molybdenum steels which contains the records of much experimental data upon the behavior of this alloy steel.

As to sources of information, both the U. S. Bureau of Mines and U. S. Geological Survey may be able to give you production data and technological information. Then there are the producers and consumers of the metal itself, who in certain cases seem willing to supply information; but sometimes a narrow policy leads to unwarranted and unhealthy secretiveness. A suggestion would be to communicate with the sources mentioned, and accumulate a bibliography on the subject, which will help greatly in the work.

THE PETROLEUM INDUSTRY

Oil Possibilities in the Dry Piney and Big Piney Districts, Lincoln County, Wyo.

BY G. B. MORGAN*

ALTHOUGH oil has been discovered so far only in Secs. 1 and 12—28—114, of Lincoln County, Wyo., prospect wells are being drilled six miles north, eight miles south, and ten miles southeast of the proved area. The results obtained in these wells will determine whether or not there is just one structure or a system of north and south parallel folds or anticlines containing oil in the Cretaceous formations, which structures are practically concealed by the overlying Tertiary beds.

The Dry Piney field proper is about sixty miles north of Kemmerer and about the same distance from Opal, Wyo., both on the Union Pacific Ry. The structure covers about 1,000 acres in Secs. 6 and 7—28—113, and Secs. 1 and 12—28—114. The topography is characterized by a high north and south ridge, called the La Barge Ridge, on or near the crest of which the oil wells are situated.

Structurally, the La Barge anticline presents some rather unusual features in the Dry Piney field. The coal-bearing Adaville formation, of Montana Age, is exposed on the surface in a narrow strip through Sec. 12—28—114 W, and Secs. 7 and 18—28—113 W. These rocks are sharply flexed, dipping at an angle of about 25 or 30 deg. on each side of the axis of the anticline, which axis bears about N., 30 deg. W. Immediately to the east of the axis the Knight formation, of Eocene (Tertiary) Age, is found resting uncomformably on the Adaville, but dipping also to the east at an angle of about five degrees. On the top of the ridge in places and on the western flank the overlying rocks are pre-Carboniferous and consist of limestone, quartzite and conglomerate. They were pushed up in that position by the same forces that caused the folding, and the result is a tremendous overthrust fault of probably 20,000 ft. displacement. Much older rocks are thus over-riding the Cretaceous formations, and on either side of the ridge the younger Tertiary formations are resting unconformably on the Cretaceous to the east and the Cambrian to the west. The Tertiary beds are slightly arched, coincidently with the older formations. This arching in the Tertiary beds over the pronounced anticlines in the Cretaceous and older rocks, especially in this field where oil has been found, has given rise to the theory that slight folding in the surface beds of the Tertiary indicates underlying structures in the Cretaceous and possible oil reservoirs. A number of operating companies are working on this theory and have found several such structures, in which they are drilling test holes.

The oil in the Dry Piney field is found at a depth of about 1,000 ft. in a sand of the Hilliard formation, which probably corresponds to the Pierre or Steele shale of central and eastern Wyoming. The sand is reported to be 43 ft. thick in one well and much thicker in another, and is believed by some to be a lens rather than a sheet sandstone. The belief held by some geologists is that the Hilliard contains a number of such lenses which are more than likely oil-bearing, and, if so, the oil-bearing possibilities will not be so much governed by structural conditions for the reason that lenses are generally sealed off by inclosing shale beds. Above the sand there is a sandy shale which gives up a small amount of shale oil and contains a thin water sand. The Hilliard, as measured by Schultz, is about 3,000 ft. thick and is underlain by the coal-bearing Frontier formation. The Frontier in central Wyoming is the principal oil-bearing formation and is not coal-bearing. It is not improbable that the Hilliard will be found to contain the producing oil sands in this district.

More systematic and deeper drilling in this field should produce good results. More care should be taken to shut off the water before entering the sand in drilling shallow wells. Also, if proper precautions are not soon taken to shut off the water from the sand in the producing wells, the production from the first sand will be greatly impaired in this field.

*Abstract of Bulletin 9, Wyoming Geological Survey.

Drilling Activities in Arkansas

It has been announced that work will begin at once on drilling two wells for oil in Bradley County, Ark. The Southern Lumber Co. has entered into a contract with the Caldwell Oil Co., of Oklahoma, to sink five wells on the lumber company's holdings. A crew from Shreveport, La., has erected two derricks, one in the southern end of the county, near Morobay, and the other near Blue Springs.

The Southern Lumber Co. and the Arkansas Lumber Co. have a contract with the Standard Oil Co. by the terms of which the Standard will take over 10,000 acres owned by the lumber companies in the vicinity of Vick. The contract stipulates that the first well is to go down in the Vick vicinity within 120 days from the date of contract.

Petroleum in Bolivia

Interest is being manifested in the petroleum field of the Province of Azero, Bolivia, according to a report issued by the Department of Commerce, and indications seem to show that there exists in this region a substantial basis for the development of the oil industry. Vast concessions of lands in the area have been acquired and serious reconnaissance work has been carried on. A local company organized in Sucre and known as "Sindicato de Sucre" holds 65,000 hectares in the provinces of Azero and O'Connor and has a nominal capital of 1,000,000 bolivianos and a paid-up capital of 550,000 bolivianos. It posseses two drills, with which it intends to bore five or six wells. On the basis of the results which it anticipates from these wells the promoters of the company plan to organize a larger company to work their holdings.

NEWS FROM THE OIL FIELDS

Texas Co. Increases Capital Stock

From Our Special Correspondent

An amendment to its charter has been filed at Austin by the Texas Co., increasing its capital stock from $85,000,000 to $135,000,000. This is the formal filing of the amendment, although the stock increase was made at a regular stockholders' meeting last autumn. The stock was paid up 30 per cent Jan. 9, 30 per cent April 9 and 40 per cent July 9.

The Texas Co. gusher at West Columbia, Brazoria County, continues to flow at the rate of 25,000 to 30,000 bbl. per day, according to the last report. This well has caused the prices of leases in and near the field to increase tremendously. A one-half royalty on two and one-half acres is said to have sold for $15,000. Leases on many other tracts have sold for from $3,500 per acre down to several hundred dollars, depending on location. One tract of twenty acres, a considerable distance from the gusher and near which a dry hole was drilled some time ago, brought $600 per acre with a one-eighth royalty held out.

The Gonzales Creek Oil Co., which owns twelve acres within the city limits of Breckenridge, Stephens County, brought in a well recently which made an initial production of 1,500 bbl. daily, and later increased to 7,500 bbl. Considerable oil was lost before the big flow could be handled. The company was organized four months ago, and is capitalized for $90,000. The larger part of the stock is said to be held by Breckenridge men.

Extensive wildcat drilling is being done in the western part of Lampasas County. Possibly a dozen wells are being put down, and seven of them range in depth from 1,200 ft. to over 2,000 ft. Though no producing well has yet been completed it is claimed good oil and gas showings have been found.

Red River Boundary Case Holds Hearing

From Our Special Correspondent

Taking of evidence in the Red River boundary case between Oklahoma and Texas has begun in Oklahoma City before Special Commissioner Frederick S. Tyler, of Washington, D.C. Attorney General Prince Freeling, of Oklahoma, and Attorney General C. M. Cureton, of Texas, are present. Several hundred witnesses have been summoned, and it is expected that it will require over two weeks to take the testimony. The first witness for Oklahoma was Judge George S. Marsh, of Madill, Okla., whose testimony was supported by old Spanish treaties and by a diary of President Adams regarding the boundaries now in dispute.

Tar Sands in Alberta To Be Tested for Oil Recovery

From Our Special Correspondent

The Canadian government has withdrawn from sale, lease, or settlement approximately 55,000 acres of land along the Athabasca River in Alberta, subject to leases already issued under the petroleum and natural gas regulation. This action is taken because representations have been made to the Department of the Interior that as the result of investigations recently undertaken it is confidently expected that a successful process will soon be evolved for the extraction from the tar sands of the Athabasca River of oil, bitumen, and other hydro-carbons in commercial quantity. In 1913, Dr. Bosworth, of the Imperial Oil Co.'s research laboratories, estimated that sufficient oil could be obtained from the Athabasca tar sands to supply the world demand for many years. Before the war Germany sent a number of chemists to make surveys of the tar sands, to obtain a supply of oil and gasoline. One of these chemists had secured a lease in 1913, but died on his return voyage to Germany. Attempts have been made to compute the amount of the tar sands available for reductions, but the nearest estimate that can be at present made runs into billions of tons. The one drawback to development is the scarcity of fuel to withdraw the oils for which heat is necessary, but there are hopes that this can be overcome by the finding of natural gas at McMurray.

The Canadian government has granted tar sand rights to 1920 acres to General William Lindsay, who claims that investigations conducted on behalf of himself and associates have resulted in the discovery of a successful process for the extraction of the oil, bitumen, and other hydro-carbons contained in the tar sands.

During the last two weeks the U. S. Geological Survey has required an average of only four days for passing on the geological features of permits under the Mineral Leasing (Oil Lands Leasing) Law. The work has been so systematized that little delay now results in establishing whether the permit applies to an area within or without a geological structure of a known oil field.

The Midwest Co. is sinking a new well north of Boulder, Col. Plans call for sinking the well to a depth of 4,200 to 5,000 ft., with the view of putting it through the Benton shale. The hole is started with a 20-in. diameter. The Midwest holds drilling contracts on about 500 acres of land adjoining the tract on which they are now working.

Kentucky Production Decreases

From Our Special Correspondent

Production in Kentucky decreased considerably last month. Wells completed number 189, a falling off of 107. New production was 7,529 bbl., a decrease of 559 bbl. Work under way totals 979 wells.

Whittle No. 1, a small well on the Bailey farm near Bowling Green, Warren County, has suddenly developed into a sensation, for conservative Kentucky. When the tools were pulled on Aug. 13, the flow from the well increased to 100 bbl. per hour, or about 2,000 bbl. a day. The tools had been left in the hole six weeks ago when there was a fire at the well. Whittle No. 3 is expected in early next week, and has practically the same formations and other indications as No. 1, according to O. F. Whittle, the owner.

The big gas well found two weeks ago on the Smith farm near Temple Hill, Barren County, by the Merry Brothers, has settled down to a production of 15,000,000 cu.ft. daily, according to the mercury test. The well is characterized by experienced oil and gas observers from Louisiana as the best one north of their own fields. Merry Brothers already have begun another well across the creek, and intend to put down four others as soon as possible.

James & Watkins of Chattanooga, owners of No. 2 on the Perkins lease on the Barren River Pike, report that the well is pumping 200 bbl. a day, which has continued for two days.

The Hugh Potter gusher brought in a short while ago seven miles south of Bowling Green, is now rated at about 700 bbl. production daily.

Japanese Oil Discoveries

Although a number of wells sunk in Formosa have proven failures or disappointments, one well recently sunk in Kagi Prefecture, Formosa, is reported as producing 400 gal. of oil an hour, from a depth of 400 ft., while another bore on that island failed entirely. It is reported that a new gusher had been struck at Kami-Shin-jomura, Minami Akita-gori, after boring to a depth of over 667 ft., which yielded about 3,400 gal. of oil per hour. Due to a shortage of vessels to transport the oil, large reservoirs are being dug in which to store it.

The Pomona Oil Co., which is owned largely by Riverside, Cal., interests and which is drilling its first well south in the hills of that county, is now down 1,700 ft. and is being utilized by the management for the fires under the boring and water boiling machinery.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Demurrage Claim on Frozen Ore Shipments Valid

U. S. Supreme Court Allows Charge of Pennsylvania R.R. Against Kittaning Iron & Steel Co.

In the demurrage case of the Pennsylvania R.R. Co. vs. the Kittaning Iron & Steel Manufacturing Co., the Supreme Court of the United States has reversed the judgment of the Supreme Court of Pennsylvania. Mr. Justice Brandeis delivered the opinion of the court.

It appears that the Uniform Demurrage Code was duly published as a part of the freight tariffs of the Pennsylvania R.R. prior to Nov. 1, 1912. On various dates from Nov. 1, 1912, to April, 1913, the Kittaning Iron & Steel Manufacturing Co. received from the railroad an aggregate of 227 cars of iron ore, all interstate shipments; and on them the railroad claimed $1,209 for demurrage. The company refused to pay these and other demurrage charges, and this action was brought to recover the amount. The trial court disallowed the claim and the judgment was affirmed by the State Supreme Court.

Before the ore cars were received the Kittaning company had entered into an average agreement with the railroad, as provided in Rule 9 of the code. The aggregate number of days' detention of these cars after they reached the company's interchange tracks (in excess of the free time under the average agreement), was 1,209; and the demurrage charge fixed by Rule 7 was $1 per day, or fraction thereof, that a car is detained after the expiration of the free time. The ore of these cars was frozen in transit; and the company insisted that this detention of the cars beyond the "free time" had resulted from this fact, and claimed exemption from demurrage charges under Rule 8.

"When shipments are frozen while in transit so as to prevent unloading during the prescribed free time, this exemption shall not include shipments which are tendered to consignee in condition to unload. Under this rule consignees will be required to make diligent efforts to unload such shipments."

The Kittaning company had at its plant a device for thawing cars of frozen ore through "steaming." By this means it was able to unload as much as five cars of frozen ore a day. The daily average number of cars of frozen ore received during the period involved was far less than five cars. On some days only one or two cars were received, though on others as many as thirty-five arrived.

The railroad contended that the determination in any case whether a detention was due to the fact that the contents of a car was frozen could not be affected by the circumstances that a large number of such cars happened to have been "bunched"; and that, as each car, considered separately, could have been unloaded within the free time, the consignee must bear whatever hardship might result from many having arrived on the same day, unless relief were available to him either under the "bunching rule" or under the "average agreement." The question presented, says the court, is that of construing and applying the frozen-shipments clause.

The purpose of demurrage charges is to promote car efficiency by penalizing undue detention of cars. The circumstances of the particular shipper was not considered in fixing the free time of the Uniform Code. When the framers of this code prescribed forty-eight hours as the free time, they fixed the period they considered reasonable for the average shipper to unload. In many cases more time would be required, and, in many, less.

In applying the allowance of free time and the charges for demurrage the single car was treated throughout as the unit, just as it is in the making of carload freight rates. The effect on the charges of there being several cars involved was, however, provided for by two rules: (1) The bunching rule, under which the shipper is relieved from charges if, by reason of the carrier's fault, the cars are accumulated and detention results. (2) The average-agreement rule, under which a monthly debit and credit account is kept of detention, and the shipper is relieved of charges for detaining cars more than forty-eight hours by credit for other cars which have been released within twenty-four hours.

From the hardship resulting from excessive receipts of cars even where shipments are not frozen, either the bunching rule or the average agreement ordinarily furnishes relief. If the company had not elected to enter into the average agreement the bunching rule might have afforded relief under the circumstances which attended the deliveries here in question. As any one of the 227 cars on which demurrage was assessed might have been unloaded within the forty-eight hours free time, the undue detention was not the necessary result of the ore therein being frozen, but was the result of there being an accumulation of cars so great as to exceed the unloading capacity. And the court thought that the frozen shipment rule did not depart from the established policy of treating the single car as the unit in applying demurrage charges as well as in applying carload freight rates.

The judgment of the Supreme Court of Pennsylvania was reversed.

Public Use of Tract on Grand Canyon Affirmed

Cameron Denied Title to Claims About The Head of Bright Angel Trail, In Colorado

The Supreme Court of the United States has affirmed judgment in the case of the United States against Ralph H. Cameron and others, enjoining the defendants from occupying, using for business purposes, asserting any right to, or interfering with the public use of, a tract of land in Arizona, approximately 1,500 ft. long and 600 ft. wide, which Cameron was claiming as a lode mining claim.

The tract is on the southern rim of the Grand Canyon of the Colorado and embraces the head of the Bright Angel Trail. Since 1908 all but a minor part of it has been a part of the Tusayan National Forest reserve. This was withdrawn from operation of the public land laws, except the mineral land law, but therein was a saving clause in respect of any "valid" mining claim theretofore acquired. The court herein holds that Cameron's mining claim is not valid.

This claim is known as the Cape Horn lode claim, and was located by Cameron in 1902, after the creation of the forest reserve, and before the creation of the monument reserve. To make the claim valid, or to invest the locator with a right to the possession, it was essential that the land be mineral in character, and that there be an adequate mineral discovery within the limits of the claim as located (Revised Statutes, No. 2320), and the discovery must have preceded the creation of the reserve.

Cameron also had sought patents for other claims embracing other portions of the trail into the Canyon. Protests to his claims were made, charging that the land was not mineral and that there had been no supporting mineral discoveries. After a hearing the Commissioner of the General Land Office held the claims were not valuable for mining purposes, and therefore invalid. The matter was appealed to the Secretary of the Interior, who said, among other things:

"With that possible exception (in the case of the Magician lode claim), the probabilities of such deposits occurring are no stronger or more evident at the present time than upon the day the claims were located. The evidence wholly fails to show that there are veins or lodes carrying valuable and workable deposits of gold, silver, or copper, or any other minerals within the limits of the locations. Sufficient time has elapsed since these claims were located for a fair demonstration of their mineral possibilities."

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Society of Economic Geologists Organized

New International Society of Geological Engineers Will Advance Geology as Applied to Mining and Other Industries

As the result of a movement which began in December, 1919, a special society for professional practitioners of applied geology, or geological engineers, has just been organized. The objects of the society, as stated in the preamble to the constitution, are:

The advancement of the science of geology in its application to mining and other industries; the diffusion of knowledge concerning such application; the advancement and the protection of the status of the profession; the definition and maintenance of an adequate professional standard; and the formulation and maintenance of a code of professional ethics.

The name of the new society will be the Society of Economic Geologists. This was selected as the result of a ballot in which the names Society of Applied Geology and Society for Geological Engineers were also balloted for.

