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ENGINEERING AND MINING JOURNAL

A Weekly Journal of the Mining and Mineral Industries

February 28, 1920

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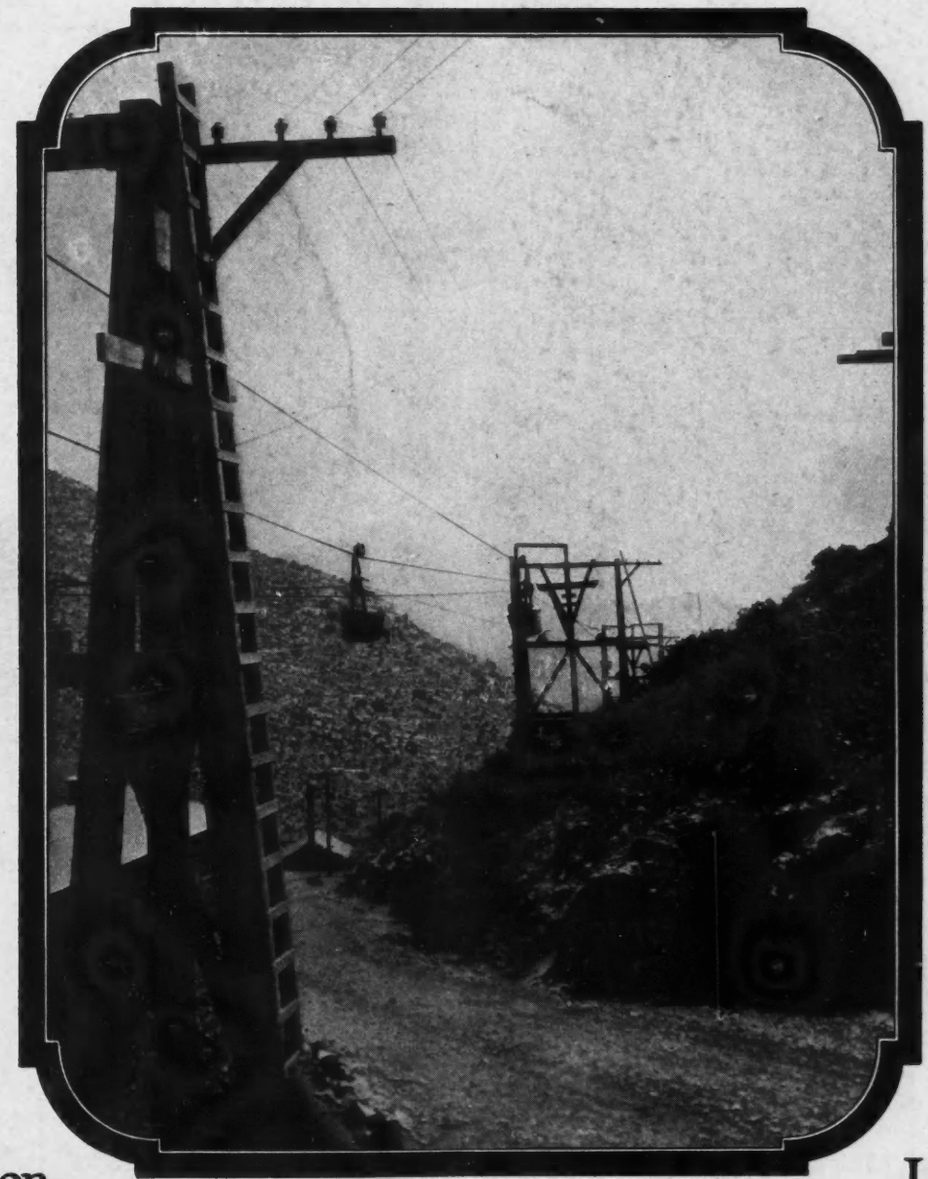

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries

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Volume 109 New York, February 28, 1920 *Number* 9

IS IT TRUE?

THAT the vastly predominant and average dip of important mineral veins of the fissure type in western North America is *seventy degrees* from the horizontal? It is so in my experience. It is also true, though less strikingly, of faults. I have never seen attention called to what has the suspicious appearance of covering up a law. If so, why?

This is a problem for the mining engineer, the geologist, and the geophysicist combined. The mining engineer and the geologist can testify whether or not it is true, and the geologist and the geophysicist can perhaps tell us why it is so, if it be true. I haven't the slightest idea.

Is It True?

That important mineral veins of the fissure type in western North America tend distinctly to strike easterly-westerly rather than northerly-southerly? It is so in my experience, and I have never seen attention called to what must, if true, denote some broad underlying principle. I mean this as a generalization, not an approximately exact mathematical statement—which I do mean in the case of the dip angle problem above. If the strike tendency is true as a generalization, why is it so in a region where the *principal* folds, intrusions, and faults follow a general northerly-southerly trend?

The mining engineer, the geologist, and the geophysicist are requested to make *short* comments on the above, which we will publish, if of sufficient interest, in the "What Others Think" department. Don't bother to point out to us the thousand exceptions—we know them already. Stick to the main question.

J. E. SPURR.

The Banker's Dream

He is living on the interest of his debts—*Ancient Joke*

THE study and handling of bonds, notes, credits, exchange, acceptances, discounts, and rediscounts leads to a strange type of madness. From the type of madness where a mass of paper money is supposed to be on a gold standard because secured by a 40 per cent "gold reserve" in the vaults in Washington, it is natural to progress to the complete madness induced by long exposure to paper currency, of believing the gold altogether unnecessary. A banker speaking the other evening to the New York Section of the American Institute of Mining and Metallurgical Engineers declared his belief that the paper was the reality and the gold a superstition. He proposed, as an international remedy, to fund together all the national debts in the form of an international bond issue, and to issue paper currency secured by these bonds. "Then," he said, "we should have *plenty* of money"—on account of the immense total of the bond issue, and hence of the security.

The idea sounds good to us—just before the wife says, "Wake up—you're dreaming! Get up and go to work; and first fix the furnace, and shovel the snow off the sidewalk before breakfast." Oh, boy! What a grand plan! The more we owe, the more money we have. If we haven't enough, all we have to do is to increase our debts, and issue more money on them as security.

The troublesome gold question we get rid of by absolutely refusing to recognize it—gold shall be outlawed, and on our pyramided debts we shall rise to heights of affluence and speculative joy yet unexplored. What a wonderful banker's dream! What unlimited rake-offs! It is possible, is it not—nay, probable—that there would be room for more bankers? If so, we should like to apply. Possibly we could all be bankers.

Wake up, Mr. Banker, you're dreaming! It snowed a foot last night, and the wind is blowing like ——— ! Get up and go to work!

Jellyfish and Barnacles

FROM an economic standpoint, at the present juncture, we may group ourselves in this thrice-blest (by comparison with the rest of the world) America, as jellyfish and barnacles, as floaters and sinkers. The heavier-than-water or attached type is tied down to the

gold standard; the lighter-than-water or opportunist type travels along with credit inflation. As the sea of inflation rises, the latter ever swims joyously in the sunlight, while to the former the light of day becomes ever dimmer.

The sinkers or barnacles are, first of all, the gold miners. They are the hopelessly anchored type. But in the same class, more or less, are most of the salaried folk whose wage was fixed on a gold basis—teachers, professors, Government employees—all those deriving income from investments, and the mass of all salaried employees. They are the new-poor; while the cost of living has doubled, their income has not changed, or, if it has changed, the change has not been in proportion.

The floaters or jellyfish are pre-eminently those who buy and sell on the same basis, whatever the inflation—merchants of all sorts, business men of many sorts—especially dealers in things to wear and to eat, dealers in luxuries bought deliriously by the new-rich, labor of nearly all kinds, farmers, and real-estate men. The sinkers (let us not follow the barnacle and jellyfish metaphor too closely) struggle for relief as the tide rises; and every now and then one frees himself and rises to the surface, where he fattens on the sunlight, as who should say, "Another Survey geologist has joined the Sun Oil Company." Otherwise, the location of the sinker is marked at the surface only by bubbles as he struggles for existence or breathes his last. Colleges (professors of economics and all) struggle to float—huge funds are begged for, for the floaters, as life-savers; and the whole stupid but vital excitement of the day is to keep on top—if you can.

Some of these professors of economics tell us that we are on a permanently higher price level. Be sure of one thing, however: with no fixed standard there can be no fixed level at all. We are warned that shoes will be 50 per cent higher in the spring. The shoes you used to pay $5 for, and now pay $10, will cost you $15. Cheer up, however; shoes cost $150 a pair (600 marks) in Germany. In gold? Surely, in both countries; both the United States and Germany are on a gold basis. But we fear we must qualify: the price of gold at ten times as much in Germany as in the United States is too much for either a miner or an economist to explain. In fact, the price of shoes will be on the same basis in both countries—the basis of bunk, positive and comparative. In other countries the basis is superlative; in Austria they are using the krone notes for pasting over cork stoppers on bottles.

If governments would adopt the same standards of business solidity as are upheld for individuals and corporations, our financial difficulties would dissolve; and gold miners and other barnacles would not be robbed by the bankers and other floaters. But the game is too good for the "financier" to overlook. A few years ago old-fashioned Nicaragua was shown how to do the trick by obliging American bankers. Nicaragua was on substantially the same monetary basis as Mexico—pinning its benighted faith upon "sols," or healthy silver dollars like the Mexican peso, worth the face value in silver, at the then current price. The bankers showed the government how to put the country on a "gold basis." The "sols" were all called in, and new silver coins having the same face value, but only half the size (cordobas), in imitation of the Yankee trick, were issued. Carrying the game a bit further than in the United States, no "gold reserve" was established for Nicaragua; but the "prestige" of the American bankers was substituted! It takes a financier to make two dollars grow where one dollar grew before; but, for a quick turn, the second dollar has to be stolen from its original possessor.

Western vs. Eastern Co-operation

MINING and metallurgical engineers who are familiar with technical industries in both the East and the West, and who have had opportunity to observe the attitude of the individual members of the technical staffs of mining, metallurgical, and chemical enterprises, have been impressed by the extreme divergence between Eastern and Western policy. An Eastern technical man who is attached to a large industrial enterprise frequently engages willingly in conversation, with the attitude of one whose sole purpose is to gather as many new ideas as possible from the discussion, but to give practically nothing in return, unless it be the impression that he is full of trade secrets but dare not impart them. This attitude on the part of the Eastern technical man may be the result of a general belief that successful competition with others may be maintained only so long as some secret method or process is carefully guarded.

The Western engineer is likely to gain the impression that the Eastern policy is to build up an industry around one or more trade secrets. In one instance this policy was so carefully followed that the work of one research department was not permitted to be known in another department in the same organization. It is only fair to admit in this connection that in certain instances a chemical or metallurgical patent would be difficult or impossible to defend successfully, even with unlimited financial resources, thanks to our inadequate patent laws. However, as a general policy, the reluctance to co-operate, and the unwillingness to let go of a single idea because the other fellow might develop it, surely have a tendency to stunt the growth of the organization that fosters the practice, and, in a more general way, hamper the development of the industry concerned.

Now turn to the general attitude of the typical, successful Western industrial enterprise, and note how it differs from that of the Eastern company engaged in similar activity. When the Eastern engineer comes West for the first time, he is usually surprised to observe how cordially he is received at a mining or metallurgical plant, large or small. There is none of that secretiveness that characterizes the Easterner's attitude. The willingness and freedom with which his questions are answered, however inquisitive they may be, is a refreshing revelation to him. At first he wonders how an organization could afford to give away all it knows and hope to compete successfully with its industrial rivals. The secret of the phenomenal development of many of the Western mining and metallurgical organizations is that they have no secrets; they are not at the mercy of one or two jealously guarded concealed and hidden methods or processes. New ideas circulate freely in the organization and between the technical men of rival enterprises. The benefit is mutual; everybody gains. New ideas are developed which anybody is welcome to use.

This is better than smothering an idea so that nobody can use it.

Although some exceptions might be cited, it is generally true that co-operation is better than secrecy. Co-operation builds up, whereas secrecy holds down. Exchange of information enlightens; concealment mystifies. Collaboration assists development; opposition impedes it. The liberal and generous exchange of ideas among engineers, metallurgists, and chemists is a powerful factor in the scientific achievements of our nation; whereas the practice of hoarding valuable information, when not justified by necessity, is a millstone retarding advancement.

Another Market Myth

THE *Engineering and Mining Journal's* quotations on copper have frequently, to our knowledge, been accused of being too low—a fact which, if true, would work to the disadvantage of the small miner and to the advantage of the purchasing custom smelter. The implication was collusion—an implication which we have disposed of in a preceding editorial note as far as the McGraw-Hill company is concerned, and which we shall now proceed to do as regards the *Engineering and Mining Journal.*

Please refer to a table originally compiled by the *Engineering and Mining Journal* and reprinted in the "Mines Handbook," edited by Walter Harvey Weed—the last edition (1918) which has appeared—page 212. This table gives for each year of the twelve years 1905-1916 the average price actually realized for copper, as reported by eight of the largest producers representing 40 per cent of the United States production (which is regarded as representative of the whole industry); and compare these with the average of the *Engineering and Mining Journal* quotations for that year. In 1905 the average realized was 15.597c., against the *Engineering and Mining Journal's* quotation of 15.699; in 1906, 19.146, against 19.616; in 1907, 18.043, against 20.661; in 1908, 13.348, against 13.424; in 1909, 13.211, against 13.335; in 1910, 12.96, against 13.039; in 1911, 12.657, against 12.634; in 1912, 15.841, against 16.341; in 1913, 15.222, against 15.269; in 1914, 13.458, against 13.602; in 1915, 17.299, against 17.275; and in 1916, 25.710, against 27.202. It will be noted that in ten out of the twelve years, the *Engineering and Mining Journal's* average copper quotations were higher than the prices actually received by the large producers, by a margin as great as 2½c in 1906 and 1½c. in 1916. For the two other years, *Engineering and Mining Journal* quotations were only very slightly lower—so close, as to be practically a check with the prices realized.