The following officers have been elected:

President R. A. F. Penrose, Jr., Philadelphia, Pa.; vice-president, E. S. Bastin, Chicago, Ill.; secretary and treasurer, J. Volney Lewis, New Brunswick, N. J. The other directors are W. H. Emmons, Minneapolis, Minn.; Hoyt S. Gale, Washington, D. C.; Waldemar Lindgren, Boston, Mass.; A. C. Veatch, New York City; and H. V. Winchell, Minneapolis, Minn.

The official organization meeting of the society, which will begin its first official calendar year, will be held in Chicago, Dec. 28 to 30, 1920, at the same time and place as the meeting of the Geological Society of America. The new society is intended to be not only national but international in its scope, and for this reason the word American has been omitted from its name.

The organization was effected by a selected committee of sixty from among the most prominent geological engineers of the country. However, the constitution provides that the charter members shall be those elected during the first year of the society.

Extracts from the Constitution follow:

Membership

The society shall comprise members, who, by knowledge, experience and honorable standing are qualified to advance the objects of the society, and who shall be elected to membership as hereinafter provided.

It may also comprise associates, who shall have the privilege of attendance at meetings, presentation of papers, and receipt of proceedings, if any.

A candidate for membership must have had eight years' professional experience, including not less than five years of work principally devoted to geology applied to mining or other industries, of which three years must have been in positions of responsibility. Graduates in geology or engineering of approved schools shall be credited, as to the eight years, with one-half of the time prescribed for graduation. Geologists or engineers who have rendered signal service in application of geology to mining or other industries may also be eligible.

A candidate for associateship shall have been engaged in studying or practicing the science of applied geology for at least two years. The object of the associate class is to open the advantages of the society to students and younger workers.

Officers and Directors

The affairs of the society shall be managed by a board of directors, who shall be elected annually by letter ballot in the manner hereafter prescribed.

The board of directors shall consist of the officers of the society named below, and five other directors. The officers of the society shall consist of a president and vice-president, who shall be elected annually as hereinafter provided, and a secretary and treasurer, who shall be elected by the board of directors. The offices of secretary and treasurer may be combined in one person by vote of the board of directors. The term of office of the other directors shall be two years. At the first election five directors shall be elected, three to serve two years, and two to serve one year. In the event of a vacancy in the board of directors the remaining directors of the board may elect a successor to fill the vacancy until the next election. Directors are permitted to vote by proxy.

Stated Meetings

There shall be two regular meetings at times and places to be decided on by the board of directors.

Admissions

A candidate for membership must be proposed by three members; and if approved by the board of directors, shall, after investigation, then be elected by a direct ballot vote of all the members of the society, subject to final confirmation by the board of directors. In the election of members by the society three-fourths of all votes cast shall be be required to elect; provided that if ten votes be cast against the candidate he shall be considered rejected. A candidate for associateship must be proposed by three members, and shall be elected by the board of directors. In the confirmation of membership and election of associates by the board of directors a majority vote is necessary for acceptance; provided that two adverse votes in the board may defer the acceptance, in which case the board may again consider the candidate and vote on him for acceptance at any meeting after the lapse of one year.

Annual Dues and Life Membership

The annual dues of members shall be $5. The annual dues of associates shall be $5. Life membership shall be $75.

Nominations

A feature of the by-laws of the society is in regard to nominations and elections:

In all elections of officers, members shall be provided with tickets containing the nominations of at least three candidates for each office.

In advance of the annual meeting the board of directors shall appoint a nominating committee of three members, not more than one of which shall be a member of the board. This committee shall nominate three candidates for each office to be filled by election at the ensuing annual meeting, and these nominations will be sent to the members at least ninety days before the time of the annual meeting. To this ballot shall be added any further nomination which is proposed and supported by ten or more members. Such further nomination must be received by the board at least sixty days before the date of the annual meeting, and the nominating committee shall send out ballots containing a complete list of nominees at least forty-five days before the meeting. Votes to be counted must be received by the committee of tellers on the day previous to the first day of the annual meeting.

A plurality vote shall elect.

Another feature provides for the retirement of the officers if their actions are not approved of by the society.

Vote of Confidence

The board of directors, by a two-fifths vote of the directors or upon the request in writing of 20 per cent of the members of the society, shall submit any question upon which they have passed to the membership for a vote of confidence. Such vote must be inaugurated within fifteen days after a motion for a vote of confidence has been passed by the board or a request in writing by 20 per cent of the members of the society has been received by the secre-

tary; and the majority of votes received within thirty days after the mailing of a ballot shall decide. In case such question is decided against the board, the members thereof shall forthwith resign office, their resignations to take effect on election of their successors, and a new election of the whole board shall be immediately ordered to be conducted as provided in the bylaws.

Interest in and Utilization of Liquid Fuels in France

The following from *Echo des Mines et de la Métallurgie* is a summary of a recent address by M. Dumanois, chief engineer of the Marine, before Société d'Encouragement:

Before the war, coal formed France's chief source of fuel. Her coal production, which was becoming deficient, had been further diminished by subsequent conditions, and attention has now turned to the possibility of substituting liquid fuels, especially petroleum and its derivatives. Some delude themselves with the belief that liquid fuels can permanently replace coal and that their use can end the fuel crisis. In the first place, petroleum is an imported product which, under unfavorable exchange, at present is procurable at a high rate, and this condition is likely to continue.

Since abandoning their rights in Upper Mesopotamia and in Kurdistan, no oil source is under the control of French interests and their domestic and colonial production is insignificant.

But France has to fear a crisis in quantity rather than in price of liquid fuel. The world production of mineral liquid fuels is really notably less than the world's consumption. The United States, which furnishes 70 per cent of the world's total supply, while consuming 85 per cent, must import oil (e.g. 5,000,000 tons of Mexican oil in 1919), and drew more than 3,000,000 tons from their reserves in both 1918 and 1919. Their consumption in 1918 amounted to one twentieth of their underground reserves.

In 1918 the world's production of crude oil was less than 80,000,000 tons, which is the equivalent of annual consumption in coal of France. If one considers the great excess in calorific power of gasoline over coal, and its better thermic utilization, it is seen that to replace only 20 per cent of the French coal consumption by gasoline they should have to absorb more than one-tenth of the world's oil production. The fuel crisis is world-wide, however. One may say, then, that in the near future, France will be altogether without petroleum and its derivatives.

Nevertheless it is of the first importance, for the national defense, that France have a supply of liquid fuel. M. Dumanois, therefore, is of the opinion that liquid fuel, being the fuel de luxe, should be specially reserved for Diesel engines, and that modifications in existing installations should aim at improving both the rational use of solid fuel and the technical efficiency of the personnel in charge.

In closing the speaker pointed out the value and interest of the following: Searches for oil in France and her colonies; the development of the bituminous shale (shale oil) industry, and of winning oil from coal. He was quite in agreement with Barbet as to the possibility of securing cheap and adequate supplies of alcohol from the colonies, e.g., of banana alcohol, and stated that it was possible to secure supplies of castor oil from the colonies to take the place of mineral oil lubricants. Such a measure would insure France against future needs and enable her to decrease importations of petroleum and its derivatives.

Robert W. Hunt Medal Committee Proposes Portrait of Medallist

The Robert W. Hunt Medal Committee of the A. I. M. E. was organized for the purpose of raising funds for the Robert W. Hunt Medal, but the partners and employees of Robert W. Hunt & Co. insisted on presenting these funds to the Institute, and therefore raised and paid over a fund of $7,500 in addition to the $1,000 paid for designs and die-cutting. Its proceeds provide the annual medal and money prize. The committee, therefore, now proposes to the members of the Institute that a fund be raised by subscription among the members for the painting of a portrait of Captain Hunt to be presented to the Institute and placed in its Members' Rooms along with the portraits of Dr. Rossiter W. Raymond and others. Captain Hunt has been twice president of the A. I. M. E. He has served for several years as a member of its governing body. He was also the recipient of the John Fritz Medal.

It is desired that the tribute be made as popular as possible by having a large number of members subscribe. Sums of $1 or less will be gladly received. The excess over the $25 subscribed by any individual will be returned, provided the necessary amount for the portrait is oversubscribed. Checks should be made out to the Robert W. Hunt Fund and addressed Secretary, American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York City, N. Y.

Engineers' Club of Duluth Elects New Officers

At the annual meeting this year The Duluth Engineer's Club elected W. S. Heald, president; O. B. Bjorge and Ray S. Huey, vice-presidents; Geo. C. Olmsted, secretary; and A. U. Shipman, treasurer. Other members of the board of directors will be A. M. Frazee, Frank Hutchinson, W. J. Mathews, and Col. F. A. Pope. The club's representative on the Minnesota Joint Engineering Board will be W. H. Woodbury, the former secretary; and ex-director J. L. Pickles was elected delegate to the organization Committee of the Minnesota Federation of Engineers.

Federated Engineering Societies Invites Others To Join

Joint Conference Committee, Acting Ad Interim, Sends Cordial Letter

It has been frequently insisted that the recently organized "Federated American Engineering Societies" should be spoken with the accent on the last word—the federation does indeed aim to unite societies into an effective union. In furtherance of this ambition the Joint Conference Committee of the A. S. C. E., A. I. M. E., A. S. M. E., and A. I. E. E., acting under the authority of the Organizing Conference, is mailing the following invitation to the engineering and allied technical organizations of the country.

THE FEDERATED AMERICAN ENGINEERING SOCIETIES
JOINT CONFERENCE COMMITTEE
29 West 39th Street, New York
July 26, 1920.

My dear Sir:

The Joint Conference Committee of the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, acting as the Ad Interim Committee in accordance with the authorization of the Organizing Conference held in Washington, D. C., June 3-4, 1920, extends to your organization a cordial invitation to become a charter member of the Federated American Engineering Societies, and to appoint delegates to the first meeting of the American Engineering Council, of which due notice will be given, to be held in the fall of this year.

There has been previously sent to you an abstract of the minutes of the Organizing Conference, at which there were in attendance 140 delegates, representing seventy-one engineering and allied technical organizations. It was the unanimous opinion of the conference that there should be created an organization "to further the public welfare wherever technical knowledge and engineering experience are involved and to consider and act upon matters of common concern in the engineering and allied technical professions," and that this organization should consist of societies or affiliations, and not of individual members.

On the basis of these fundamentals the attached constitution and by-laws were unanimously adopted by the conference.[1] These contain full information concerning the Federated American Engineering Societies, the American Engineering Council, its executive board, and of the various officers and committees. The basis of representation therein stated for the American Engineering Council is one representative for from 100 to 1,000 members and an additional representative for each 1,000 members or major fraction thereof.

At the gathering in Washington, which was the greatest event in the history of the engineering and allied technical organizations in this country, steps were taken which created "The Federated American Engineering Societies," which will have a far-reaching influence on the future of these professions. The fact that this action was taken without a dissenting vote indicates that the psychological moment had arrived and that there was a unanimous desire on the part of the representatives of these professions for the organization formed.

The Joint Conference Committee, the Ad Interim Committee, would ask each organization invited to take favorable action in the matter of membership in the organization at the earliest possible moment and to advise the committee promptly of the names of the delegates who will attend the first meeting of the American Engineering Council in November of this year.

The Joint Conference Committee is confident that with the universally acknowledged need for such an organization there will be a prompt affirmative response to this invitation. Very truly yours,

JOINT CONFERENCE COMMITTEE of
American Society of Civil Engineers
American Institute of Mining and Metallurgical Engineers
American Society of Mechanical Engineers
American Institute of Electrical Engineers

[1]See *Engineering and Mining Journal*, June 12, 1920, pp. 1323-1324.—EDITOR.

Book Reviews

The Magnetite Deposits of the Eastern Mesabi Range, Minnesota. By Frank F. Grout and T. M. Broderick. Bull. 17, Minnesota Geological Survey. 54 pages.

This bulletin deals with the eastern end of the Mesabi Range, where the iron-bearing formation has undergone metamorphism, resulting in a notable change of the iron into magnetite and the development of silicates, such as amphibole and pyroxene, especially close to the intrusive (Keweenawan) gabbro, which has been the cause of metamorphism. The immediate incentive to the study was the possibility of commercial magnetic concentrations of the low-phosphorous magnetic ores. The results of the study indicate that the metamorphism has not modified the iron distribution, the concentration having been antecedent; and that most of the beds showing iron concentration are conglomeratic. These are valuable observations, as is the separation of the iron-bearing formation (350-500 ft. thick) into a number of separate beds which have different economic importance, and so form valuable aids in prospecting. Even intrusive diabase sills may serve as markers.

Amphibole (mainly actinolite) is abundant, intergrown with quartz and magnetite and probably resulted from metamorphism of the glauconite mineral greenalite. Metamorphic minerals also include fayalite and garnet. Greenalite was found in the western part of the area, but is metamorphosed near the gabbro. The authors have checked the low alkali content, which is like that on the western Mesabi.

"Most of the rocks are derived from an original sediment containing granules that may have been greenalite, but the greenalite is so altered in most specimens that the name greenalite-rock is applicable to very few." "The so-called 'cherts' are derived by alterations from the rocks with granules like those of greenalite." "For the rocks of the east Mesabi there are several reasons why the name chert is not very satisfactory" (p. 14). All this, though we believe true, is not new, though it is stated here apparently as an original proposition. The original mineral of the Mesabi iron was discovered and described by Spurr in Bull. X, Minn. Geol. Survey, as an alkali-poor glauconitic mineral, and the nature of its disintegration into iron oxide and so-called "cherty silica," as shown with exemplary clearness under the microscope, was described; further the segregation of these products into separate bands or masses, producing the so-called banded "jasper and iron," was fully followed and described. These conclusions were accepted and followed by Leith and Van Hise, who called the glauconitic mineral greenalite. The discussion in the bulletin under review does not add to the clarity of the conception; indeed it would be difficult for the uninitiated to form a clear idea of the genesis of the iron and silica from this bulletin. The Lake Superior geologist suffers under the same handicaps of provincialism and inherited dogma as does the Mississippi Valley geologist: and in the Lake Superior district it appears to be impossible to break away from the hazy and mazy conception of original precipitation of "cherty siderite and sideritic chert," the like of which was never seen on sea or land. This conception antedated the discovery of the glauconitic mineral greenalite on the Mesabi, where Spurr showed that the "cherty siderites and sideritic cherts" was one phase resulting from the disintegration of the original iron silicate; and the attempt to embrace the new knowledge, without giving up the conclusions from the old data, leads to a great burden of confusion. Thus some beds of this Mesabi iron-bearing formation, which altogether is only a few hundred feet thick, are apparently conceived of by the writers of the bulletin under review as direct chemical precipitates of silica and iron—in this case assumed to have been mainly limonite (p. 4)—whereas others are believed to have yielded the same products of silica and iron oxide from the disintegration of the green iron silicate. Other and younger glauconitic formations in other regions, which are agreed to have formed under analogous conditions, offer no warrant for the theory of the primary precipitation in sea water of banded colloidal or cryptocrystalline silica, and iron carbonate or oxide; and we are inclined to regard the theory as unwarrantably imaginative.

As an example of a flight of fancy we may quote the following: "This assumption of leaching of silica in a sea where silica was accumulating does not appear plausible unless, as was true in this case, some alternative of conditions is indicated. In a shallow sea the contribution of iron and silica from magmatic or other source may furnish plenty of material for deposition. But at a distance from the source any addition of fresh water, *say from a heavy rain on the adjoining land*, would crowd back the depositing solutions and replace them by water that would dissolve and oxidize the deposits, until diffusion and convection again brought in the stronger solution." We are tempted to fall back on the desperate remark of the hero of Booth Tarkington's "Seventeen," and say "Ye Gods!"

An interesting and valuable contribution is the discovery, in certain beds of the iron-bearing formation, of markings apparently representing algae (seaweeds) which grew in the accumulating sediment and which are similar to those observed by Dr. E. S. Moore in the iron formations near Hudson Bay, and very much like those described by C. D. Walcott from the Pre-Cambrian in Arizona and Montana. J. E. S.

Nickel Smelting—The August Bulletin of the Canadian Mining Institute (503 Drummond Building, Montreal) gives a complete description (pp. 40) of the International Nickel Co.'s smelter.

Technical Papers

Accident Prevention—In 1916, five of the largest mines in the Butte district had 630 fatal and serious accidents underground in 4,893,258 shifts worked. "At this rate, if the miner should average 300 underground shifts a year, the chances of a fatal or serious accident happening to him would be at the average rate of one in 26 years." This is quite often enough, it seems to us, particularly if the accident should be one of the fatal kind. However, a lot has been accomplished in the Butte district in making conditions safe. Educational and social service work also come within the province of the safety department. Those interested should send 10c. to the Superintendent of Documents, Washington, D. C., for Bureau of Mines Technical Paper 229, "Accident Prevention in the Mines of Butte, Montana."

Earth Temperatures — The U. S. Geological Survey has just issued Bulletin 701 (price 20c. from the Superintendent of Documents, Washington, D. C.), entitled "Geothermal Data of the United States." All available data on the rate of increase of temperature with depth in this country is presented. The information is given by states and no general average is attempted. The rate of temperature increase varies with the conductivity of rocks, underground tension, mineralization, volcanic influences, movement of underground waters, the presence of large bodies of surface water and possibly with variations of radio-activity.

Research—The problem of research has generally been conducted in a somewhat hit-or-miss system in this country. Recently the National Research Council has been formed to assist in meeting some of the needs of scientific organization. "The Development of Research in the United States," by James R. Angell, states broadly some of the problems to be solved. This address may be obtained for 25c. from the National Research Council, 1201 16th St., Washington, D. C.

Concrete Mine Shafts—With shafts sunk in porphyry, considerable trouble often occurs from "swelling" due to air and moisture altering the rock structure. This seems to be prevented by a comparatively thin coating of concrete. The shaft is also made safer and more permanent. It is fireproof, and the ingress of water is easily controlled. In the *Salt Lake Mining Review* of July 15, (Salt Lake City, Utah; price 15c.) the method of concreting the triple-compartment No. 2 shaft of the Chief Consolidated, at Eureka, is described.