In general, on a rising market, *Engineering and Mining Journal* figures have been higher than those of the speculative market, which is generally quoted by other publications; on a declining market they have been generally lower; for the reason that the speculative market tends to lag behind, and follow in the wake of the movement of the real market.

The Improvement In Mine Hoists

MINING ore to the best advantage is only one of the things which the mining engineer must consider. Another, and a very important subject for cogitation, is how to get his product to the surface. Until seven or eight years ago steam hoists were the rule, and in many districts this type is still popular. Some highly developed equipment of this kind has been installed, as at the Red Jacket shaft of the Calumet & Hecla, in Michigan, where two 2,850 hp. triple-expansion hoists lift a 10-ton load in a vertical shaft almost a mile deep at a speed of about 3,500 ft. per min. The weight of the skip and the total length of the steel cable is nearly as much as the load hoisted.

Electric hoists have, however, rapidly gained in favor, particularly since the introduction of suitable motor equipment. This type is now popular in the Western states and is being considered by the French engineers for the re-equipment of the devastated mines in the north of France. It has been widely installed in the Butte district, the Butte & Superior company having an extremely powerful one, driven by two 1,800 hp. direct-current motors. The world's largest electric hoists, however, according to John Munro, of the Johannesburg Consolidated, are to be installed at the Randfontein Central mine. These hoists, or winders as they are called by British engineers, are to be capable of raising a net load of five tons each, from a depth of 5,000 ft. at 4,000 ft. per minute.

Contemporary Metal Quotations

OUR contemporary the *Mining and Scientific Press* reverts to the old theme of the *Engineering and Mining Journal's* metal quotations, concerning which we are endeavoring to educate our readers. The general tenor of the criticism is that while the *Engineering and Mining Journal's* quotations under Mr. Ingalls had been unspeakably rotten, now that he had relinquished them they would be far worse.

The criticism is unfair in this—that it leaves the readers with the impression that its own quotations are better—and neglects to inform them that, faulty as the *Engineering and Mining Journal's* quotations may be, they are acknowledged the best. Other quotations, including those of the *Mining and Scientific Press,* reflect the minor or speculative market, those of the *Engineering and Mining Journal* the whole market, giving due and proper weight to the minor or speculative market.

Oil Field Practice Which Should Be Obsolete

UNDER the title "What Others Think" on page 545, we are publishing a communication from George A. Laird which brings up a question of considerable importance. The art of drilling for oil has, outside of the employment of rotary tools, advanced but little since the early days of the industry. This speaks well for the efficiency of the equipment which has stood the test of time but is not indicative of a proper amount of progressiveness among those who have made and used the tools.

The average oil field practices of today are anything but shining examples of modernism and efficiency. Cannot some of our mining engineers who have entered the oil fields devote some of their time to making the work of drilling for oil as scientific a practice as metal mining?

We would be glad to hear other opinions on this subject, particularly as to the most fertile fields for investigation and experiment.

WHAT OTHERS THINK

The Chestatee Relief Case

Considerable publicity has been given in recent issues of the *Engineering and Mining Journal*, under "News From Washington," to the attack made on me by the attorney for the claimants in the claim of the Chestatee Pyrites & Chemical Co. for reimbursement under the War-Minerals Relief Act. Charges were made that I either did not or would not understand the claim, and other efforts were made to discredit the accounting work.

Some of the evidence from the other side may be of interest to those who have followed this case in the *Engineering and Mining Journal*. During my examination before the committee on Mines and Mining the attorney for the claimant was told plainly by me that he was misconstruing my report and distorting the figures therein for the purpose of confusing the committee.

Later I was asked to prepare a statement showing what, on the basis of the award recommended by the commission, it was considered the 25,000-ton plant would have cost. I prepared the statement and filed it, together with the accompanying explanatory statement, in which I take occasion to answer some of the charges made against me. There was not much "come-back" on this. Mr. Pratt asked me if in making the statement that the expenditures prior to date of stimulation, bank and cash balances, acounts receivable, etc., should not have been included in the claim, I took into consideration the $200,000 salvage allowed by him. I answered this question by asking him what salvage he had placed upon his bank account, accounts receivable, etc.

The whole idea seemed to be to discredit all the work done on their claim, and the extracts will show how these charges were met. C. B. HOLMES.

Washington, D. C., Feb. 16, 1920.

The statement prepared by Mr. Holmes that he refers to in the above letter is given as follows:

Attached is a statement showing that in view of the award made, the commission considered $386,586.61 would have been the cost of a 25,000-ton enterprise (exclusive of railroad); this statement also being explanatory of the paragraph in my report:

> "The books show that of the amount expended between June 18, 1917 and Nov. 11, 1918, $514,209.67 was for completion of work started previous to June 18, 1917 (*as shown by accounts opened*). The balance $141,251.80 being expended on new work after June 18, 1917."

Paragraph 10 of claim is as follows:

> "The improvements put on said property and chargeable to the United States actually cost claimants $909,925.69. An itemized statement of each improvement and the cost thereof, showing how said total is reached, is attached hereto, marked Exhibit "B," and made part hereof. The expenditures shown in said exhibit as made after Nov. 12, 1918, were made in liquidation of contract obligations incurred prior to said date."

Mr. Trelawny's audit proved the above paragraph to be an incorrect statement of fact, both as to figures and the words "Chargeable to the United States." Claimant had included expenditures made not only prior to the stimulation date but prior to Apr. 6, 1917. The act contemplates paying losses incurred between Apr. 6, 1917, and Nov. 11, 1918; or between the date of stimulation and Nov. 11, 1918.

Paragraph 15 of claim is as follows:

> "Recapitulating claimants' account:
>
> United States to Claimants, Dr.:
>
> | | | |
> |---|---|---|
> | To improvements, machinery, etc., Paragraph 10 above | | $909,925.69 |
> | To cost of financing, Paragraph 12 | | 230,000.00 |
> | Total debts | | $1,139,925.69 |
> | **Credits:** | | |
> | By apparent profits, Paragraph 13 | $25,752.96 | |
> | By salvage, Paragraph 14 | 200,000.00 | 225,752.96 |
> | Net loss due | | $914,172.73" |

This paragraph is the claim. It states that improvements, machinery, etc. (referring to Paragraph 10), cost $909,925.69. Paragraph 10 refers to Exhibit "B" for detail of the above amount.