Storage Batteries—We advise any of our readers who maintain storage-battery trucks or tractors to send 30c. to the Superintendent of Documents, Washington, D. C., for Bureau of Standards Circular No. 92, 94 pages. It is devoted to the operation and care of vehicle-type batteries.

MEN YOU SHOULD KNOW ABOUT

E. P. Mathewson, mining enginer, has gone to Arizona on a professional engagement.

D. S. Dean inspected the Menominee and Gogebic range mines of the Keweenaw Association August 7 to 11.

William J. Deavitt has been retained by the Manta Mining Co., of Chihuahua, Mex., as consulting engineer.

J. M. Brooks, Jr., has succeeded **Paul Steger** as manager of the Santa Eulalia unit of the Cia. Minerales y Metales.

H. S. Gale, who recently returned from South America, has resigned from the Geological Survey to enter private employ.

A. E. Drucker, mining engineer, is examining copper mines in the Olympic Range of Washington, for Aberdeen, Wash., interests.

David H. Collier, for the last two years engaged as a mining engineer in Burma, is temporarily in New York, where he recently arrived from London.

Dwight E. Woodbridge, mining engineer of Duluth, Minn., has recently returned from an extended trip into the Hudson Bay country, where he has been exploring for mines.

Stewart Thorne, manager of the Trethewey mine, Gowganda, Ont., has resigned on account of ill-health. **Murray Kennedy** formerly with the Beaver mine, Cobalt, succeeds him as manager.

Dr. Waldemar T. Schaller has severed his connection with the Great Southern Sulphur Co., Inc., of New Orleans, La., and has returned to the United States Geological Survey, Washington, D. C.

Frank M. Manson, president and general manager of the Western Ore Purchasing Co., was in Nogales recently, and is now in Mexico, seeking a suitable location for an ore-buying agency in Sonora.

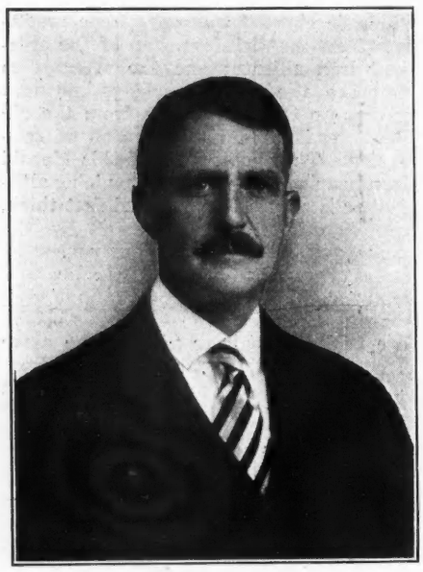
D. C. Jackling has been in Salt Lake City, Utah, in conference with **C. B. Lakenan,** general manager of Nevada Consolidated Copper Co., and **G. L. Hinckley,** general manager of the Nevada Northern R.R., of Ely, Nev.

George A. Laird, consulting engineer, who has recently returned from Mexico, has been appointed general manager of Guiana Development Co. and will leave for South America about Sept. 1. His present address is in care of R. T. Wilson & Co., 120 Broadway, New York, N. Y.

S. W. Stratton, director U. S. Bureau of Standards, sailed for Europe recently to attend the session of the International Bureau of Weights and Measures at Paris during September. Dr. Stratton will be the official representative of the United States at the session.

Allen Murray Yonge, of Staunton, Va., returned at the end of July from his trip to the West Indies, and is now in Washington, where he will open an office as consulting engineer in mining and economic geology. He may be addressed at Buckingham Hotel, Washington, D. C.

Freeman F. Burr, M. A., geologist to the Maine State Water Power Commission and to the Central Maine Power Co., Augusta, Me., is spending much of his time this summer investigating



FREEMAN F. BURR

mineral deposits in Maine with a view to their development by means of electric power. At the same time he also has to pass judgment on the suitability of rock structures at prospective power sites and search for construction materials. His geologic work for the past six years, under the State Water Storage, Public Utilities and Water Power Commissions, has taken him into nearly every part of Maine and he is probably more familiar with that state's geology and mineral resources than is any other person today. His special studies in the character and distribution of peat and of feldspar have been of special value to Maine, and were based on preparatory work in geology and botany at Lawrence Scientific School, Cambridge, Mass., from which he graduated in 1900, at Columbia University from which he received the M. A. degree in 1913, and at other schools. Mr. Burr has had field experience in all the New England and some of the Middle Atlantic and Central States. In view of the above it was quite proper to elect him a member of the Association of State Geologists, although Maine herself has not yet seen fit to follow the lead of many other states and establish for her own benefit an adequate modern survey of her mineral and other natural resources.

John Borg, of New York City, was recently elected president and chairman of the executive board of the Callahan Zinc Lead Co., to serve the unexpired term of the late John A. Percival. **Chares H. Borg,** of New York, brother of the new president, was elected to the vacancy on the board of directors, and **Gust Carlson,** of Duluth, was elected a member of the executive committee.

Carroll R. Forbes is still professor of mining at the head of the mining department of the Missouri School of Mines and Metallurgy at Rolla, Mo. Prof. **Charles H. Fulton,** who recently resigned from the Case School of Applied Science, was appointed to the directorship of the University of Missouri School of Mines and Metallurgy at Rolla and does not supplant Professor Forbes, as our note of Aug. 7 seemed to indicate.

OBITUARY

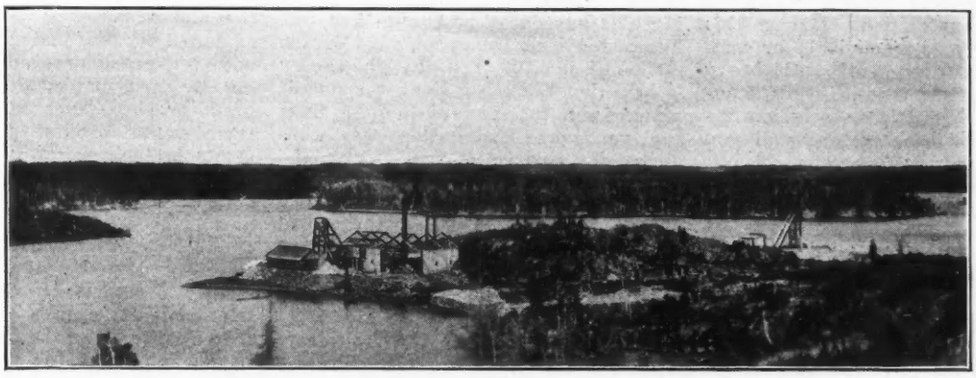
J. George Leyner, inventor of the Leyner drill, and founder of the Leyner Engineering Works, died in his 60th year on August 5 at his home in Littleton, Col., from injuries received in an automobile accident on the Denver-Littleton road August 3. Mr. Leyner was the first white child born in Boulder County, Col., and had been in business in Denver for nearly 40 years. When a young man he invented the rock drill which bears his name and which was responsible for the success of the J. George Leyner Engineering Works, later taken over by the Ingersoll-Rand Co. At the time of his death Mr. Leyner was president of the Leyner Engineering and Manufacturing Co. For some time he had been working on the invention of a farm tractor. The plans were completed before his death, and the Leyner tractor is now in process of construction at the Vulcan Iron Works.

SOCIETY MEETINGS ANNOUNCED

American Chemical Society will hold its fall meeting with its **Chicago Section** at Chicago, Ill., Sept. 6 to 10, inclusive. Hotel headquarters will be at the Congress Hotel, Michigan Boulevard and Congress Street, where registration will begin Sept. 7, and an information bureau located. The Division of Industrial & Engineering Chemistry, H. E. Howe, Woods Hole, Mass., secretary, plans for its second session a symposium on fuels, arranged by A. C. Fieldner of U. S. Bureau of Mines and including eleven papers. Prof. W. A. Noyes will deliver the presidential address on the evening of Sept. 8, and the banquet ($4.00) will be held on Sept. 9 at the Congress Hotel. Secretary Chas. L. Parsons is at 1709 G St., N. W., Washington, D. C.

THE MINING NEWS

LEADING EVENTS



GENERAL VIEW OF FLIN FLON PROPERTY ON FLIN FLON LAKE, NORTHERN MANITOBA, SHOWING PLANT UNDER CONSTRUCTION AND HEADFRAMES AT TWO SHAFTS ABOUT 1,000 FT. APART. THE SMALL HILL BETWEEN SHAFTS IS A HORSE IN THE OREBODY

Pushing Flin Flon Development

Keen Interest in Results on Which Depend Railroad from The Pas—Lead-Silver Strike at Herb Lake

Development work at the Flin Flon property in northern Manitoba is progressing rapidly, No. 1 shaft now being down 200 ft. and No. 2 100 ft. Drifting and crosscutting are being done on the orebody in No. 2 shaft at the 100-ft. level and encouraging results are reported. Considerable interest is being taken in this property and the present work being done because on the results of development will depend the building of a railway from The Pas to the property. This line, if built, will also tap several other districts where promising orebodies are under development. Inasmuch as a good part of the line will go through the heart of Manitoba's mineral district, prospecting and mining are being vigorously carried on in the sections affected. Diamond drilling is still going on at the Gordon claims at Copper Lake. These are the claims that were staked last season on a promising discovery of gold quartz, resulting in a rush of prospectors to the Copper Lake district. It has been stated that the owner, J. P. Gordon, will spend $50,000 on the claims.

A recent discovery on the north side of Herb Lake, in northern Manitoba, is attracting considerable interest. Here a body of silver-lead ore has been found, the first one of such ore to be found in this district. It is understood that the body is very large. The indications, judging from the surface capping, would suggest that it is about 100 ft. wide and about 1,000 ft. long. The assays from surface samples run about 12 oz. silver and 20 per cent lead, with only slight recovery in gold values.

WEEKLY RÉSUMÉ

Development of the Flin Flon property in Northern Manitoba is progressing rapidly. A plan for refinancing the Canada Copper Corporation has been put before the stockholders. Reports from Quebec indicate that the asbestos industry continues to thrive. The Premier, near Stewart, B. C., is said to have cut new ore. In Idaho, control of the Kill Buck property has been obtained by the Interstate Callahan. In California, high costs have forced the shut-down of the Shawmut mine. In New Mexico, Phelps Dodge has started its new Burro Mountain concentrator. In Arizona, the San Carlos Reservation is to be opened to prospectors. The Crater Mining Co. is prospecting for a huge meteor in the crater near Winslow, Ariz.

At Washington, witnesses were heard by Secretary Payne on August 10 in regard to war minerals relief. The Bureau of Mines has formed a division of non-ferrous metallurgy. A new mine-rescue car has been destroyed by fire in the N. Y. Central shops.

Valuation of Mexican Industry Announced

The total valuation placed on three industries in Mexico by the Mexican government is 1,230 million dollars Mexican, according to a recent official announcement in *El Universal*, Mexico City. The oil industry, including 1,100 wells, railroads, pipe lines, machinery and capital invested, is valued at $660,000,000. The mining industry, including 3,136 mines, railroads, machinery and capital invested, is second, its valuation being $400,000,000. The textile industry is third with $170,000,000, this including the value of 190 factories, railroads, machinery, power plants and capital invested. The textile industry is the one that yields most revenue to the Federal Government. How it is possible to arrive at such figures at the present time is not known.

To Reorganize Canada Copper

Company Seeks To Raise Half Million —Fifty-Cent Assessment Levied— Defaults on July Interest

The Canada Copper Corporation, whose 2,000-ton concentrator has been standing idle at Allenby, B. C., ever since its completion late in 1919, is to be reorganized. It is understood that the erection of the plant cost considerably above the estimate. The company is a Virginia corporation capitalized at $10,000,000. A plan proposed by a readjustment committee composed of August Heckscher, Colgate Hoyt and Lucius W. Mayer provides for reorganization under Canadian laws, the capital and number of shares to be the same as at present. The new company will acquire all the property and assets of the old and will assume all its obligations. Stockholders are to be permitted to exchange the stock of the present company for that of the new company share for share upon paying an assessment of 50c. per share. Without such payment a stockholder will obtain only one new share for three of the old issue. The company has defaulted interest, due July 1, on its first mortgage bonds. The total sum needed by the company is $500,000, which is wanted for the following purposes: July 1 bond interest $75,000; bills payable $175,000; readjustment expense $25,000; and working capital $225,000.

"The original plan called for the operation of the plant in July, 1919," says the company's statement, "at which time the railroad and power facilities to be provided by the Canadian Pacific Railroad were also to be ready. The program covering the work under our control, viz., development of the mine and the construction work in connection with the mine, as well as the

construction of the mill, was well maintained until it became obvious that the interests building the railroad and power lines would not have them completed in the time specified. The delay of over a year's duration has been caused by circumstances over which your company has had no control, and is due entirely to the failure of the railroad and power companies to complete their construction. During this period of enforced inactivity your company has been burdened with heavy overhead charges, though every economy has been practiced, including reduction and in some instances discontinuance of salaries of your officials. Certain necessary expense to maintain the property, such as the maintenance of a skeleton organization, insurance and other overhead charges, could not be avoided. The necessity of hauling materials by truck to the mill and mine incurred another considerable unanticipated expense. Had the railroad and power lines been completed on schedule, the plant would now be in operation and the company receiving income. The mine has for some time been ready for extraction of ores, and since the concentrator is completed, the plant can be placed in operation as soon as the railroad can deliver ores to it. We are now advised that the railroad will be fully completed in September and the power line shortly thereafter, so that extraction of ore and the transportation thereof to the mill may be expected to commence during October, and the company's product should be available for disposal immediately thereafter."

Anaconda and Clark Interests Effect Compromise

Details of the compromise agreement between Anaconda and the W. A. Clark interests whereby Anaconda gives to the latter a portion of the Emily vein under the surface of the Pilot-Butte claim have not been disclosed, but it is said to be a victory for the Clark interests. A vein apexing in the Elm Orlu claim, the prior location, was found to unite with the Emily on dip at about the 2,400-ft. level of the Pilot-Butte, where the orebody has a width of about 50 ft. with the grade ranging up to 6 per cent copper with some silver.

Anaconda years ago instituted suit against the Pilot-Butte, claiming the Pilot-Butte's chief fissure, the Emily, on the ground of extralateral rights, purchasing the property later for $1,125,000. This sum was later alleged to be insufficient by certain interests who had been connected with the Pilot-Butte.

To Open San Carlos Reserve

The San Carlos Indian Reservation is to be opened at once for prospecting. The western section is known to be especially rich in asbestos, generally found in localities so rough that airplanes or dirigibles have been suggested as means for bringing out the ore.

Prospecting for a Buried Meteor at Winslow, Ariz.

Newly Organized Mining Company Drilling on Edge of Famous Crater, Over 4,000 Ft. Across

It is reported that the famous Meteor crater, west of Winslow, Ariz., is to be drilled by a new corporation, the Crater Mining Co. Two Standard drilling rigs have been purchased and will be erected near the inner edge of the pit, which is 4,100 ft. wide. The theory is held that the celestial visitor sought plunged into the earth at an angle from the vertical. Exploration was conducted for a period of years within the pit by a Philadelphia company that found almost insuperable the difficulty of handling the quicksand that filled in the great hole. Drilling discovered fragments of the meteor, however, though it is believed that the main mass has not been located. The metal, as shown by analyses of the fragments within and around the pit, shows a very high percentage of nickel and will possibly be of considerable value if it can be handled. It has been estimated that the meteor need not have been over 500 ft. in diameter to have made the crater, but it is hoped that there will be found a mass from 1,000 to 2,000 ft. in diameter. Specimens of the metal, generally labeled as from the Canyon Diablo Meteor, are on exhibition at many Eastern museums, the largest of the pieces being at the Field Columbian Museum in Chicago.

Homestake Co. Holds First-Aid Contest

In the first-aid and mine-rescue contest held on Aug. 8 at Lead, S. D., in the Black Hills, between teams from the Homestake Mining Co., Team 1, composed of E. English, captain, L. B. Wright, J. B. Chastain, T. G. Houston, J. R. Treweek and T. V. McNally, took first place. This team will represent the Homestake company at the Bureau of Mines meet in Denver early next month. Team 3, captained by Abe Aladalo, was awarded second place and Team 2, W. S. Primrose, captain, was third. The company gave cash prizes to the three winning teams as follows: $150, $120 and $60. The contests were in charge of B. W. Dyer, engineer in charge of Bureau of Mines Rescue Car No. 5.

New Producers in Arizona

The following new properties were added to the list of producers in Arizona in 1920: Arizona Asbestos Association, valuation $119,060.50; Pierce & Gardiner property at Patagonia, assessed at $20,908; Leadville Mining Co., in Cochise County, assessed at $42,261; Copper Basin Group, formerly the Senator Group, in Yavapai County, assessed at $48,544; and El Tiro Leasing Co., in Pima County, assessed at $183,148. The Arizona Copper Co. asked a decrease of at least $1,000,000 from the tentative estimate.

Quebec Asbestos Industry Still Thriving

Contract System Has Offset Labor Scarcity—U. S. Alloys Mill Started in Chrome District

Industrial conditions have been particularly active in the asbestos business this season; the working companies have been aiming at maximum production and all potential sources are being exploited for raw material. Companies with low-grade propositions are striving to earn dividends and the high-grade properties are using up some of their excess profits to effect betterments in their working plants as well as to stabilize their capital account, both of which were seriously neglected during the lean years of the industry.

Labor conditions have been very satisfactory, the shortage in men being largely overcome by the adoption of the contract system in the mines, thereby increasing the tonnage per man to a point where the net cost per ton of ore hoisted was not materially increased. The result has been a marked increase in the efficiency of the miners and a considerable influx of labor which has been drawn from the surrounding industries. The Bell Asbestos Mines have recently adopted this system, leaving only the Johnson company employing the wage system. The old argument that under any form of contract work it is impossible to sort the ore properly in the pit is well founded, but at a time when the best tonnage obtainable is insufficient for the growing needs it is generally agreed that a small loss in the high-grade crudes may be overlooked in the effort to keep up with the demand. Undoubtedly when the market for the shorter grades has been met it will again be the proper policy to obtain a maximum saving of the crude asbestos.