Exhibit "B" is a correct statement of assets and liabilities. It has been stated that I did not look at the liability side f the statement and did not or would not understand the claim. The amount expended by claimants is reflected by the asset side of the balance sheet. Included in the claimed total expended for improvements, machinery, etc., were the following items: Bank and cash balances, $904.77; accounts receivable, $30,341.91; inventories, $26,481.37; and sinking funds, $24,603.73; total, $81.331.78.

The United States was asked to pay claimants for their bank and cash balance; for $30,000 of money owing to them; for the amount of book (not physical) inventories; and for an erroneously set-up sinking fund of $24,000.

The question involved in this claim is how much more was expended due to Government stimulation than would have been expended had there been none. This it was impossible to determine from the books. In a letter written by the chairman of the commission to claimants they were requested to furnish a statement showing in detail what they would have expended in comparison with what they actually expended; this statement to show sizes, capacity, cost, etc., of machinery contemplated for a 25,000-ton plant and that finally purchased and installed. In answer to this Mr. Pratt furnished a statement which was incorporated in your record at the last hearing. This did not give the detail asked for. That part of it which shows the amount which claimants would have expended, I make no comment on; but that part of it which claims that *all* expenditures made after June 18, 1917, were made at the request of the Government, I took issue with and showed that of the amount included in that statement expended up to Nov. 11, 1918, $514,209.67 had been expended and charged to accounts incorporated on claimants' books prior to June 18, 1917, in completion of work started previous to that date, (*as shown by claimants' books*), the only guide I had from an auditing standpoint, leaving for the commission to decide how much of that amount and the $141,251.80 of new accounts opened after June 18, 1917, were due to Government stimulation.

Referring to p. 59 of claimants' brief and to the testimony given bfore this committee by Mr. Watkins, I quote "By this method Mr. Holmes concluded that something in excess of $514,000 would have been spent had there been no Government request." I drew no such conclusion, although in my testimony quoted by Mr. Watkins it is made to appear so. He asked me the question: "Then, in arriving at that item of $514,000 you have assumed that any account already opened should be properly charged to the period prior to June 18, 1917?" I answered, "Yes, sir," probably not understanding the intent of the question. I intended to imply, as I did in the rest of my answer on that subject, that charges

to all accounts ascertained to have been opened prior to June 18, 1917, were properly inclusive in the $514,000 for the purpose for which it was intended, namely, to show the commission that Mr. Pratt was wrong in stating that *all* expenditures after June 18, 1917, were made at the request of the Government; or in other words, had Mr. Galloway never visited the property the books would not have shown another entry after June 18, 1917.

It is assumed and made to appear by Mr. Watkins, that the paragraph in my report first quoted, taken in connection with my answer to the question of Mr. Watkins above quoted, influenced the commission in its award. This assumption is controverted by the award itself, as had such been the case there would have been none, Mr. Watkins having made me appear as settling the claim by reporting that no expenditures made after June 18, 1917, were due to Government stimulation.

Applied Psychology at Carnegie Hall

The other evening at Carnegie Hall, when Herbert Hoover was presented with the Civic Forum medal of honor[1], there were six speakers. In these times when the engineer is being compared with other types of men, it is interesting on such an occasion to notice how engineers appear in public. There were two engineers among the six speakers, Mr. Hoover and the president of the Institute, Horace Winchell. The four other speakers were lawyers and college presidents: Hon. Charles E. Hughes, Hon. Henry Morgenthau, President Wilbur of Stanford University, and President Aurelia Reinhardt of Mills College. In my opinion the engineers showed up rather well.

Mr. Hughes delivered a conventional and platitudinous talk, taking about ten minutes to say nothing. Mr. Morgenthau, who spoke late, remarked that each of the previous speakers had stolen a bit of his thunder, and what he did say was the old familiar prattle.

President Wilbur read a professorial paper, beginning "There are no recognized standards for judging human accomplishment"—at which everyone went to sleep. President Reinhardt, being a woman, stirred things up and quickened the interest.

Mr. Winchell was bound least of all by deadening tradition, and gave the best address of the evening. He tried some poetry, talked about "headlines and bread-lines," told some interesting facts about Hoover, referred to Abou Ben Adhem, said that "part of Hoover's income at college was derived from conducting a laundry," and generally made an impression.

Hoover, of course, though no orator, was the hero of the occasion, and aroused a feeling of pride for Americanism. His appearance, personality, and modesty touched everyone deeply. Who says engineers have no faculty for public affairs? P. B. MCDONALD.

New York University, Feb. 20, 1920.

Wood as a Metallurgical Fuel

I am connected with a copper mine in a densely wooded region. This mine will probably produce concentrates, carrying from 25 to 30 per cent sulphur, suitable for reverberatory smelting. Can any of your readers inform me: (1) If wood has been or can be successfully used in heating small or large reverberatory furnaces; (2) has producer gas made from wood of fair calorific power ever been used for this purpose, and, if not, what is the prospect of its being so utilized?

Johannesburg, Jan. 3, 1920. E. M. WESTON.

[1]The Civic Forum medal, by the way, has been given to but four men: Edison and Bell (inventors), and Goethals and Hoover (engineers).

Standard Rig Drill Bits

In the matter of modernizing tools used in the drilling of oil wells with the standard rig, little has been accomplished in the last decade, due largely, perhaps, to the fact that contractors are afraid to experiment and companies that own their own rigs do not try to overcome objections offered by drillers working on company time.

The novice at drilling, or the man who, for the first time, has complete charge of a string of tools, many times gets a crooked hole, due to his desire to make speed; on the other hand, the old driller frequently sacrifices speed to safety to an abnormal degree for fear of a crooked hole.

In the *Engineering and Mining Journal* of May 12 and July 28, 1917, "Drill Bits and Drill Steel for Metal Mining," George H. Gilman gives full details of experiments made at the plant of the Sullivan Machinery Co. with various bits for use with the air drill.

The results of a standard rig bit and of a machine drill bit are to all intents and purposes the same; concussion, exerted through the cutting edge, is explained by Gilman: "The following features of design should each receive individual consideration: Shape of the cutting edge; total length of cutting edge; length and area of the reaming edges; and size and shape of clearance grooves for the ejection of rock cuttings." Also: "Uniformity of metal adjacent to the cutting edges: and adaptability of the bit to the available sharpening facilities."

It is undoubtedly out of the question to provide specifications for a bit suitable for all conditions, but a modification of what is practically a "standard" bit would be a vast improvement.

The rotating of the standard rig bit is often left to the drill itself. When jars are used it is more desirable that a rotating motion be imparted to the bit by twisting the rope and when boulders or case hardened seams deflect the blow of the ordinary bull bit, it would seem as if the Gilman double arc bit would be more likely to keep the hole straight.

This bit, which has an increased cutting area of approximately 150 per cent, could be attached to a heavier stem, and as the rapidity of blow is governed entirely by depth of hole and "snap" of the rope, length of stroke and impact of blow could be increased to a measurable extent.

In a communication from Mr. Gilman regarding this style of bit, he says: "It will drill a perfectly round hole, and its crushing action is far superior to that of the ordinary bull bit. It will, of course, be necessary to modify the angle of the cutting edge to suit the requirements, and I should be inclined to experiment at the outset with a cutting edge angle as great as 140 deg."

The drill sharpened in the field is usually of no definite angle; it is measured by eye, at the option of the driller or tool dresser. A set of swages could easily be prepared to form this double arc, and it would seem as if this style of bit would prove far more efficacious than one with a single cutting edge.

Mr. Gilman has done so much to advance the art of tool dressing for rock drills that he might possibly offer some suggestions which would be of benefit to the oil-well driller.

GEORGE A. LAIRD.

New York, Feb. 18, 1920.

By The Way

The Franking Privilege

We have received a copy of the speech of Senator Reed of Missouri delivered in the Senate Jan. 24, attacking Mr. Hoover. In acknowledging the courtesy of the sender we beg to say that we trust some day the burdening of the Senate's time, of the Government Printing Office, and of the United States mails under the franking privilege with crude political propaganda of this sort will be a punishable offence.

Schwab Optimistic

Charles M. Schwab had his fifty-eighth birthday on Feb. 18. As if in an attempt to commemorate this event, a New York paper published a startling account of how four inventors, two of them Belgians and the others French, had after six months of hard labor discovered a way of revolutionizing the steel industry. They had devised a process, according to the paper, by which alloy steels could be made at roughly the same cost as ordinary bessemer steel, with the sole added expense of the alloys used. The article referred to pointed out the great advantages that France and the world in general would derive from the new method, and, in short, was so written as to make a more optimistic man than Mr. Schwab feel bad on his fifty-eighth birthday, if he happened to be vitally interested in America's premiership in the steel world and at the same time was having a fifty-eighth birthday.

But Mr. Schwab refused to be downhearted. "Why," said he to a *Sun* reporter, "the new process amounts to nothing more than we have been doing in this country for years. They say the Frenchmen and Belgians have invented a secret process by which they can manufacture nickel, chrome and similar steels at a cost amounting to not more than a high-grade bessemer steel plus the cost of the alloy. And that is just what has been going on in the mills in this country right along, except that we don't make such a secret about it. They don't know anything over there that we don't know —yet."

King's Ascent of Mount Tyndall

"We did not dare climb one above another, according to our ordinary mode," wrote Clarence King in describing his ascent of Mount Tyndall, in the Sierra Nevadas, in the '60's, "but kept about an equal level, a hundred feet apart, lest, dislodging the blocks, one should hurl them down upon the other.

"We climbed up smooth faces of granite, clinging simply by the cracks and protruding crystals of feldspar, and then hewed steps up fearfully steep slopes of ice, zigzagging to the right and left, to avoid the flying boulders. When midway up this slope we reached a place where the granite rose in perfectly smooth bluffs on either side of a gorge—a narrow cut or walled way leading up to the flat summit of the cliff. This we scaled by cutting ice steps, only to find ourselves fronted again by a still higher wall. Ice sloped from its front at too steep an angle for us to follow, but had melted in contact with it, leaving a space three feet wide between the ice and the rock. We entered this crevice and climbed along its bottom, with a wall of rock rising a hundred feet above us on one side, and a thirty-foot face of ice on the other, through which light of an intense cobalt blue penetrated.

"Reaching the upper end, we had to cut our footsteps upon the ice again, and, having braced our backs against the granite, climbed up to the surface. We were now in a dangerous position; to fall into the crevice upon one side was to be wedged to death between rock and ice; to make a slip was to be shot down five hundred feet, and then hurled over the brink of a precipice. In the friendly seat which this wedge gave me, I stopped to take wet and dry observations with the thermometer, this being an absolute preventive of a scare—and to enjoy the view.

"The wall of our mountain sunk abruptly to the left, opening for the first time an outlook to the eastward. Deep—it seemed almost vertically—beneath us we could see the blue water of Owen's Lake, ten thousand feet down. The summit peaks to the north were piled in Titanic confusion, their ridges overhanging the eastern slope with terrible abruptness. Clustered upon the shelves and plateaus below were several frozen lakes, and in all directions swept magnificent fields of snow. The summit was now not over five hundred feet distant, and we started on again with the exhilarating hope of success.

"But if nature had intended to secure the summit from all assailants, she could not have planned her defenses better; for the smooth granite wall which rose above the snow-slope continued, apparently, quite around the peak, and we looked in great anxiety to see if there was not one place where it might be climbed. It was all blank except in one spot; quite near us the snow bridged across the crevice and rose in a long point to the summit of the wall—a great icicle column frozen in a niche of the bluff—its base about ten feet wide, narrowing to two feet at the top. We climbed to the base of this spire of ice, and, with utmost care, began to cut our stairway. The material was an exceedingly compacted snow, passing into clear ice as it neared the rock. We climbed the first half of it with comparative ease; after that it was almost vertical, and so thin that we did not dare cut footsteps deep enough to make them absolutely safe. There was a constant dread lest our ladder should break off, and we be thrown either down the snow-slope or into the bottom of the crevasse.

"At last, in order to prevent myself from falling over backward, I was obliged to thrust my hand into the crack between the ice and the wall, and the spire became so narrow that I could do this on both sides, so that the climb was made as upon a tree, cutting mere toe-holes, and embracing the whole column of ice in my arms. At last I reached the top, and, with the greatest caution, wormed my body over the brink, and, rolling out upon the smooth surface of the granite, looked over and watched Cotter make his climb. He came steadily up with no sense of nervousness, until he got to the narrow part of the ice, and here he stopped and looked up with a forlorn face to me; but as he climbed up over the edge, the broad smile came back to his face, and he asked me if it had occurred to me that we had, by and by, to go down again.

"We had now an easy slope to the summit, and hurried up over rocks and ice, reaching the crest at exactly 12 o'clock. I rang my hammer upon the topmost rock; we grasped hands, and I reverently named the grand peak Mount Tyndall."

Valuation of Mines for Taxation

Retroactive Features of the Excess-Profits Law as Now Administered—Economic Fallacy of the Statute as Applied to the Taxation of Mines—Definition of "Assets" Now Subject to Caprice of Assessors

BY J. R. FINLAY
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Written exclusively for *Engineering and Mining Journal*

THE perplexities due to the income-tax and excess-profits tax laws have already been thrashed out and expounded in a hundred different ways; and out of all the discussions there seems to come only one conclusion: the law is based on an economic fallacy, and the practical question is how to escape from the consequences of a false start. This does not seem to be the subject on which I am asked to write, which is merely valuation for taxation, but here again we shall find we are swinging around in a circle. Taxation is fixed by law, and that law attempts to prescribe the value which is to be taxed, so that in discussing the valuation we shall really be discussing, or interpreting, the law, and in half a sentence we are back where we started from.