Properties changing hands or being reopened under new conditions are as follows: At East Broughton the Poulin mine has been sold to the S. W. Cohen interests at Montreal, with G. P. Angus as superintendent; the Boston property, part lot 13, R./V, has been leased to J. A. Jacobs under the name of the Asbestos Mines, Ltd., H. W. Edmondson, local manager; and the Montreal property, lot 13, R./VIII, has been purchased through H. B. Lee for the Mutual Chemical Co. This company has added this asbestos holding to its present large holdings in the chrome district in the Black Lake-Coleraine district. Work was undertaken on the property in 1910 but lack of capital prevented the plant from being put into operation. The present intention is to complete equipment for operation as soon as possible.

In the chrome district, the 200-ton mill of the U. S. Alloys on the Belanger property on Caribou Lake has been started, and the "Old Red Mill" of the Black Lake Asbestos & Chrome Co. is being re-equipped to handle a large tonnage of low-grade ore which has accumulated from underground operations of the last two years.

Discovery at Nixon Fork, Alaska, Cause of Excitement

Promising Claims Being Worked by Alaska-Treadwell—Little Quartz Previously Discovered

BY J. G RIVERS

Flat, Alaska, June 26—There has been considerable excitement of late in connection with a discovery of a conglomerate ledge on the Nixon Fork, which is one of the tributaries of the Kuskokwim River and about 60 miles northeast of the town of McGrath. This ledge extends along the ridge between the head of Hidden and Ruby creeks, both of which have shown placer prospects, and several mineral locations have been made and some development work done on this ledge. On one claim the ledge is said to be 24 ft. wide and on another claim a shaft 60 ft. deep has shown good values to that depth, the ledge averaging about 6 ft. in width.

Last summer Thomas P. Aitken took an option on the property and during the winter of 1919-20 sacked enough ore for shipment to pay for his development work but as his assayer did not give out any information there is no telling what the mine run will average. It is reported that some of the best ore assays around $200 per ton and from that down to $20 and that the average is well over $100 per ton. However, this is not authoritative. The ore is said to carry gold, silver and copper, free gold being visible in the samples seen by the writer.

Aitken allowed his options to lapse this spring and the owners of the ground have let options to the Alaska Treadwell Gold Mining Co., which now has a crew at work doing development work. This company has paid $20,000 on the option price of the property which is approximately $1,250,000, the balance to be paid in installments distributed over a period of four years.

It is significant that the payments already made were made solely upon the strength of the showing of Aitken's development work without any additional development by the Alaska Treadwell, which would indicate that the latter is very favorably impressed with the proposition.

If this goes through it will mean a great deal to this part of Alaska as heretofore no quartz worthy of mention has been discovered. It will stimulate prospecting and may be the means of getting the Government to extend a branch of the railroad to the headwaters of the Kuskokwim River.

New Rail Rates May Affect Steel Mills Adversely

Readjustment of rail rates between upper Lake ports and the seaboard so as to make Lake transportation of grain more profitable may have an adverse effect on the iron and steel industry, it is pointed out, in that it will take ships out of the ore-carrying trade at a time when it is desirable to increase iron-ore stocks at steel mills.

Australian Notes

Settlement of Broken Hill Dispute Sought—Commission Reports on Health of Miners

From Our Special Correspondent

Melbourne, July 19—The New South Wales Government called a compulsory conference of the parties to the labor dispute at Broken Hill under the chairmanship of Mr. Holme, State Commissioner of Conciliation. It was agreed to submit the whole matter to an independent tribunal consisting of a judge or other chairman (to be selected by the Prime Minister and the Premier of New South Wales) and five representatives of each side. They further agreed to bind themselves to abide by the decision of this tribunal, it being understood that where they, through their representatives, fail to agree, the judge or chairman shall decide the question.

REPORT ON HEALTH OF MINERS

An interim report to the Premier by the technical commission of inquiry of the Board of Trade, appointed by the government to inquire into the dust conditions and health of the miners at Broken Hill, has been issued. As a result of an examination of about 2,800 workers the report sets out that ankylostomiasis (hookworm) is not present at Broken Hill; that no person suffering from tuberculosis should be permitted to work in the mines, either on the surface or below ground; that compensation should be given to all persons found to have been affected with progressive tubercular disease of the lungs; that some scheme for providing employment for those persons withdrawn from the mine should be prepared so that no obligation is thrown on the mine worker removed from the mine to find himself a fresh avenue of employment; that individuals affected with pneumoconiosis and withdrawn from work on the mines should be kept under observation; that should they become affected with tuberculosis they should receive compensation, since it will be only a question of time before a fatal termination is reached.

The majority of those who work in the mines at Broken Hill, continues the report, have shown no signs of the accumulation of dust in their respiratory organs. If a resumption of work should take place at Broken Hill the remaining 3,500 men, who have not been before the commission, should be subjected to immediate medical examination. The commission is of the opinion that a thorough investigation of the ventilation and dust conditions of the mines should be undertaken when the mines resume work. The operation of mining can be carried on at Broken Hill with complete safety as far as any material injury to the lungs of the mine workers is concerned.

NEW WESTRALIAN COMPANY ORGANIZED

The Knowna Red Hill Mining Co., with a nominal capital of £100,000, has been formed to work an area at Knowna, Western Australia, which has been favorably reported on by D. L. Doolette, promoter of the Bullfinch gold mine, Southern Cross, and son of G. P. Doolette, chairman of the Great Boulder Proprietary.

MT. MORGAN EXPERIMENTS CEASE

Experiments have been proceeding for some time in roasting, leaching and chlorinating certain types of Mt. Morgan ore, but have now been discontinued. the conclusion having been reached that the extra recovery gained would not justify the large capital outlay required for treatment plant. The industrial court granted increased wages to the employees during the half-year ended May 30, that involved an additional annual expenditure of £32,-800. Further claims amounting to £24,-000 per annum are now being heard.

Recent Production Reports

Utah Copper produced 8,500,000 lb. copper in July, against 10,000,000 in June.

Chino Copper's July output was 4,360,932 lb. of copper against 4,010,-069 in June.

Ray Consolidated's production in July was 4,500,000 lb. copper as against 4,520,000 in June.

Nevada Consolidated produced 4,650,-000 lb. copper in July, the same as in June.

Granby Consolidated M. S. & P. Co. produced 2,400,000 lb. copper in July, compared with 2,079,000 in June.

The Rand's gold output in July was 736,000 fine ounces, against 715,000 in June, 699,000 in May and 686,000 in April.

Shipments of domestic copper ore from Alaska to the United States in July totaled 8,510 gross tons, containing 5,797,645 lb. valued at $1,107,969.

Greene Cananea in July produced 3,500,000 lb. copper, 130,750 oz. silver and 770 oz. gold.

North Butte produced 1,505,079 lb. copper in July compared with 1,616,822 in June.

Kerr Lake produced 52,228 oz. silver in July against 52,831 in June.

Research in Metallurgy of Iron Successful

Investigations carried on by Prof. Alfred Stansfield of McGill University, Montreal, into the reduction of iron ores by gases at low temperature and with the electric furnace, are stated by the Advisory Council for Scientific and Industrial Research to have been attended with satisfactory results. On some of the findings patents have been applied for to permit of the commercial development of methods that will enable the utilization of Canadian low-grade iron ores. The investigation was assisted by a grant of $1,200 from the Advisory Council.

The American Metal Co. is reported to have purchased the smelter of the Arkansas Zinc & Smelting Corporation at Van Buren, Ark. The plant has 3,200 retorts and has been in operation for several years.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War Mineral Relief Arguments Heard by Secretary Payne

Witnesses Object to Commission's Interpretation of Law—Right of Appeal Claimed

Before a large gathering on August 10 of those interested in the War Minerals Relief Act, the Secretary of the Interior heard the arguments of witnesses presented by the American Mining Congress. Objection was made to the manner in which the War Minerals Relief Commission is interpreting various phases of the Relief Act and it was urged that the Secretary of the Interior make it clear that he is not opposed to an amendment which will permit claimants to appeal their cases to the Court of Claims. The point was made that the law specifically provides that the Government may have this right of appeal and, as a consequence, it was contended that it was inequitable for the other parties concerned not to have a similar privilege. This is particularly glaring, it was held, from the fact that the War Department claimants, given relief in the same act, have the right to appeal to the Court of Claims.

Secretary Payne stated at the hearing that he has no objection to the enactment by Congress of a measure giving the claimants the right of appeal to the Court of Claims. He agreed also to choose, with the consent of the claimants, typical cases covering contested points which he would hear personally with the idea of establishing precedents which should be followed in decisions in similar cases.

The principal argument for the American Mining Congress was made by Herbert Wilson Smith. Henry R. Harriman and Edgar Watkins, attorneys for certain claimants, also spoke, as did James F. Callbreath, the secretary of the American Mining Congress. Senator Shafroth, the chairman of the War Minerals Relief Commission, presented the commission's side of the case.

During the course of the hearing, Secretary Payne characterized the work of the commission as having been very diligent. He also called attention to the fact that he gives individual attention to many of these cases.

In his arguments Mr. Watkins, who had assisted in presenting the claim of the Chestatee Pyrites & Chemical Co., declared that the commission has assumed the rôle of prosecutor for the Government rather than serving as an impartial tribunal interested alike in the equities of each party to the case.

Awards recommended by the War Minerals Relief Commission, during the week ended August 7 aggregated $15,225.99. The recommendations were as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): J. F. & J. W. Barneberg, manganese, $11.117.27, 54 per cent; the Kromore Company, chrome, $2,645.50, 24 per cent; L. C. Chrome Co., chrome, $1,035.22, 61 per cent; Schwartz & Geisendorfer, chrome, $428, 4 per cent.

Bureau of Mines Forms Division of Non-Ferrous Metallurgy

A division of non-ferrous metallurgy has been created in the U. S. Bureau of Mines. It will be under the immediate direction of A. E. Wells, who will have the title of chief metallurgical engineer. The headquarters of the division will be maintained in Salt Lake City. Mr. Wells just has taken up work for the bureau again, after having been on detached duty with the Anaconda Smoke Commission.

Mine Rescue Car Destroyed

One of the new mine rescue cars of the U. S. Bureau of Mines was destroyed by fire last week while in the shops of the New York Central R.R. for minor repairs. It will be replaced by the railroad company. Owing to the rapidly increasing demand for this type of equipment, the loss of this car will curtail the bureau's work to an important extent during the nine months which will be required to construct a new car.

Question of Smelter for Alaska To Be Considered

With the idea of stimulating mining activities in Alaska, an intensive study of mining and metallurgical conditions in that territory is being conducted jointly by the U. S. Bureau of Mines and the Geological Survey. At the special request of the Secretary of the Interior, A. H. Brooks has been looking into the oil situation in Alaska and now, in co-operation with O. C. Ralston, of the Bureau of Mines, he will study metallurgical problems. One of the questions to receive immediate attention is that of determining the advisability of establishing a smelter in Alaska.

Federal Power Commission Completes Plans

The Federal Power Commission has perfected its internal organization plans. It will be sub-divided into engineering, accounting, statistical, regulatory, licensing, legal, and operation divisions. The country has been divided into five districts, each to have a branch office as follows: No. 1, Washington; No. 2, St. Paul; No. 3, St. Louis; No. 4, Denver; No. 5, San Francisco.

Few Technical Men in Training for Government Work

Number of Graduates Entering Survey or Bureau of Mines Small—Better Salaries Elsewhere

Apprehension is felt in the U. S. Bureau of Mines and other Government bureaus as to the outcome of their work a few years hence, as few new technical men are being trained in the work of these bureaus. At present the initial salaries of $1,200 to $1,500 paid by the Government are not attractive to the young men who are being graduated from engineering schools. A survey of the class graduated this year at one of the large schools shows that these graduates are readily absorbed by private industry at salaries ranging from $2,000 to $3,000.

The tendency in the Government's technical bureaus is for the men in the more important offices to pay less attention to offers of higher salaries in private employment. Although the turnover is much smaller among such men the positions must occasionally be filled by some one who has a thorough understanding of Government practice. Some years ago, when Government salaries were more attractive to engineers who just had completed their education, a considerable number of such young men were absorbed by the bureaus each year. These men eventually became the successors of the division chiefs and the more important executive technical specialists. Now that there is no new class being trained the fear is expressed that vacancies in the more important positions cannot be filled with the same type of men as in the past.

Quicksilver Dropped This Year

No field work in quicksilver will be undertaken by the U. S. Geological Survey this season. F. L. Ransome, who is in charge of that subject, will remain in Washington to continue work on his report on the geology and ore deposits of Arizona as a whole.

Many Prospecting Permits Under Mineral Leasing Act Sought

Applications for prospecting permits under the Mineral Leasing Act now number 2,000. The General Land Office, on receipt of the application, sends them to the land application board of the Geological Survey for report. These applications are given a preferential status, with the idea of facilitating exploration and development under the new law.

Purchases of silver by the Bureau of the Mint under the Pittman Act totaled 10,603,354 oz. on Aug. 10.

NEWS BY MINING DISTRICTS

MEXICO

Many Companies Preparing To Operate Under New Regime

Mexico City—An immediate improvement is reported as a result of the recent decree removing fines for failure to pay mining taxes throughout Mexico during the last six or seven years. Large numbers of mine owners, particularly in the northern states, are responding and the Department of Commerce and Industry reports that to the end of the first week in August 400 smaller properties in the State of Chihuahua alone had availed themselves of the conditions of the decree and are preparing to begin operations. Seventy-seven applications were made in the State of Jalisco, eleven in Zacatecas, thirteen in the State of Mexico, twenty-two in Hidalgo, nine in Guerrero, and thirty-four in the State of Guanajuato.

The surrender of Villa has also had the effect of starting some work going in the State of Chihuahua, where the depredations of this particular bandit have paralyzed the mining industry for the last four years.

The Xacualpam district is returning to some of its oldtime, pre-revolution activity. Eleven American companies have resumed work during the last two months and are shipping high-grade ores, mostly to the Minerales y Metales smelter at Monterrey. Considerable money is being expended in reopening roads and putting the camp in shape.

In the district of Temescaltepec several of the larger mines have begun work again and others are preparing.

The Sultepec district remains rather quiet. Two of the old properties have resumed but the major portion of the companies find themselves short of funds. Labor conditions in all these camps are bad, that is, labor is scarce and every available man is being secured.

Querétaro

The Amoles Mining & Reduction Co. at Pinal de Amoles, district of Jalpan, is developing two of its principal properties by running large working tunnels in from the ravine and cutting under all the old workings for the purpose of drainage and cheaper extraction of ore. One of the tunnels is to be 420 meters and the other 700 meters long. The company is running one stack steadily at present and the silver and lead bullion is being shipped to the A. S. & R. smelter at Aguascalientes. As soon as the rainy season is over a second furnace will be blown in.

El Doctor mine, belonging to the Braniffs, in the same district is running its smelter and shipping two cars of bullion per week. It has just acquired a new Holt Caterpillar and Troy wagons which haul 15 tons each trip over a distance of 150 kilometers to railroad.

Oaxaca

Tavichi District Coming To Life

The old Tavichi district, most important in the state, after being absolutely abandoned for four years is again showing signs of life. George Huston has struck a parallel vein in the old Escuadra mine and is making weekly shipments to Aguascalientes.

The Vichachi mine, property of the Hamiltons, has been unwatered and is taking out shipping ore.

The Juanita has begun work and is sinking a new shaft near the San Juan shaft. The latter property is still in litigation and is being administered by the courts.

Guerrero

Mines Department Refuses Denouncements Made by J. C. Flournoy

The Puerta del Sol, an old gold property in the Minas district belonging to a Spanish syndicate, has resumed work and is erecting a flotation plant.

The Campo Morado property, one of the most famous in Mexico, which has been in the hands of the bandits for the last six years, has been turned over to the owners by the new government and steps have been taken to reopen the property. Owing to the activities of "highgraders" the mine is said to be in a rather bad condition.

The Department of Mines, City of Mexico, has just rendered a decision refusing denouncements made during the Carranza regime by James Campbell Flournoy, of Washington, D. C., on the Santa Ana, San José de Cuitzuitla, San Basalio, Socavon de Guadalupe, Ampliacion de Mina Grande, Haines, La Cruz del Sur and San Antonio properties of the Balsas Valley Co., of St. Louis, Mo. The decision is important and far reaching as these properties were only a few of a large number of mines in various parts of the country which had been denounced on the pretext of failure to pay taxes, special decrees, etc. The action of the department indicates the intention of the government to respect all interests legitimately acquired and that no advantage will be taken because of failure to live up to the letter of the law during these turbulent times.

Guanajuato

Guanajuato—A. A. Taylor, of Taylor Bros., Chihuahua, Casas Grandes and El Paso, has purchased an interest in the Ruby Silver Tunnel property situated four and a half miles west of the City of Guanajuato on the automobile highway to La Luz. Development has begun and drifting is in progress on a vein many feet in width, 5 ft. on its foot wall averaging around half a kilo in silver with 30 to 80 grams gold, or above $40 U. S. currency, per ton. This property has been a steady producer for years. In fact, during the entire revolutionary period it has been worked on the "buscon" system, shipping its ores to the smelters and local mills. The Ruby Silver Tunnel is rather a historic property, Baron von Humboldt in his writings on Guanajuato stating that it was the most highly mineralized piece of ground in the entire La Luz district.

The Pasadena mine, situated four and a half miles east of Guanajuato and directly adjoining the famous El Monte San Nicolas property, is being reopened after six years of idleness. Surface equipment, machinery and houses destroyed or stolen during the revolutionary period are being reconstructed and replaced under the management of C. Bartholomai, many years with the Moctezuma Copper Co. of Nacozari, Son. Work is being rushed at the Pasadena. The present shaft, which is almost 1,000 ft. deep, is to be enlarged to one of three compartments. It is also to be deepened.