The manner in which the valuation of a property is described under the excess-profits tax law, as expounded by Mr. Talbert, chairman of the Tax Advisory Board of the Commissioner of Internal Revenue, is that the capital represented in that property is merely the *contributions made by the stockholders* to the company that owns it, at the time when the enterprise was started; if one company or ownership on the same property is dissolved or terminated, and a new one begins, then the price paid or the contribution made for the new company rules. The fact that the property is the same does not make any difference: the controlling thing is, whether its ownership has changed or not. A valuable property may have been started in the hazy past by prospectors working with their hands—their capital might have been called nothing, and it would stay nothing unless they sold out or started a new company, in which event, of course, the value might be placed at any figure, and that value would then be invested capital. But the property is the same; these sales or rearrangements of ownership add nothing to it and take nothing from it. Under this law, thus interpreted, we are not to value the property, but the changes of ownership.

RATE OF TAXATION UNDER EXCESS-PROFITS TAX LAW

Now, the rate of taxation under the excess-profits tax law is based entirely upon the amount of the "invested capital." Suppose you have a mine yielding $1,000,000 a year, excess of receipts over expenditures—what are you to pay in excess-profits tax? Why, if your "invested capital" is $1,000,000, you pay about $600,000; if it is $10,000,000, you pay about $50,000 and so on with changes ad infinitum. In the first case, the stockholders get a dividend of $400,000; in the second, of $950,000. I have not at hand the precise wording of the law and the regulations of the Treasury Department, but the differences shown are a correct exhibit of the state of facts. Let us add that the mine making these supposed earnings, and facing in such a manner the vicissitudes of taxation, was, up to the summer of 1917, running with all obligations under the law satisfied. Thereafter, like lightning out of the cloud of war, comes a new situation. The owners now find that henceforth their right to the property is to be subject not to the laws of trade and industry, but has become the football of such caprice and chance as may have occurred in the past. We have been led to believe that under the Constitution of the United States we were not to have retroactive laws. It is rather violent to be confronted with a situation which makes the value of your property subject, not to a retroactive law merely, but to a law which embodies and sets up, as a test, *retroactive caprice*.

In the first sentence of this article, I called the theory of this law an economic fallacy. That, I believe, is the truth, and there is no use qualifying it by adjectives. So long as this fallacy is the starting point for taxation, it is also bound to be the starting point of valuation. Is it not self-evident that it makes a lot of difference whether the earnings of a property are to be reduced by 60 per cent or by nothing at all? This, of course, applies to the situation of the private owner and the valuation for private purposes. When we come to discuss the question of valuation for public purposes, that is, for the underlying question of what the taxes are to be—that, we see, is not a question to which any engineering or financial theory can be applied. We have already gone to the end of the matter when we discern that the principle which has been set up above all other principles, and which has most to do with valuations either for public or private purposes, has nothing to do with the merits of the property, but is a mere inquiry into the caprices of the past owners in regard to the amount of nominal capital.

It is hard to be interested in a mere process of iteration, although it seems to me this point ought to be reiterated until it reaches enough people to cause a change in the law. It is true, in all probability at least, that the mining industry is just as well able to live under this law as any other industry. There are no changes in the principles of valuation, except those that have been introduced by this law. It would be merely a barren complaint to say that the principle of this law is a false one unless one is prepared to offer a correct one.

CAPITAL IS THE PRESENT VALUE OF ASSETS

Such a principle is that capital, call it "invested" capital to conform to the wording of the law, is the present value of assets. The way to apply this principle should be the way of the common law.

It is impossible in such a communication as this to go into the general subject of how valuations should be worked out under the present law, or under any law that might be substituted for it, but as I have been asked to contribute my views on the subject, I may point out that I have tried to discuss it much more fully than is here possible, dwelling on such changes as have been brought about by the war, particularly in the matter of higher or different prices, in a new edition of my book on the "Cost of Mining," which is now in press.

Graphite in Quebec, Canada

Mineralogically Similar but Geologically Distinct From Alabama Deposits—Dry Concentration Superseded by Flotation, With Much Improved Results—Present Product Compares Favorably With Ceylon Article—Future Prospects of Industry Attractive

BY H. P. H. BRUMELL
Buckingham, Quebec
Written exclusively for *Engineering and Mining Journal*

AFTER a period of inactivity, the graphite industry in Quebec shows marked signs of recrudescence, more especially in the Buckingham district, wherein, previous to the war, it had reached a position of considerable importance. Crystalline, or flake, graphite is widespread in its occurrence in that part of the province occupied by the Grenville or upper part of the Laurentian series of rocks developed so extentively in the counties of Argenteuil, Labelle, Wright, and Pontiac, lying to the north of the city of Ottawa and the Ottawa River. Throughout these rocks it occurs in massive form, or in veins, and disseminated, and it is from ores of the latter type that the greatest production has been and is expected to be obtained. The massive, or vein, deposits are found more especially in the comparatively large limestone areas of Argenteuil County, where they have not yet been found to be profitable, but in the schists and gneisses of Labelle County a great deal of work has been done and a considerable production obtained.

GEOLOGY OF THE DISTRICT

For the purpose of this paper regard will be had only to the deposits of Labelle County, wherein the three townships of Templeton, Buckingham, and Lochaber are situated, in the order named, from west to east, immediately along the north shore of the Ottawa River. The valley deposits of the river overlie the crystalline rocks for a considerable distance back from the river, and it is near the eastern boundary of Templeton, in the fourth, fifth, and sixth ranges, that the graphitic gneisses first outcrop. From here they extend in a northeasterly direction into Buckingham in a band including the fourth to the eighth ranges. There is then a gradual change in direction, the band traversing the township in a more easterly direction to near its eastern boundary, where it again turns to the northeast, and so through the northwest corner of Lochaber Township into the Township of Mulgrave, where it is cut off by a large granitic mass. With the exception of isolated masses of gabbro and other eruptive rocks having graphitic zones or carrying included graphite-bearing masses, the rocks of the band consist of gneisses and, to a small extent, limestones, the latter in the form of lenses and rarely of great extent. The entire system is cut by numerous dikes of gabbro, diorite, and pegmatite, and in the neighborhood of the greatest eruptive disturbance is found the greatest enrichment of graphite.

ALABAMA AND QUEBEC FIELDS MOST IMPORTANT OF NORTH AMERICA

Of the graphite fields of North America the most important are those of Alabama and Quebec, wherein, although the graphite in each is crystalline, the modes of occurrence and gangues are very different, and as the Alabama ore is so well known it may not be amiss to quote from my recent paper "Graphite in Quebec and Alabama—a Comparison," to describe the Labelle County ores:

"In comparing the two fields and the graphitic deposits therein it will be noted that in Quebec there is an enrichment in graphite of the beds at or near the contact with the eruptives, while in Alabama there is an increase of muscovite without any appreciable change in the graphite content. The gangue, in Alabama, consists almost entirely of a very friable quartz, with a small quantity of white fibrous mineral, probably sillimanite, and occasionally mica, either biotite or muscovite, cyanite and tourmaline. The gangue of most of the ores of the Buckingham district consists only in part of quartz, the other common minerals being orthoclase, pyroxene, hornblende, sillimanite, and occasionally mica (usually biotite), zircon, tourmaline, chondrodite and pyrite.