At the Esperanza mine, work of building the new tramway to the San Matias mill on the outskirts of the city has been under way for some time. A mill for treating Esperanza ores is being remodeled into a continuous-process counter-current cyanide plant with a capacity of about 9,000 tons monthly. The Esperanza was taken over from the "Casa Castenada" after long idleness.

Guanajuato camp was one of the few not affected by the almost general strike that recently occurred throughout Mexico. The utmost harmony is said to exist between the workmen and mine owners.

Nayarit

Esperanza Exploration Co. Acquiring Holdings Near Cuale

The Esperanza Exploration Co., of El Oro, has acquired large holdings in and near Cuale, in the State of Nayarit (formally Tepic). The mines are situated about 25 miles from the port of Las Peñas, to which point a truck road is being built. Large quantities of machinery have been ordered and will be transported over this road. The company has acquired all the properties in this district, some of them having been large producers of gold and silver in the days of Spanish mining; others were acquired through denouncement. Altogether this is looked upon as quite significant of the fact that confidence is returning in Mexican mining.

The Cucharas mine was recently examined by engineers with a view to purchasing. This is a silver-copper property located near Acaponeta in the State of Nayarit, and belongs to the Lacy interests of Los Angeles, Cal. There is a matting furnace on the property which has been operated to some extent in years past.

Messrs. Newman and York are traveling through the West Coast looking for mining properties for a New York syndicate.

The property of J. B. Shepard, of Denver, Col., situated in the Santiago de los Caballeros district, is under option to Pasadena, Cal., capitalists, who are to start cleaning out the caved workings for examination, with a view to purchase. A truck road is projected to connect this district with the Southern Pacific de Mexico, at the station of Guamuchil. This proposed road will open up a large silver and lead producing district, and will undoubtedly be the direct cause of the development of many promising prospects, as well as the reopening of many large mines which were worked successfully before the revolution.

Chihuahua

Santa Eulalia—Read Miller and associates have ceased operating a sub-lease of the Santander.

Durango

It is reported that the Hayden Stone interests have also taken an option on the famous mines at Cianori, Durango. These mines belong to the house of Wohler Bartning, of Mazatlan, and have records of very large silver production. The export ore from these properties carries about 1,000 oz. silver to the ton with a trace of gold. The low-grade ore was formally treated with cyanide with good results. There is a twenty-stamp mill with cyanide equipment on the property.

Copalquin District—The Rocha Mining Co., owners of the San Igancio, Soledad and Chiuhuahvilla mines, are doing extensive development work. There is a 10-stamp mill with cyanide equipment on each of these properties, and their normal production is about 60,000 oz. silver per month and 3,000 oz. gold. Sr. Don Everisto Paredes is general manager and Charles Hitchler is metallurgist in charge. These mines have been large producers for many years. The San Ignacio has produced to date about $6,000,000 gross, the Soledad about $500,000, and the Chiuhuahvilla about $200,000. In times gone by, the miner's wage consisted of one tablespoonful of ore each day, it is said, for which they were perfectly contented to work twelve hours per day.

Mocorito—The Palmarito and Potrero companies, in the Mocorito district, are both working full capacity in spite of the recent decrease in foreign silver. The mining agency in Mocorito reports an increase in the number of denouncements being made by foreigners.

Capt. R. D. Adams and Col. J. E. Leckie, of San Francisco, expect to be in Mexico this fall with an exploration and development company. They have options on a number of promising prospects, as well as partially developed mines, and will occupy themselves principally with the development of mining properties in Sinaloa and Western Durango.

CANADA

British Columbia

New Ore Reported in Premier—Ward Difficulties Finally Settled

Stewart—R. K. Neil, part owner of the Premier mine, recently stated that a 100-ton cyanide plant is being installed and will be ready for use early next year. It is reported that a new orebody has been cut in Tunnel 2. About 150 men are employed.

There are about 100 claims staked in the Marmot River section of Portland Canal and on many development work is in progress. George Clothier, government mining engineer, recently made a tour of inspection through the district with a view to ascertaining the extent of the necessary road and trail improvements. The B. C. Exploration Company is heavily interested in this section. P. D. I. Honeyman has a small crew of men at work for this company on the Salmon River Lode Mining Co.'s property, near the Big Missouri group.

One of the two diamond drills on the Big Missouri has been closed down, that at work on the E Pluribus claim being continued. This is the claim on which high-grade ore is being opened.

The Northern Light and Spider groups on Salmon River and the Fitzgerald Group on the Bear River are being thoroughly explored by the Algunican Development Co., whose operations are more extensive than those of any other concern interested in the district, with the exception of the Premier Mining Co.

Alice Arm—The Dolly Varden is shipping 150 tons of ore a day and preparations are being made for the extension of the railway to the Wolf Group. The Toric, Tiger, Musk, Silver Horde, Climax and other prospects are being opened up. Surface stripping is being done on La Rose Group.

Quesnel—Once again R. T. Ward, of the Bullion Placer Leases, Cariboo, has been heard of in connection with litigation. Having won his long drawn-out suit with John Hopp it was thought that the operation of the long-disused property would follow without delay. Some of Mr. Ward's associates, however, challenged his right to retain control of the management of the project. A settlement has been reached.

Nelson—The Provincial Prospectors' Protective Association continues to gather strength. Local organizations representing the Grand Forks and Smithers districts have applied to the central body for copies of the constitution and there is every reason to believe that they will become affiliated. It has been decided that the Provincial Attorney General shall be asked what action will be taken to protect prospectors' cabins and caches from the depredations of thieves. It appears that members of the association have been put to expense and annoyance in many instances by finding their headquarters in the hills rifled on returning from their periodical trips.

Ontario

Hollinger's Costs Increased—New Company To Take Over Bewing-Moreing Interests

Porcupine—It is stated that a new company is being organized to take over the interests of the Bewing-Moreing company, an English concern, which in the early days of the Porcupine camp purchased a number of claims in the area. They were unable to develop their holdings owing to the war. The financing of the new company is said to have been arranged looking to active operations in the immediate future.

Mining costs at the Hollinger Consolidated have increased to a greater extent than was anticipated owing to the increase in wages. It was expected that the higher pay would add about 25c per ton to the cost of treatment, as the management calculated that larger forces would be attracted and that increased efficiency would result, neither of which anticipations has been realized, the increase in operating costs being about 50c per ton. While in some respects the result of the raise in wages has been disappointing, it is realized that it was a wise measure, as otherwise the company might have been unable to retain sufficient labor to continue in operation.

The McIntyre has purchased the Blue Diamond Coal Mines, of Brule, Alta, with an area of about 3,300 acres, and has secured an option on the Canadian Coalfields, Ltd., in the same vicinity, with a larger area. The Blue Diamond is producing over 500 tons of steam and coking coal daily. It is capitalized at $1,500,000 and the Canadian Coalfields at $10,000,000. A 50 per cent interest in the transaction has been offered to the Temiskaming Mining Co.

Cobalt—At the Bailey a shoot of high-grade ore 4 to 5 in. wide has been cut at the 5th level.

The case against the Mining Corporation of Canada, charged with conducting blasting operations without taking proper precautions, was sent by the Police Magistrate to a higher court for trial.

Kirkland Lake—At the annual meeting of the Kirkland Lake on August 10. President F. L. Culver stated that a spectacular new find had been made in No. 8 drift on the 400-ft. level in virgin territory. Questioned as to reports of a possible merger of the company with the Orr and Teck-Hughes mines, Mr. Culver stated that the suggestion of an amalgamation had been made but that the matter had gone no further.

The new mine plant of the Hunton-Kirkland has been installed and is ready for operation. It is planned to put the shaft down to the 300-ft. level where lateral work will be undertaken.

South Lorrain—The Keeley is installing the old Trethewey mill equipment, which is expected to handle about 80 tons of low-grade ore daily. Underground work is being carried on at the 300-ft. level.

Quebec

Harricanaw River.—A report of an important discovery of silver in this district some 30 miles south from Amos on the Transcontinental Ry., caused a rush of prospectors. The report turned out to be erroneous, the alleged discovery proving to be a crack in the mica schist which had been salted by the insertion of a small amount of leaf silver.

CALIFORNIA

Shawmut Mine Suspends Because of High Costs—Morning Star Mill Erected

Portola—The mill at the Gruss mine is now installed and crushing is expected to begin about August 20. Recent developments have exposed much high-grade ore, running $104 to $120 per ton.

Shawmut—Operations have been suspended at the Shawmut mine, the largest producer of Tuolumne County. The mine is owned by the Tonopah Belmont Development Co., of Tonopah, Nev. Although the ore is of good grade with a large tonnage blocked out, the steadily mounting labor and material costs have made it advisable to shut down.

Jackson—A large mill has been erected at the Morning Star group, seven miles southeast of Jackson in Amador County. The property contains large bodies of medium-grade ore near the surface and is to be worked on a large scale. The group was formerly named the Boston.

Washington—A new compressor and auxiliary equipment have been added to the plant at the Red Ledge mine near Washington, Nevada County. Several new buildings are also being erected. Efforts are being made to place the Red Ledge on a sound productive basis.

Columbia Hill District—Three miles of new ditch between Bloody Run and Grizzley Canyon, in the Columbia Hill section, are being built by the Delhi Mines Co. A 900-ft. tunnel has been completed and will be used to carry water through the mountain; it will be ready for use in thirty days. The new water line will eliminate the use of the old two-mile ditch and 2,000-ft. flume line around Whistle Point, which has been practically useless all winter.

Sutter Creek—Drifting on the 3,500-ft. level of the Old Eureka is progressing well, and it is expected that the laterals will enter territory where extensions of rich veins are thought to be.

Darwin—The Darwin Silver Co., owning the Lucky Jim, Defiance and Lane properties, is working about fifty men on the Lucky Jim putting old workings into condition for active development. Heretofore the mine has been worked only for shipping ore but now there is a substantial quantity of low-grade ore. It is intended to install a mill which will treat all ores under $50. The process will probably be water concentration followed by cyaniding. A. G. Kirby is manager.

Swicegood, Putnam & Shea are installing jigs on the Wonder property for treating low-grade ores in mine and on dump. Water is to be pumped from Darwin Wash.

Recent attempts by Porter & Seaman to sulphide and float the chloride and carbonate ores from the Lane and Jackass mines at the Lane mill have proven unsuccessful. The mill is being dismantled and efforts are now being concentrated on the Jackass mine, where shipping ore of good grade has been opened up.

At 100 ft. depth on the property of the Argus Sterling Co., 12 miles south of Darwin, a drift has been advanced 75 ft. on a shoot of lead carbonate ore which has an average width of 3 ft. The smelter valuation of the first carload shipped was $110.50 per ton, the lead content being 47 per cent. A second carload is now in transit. A. C. Taylor, of Los Angeles, is manager.

Trona—Certain improvements in the process have been made at the plant of the American Trona Corp. in the Searles Lake district. Working forces are being increased as rapidly as possible.

At the Copper Queen, operated by the Slate Range Minerals Co., a winze which is being sunk from the lowest level in the mine is now down 90 ft. and galena carrying high silver values is coming in. The combination table and flotation mill is being operated to full capacity on lead-carbonate ores, which receive a sulphidizing bath before flotation. Shipments of both crude ore and concentrates are going forward to the smelter regularly. L. D. Hirschfeldt, of Bakersfield, Cal., is manager.

NEVADA

United Comstock Installing Equipment for Driving New Tunnel—Rochester Mines To Continue Shut Down

Tule Canyon — The Silver Hills Nevada Mines Co. is now operating the three-stamp mill recently brought from California by W. J. Loring, manager, and it is thought that it will handle about 18 tons daily. The stamps weigh 1,050 lb. each. It is expected to run the mill in conjunction with the five light stamps that were on the property when it was taken over by the present company. The three-stamp mill is the one used by Mr. Loring to test the ore in the Calaveras and Morgan mines and he considered it a mascot.

Virginia City—Work of installing the compressor and other surface equipment for driving the big electric haulage tunnel of the United Comstock Mines Co. was started July 31. The tunnel will be 8 x 8 ft. in the clear, the portal being located at American Flat at the site of the 1,000-ton mill that is to be built later. The V. & T. Railroad Co. is to build a spur track from its station at Scales to the mill-site.

Simon—In answer to a direct question, P. A. Simon has denied to a representative of the *Engineering and Mining Journal* the reports that the control of the Simon Silver-Lead mine has passed to the International Nickel Co. and that Charles D. Kaeding is to have charge of the property. Mr. Simon states that the resignation of Albert Burch was a matter of economy and that while Mr. Kaeding is being consulted by him at times he is not on the payroll of the company. Tom McNamara, who has worked under Kaeding for years, is foreman at the Simon mine, succeeding Ed Orr, who held the position under Mr. Burch.

Searchlight—The last of several carload shipments by Burdick & Perkins, lessees at the Duplex mine at Searchlight, is said to have yielded the shippers $9,000.

Snake Range—A 1,200-ft. tunnel has been driven on the lead-silver property of Dearden & Johnson near the head of Snake Creek, about 40 miles southeast of Ely. The vein is 18 in. wide and is said to carry high values.

Rochester—It is expected that the mines at Rochester and Packard which were forced to close down as a result of lack of power, due to a shortage of water for generating electricity, will have to remain idle for some weeks. After the irrigating season is over there will be water enough for power.

MONTANA

Jefferson Mines Plan Leaching Plant—Tuolumne To Use Own Trucks

Butte—Crosscutting by North Butte for the Edith May vein on the 3,600-ft. level continues, with the belief that the ledge will be reached within a week or two.

The Tuolumne Copper Co. is planning to install its own system of trucks for transporting ore from its Main Range properties to the loading platforms alongside of the Northern Pacific tracks, about a mile distant.

Four hundred steel lockers have been purchased by Davis Daly for the new dry house to be installed at the Colorado mine. A new blacksmith shop and a framing plant of modern construction have been completed and a tool sharpening works will also be installed. Storage rooms for mine supplies have been built and a garage for trucks. The ore showing on the 2,700 level is reported to be good.

Potomac District—From 4 to 5 ft. of ore carrying up to 4 per cent copper has been opened by Potomac Copper in the No. 4 tunnel being driven for the Copper Cliff property. The objective will not be reached before 60 days, according to the company's Butte office.

Whitehall District—A two-compartment shaft has been sunk by the Jefferson Mines Co. to a depth of 218 ft. with the 300 level as the objective, at which point the ore deposit will be crosscut. The installation of a leaching plant to treat the upper oxidized portions of the deposit, which carry varying amounts of copper, ranging from 2 to 6 per cent, is planned.

IDAHO

Coeur d'Alene District

Nabob Shipping Lead and Zinc Concentrates — Interstate-Callahan Takes Up Option on Kill Buck

Pine Creek—The Nabob Consolidated Mining Co. is now hauling both lead and zinc concentrates to the railroad. The 150-ton mill is running only one shift, but will add two more as soon as a raise is completed to the Denver tunnel level, which will make much ore available.

Wallace—The Consolidated Interstate-Callahan has exercised the option held on the control of the Kill Buck Mining Co., which was owned by Senator W. A. Clark and associates of Butte. The Kill Buck property joins the Chicago-Boston, control of which was recently purchased by the Interstate-Callahan, and the two properties will be jointly developed and eventually consolidated. The Chicago-Boston company is sinking from the 200 to 400 level, at which point the vein will be explored, while sinking will continue. A large body of lead-silver ore has been opened on the 200 level.

The Friend Mining Co., operating on Beaver Creek, is arranging to construct a mill that will handle about 10 tons of ore per day, the company now using a hand jig. It is intended to handle both mine and mill with the same working force. As soon as there is a sufficient accumulation of ore the men will come out of the mine and run the mill, and when the ore is cleaned up they will return to the mine and repeat the operation. In this way the management expects to pay for development. A shoot of lead and zinc ore has been followed about 400 ft. in the main tunnel. It carries from 6 to 18 inches of good ore.

The Jack Waite Mining Co. has two motor trucks hauling ore to the railroad at Prichard, 13 miles from the mine, each truck hauling 3 tons and making two round trips per day. Much of the ore is hand-sorted and the lower grade is hand-jigged. Two jigs are working and two more will soon be added. The mine is reported to be in good condition for production and would easily supply a 100-ton mill for several years. The ore being shipped is running above 50 per cent lead but low in silver.

COLORADO

To Increase Capacity of Boulder County Mill—First Unit Completed at Telegraph Mine at Ward

Victor—The Bonanza property is being developed and operated by the Granite Gold Mining Co. under lease from the United Gold Mines Co. A winze is being sunk in ore. Recent development work has produced a carload assaying $60 a ton.

Breckenridge—The Tymos Mines Co. is equipping and developing its property at Shock Hill. A transmission line has been completed to connect with the Colorado Power Co.'s system. Electrically driven pumps and other equipment will be installed. It is planned to drive a crosscut 1,000 ft. from the 300-ft. level toward the Brooks-Snyder and Ground Hog properties. George B. Tyler is president of the Tymos company.

Two shifts are employed in sinking the shaft on the Missouri property, which is being developed under lease. The shaft has reached a depth of 115 ft. and will be sunk an additional 50 ft.

Ward—The American Gold & Platinum Co. has completed the first 25-ton unit of its plant for treating gold-platinum ores from the Telegraph mine. Preliminary tests are reported to have been successful, and indicate that the ore averages $14 gold and $200 platinum per ton. John Ogden is manager.

Cardinal—The new flotation equipment recently installed in the Boulder County mill is in successful operation. The capacity of the plant will be increased from 40 to 100 tons per day. It is estimated that the ore supply will keep the mill running for about two years. The Boulder County Tunnel has been advanced 2,700 ft. on the vein, of which about 1,200 ft. is in ore.

Silverton—The Bandora mine is reported to have been sold by William Sullivan to Denver capitalists for $100,000. It will be operated under the management of Henry Wycoff. Arrangements are being made to purchase the Eucon mill and move it to the Bandora mine. The mill is owned by J. F. Sweet, of Boston.