"The ore at present mined in Alabama consists almost entirely of the weathered portion of the beds, the weathering usually extending down to the water level in the valleys between the hills on which, almost without exception, the deposits are found, the valley bottoms being usually filled with soil washed down with other detrital matter from the higher ground. This weathered ore is very soft, in most instances breaking down, on quarrying, like sand, and the whole is easily milled, the quartz being very friable. In contradistinction to the foregoing, the ores of Buckingham are usually hard and tough, except for a very small amount of weathered material at the surface. The quartz in many instances, more especially when forming part of a gabbro which at times constitutes the gangue, is almost carnelian and very hard, while the hornblende tends to toughen the ore. . . . The Buckingham graphite is a larger and heavier flake than that of Alabama, and it is probably due to this superiority in weight for bulk that it is more in favor with the crucible manufacturers and has usually commanded a higher price."

DRY METHOD OF CONCENTRATION FORMERLY USED

Until recently, most of the research work in connection with the refining of the mineral on this continent was done in Quebec, where the highest degree of extraction had been obtained, the most successful plants being those using an entirely dry method, concentration being made by means of pneumatic tables. To follow the evolution of the industry in the province until 1918 it is necessary only briefly to describe the various methods used by the North American Graphite Co., the Anglo-Canadian Graphite Syndicate, the Buckingham Graphite Co., the Dominion Graphite Co., and the Plumbago Syndicate, all the work of these companies being done on three mills owned or operated by them in the order named.

The original North American mill was equipped with crusher, stamps, buddles, drier, buhr-stones, and reels. The finished stocks were of high grade, assaying: Coarse flake, 92-95 per cent; fine flake, 90-92 per cent, and dust 60-72 per cent. The method was crude, and only about 30 per cent of the graphite content was saved. In 1901 the Brumell hydraulic separator was patented and introduced, and was probably the pioneer of all flotation machines; its operation has properly been styled "skin-flotation." With this machine a concentrate assaying about 55 per cent was obtained, with an extraction of about 50 per cent of the graphite in the ore. The next improvement of note was the Hooper pneumatic concentrator, the first successful pneumatic machine on the market. When the Hooper machines were introduced it was found necessary to classify closely, and this was done by means of the so-called Brumell barrel machine (which was used as a deduster), and Columbian screens. The tailings from the Hooper machines were then fed over Brumell separators, with marked improvement in the total recovery.

The concentrate assayed about 60 per cent, and the recovery reached approximately 70 per cent. This method was used at the mills of the Anglo-Canadian Graphite Syndicate, successors to the North American Graphite Co., and the Buckingham Graphite Co. In 1908, at the mill of the Buckingham Graphite Co., were introduced the Sutton, Steele & Steele dry-concentrating tables, when the mill was made an all-dry one, and much better concentrates were obtained. They averaged, during a period of twelve months, 79.2 per cent, with a recovery of about 78 per cent. In 1915 the mill of the Dominion Graphite Co. was taken over by Plumbago Syndicate, and a complete dry-table plant installed, consisting of a screenless sizer and tables. As the result of operations here, a recovery of merchantable graphite of 85 per cent was made, the average graphite content of all grades being 63.7 per cent, as follows: GR (coarse flake), 91.3 per cent; GE (fine flake), 70.0 per cent; P12 (dust), 46.0 per cent; and the grades were obtained in the following proportions: GR, 35.5 per cent of the whole output; GE, 21.3 per cent; and P12, 43.2 per cent.

The term "merchantable graphite" is used to describe the finished product as it goes to market, and does not consist entirely of graphite, but of finished products assaying in purity from 40 per cent, for low grades, to any percentage obtained over 90 per cent; thus a recovery of merchantable graphite of apparently more graphite than is contained in the ore is often made.

Flotation Only Recently Introduced

The introduction of oil flotation as a means of concentration was made, in 1918, at the mill of Plumbago Syndicate, when four Callow cells were installed. The trials having proved successful, all arrangements were completed, and it was the intention to operate continuously, when, unfortunately, the mill was completely destroyed by fire in October of that year. During the same year the mill of the late Peerless Graphite Co. was purchased by the Consolidated Graphite Mining & Milling Co., of Nashville, Tenn., and the work of remodeling it was begun at once. The original installation was dry throughout, the system of concentration consisting of the scalping off of the freed flake after grinding the ore with smooth polishing, or flour-mill, rolls. The new installation, recently completed, makes the mill a wet one, concentration being made in Callow cells, the plant consisting of a double Blake crusher, heavy-duty rolls, Hardinge mill, Dorr classifier, Callow double-roughing cells and cleaning cells, Wilfley tables, revolving drier, polishing rolls, mill-stones and the necessary revolving screens and graders. This company is now operating successfully, making a recovery of approximately 90 per cent of the graphite content of the ore. Flotation has clearly demonstrated its superiority. The extraction is higher and the percentage of recovery of No. 1, or the most valuable stock, is greater than formerly, and all stocks are higher in carbon. The stocks now being produced by the Consolidated company are probably of the highest grade produced on the continent, No. 1 assaying 94.7 per cent, and Nos. 2 and 3, 90.7 per cent and 86.1 per cent, respectively. It is only natural that stocks of such purity should find a ready market. A second local company, the Quebec Graphite Co., whose mill has been idle for some time, is remodeling its plant, which consisted of a jaw crusher, Krupp ball mill, and Ferraris tables, replacing the two latter by a Hardinge mill and Callow cells, though all the details of the new arrangement have not been given out.

It is stated that the old North American mill, which has long been idle, will be remodelled in a way similar to that adopted by the Consolidated company, though a Marcy mill will be used instead of the Hardinge. It is also reported that a New York syndicate has become interested in several properties in the district and is considering the erection of a mill or of several mills wherein the Callow system will be installed.

Alabama and Quebec Deposits Geologically Different

In comparing the graphites of Alabama and Quebec it will be found that they are only mineralogically similar, both being crypto-crystalline and affording what is known to the trade as "flake graphite." Geologically, they are far apart, the ore of Buckingham being of Archæan and that of Alabama of Carboniferous age. Genetically, the Buckingham graphite is inorganic, or elemental, whereas that of Alabama is organic, being the result of the alteration of coaly or carbonaceous material contained in the sedimentary sandstones prior to their metamorphism. In the matter of graphite content a marked divergence exists, as is evidenced by the following extracts from official reports on the two districts. George D. Dub, "Preparation of Crucible Graphite," U. S. Bureau of Mines, 1918, says: "The ore in Alabama averages about 2½ per cent graphitic carbon." Fritz Cirkel, "Graphite," Mines Branch, Canada, 1907, says: "The percentage of graphite generally met with in disseminated ores, from which so far the bulk of the Canadian graphite has been extracted, may be put down from 7 to 30 per cent."