ARIZONA

Hardshell to Reopen—Diamond Drilling at Three R Encouraging

Patagonia — The Hardshell mine, which has been shut down since May, is ready to be reopened. Owing to the shortage of fuel oil caused by the railroad strike the company was forced to suspend. Advantage was taken of the shutdown to enlarge the surface plant. New hoisting equipment has been added and everything is ready now except for completing additional fuel oil storage tanks. There is ample boiler and pump capacity and no difficulty is expected in unwatering the mine.

At the Flux property the mill is being overhauled and will shortly be put into operation.

Diamond drilling with one machine continues at the Three R mine. Results are not being announced. It is said they are encouraging. Ten holes have been drilled to cut a parallel vein to the main workings. The Colossus tunnel is being advanced.

At the Blue Nose, jigs are being built to treat some fairly high-grade ore from the dumps.

Duquesne—The Bonanza mine is being unwatered from the 160 level to the 300. Lessees are working on different parts of the property. The railroad point nearest to this property is Zorilla, a station on the Southern Pacific de Mexico, in Sonora. The ore is hauled to this point, crossed in bond and brought out at Naco, Ariz., where the S. P. de M. connects with the El Paso & Southwestern R.R.

Dragoon—Mills & Co., lessees on the Texas-Arizona, who struck high-grade lead-silver ore several months ago, are installing a compressor, direct-connected to a fuel-oil engine. A drift has been started on the 350 level, which should cut the orebody within 150 ft. Stoping will be started on this level when the vein is reached.

Johnson—Installation of a hoist and compressor at the Mammoth has been completed and two shifts are working breaking ground and hoisting.

Dos Cabezas—Sill & Sill, of Los Angeles, have been retained as consulting engineers for the Dives mines. The ore being mined and treated at the company's mill is running about $20 per ton, a large part of which is being recovered on the plates.

Good progress is being made in the tunnel of the Gold Prince Mining Co., where it is expected the main vein will be reached within 30 ft. Installation of tables and electric wiring will complete the new mill. A test run is to be made about Aug. 20.

Bert Macey, of Tombstone, has arrived with miners to start work on the Le Roy Con. Mining Co.'s property.

Globe—The Northwest Inspiration is crosscutting at 300-ft. depth in a 700-ft. tunnel with the expectation of picking up the Warrior vein within a couple of hundred feet. The main shaft is to be sunk from 340 to 540 ft. Jack Huston is in charge.

The cutting of Old Dominion's Maggie vein on the 19th level is considered important as affecting the future of the Old Dominion. The vein is practically new and undeveloped. The ore cut thus far runs over 5 per cent. Operations are to be continued down to the 20th level to secure drainage.

Willcox—The Grand Reef property, in the Aravaipa district, 60 miles north of Willcox, is reported to have been sold by Richard V. Dey, of New York, to the Aravaipa Leasing Co., a corporation controlled within the American Lead & Zinc Co. An immense dyke, cut by a canyon to a depth of several hundred feet, shows a number of paystreaks of silver ore, the broadest being 20 ft. in width. A mill has been operated at the mine by lessees, though the long wagon haul to the nearest railroad point is understood to have consumed all profits. It is though that a railroad route can be found to Willcox. The lease was recently abandoned and it was announced that the mill would be junked.

Jerome—The Shea tunnel is within 100 ft. of the main shaft. The heading is now in 1,140 ft., with a vertical depth of 460 ft., and is in ore. Shipments are being made to the U. V. Extension smelter, the ore coming from the 350 level.

Creditors of the Verde Apex have brought a $24,000 suit against the company for unpaid bills.

NEW MEXICO

Burro Mountain Mill in Operation

Tyrone—The first unit of the new mill of the Burro Mountain Branch of the Phelps-Dodge Corporation was put into operation Aug. 2. This marks the resumption of regular operations at this property. A year ago the mill was shut down and since that time has been remodeled, various improvements being installed.

Silver City—A meeting of the stockholders of the Silver Spot Mines Co. was held Aug. 3. R. I. Kirchman is in charge of developments.

SOUTH DAKOTA

Trojan Shaft Below 100 ft.—Operations Curtailed by Labor Shortage and High Costs

Deadwood—The Iron Hill tunnel has been advanced 1,285 ft. and it is expected that the old Iron Hill workings will be tapped very soon. The tunnel will cut the mine at a depth of 300 ft. and will drain the property and allow further development of this one-time famous silver mine.

The Cutting property is being developed by means of a drift on the 200-ft. level. The shaft has been sunk to 500 ft. depth and a short lateral driven at that depth. A drift has also been driven on the 350-ft. level but the work is being confined to the 200 level until suitable pumps can be installed to handle the large amount of water.

Trojan—Sinking of the Trojan shaft is now below the 100-ft. point and continuing. From the surface the shaft has been concreted to a depth of 70 ft. The shaft will be continued to a depth of from 600 to 700 ft. The plant and mines of the company are in continuous operation although at reduced capacity owing to labor shortage and high costs.

MICHIGAN

Gogebic Range

Installing New Hoisting Equipment at Winona Shaft of Ironton Mine

Ironwood—The new electric hoists and flywheel set for the Winona shaft of the Ironton mine at Bessemer, Mich., are now erected, and the switching apparatus is being installed. Power will be purchased from the street railway company and used to drive the motor-generator-flywheel set, which will supply the direct current for the hoists. The cage hoist has two drums clutched to the main shaft, which is driven through gears. The ore hoist also has two clutched drums, but its motor is connected directly to the main shaft. It is rated at 1,650 hp., using 2,550 amp. at 525 v. All four drums are fitted with post brakes. The two skips and two cages will be run in balance as much as possible. Practically all of the hoisting for this mine will be done at this shaft. Electric-driven air compressors are to be installed in the new engine house also.

Two of the three 400-gal. pumps ordered for the Davis mine have been received. They are four-pole, pot-form, center-packed plunger pumps. The plungers are 4¾-in. in diameter with a 24-in. stroke, and the pumps will be driven at 52 r.p.m. through herringbone gears by 300-hp. induction motors. They will work against a head of about 2,600 ft., to withstand which pressure the water ends are made of forged steel.

Continued delay in delivery of material is holding up the erection of the transmission line from the Davis and Puritan mines to the power station at the Pabst mine.

The district offices of the McKinney Steel Co. have been moved from the Colby mine into a new building at the Ironton mine.

The Republic Iron & Steel Co. is installing a 600-gal. pump on the 12th level of the Plumer mine at Pence, Wis.

ALABAMA

Preparing for Deeper Mining in Birmingham District—Electrification of Mines Being Pushed

Birmingham—The Woodward Iron Co. will not make use of its new shaft for some time, but is simply preparing for the time when its present workings are exhausted. The shaft was sunk during the last year and a half. It has been concreted and the hoisting machinery installed so that it is ready whenever needed. According to a company official the ore in the shaft at depth is better than that nearer the surface. The ores near the lower end of Red Mountain, where the Woodward properties are located, are self-fluxing. The shaft is of sufficient capacity to supply the company's five furnaces.

Together with the Shannon mines of the Gulf States Steel Co., the Woodward mine is part of the plans for deep mining in this district. Borings are now being made on virgin ground. The two projects mentioned promise large outputs, which will cover demands for years to come.

Electrification of the iron mines of the Birmingham district continues, with the Sloss-Sheffield Steel & Iron Co. building transmission lines from its power plant at North Birmingham, near the byproduct coke ovens, while the Tennessee Coal, Iron & R.R. Co. and others are using power from the Alabama Power Co., which has a hydroelectric plant on the Coosa River. The latter company is adding a fifth unit to the plant, which will increase the total capacity to 105,000 hp. The flow of water in the Coosa is not sufficient the year around to operate all five units but it is believed that water can be stored while the river is up. The Alabama Power Co. is furnishing power not only to ore mines but to coal mines, cotton mills and various other manufacturing plants.

The Tennessee C., I. & R.R. Co. is giving much attention to all developments on Red Mountain, the little communities established being looked after, and welfare work is said to be securing excellent results.

JOPLIN-MIAMI DISTRICT

Oklahoma-Missouri-Kansas

Niangua Mining Co. Operated by Receiver—Hawkins Company Opening Rich Lead Property Four Miles from Baxter

Commerce, Okla.—The Tydings & Seals Mining Co. has recently taken a lease on the tract of the Commerce Mining & Royalty Co. adjoining Commerce, and has started two concentrators on it and will start a third within a few weeks. The mills placed in operation are the Turkey Fat and the Cactus, the latter having been renamed the "Dinty Moore." The dirt for the latter mill is being taken from the old Midas shaft. The Never Sweat mill has been renamed the "Maggie" by the company and will be placed in operation as soon as necessary overhauling and new installations are completed. Included in the company are John Newton, general superintendent for the Commerce Mining & Royalty Co., with many years' experience in this district, and Homer Seals and T. Rader, formerly operators at Joplin, and Walter Tydings, of Commerce.

Baxter Springs, Kan.—A new lead mine of exceptional richness has been opened up by the Hawkins Mining Co. on the Dawes land, four miles southeast of Baxter. The lead is found at 100 ft. and the run extends down to 150 ft., many large chunks weighing up to a ton or more having been recovered. Hand jigs have been installed and the company plans to erect a mill. Harry Hawkins, of Miami, is general manager for the company.

Picher, Okla.—The Niangua Mining Co. recently went into bankruptcy and is being operated under the management of W. S. O'Bannon, as receiver. The No. 1 mill of the company burned down some months ago, and the No. 2 plant has not been sufficient to pay on the lease at the rate contracted. The receivership, therefore, is more a mutual agreement proposition on the part of the creditors, calculated to give the company a better chance. Since it was created, the company has driven a 600-ft. drift connecting the No. 2 mill with the No. 1 mine. In addition, better dirt has been found in the No. 2 mine, so a good production is being recorded at present.

The Keltner Mining Co. is installing a 150-hp. gas engine and an 880-ft. compressor for operating the field shaft recently completed 200 yd. north of mill.

The new 300-ton mill of the Aztec Mining Co. has been placed in operation. It includes a sludge room with a 50-ft. Dorr thickener. Electric power is used throughout except for one compressor. H. G. Larsh, Joplin, Mo., is president.

The Red Bird Mining Co. has completed a small concentrator on the 40-acre lease adjoining Aztec, the lease on the southeast. Frank Childress, of Galena, and R. L. Kidner, of Joplin, are the principal owners.

THE MARKET REPORT

Daily Prices of Metals in New York

Aug.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
12	18.35@18.50	44.50	47.75@48.00	9.00	8.75@9.15	7.80@7.85
13	18.35@18.50	44.50	48.00@48.25	8.90@9.00	8.75@9.15	7.85@7.90
14	18.35@18.50	44.50	48.00@48.25	9.00	8.75@9.15	7.90@7.95
16	18.35@18.45	44.50	47.75@48.00	9 00	8.75@9.15	7.95@8.00
17	18.35	44.50	48.00@48.25	9.00	8.75@9.15	7.90@8.00
18	18.35	44.50	47.75@48.25	9.00	8.75@9.15	7.90@7.95

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. All prices are in cents per pound.

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

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. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
12	93¼	95¼	112	276½	283½	36	36¼	41⅜	43¼
13	94½	96¼	112	276¾	283½	35¼	35¾	41½	43
14	....	....	....	....	....	....	....	....	....
16	94	95¾	111	274½	282	35⅜	36	41	42½
17	93½	95	111	274¾	281¾	35⅞	36⅜	41¾	43½
18	93⅞	95½	111	274½	281½	35½	36	41¼	42¾

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

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver			Aug.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
12	365	99½	95⅜	58¾	16	363	99½	95⅞	59⅜
13	362	99½	95⅜	59¼	17	363	99½	97¼	59¾
14	363	99½	95⅜	59⅛	18	362½	99½	98	60½

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.

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

Metal Markets

New York, Aug. 18, 1920

Possibly in no week this year have the metal markets exhibited less activity than in that just past. Consumers are, in general, showing no interest, nor are conditions expected to improve much until after Labor Day.

Copper

The fair buying which we reported last week proved to be only a flash in the pan. Consumers are not in the market, and there also seems to be little inclination to sell at current prices. Inquiries for reasonaby large lots would soon push the market up at least ¼c. above current quotations. Some small lots of metal are reported as being offered by second-hands from the Middle West. Near-by metal in small lots can be obtained at our prices. Larger lots of copper for forward delivery we quote at 18.50@18.85c.

Lead

The only event of importance during the last week was the action of the A. S. & R. in advancing its contract price to 9c., New York, on Thursday. At this price, lead from Europe can be brought into this country and sold at a very attractive profit, and international traders have not been slow to take advantage of the situation. Several thousand tons have arrived or been contracted for, largely American, Australian and Mexican brands, although Spanish and German lead is also included. The demand, however, is not as large as might be supposed, consumers rightly assuming that the price is not likely to go higher, so that, outside of contract business, only present demands are being provided for. Large producers are turning down orders and making no promises regarding shipment. We quote lead for near-by delivery, both New York and St. Louis, at 9.00@9.25c.

Zinc

The feeling in the zinc market is decidedly more cheerful. Demand is much more active at the higher prices now prevailing, though business is not yet what might be termed strong. Those who are selling now are, in general, resellers, who bought at 8½c. and less and are willing to take a reasonable profit. Producers are not anxious to get rid of their metal, for they believe that prices will go still higher. Production continues to be curtailed, and one Western smelter bought outside zinc to fill his contracts. It would not be at all surprising to see zinc gradually approach 8¾c., at which point importations from Europe would begin to pay at current London prices.

Forward deliveries command 5 to 10 points premium over the prices which we quote, which represent the near-by market. There is little or no demand.

Tin

No signs of life are yet apparent in the tin market. Demand is equally lacking for all grades and deliveries, and prices are largely nominal.

Straits tin for future delivery: Aug. 12th, 48.00@48.25c.; 13th, 48.25@48.50c.; 14th, 48.25@48.50; 16th, 48.00@48.25c.; 17th, 48.00@48.50c.; 18th, 48.00@48.50c.

Arrivals of tin in long tons: Aug. 10th, Australia, 100; 12th, China, 50; Straits, 25; 17th, Liverpool, 60; London, 85.

Silver

The silver market has been steady the last week in London, on buying for China and Indian bazaars, and closes with advancing tendency on higher rates from China. The New York market has been above London parity on a good demand from China banks which has developed this week, and closes strong. Offerings of foreign silver continue limited. If Chinese and Indian

demand continue urgent, it is possible the silver export price will pass the limit of $1 per fine oz., fixed for domestic production under thé Pittman Act, in which event the export and industrial demand must take care of all domestic production to maintain price level over the Government figure.

Last week, some copies of the *Engineering and Mining Journal* appeared with the prices of New York domestic and foreign silver interchanged. The 99½c. price of course applied to silver of domestic origin.

Mexican Dollars—Aug. 12th, 72⅝; 13th, 72⅝; 14th, 72⅝; 16th, 73; 17th, 74¼; 18th, 75.

Gold

Gold in London on Aug. 12th, 111s. 11d.; 13th, 112s. 11d.; 16th, 113s. 3d.; 17th, 114s.; 18th, 114s.

Foreign Exchange

Price changes during the week were narrow. Sterling is not likely to advance materially for some weeks, owing to the large volume of grain and cotton bills which will be thrown on the market. Yesterday, francs were 7.28c.; lire, 4.86c. and marks 2.10c. New York funds in Montreal, 13/16 per cent premium.

Other Metals

Aluminum—The Aluminum Co. of America has announced a price increase of about 2c. per lb. effective Aug. 10: Ingot, 99 per cent and purer, 35.1c.; 98@99 per cent, 34.9c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Market continues weak. Spot, 7c. per lb.; Cookson's "C" grade, 14@15c. Chinese and Japanese brands, 7c. W. C. C. brand, 9@9½c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots, and $2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market dull.

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

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

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

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

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

Palladium—$95@$110 per oz.

Platinum — Firm at $110@$115 per oz. $105 per oz. in 100 oz. lots.

Quicksilver — Market steady; $85@$88 per 75-lb. flask. San Francisco wires $83. Steady.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**, black, powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

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

Metallic Ores

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

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 80@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. Operators claim it will be necessary to advance ore prices, owing to increased cost of production.

Manganese Ore — 70@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum ore—85 per cent MoS_2, 75@85c. per lb. of contained sulphide, New York.

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

Titanium Ores—Ilmenite[1], 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6@$7, in New York.

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

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

Zircon—Washed, iron free, 5c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

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

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 14—Zinc blende, per ton, high $51.75; basis 60 per cent zinc, premium, $48.50; Prime Western $47.50@$45; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $45.73; calamine, $38.86; all zinc ores, $44.54.

Lead, high, $104.30; basis 80 per cent lead, $100; average settling price, all grades of lead, $99.20 per ton.

Shipments for the week: Blende, 7,916; calamine, 211; lead, 1,344 tons. Value all ores the week, $503,610.

Eighty tons were reported purchased on $45 basis, 2,600 tons on $46 basis, largely purchased by a smelting company from a subsidiary mining company, and the balance of 12,000 tons purchased, except the premium and fines and slimes grades, was on $47.50 basis.

Platteville, Wis., Aug. 14—Blende, basis 60 per cent zinc, $50 per ton for high-grade. Lead ore, base 80 per cent lead, $100 per ton. Shipments for the week: Blende, 1,551; calamine, 30; lead, 26; sulphur ore, 32 tons. Shipments for the year: Blende, 44,624; calamine, 2,330; lead, 387; sulphur ore, 1,209 tons. Shipped during the week to separating plants, 2,124 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$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 Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

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

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground.

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $25@$30 car lots, f.o.b. Baltimore; ground, $17@$20, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4½@15½c.

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

Kaolin—See China Clay.

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

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

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

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

Monazite — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

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

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 less quantities, including bags.

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

Talc — Paper making, $10@$20 per ton; roofing grades, $9@$15; rubber grades, $10@$15, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $15@$20 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

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

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

Ferro Alloys

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

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

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, prompt delivery, $200@$225 freight allowed; last half, $200@$220; English, $195@$200, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $75@$80, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

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

Ferrovanadium—Basis 30-40 per cent, $6.50@$9.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire quoted, 22½@23c.

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

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

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

Yellow Metal — Dimension sheets, 26⅜c.; sheathing, 25⅜c.; rods, ⅜ to 3 in., 23⅜c.

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

Refractories

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

Chrome Brick—$90@$100 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $50@$55 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $45@$50. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$100@$110 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110@$120.

Silica Brick—9-in. per 1,000, $51@$55, Birmingham, Ala.; $55@$60, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, Aug. 17, 1920

Production of steel ingots in July was at the rate of about 39,900,000 gross tons a year, representing a decline of 6 per cent from the June rate. Pig-iron production by steel interests decreased in lower ratio and some seems to have accumulated. There was also accumulation of semi-finished steel, on account of car shortage, and shipments of finished steel were nearly equal to the amount produced.

Pig Iron—Claims are made of a recent transaction in basic setting the market at $48.50 Valley, but there are some uncertainties connected with the report, and the reported $2 advance is not confirmed. Bessemer is said to have sold in several small lots at $47, in one case at $50, and one sale of 500 tons of foundry for the balance of the year at $50.50, Valley basis, is reported. Transactions are only a small fraction in volume of those that have hitherto occurred when the whole market was advancing, hence we quote last week's prices, subject to premiums for delivery: Bessemer, $47; basic, $46.50; foundry, $46, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40, but to advance 40 per cent next week.

Steel—A week ago sheet bars were reportable at $70, a decline of $5, and now it appears that $70 could be shaded slightly. Billets are quiet at $60@$65.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$20.

An Analysis of the Copper Situation

Record for Half Year Satisfactory, but Present Condition Exhibits Tendency To Lose Gains—Domestic Consumption About Twice Pre-War Rate—Foreign Demand Was Encouraging—Need of Co-operative Policy in the Industry

THE copper market is still in the doldrums. With the exception of the first three or four months of the year, when buying of copper occurred on an unprecedented scale, the copper trade has sunk into a lethargic state from which relief is not yet in sight. The table presented herewith records the statistical position of the metal so far as can be ascertained from available figures, a close inspection of which indicates that the results of the trade during the first half of the year were satisfactory, but that there is a tendency at the present time to lose a measure of the improvement gained.

Export trade, which has been largely counted upon to assist the copper market in its troubles, has exhibited encouraging aspects, the total exports for the half year being about 373,000,000 lb., or at the rate of 746,000,000 lb. annually, which compares favorably with exports averaging about 800,000,000 lb. for the five years preceding the war. Imports were a little above the pre-war rate of 360,000,000 lb. annually. The figures indicate that despite financial difficulties European nations and Japan were factors in the copper market whose importance should not be underestimated. The net balance of exports over imports of copper was maintained in the varying monthly amounts indicated with the exception of June, when a small adverse balance was recorded. Results over one month, however, are never of any particular significance, but should this condition be maintained for several months it will impair part of the export record made earlier in the year.

Domestic smelter production of blister copper has not varied much—always within a few per cent of the preceding month—and is at the rate of 1,415,000,000 lb. yearly, about 17 per cent more than the pre-war rate of 1,210,000,000 lb. Refinery production is also above the pre-war rate. Owing to the large stocks of crude copper on hand at the refineries, transporation troubles did not affect refining as much as expected.

The estimates of sales into foreign and domestic consumption total about 860,000,000 lb. for the first half of 1920. Domestic deliveries of copper for the same period are estimated at 680,000,000 lb. Exports were 373,000,000 lb., a large portion of domestic deliveries and exports the conclusion of heavy sales in the latter part of 1919. The estimate of domestic deliveries or consumption would indicate a consumption of copper of 1,360,000,000 lb. annually, or on a scale much larger than the pre-war rate of 741,000,000 lb.—almost twice as much, in fact. This is one of the most optimistic indications in the copper industry, and were it not for one other factor which seemingly the copper industry is unable to eliminate, the market would be in a highly satisfactory condition. This factor, of course, is the large stock of both crude and refined copper still on hand. Domestic consumption is doing its share, but enlarged buying from foreign quarters, from France, England, Italy and particularly Germany, is necessary before any great inroads into surplus stocks can be made.

On Jan. 1, 1919, according to the U. S. Geological Survey, there were on hand refined stocks amounting to 180,000,000 lb., and of blister copper, 562,000,000 lb. On Jan. 1, 1920, there was 631,000,000 lb. of refined copper on hand and 310,000,000 lb. of blister copper, or a total of 940,000,000 lb. of copper. Let us say an average cost of 14c. per lb. had been expended upon this product, or a total outlay of $131,600,000, which is quite a bit of capital to have tied up in unmarketed copper in these days of stringent credit facilities. The good record made in the first half of the year indicates that the stocks of refined copper were reduced, and are now between 475,000,000 and 500,000,000 lb., though there is probability that stocks of blister copper, if they show any change, exhibit an upward trend. It is probable that for the first few months of the year decided inroads were being made into the refined copper stocks, but that this improvement diminished monthly, so that now practically no reduction is recorded.

The price of copper has in general moved in sympathy with the situation in the metal. The lowest average price for electrolytic this year was recorded in June (18.07c.), but in comparison with the conditions existing a year ago with copper between 14c. and 17c. the present averages are a pleasing comparison. The current stagnation in the copper market comes at a time when demand should be particularly brisk, when requirements for the latter part of the year are ordinarily covered. August last year, it will be remembered, was the month in which the peak prices of copper for the year were attained (over 22c.). That copper will go much above its present level before the end of the year seems unlikely unless there is a material change in the fundamental difficulties hampering the industry. Twenty-cent copper is a low price, but if attained would be a creditable showing, considering the adverse conditions.

The seriousness of the present condition demands emphasis. The United States, which is the world's leading copper-producing country, is marketing a wasting asset at a cost but little above the cost of production. Every pound of copper sold diminishes by so much the nation's copper resources, which, although tremendous, are not of such a character as to warrant producing them and supplying the world at prices which represent an exceedingly small return. The obvious remedy that first comes to mind is to curtail production, thereby creating a smaller supply and easing the acute labor situation in other fields. In some cases, such as a step, by increasing the overhead expenses, might increase the cost of production. All producers have decreased their production drastically from war rates, and generally to the economic limit, refraining from a further decrease not only for business reasons but for the certain measure of responsibility that they have toward the mining communities which depend for their existence upon the continued operation of the mines. Nevertheless, the situation is critical, and copper producers would be justified in forming plans whereby this valuable resource may be conserved to the best advantage and no one producer will take unfair advantage over his neighbor.

ANALYSIS OF THE COPPER SITUATION FOR FIRST HALF OF 1920

In Pounds

Month	Crude Copper Production	Imports	Exports	Net Exports	Estimated Sales Foreign and Domestic	Estimated Stocks of Refined Copper on First of Month	Estimated Domestic Delivered	Average Price
Jan.	121,900,000	34,220,000	49,680,000	15,460,000	239,000,000	(a) 631,000,000		18.92
Feb.	117,450,000	39,170,000	57,600,000	18,430,000	89,000,000	612,000,000	500,000,000	18.57
Mar.	120,310,000	28,870,000	88,030,000	59,160,000	320,000,000	585,000,000		18.33
Apr.	116,080,000	21,950,000	64,390,000	42,440,000	100,000,000	520,000,000		18.66
May	114,960,000	44,860,000	83,280,000	38,420,000	62,000,000	469,000,000	90,000,000	18.48
June	116,670,000	31,510,000	30,100,000	(b) 1,410,000	52,000,000	456,000,000	90,000,000	18.07
Totals	707,370,000	200,580,000	373,080,000	172,500,000	862,000,000	485,000,000 July 1st.	680,000,000	18.51 Six Months
Yearly rate	1,414,740,000	401,160,000	746,160,000	345,000,000	1,724,000,000	.....	1,360,000,000	

(a) 310,000,000 lb. crude copper in addition.
(b) Net imports.

MINING STOCKS

Week Ended August 14, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	*40	*40	*40		
Ahmeek	Boston	60	58	58	June '20, Q	.50
Alaska-B.C.	N. Y. Curb.	1 1/16	1	1		
Allouez	Boston	22	20	21	Mar. '19,	1.00
Anaconda	N. Y.	52 1/2	49 1/2	52	Feb. '20, Q	1.00
Ariz. Com'l	Boston	9 1/2	8 1/2	9 1/2	Oct. '18,	.50
Big Ledge	N. Y. Curb.	7/16	3/8	7/16		
Bingham Mines	Boston	8 1/4	8	8	Sept. '19, Q	.25
Calumet & Ariz.	Boston	54	52	54	June '20, Q	1.00
Calumet & Hecla	Boston	300	290	300	June '20, Q	5.00
Canada Copper	N. Y. Curb.	1/16	1/8	1/8		
Centennial	Boston	11	11	11	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	39	33 7/8	37 1/8	June '20, Q	1.00
Chief Consol.	Boston Curb	3 1/2	1 3/4	3	Feb. '20, Q	.10
Chile Cop	N. Y.	14 1/2	12 5/8	14 1/2		
Chino	N. Y.	26 3/8	24 1/2	25 1/2	June '20, Q	.37 1/2
Columbus Rexall	Salt Lake	*43	*38	*40 1/2		
Con. Ariz.	N. Y. Curb.	2	1/4	2	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb.			2 1/8		
Copper Range	Boston	36	34 1/2	34 1/2	June '20, Q	.50
Crystal Copper	Boston Curb	*30	*27	*26		
Davis-Daly	Boston	7 1/8	7 1/2	7 3/8	Mar. '20, Q	.25
East Butte	Boston	10 1/4	9 1/8	10 1/4	Dec. '19, A	.50
First Nat'l	Boston Curb	*90	*90	*90	Feb. '19, SA	.15
Franklin	Boston	*70	*40	*50		
Gadsden Copper	N. Y. Curb.	...	...	*71		
Granby Consol.	N. Y.			33	May '19, Q	1.25
Greene-Can.	N. Y.	25	23 1/2	25	Feb. '19, Q	1.50
Hancock	Boston	4	4	4		
Houghton	Boston Curb	*40	*40	*40		
Howe Sound	N. Y. Curb.	3 1/2	3	3 1/4	July '20, Q	.05
Inspiration Con.	N. Y.	46 3/8	43 1/4	46 1/2	July '20, Q	1.00
Iron Cap	Boston Curb	8 1/2	8 1/2	8 1/2	Feb. '19, M	.25
Isle Royale	Boston	29	25	26	Sept. '19, SA	.50
Kennecott	N. Y.	24	22 1/2	24	June '20, Q	.50
Keweenaw	Boston	...	...	1 1/2		
Lake Copper	Boston	3	2 3/4	2 3/4		
La Salle	Boston	2 1/2	2 1/2	2 1/2		
Magma Chief	N. Y. Curb.	...	...	*21		
Magma Copper	N. Y. Curb.	26	24 1/2	25	Jan. '19, Q	.50
Majestic	Boston Curb	*13	*10	*12		
Mason Valley	N. Y. Curb.			2 1/2		
Mass. Con.	Boston	2 3/8	2 1/8	2 1/4	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5 1/4	4 1/2	4 7/8		
Miami	N. Y.	19	18 1/2	18 5/8	May '20, Q	.50
Michigan	Boston	4	4	4		
Mohawk	Boston	60	58 1/2	58 1/2	Feb. '20, Q	1.50
Mother Lode (new)	N. Y. Curb.	5 1/4	5 1/8	5 1/4		
Nevada Con.	N. Y.	11	10 1/2	10 3/8	June '20, Q	.25
New Arcadian	Boston	...	...	3		
New Baltic	Boston Curb			3		
New Cornelia	Boston	17	16 1/2	16 1/2	May '20,	.25
Nixon Nev.	N. Y. Curb.			*9		
North Butte	Boston	14 3/8	14 1/4	14 1/4	Oct. '18, Q	.25
North Lake	Boston	1/2	1/2	1/2		
Ohio Copper	N. Y. Curb.	...	...	1/16		
Ojibway	Boston	1 1/2	1 1/2	1 1/2		
Old Dominion	Boston	23	21	21	Dec. '18, Q	1.00
Osceola	Boston	1 1/2	1 1/2	1 1/2	June '20, Q	.50
Phelps Dodge	Open Mar.	†195	†180	...	July '20, Q	2.50
Quincy	Boston	46	44	44	Mar. '20, Q	1.00
Ray Con.	N. Y.	14 1/2	13 1/2	14 1/2	June '20, Q	.25
Ray Hercules	Boston Curb	...	...	*60		
St. Mary's M. L.	Boston	38 1/2	38	38 1/2	June '20, K	2.00
Seneca	Boston	14 1/2	13 3/8	13 1/2		
Shannon	Boston	1 1/2	1	1 1/2	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	8 3/4	8 1/2	8 1/2	Jan. '20,	.25
South Lake	Boston	...	...	2		
South Utah	Boston	*15	*15	*15		
Superior	Boston	4 1/2	3	4 1/2	Apr. '17,	1.00
Superior & Boston	Boston	3 1/2	3	3 1/16		
Tenn. C. & C.	N. Y.	9 1/2	9	9 1/2	May '18, I	1.00
Tuolumne	Boston	*60	*60	*60	May '13,	.10
United Verde Ex.	Boston Curb	30 1/2	29 1/2	30 1/2	June '20, Q	1.50
Utah Con.	Boston	6 1/2	6	6	Sept. '18,	.25
Utah Copper	N. Y.	61	56 1/2	60 1/2	June '20, Q	1.50
Utah M. & T.	Boston	1 1/2	*95	1	Dec. '17,	.30
Victoria	Boston	...	...	1 1/2		
Winona	Boston	*50	*50	*50		
Wolverine	Boston	13 1/2	12	13	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb.	4 1/2	3 7/8	4	June '20, QX	.20
St. Joseph Lead	N. Y.	14 1/8	14 1/8	14 1/8	June '20, QX	.50
Stewart	Boston Curb	...	...	*16	Dec. '15,	.05
Utah Apex	Boston	1 1/16	1 1/2	1 1/2	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	12 1/8	11	12	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.			44 1/2	May '20, Q	1.50
Butte C. & Z.	N. Y.	7 1/4	6 1/2	7 1/8	July, '18, I	.50
Butte & Superior	N. Y.	19	16	18 1/2	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	10 1/8	9 1/2	10 1/4	June '20, Q	.50
New Jersey Z.	N. Y. Curb.	186	184	184 1/2	May '20, SA	4.00
Success	N. Y. Curb.	*5	*4	*4	July '16,	.03
Yellow Pine	Los Angeles	...	...	1.01	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1 1/2	1	1 1/8		
Alaska Juneau	N. Y.	1 1/8	1 1/2	1 1/2		
Carson Hill	N. Y. Curb.	...	...	24 1/2		
Cresson Consol. G.	N. Y. Curb.	...	...	1 7/8	June '20, Q	.10
Dome Ex.	Toronto	*34	*30	*34		
Dome Mines	N. Y.	12	10	11 1/2	July '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡...	...	*73	May '20, Q	.02
Goldfield Con.	N. Y. Curb.	*9	*8	*8	Dec. '19,	.05
Hedley	Boston	...	...	4 1/2	June '19,	.10
Hollinger Con.	Toronto	5.65	5.65	5.65	June '20, BM	.05
Homestake	N. Y.	50	50	50	Sept. '19,	.50
Kirkland Lake	Toronto	*57 1/2	*51	*57 1/2		
Lake Shore	Toronto	1.15	1.15	1.15	Oct. '19,	.02 1/2
McIntyre-Porcupine	Toronto	2.04	1.85	2.04	May '20, K	.05
Porcupine Crown	Toronto	*31	*25	*30	July '17,	.03
Portland	Colo. Sprgs.	‡...	...	*60	July '20, Q	.01 1/2
Reorgan. Booth	N. Y. Curb.	5	3	3	May '19,	.05
Silver Pick	N. Y. Curb.	*6	*5	*5		
Teck Hughes	Toronto	*8 1/2	*8 1/2	*8 1/2		
Tom Reed	Los Angeles	1.10 1/2	1.00	1.08	Dec. '19,	.02
United Eastern	N. Y. Curb.	2 1/16	2 1/4	2 1/16	Apr. '20, Q	.21
Vindicator Consol.	Colo. Sprgs.	‡...	...	*18	Jan. '20, Q	.01
West Dome Consol.	Toronto	*7	*7	*7		
White Caps Min.	N. Y. Curb.	*9	*7	*8		
Yukon Gold	Boston Curb	1 1/2	1 1/2	1 1/2	June '18,	.02 1/2
SILVER						
Arizona Silver	Boston Curb	*16	*10	*11	Apr. '20, M	.03
Beaver Con.	Toronto	*45 1/2	*44	*45	May '20, K	.03
Coniagas	Toronto	...	†2.50		May '20, Q	.25
Crown Reserve	Toronto	...	...	*25	Jan. '17,	.05
Kerr Lake	Boston	3 1/2	3 1/2	3 1/2	Sept. '19,	1.00
La Rose	Toronto	*33	*31	*31	Apr. '18,	.02
McKinley-Dar.	N. Y. Curb.	*51	*51	*51	July '20, Q	.03
Mining Corp.	Toronto	1.80	1.75	1.75	June '20, Q	.12 1/2
Nipissing	N. Y. Curb.	8 3/8	8 1/2	8 3/8	July '20, Q	.25
Ontario Silver	N. Y. Curb.	5 1/2	5 1/2	5 1/2	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb.	1/16	1/16	1/16	Jan. '12,	.10
Peterson Lake	Toronto	...	...	*12 1/2	Jan. '17,	.01 1/2
Temiskaming	Toronto	*37	*34	*35	Jan. '20, K	.04
Trethewey	Toronto	*27 1/2	*26	*27 1/2	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*2	*1 1/2	*2		
Barnes-King	Butte	‡...	....	1.11	May. '20, Q	.05
Bost. & Mont.	Boston	...	...	*63		
Cashboy	N. Y. Curb.	*7	*6 1/2	*7		
El Salvador	N. Y. Curb.	1 1/8	1 1/8	1 1/8		
Jim Butler	N. Y. Curb.	*12	*11	*11	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*5	*4	*4 1/2	June '16,	.05
Louisiana Con.	N. Y. Curb.	1/8	1/8	1/8		
MacNamara M.	N. Y. Curb.	1/2	3/8	1/16	May '10,	.02 1/2
N.Y. Hond. Rosar	Open Mar.	†13	†10	...	July '20, QX	.50
Tonopah-Belmont	N. Y. Curb.	1 1/8	1 1/8	1 1/16	Jan. '20, Q	.05
Tonopah-Divide	N. Y. Curb.	1 1/16	13/16	1 1/16		
Tonopah Ex.	N. Y. Curb.	1 1/8	1 1/8	1 1/8	July '20, Q	.05
Tonopah Mining	N. Y. Curb.	1 1/8	1 1/8	1 1/16	Oct. '19, SA	.15
West End Con.	N. Y. Curb.	1 1/8	1	1 1/16	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*19	*17	*18	July, '20, M	.01
Consol. M. & S.	Montreal	25	24	25	July '20, Q	.62 1/2
Daly Mining	Salt Lake	....	....	2.60	July '20, Q	.10
Daly-West	Boston	4 1/2	4	4 1/2	July '20, Q	.25
Eagle & Blue Bell	Boston Curb	....	....	2 1/16	Apr. '20, Q	.10
Electric Point	Spokane	‡...	...	30	May '20, SA	.03
Fed. M. & S.	N. Y.	10	10	10	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	35 1/2	32 1/2	35 1/2	June, '20, Q	1.75
Florence Silver	Spokane	‡...	...	*45	Apr. '19,	.01 1/2
Grand Central	Salt Lake	*37 1/2	*37 1/2	*37 1/2	June '20, K	03
Iron Blossom	N. Y. Curb.	1/16	*28	1/16	Apr. '20, Q	.02 1/2
Judge M. & S.	Salt Lake	4.00	3.90	4.00	July '20, Q	.12 1/2
Marsh Mines	N. Y. Curb.	*13	*10	*12		
Prince Consol.	N. Y. Curb.	1/16	1/8	1/16	Nov. '17,	.02 1/2
Rambler-Cariboo	Spokane	‡...	...	*10	Feb. '19,	.01
Rex Con.	N. Y. Curb.	*6	*5	*6		
South Heola	Salt Lake	*95	*90	*95	Sept. '19, K	0.15
Stand. S. L.	N. Y. Curb.	1/2	1/2	3/16	Oct. '17,	.05
Tamarack-Custer	Spokane	‡...	...	2.42	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.50	3.35	3.47 1/2	June '20, Q	0.10
Wilbert	N. Y. Curb.	*4	*3	*3 1/2	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	20 1/4	16 1/2	19 1/2	Mar. '19,	.50
Internat'l Nick.pf.	N. Y.	80 1/2	80 1/2	80 1/2	May '20, Q	1.50
QUICKSILVER						
New Idria	Boston	....	....	5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	....	....	*8		
VANADIUM						
Vanadium Corp.	N. Y.	68 1/2	66	67 1/2	July '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	79 1/2	75	79 1/2	July '20, Q	1.50
Asbestos Corp. pf.	Montreal	....	....	94	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	55	52 1/2	55	June '20, Q	1.00
Am. S. & R.pf.	N. Y.	89	88	88 1/2	June '20, Q	1.75
Am. Sm. pf.A	N. Y.	72	72	72	July '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	51 1/2	50	51	July '20, Q	1.50
U.S.S.R.& M. pf.	Boston	44	43	43	July '20, Q	.87 1/2

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

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	$3.55–7.00	7.09	7.02	8.25	$7.12– 8.00	4.57
No. 12	3.60–7.05	7.09	7.07	8.30	7.17– 8.05	4.57
No. 14	3.65–7.10	7.09	7.12	8.35	7.22– 8.10	4.67
No. 16	3.75–6.20	7.09	7.17	8.45	7.32– 8.20	4.77
Black:						
*Nos. 18 and 20	4.20–6.20	8.10	7.80	9.35	8.30– 9.80	5.30
*Nos. 22 and 24	4.25–6.25	8.10	7.85	9.40	8.35– 9.85	5.35
*No. 26	4.30–6.30	8.10	7.90	9.45	8.40– 9.90	5.40
*No. 28	4.35–6.35	8.10	8.00	9.55	8 50–10.00	5.50
Galvanized:						
No. 10	4.70–8.00	9.60	8.50	....	8.80–11.00	6.20
No. 12	4.80–8.10	9.60	8.60	10.10	8.90–11.00	6.25
No. 14	4.80–8.10	9.60	8.60	10.10	8.90–11.10	6.30
Nos. 18 and 20	5.10–8.40	9.60	8.90	10.40	9.15–11.40	6.60
Nos. 22 and 24	5.25–8.55	9.60	9.05	10.55	9.30–11.55	6.75
*No. 26	5.40–8.70	9.60	9.20	10.70	9.45–11.70	6.90
*No. 28	5.70–9.00	9.60	9.50	11.00	9.75–12.00	7.20

*For painted corrugated sheets add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

TRACK SUPPLIES—The following prices are base per 100 lb.f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝ in. and larger	$4.00	$3.25	$3.62–$4.25	$5.34	$7.75
Track bolts	6.00–6.50	4.90	4.75– 6.50	7.00	8.75
Standard section angle bars	3.00–4.00	3.00	2.75– 3.75	2.00	5.30

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the $2.55 places named:

	Mill Pittsburgh	New York Current	New York 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in	$2.45@$3.10	$4.47	$3.47	$4.04	$3.97
Channels, 3 to 15 in	2.45@ 3.10	4.47	3.47	4.04	3.97
Angles, 3 to 6 in., ¼ in. thick	2.45@ 3.10	4.47	3.47	4.04	3.97
Tees, 3 in. and larger	2.45@ 3.75	4.52	3.52	4.09	4.02
Plates	2.65@ 4.00	4.67	3.67	4.24	4.17

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55@$3.65	$2.55@$3.65	$2.25

RIVETS—The following quotations are per 100 lb.:

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco
STRUCTURAL						
½ in. and larger	$4.50	$6.00	$4.72	$5.62	$5.69	$6.65
CONE HEAD BOILER						
½ in. and larger	4.60	7.10	4.82	5.72	5.79	6.75
⅝ and ¾	4.75	7.25	4.97	5.87	5.94	7.00
⅞ and 1	5.00	7.00	5.32	6.22	6.19	7.25

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, iron rigging and guy ropes, +17½%; bright plow, 25% off.

Chicago, + 12½ on galvanized, 30 off on bright.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Denver	Chicago	St. Louis	Birmingham
Straight	$5.75	$8.15	$7.00	$7.00	$7.00
Assorted	5.85	8.40	7.15	7.15	7.25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:
Iron bars.....$2.35@$4.00 Steel bars.....$4.27@$4.50

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Chicago	Denver
$0.10	$0.16½	$0.18	$0.11½	$0.15	$0.18

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	12@14c.	13c.	15c.	.....
Hollow	16c.	.....	.....	21c.

STEEL AND IRON—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920:

Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
¼ to 3	57½ @ 54	44 @ 41½	⅜ to 1½	34½ @ 24½	18½ @ 8
			2 and 2½	33½	17½
LAP WELD					
2	50½ @ 47	38 @ 34½	2	28½ @ 20½	14½ @ 6½
2½ to 6	53½ @ 50	41 @ 37½	2½ to 6	30½ @ 22½	17½ @ 9½
7 to 12	50½ @ 47	37 @ 33½	7 to 12	27½ @ 19½	14½ @ 6½
13 and 14	41 @ 37½	.....			
15	38 @ 35	.....			
BUTT-WELD, EXTRA STRONG, PLAIN ENDS					
⅜ to 1½	55½ @ 52	39½	⅜ to 1½	34½ @ 24½	19½ @ 9½
2 to 3	56½ @ 53	44 @ 40½	2 and 2½	34½ @ 24½	19½ @ 9½
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	48½ @ 45	37 @ 33½	2	29½ @ 21½	16½ @ 8½
2½ to 4	51½ @ 48	40 @ 36½	2½ to 4	31½ @ 23½	19½ @ 11½
4½ to 6	50½ @ 47	39 @ 35½	4½ to 6	30½ @ 22½	18½ @ 10½
7 to 8	46½ @ 43	33 @ 29½	7 to 8	22½ @ 14½	10½ @ 2½
9 to 12	41½ @ 38	28 @ 24½	9 to 12	17½ @ 9½	5½ @ 5½

From warehouses at the places named the following discounts hold for steel pipe:

	New York	Black Cleveland	Black Chicago
⅜ to 3 in. butt welded	40%	40%	40@54%
3½ to 6 in. lap welded	35%	42%	40@50%
	New York	Galvanized Cleveland	Galvanized Chicago
⅜ to 3 in. butt welded	24%	31%	30 @40½%
3½ to 6 in. lap welded	20%	27%	27½@37½%

Malleable fittings, Class B and C, from New York stock sell at list plus 23%. Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	+$6.00	$3.25	$0.75	$1.90	$0.50	$1.05
Hot pressed hexagon	+ 6.00	2.70	.75	1.90	.50	.85
Cold punched square	+ 6.00	3.25	.75	1.90	.50	1.00
Cold punched hexagon	+ 6.00	2.70	.75	1.90	.50	1.00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50–10%
Chicago	50%	50%
Cleveland	50%	60–10–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+20%	20%	20%
Larger and longer up to 1 in. by 30 in.	+20%	20%	20%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York..... List Cleveland..... $2.50 Chicago..... $3.00
For cast-iron washers the base price per 100 lb. is as follows:
New York..... $7.00 Cleveland..... $4.50 Chicago..... $4.75

CONSTRUCTION MATERIALS

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

	New York 1-Ply c.l.	New York 2-Ply l.c.l.	New York 3-Ply c.l.	Philadelphia 1-Ply c.l.	Philadelphia 2-Ply l.c.l.	Philadelphia 3-Ply c.l.
No. 1 grade	$2.50	$3.00	$3.55	$2.40	$2.90	$3.45
No. 2 grade	2.25	2.70	3.20	2.15	2.00	3.10

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $4.25 per roll in carload lots and $4.50 for smaller quantities.

Shingles, red and green slate finish, cost $7.75 per square in carloads; $8.00 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

Tar felt (14 lb. per square of 100 sq.ft.) per roll	$3.50
Tar pitch (in 400-lb. bbl.) per 100 lb	2.00
Asphalt pitch (in barrels) per ton	54.50
Asphalt felt (light) per ton	123.00
Asphalt felt (heavy) per ton	127 00

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
Minneapolis	$0.1152	$0.2016	$0.3168
Seattle	.09	.175	.30
Los Angeles	.10	.175	.....
New Orleans	.23	.28	.30
Cincinnati	.125	.2186	.3286

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under				12 x 12-in. 20 Ft. and Knder	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$68.00	$65.00	.....	$62.50	$80.00	$70.00
Kansas City	51.00	51.25	$51.25	51.25	60.00	51.25
Seattle	.....	34.00	.....	.....	.....	35.00
New Orleans	46.00	.....	.....	.....	54.00	.....
Atlanta	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore	75.00	.....	.....	.....	87.50	.....
Cincinnati	45.00	50.00	50.00	.....	55.00	55.00
Montreal	80.00	80.00	65.00	75.00	73.00*	100.00
Los Angeles†	.....	57.00	.....	.....	.....	59.00
Detroit	67.00	.....	.....	.....	79.00	79.00
Denver	.....	43.75	.....	.....	.....	44.75

	1-In. Rough, 10-In. x 16 Ft. and Under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$110.00	$102.00	$52.00	$100.00	.....
Kansas City	102.00	106.50	106.50	113.00	$112.75
Seattle	.....	37.50	.....	.....	38.50
New Orleans	.....	42.00	.....	46.00	.....
Atlanta	85.00	90.00	.....	77.50	87.50
Baltimore (box)	57.50@65	.....	.....	57.50@62.50	.....
Cincinnati	50.00	55.00	50.00	45.00	50.00
Montreal	75.00	75.00	66.00	78.00	78.00
Los Angeles	.....	58.00	.....	.....	.....
Detroit	50.00	.....	49.00	44.00	.....
Denver	.....	42.75	.....	.....	40.25

*Montreal—Up to 22 ft.; over which, $3.00 per M. increase up to 30 ft.
†Base price, 2 x 3's and 2 x 4's, 8 to 14 ft., is $54.00

Detroit—Dimension stuff ranges from $60 to $68. See "ups and downs in the market."

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Denver	Chicago	San Francisco
Wire	$3.25@4.50	$6.00	$5.40	$4.15	$6.00
Cut	.....	.....	5.90	5.85	8.50

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago Without Bags
New York (delivered)	$4.10	$3.80	$2.30
Jersey City (delivered)	3.22	2.97	2.27
Boston	3.42	2.60	2.42
Chicago	2.15	2.15	2.00
Pittsburgh	2.20	2.20	2.05
Cleveland	2.42	2.42	2.32

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York	$19.50	$18.50	$3.50*at plant	$3.30*
Kansas City	27.20	26.20	2.50	2.40
Chicago	.....	.....	2.40	1.75
St. Louis	25.00	21.00	.....	2.25
Boston	27.50	25.25	3.70†	3.40†
San Francisco	23.50	19.50	.....	2.25
Minneapolis	24.00	19.00	2.90†	2.30
New Orleans	.....	2.25†	.....	2.45

NOTE—Refund of $0.10 per barrel.
* 300-lb. barrels. † 180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots)	$1.48	$2.15	$1.95	$2.53
5-gal. cans	1.51*	2.28	2.15	2.73

*To this *oil* price must be added the cost of the cans (returnable), which is $2.25 for a case of six.

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		One Year Ago		Current Dry and In Oil	1 Yr. Ago Dry and In Oil
	Dry	In Oil	Dry	In Oil		
100-lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25- and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

MINING AND MILLING SUPPLIES

HOSE—

	FIRE	50-Ft. Lengths
Underwriters' 2½ in		$0.85 per ft.
Common, 2½-in		30%

AIR

	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.60	$0.40	$0.30

STEAM—DISCOUNTS FROM LIST

First grade..... 20% Second grade.... 30% Third grade..... 35%

LEATHER BELTING—Present discounts from fair quantities (¼ doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30%	30%	20%

RAWHIDE LACING—For cut, best grade, 25%, 2nd grade, 30%. For laces in sides, 79c. per sq. ft.; 2nd, 75c. For semi-tanned: cut, 20%; sides, 83c. per sq .ft.

MANILA ROPE—For rope smaller than ½-in. the price is ½ to $0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0.01. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft., ⅝-in., 6; ¾-in., 4½; 1-in., 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ½ in. and larger, in 1200-ft. coils:

Boston	$0.30½	Kansas City	0.305
New York	.29	New Orleans	.29
Cincinnati	.27	Seattle	.28
Chicago	.29½	St. Louis	.265
Minneapolis	.29½	Atlanta	.295
San Francisco	.27	Denver	.30

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$1.00
Asbestos for high-pressure steam	1.70
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.70
Compressed asbestos sheet	.90
Wire insertion asbestos sheet	1.50
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.30
Asbestos wick, ½- and 1-lb. balls	.85

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$1.75	$1.60
Chicago—Creosoted	1.95	1.80
San Francisco—Douglas fir, green	1.74	1.24
San Francisco—Douglas fir, creosoted	3.36	2.38

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98	No. 5	.87
7x9x8 white oak	1.05		
7x9x8 red oak, No. 4	.80		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago In Bbl.	Chicago Carloads
Pure steam-distilled pine oil, sp.gr. 0.93–0.94	$2.30	$2.00	$1.95
Pure destructively distilled pine oil	1.80	1.90	1.85
Pine tar oil, sp.gr. 1.025-1.035	.48	.45	.43
Crude turpentine, sp.gr. 0.900–0.970	2.00	2.25	2.18
Hardwood creosote, sp.gr. 0.96–0.99*	.35	.....	.....

*F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11.00–15.50	13.00	16.00	11.00–14.00
Colored mixed	7.00–10.50	9.00–12.00	12.00	9.50–12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x13½
Cleveland	$55.00	$65.00
Chicago	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.3125	$0.3425	.....	$2.30
Boston	.....	.28	.31	.34	2.40
Kansas City	$0.2475	.27	.30	.34	2.40
New Orleans	.1975*	.2225	.2425	.....	.....
Seattle	.18	.2175	.2475	.29	2.60
Chicago	.2175	.2525	.2975	.34	2.45
Minneapolis	.2067	.2476	.2782	.....	2.80
St. Louis	.2175	.26	.285	.295	1.90
Denver	.2175	.2575	.2825	.33	2.70
Los Angeles	.22	.27	.31	.....	2.95
Atlanta	.22	.245	.265	.....	2.55
Cincinnati	.2275	.2525	.2725	.....	2.30
Montreal	.30	.32	.37	.38	4.10

* For 50%.

CHEMICALS

SODIUM CYANIDE—New York price is 25@30c. per lb.; Chicago, 30c.; St. Louis, 31c.; Birmingham, 45c.; Denver, 40c.

SODIUM SULPHIDE—New York price per pound is 9c.@10c. for concentrated, Chicago, 5c. for concentrated, 3½c. for crystals. Denver price is 6c. for crystals. Concentrated comes in 500-lb.drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 11@12c. per lb.; Chicago, 12½c.; St. Louis, 12c.

ALUMINUM DUST—Chicago price is $1.10 per lb.; Birmingham, $1.52.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union Single 25-Lb. Drums	Union 25-Lb. Ton Lots
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52	$1.49
Southeastern portion U. S. A.	115.50	110.50	1.63	1.60
Texas (except E. Paso)	124.00	119.00	1.74	1.71
El Paso, Texas	126.00	121.00	1.77	1.73
Denver, Colo	124.00	119.00	1.74	1.71
West Coast	129.00	124.00	1.81	1.77