For the purpose of further comparison the following, relating to Pennsylvania and New York State, are quoted: B. L. Miller, "Graphite Deposits of Pennsylvania," 1912, says: "It seems probable that the graphite content of the rock varies from 3 to 5 per cent." H. G. Ferguson, "Graphite in 1918," writing on New York in "Mineral Resources of the United States, 1918," says: "The normal quartz schist carries 5 to 7 per cent of graphite. This is the ore mined at present."

A marked physical difference between the graphites of Alabama and Buckingham lies in their specific gravity. According to F. G. Moses, U. S. Bureau of Mines, the

average specific gravity of Alabama graphite is 2.1, whereas, according to G. C. Hoffmann, Geological Survey of Canada, 1876, that of Buckingham is 2.268, that of Ceylon being 2.259. The Buckingham product is a coarser, bolder, and, by reason of its greater specific gravity, heavier flake than that of Alabama. This question of weight for bulk is a serious one when considering the matter of crucible stock, and it is largely due to this quality that the product of Ceylon has hitherto been held in such esteem by the crucible makers. From the following list (Fritz Cirkel, "Graphite") of well-known flake graphites, it will be seen that the Buckingham product is, on the score of weight for bulk, preferable to that of Ceylon, and its heat-resisting quality is practically equal, the ratio being 1.004 for Ceylon and 1.007 for Buckingham, the slight superiority being in favor of Ceylon.

TABLE I. SPECIFIC GRAVITY AND REFRACTORY VALUES

	Specific Gravity	Refractory Value
Madagascar	2.4085	.....
Cumberland, England	2.3455	.....
Passau, Bavaria	2.3032	.....
Buckingham, Canada	2.2685	1.007
Ticonderoga, U. S.	2.2623	1.007
Ceylon	2.2591	1.004

Complete analysis of the coarse flake, or first quality, from the Buckingham district and the principal United States districts and Ceylon are as follows: (The Buckingham product is that of the late Anglo-Canadian Graphite Syndicate, the assay being made by A. E. Tucker, Birmingham, England. The others were made at the Pittsburgh station of the U. S. Bureau of Mines).

TABLE II. ANALYSES OF COARSE FLAKE FROM VARIOUS DISTRICTS

	Buckingham	Alabama	New York	Pennsylvania	Ceylon
Volatile C	....	1.80	1.30	1.53	1.68
Graphite C	93.87	87.03	88.97	88.80	85.06
SiO_2	3.61	5.85	4.34	5.24	7.81
Al_2O_3	1.33	4.17	2.40	2.05	2.82
FeO	1.35	0.38	1.08	1.75	1.61
TiO_2	....	0.15	0.38	0.05	0.13
CaO	0.44	....	0.07	....	0.19
MgO	0.44	0.13	0.76	0.09	0.21
K_2O	0.44	0.21	0.55	0.08	0.25
Na_2O	0.44	0.04	0.12	0.12	0.11
SO_3	....	0.04	....	0.21	0.005
P_2O_5	....	0.02	0.02	0.05	0.05
MnO	....	....	....	0.07	0.04
ZnO	....	....	....	....	0.03

There are large deposits, in the Buckingham district, of relatively high percentage disseminated ores, the following list being a few of the better known:

TABLE III. GRADE OF BUCKINGHAM DEPOSITS

		Per Cent
Dominion Graphite Co	Line pit	(a) 7.28
Dominion Graphite Co	Hogg pit	12.80
Dominion Graphite Co	Swamp pit	11.90
Buckingham Graphite Co	Mill pit	(b) 9.97
Buckingham Graphite Co	Charette pit	12.60
Buckingham Graphite Co	Creek pit	18.50
Buckingham Graphite Co	Swamp pit	18.40
Buckingham Graphite Co	Big pit	27.50
Brumell & Hammond	Walker pits	(c) 11.10
Buckingham Township	Lot 22, range VI	22.3
Buckingham Township	Lot 23, range VI	30.5
Buckingham Township	Lot 22, range VII	28.1
Buckingham Township	Lot 28, range VIII	23.8
Buckingham Township	Lot 15, range IX	21.0
Buckingham Township	Lot 12, range X	13.7
Lochaber Township	Lot 11, range IX	17.2
Lochaber Township	Lot 6, range IX	13.0
Lochaber Township	Lot 21, range XI	18.3
Lochaber Township	Lot 27, range XI	23.5
Lochaber Township	Lot 23, range XII	14.1

(a) Average for two years; (b) six months; (c) four years.

According to the reports of the Geological Survey there are numerous other properties containing large deposits of ore, carrying from 10 to as high as 25 per cent of graphite.

In the matter of size of particles, the Buckingham district material may claim a considerable advantage over other North American fields, more especially over its greatest competitor, Alabama, as is evidenced by the following comparisons of screen tests of coarse-flake stocks. The Buckingham stock is "GR," produced by the late Dominion Graphite Co., whereas the Alabama stock is the average of three typical mills operating the Ashland, Minerals Separation, and Simplex types of washers:

TABLE IV. SCREEN TESTS OF COARSE FLAKE STOCKS

		Buckingham, "GR."		Alabama, No. 1.	
	Screen Mesh	Separate per Cent	Cumulative, per Cent	Separate, per Cent	Cumulative per Cent
On	30	4	4	..	..
On	40	16	20	11	11
On	50	18	38	..	..
On	60	30	68	37	48
On	70	27	95	..	..
On	80	3	98	30	78
On	90	2	100	..	..
On	100	..	..	15	93
Through	100	..	..	7	100

The "GR" stock named above was made by the old dry method of reducing and concentrating by rolls and the scalping off of the freed flake, a method most destructive of the soft graphite particle.

As showing the possibilities of some of the higher percentage ores of the district, the following results of two large tonnage tests, made with Callow cells on local ores, are given:

No. 1 ore assayed 12.8 per cent, recovery in concentrates 14.2 per cent, tailings assayed 0.46 per cent. Concentrate, plus-80 mesh, assayed 91.50 per cent, recovery 9.0 per cent; concentrates through 80 mesh assayed 74.28 per cent, recovery 5.2 per cent.

No. 2 ore assayed 18.3 per cent, recovery in concentrates 22.7 per cent. Concentrate, plus-80 mesh, assayed 92.3 per cent, recovery 10.7 per cent; concentrates through 80, plus 150, assayed 76.3 per cent, recovery 2.0 per cent; concentrates through 150 mesh assayed 50.2 per cent, recovery 10.0 per cent.

In conclusion, I expect marked activity in the graphite industry of Buckingham during 1920. The solution of the problem of separation, which oil-flotation seems to have accomplished, clears the way for a business with great possibilities. In the past, high-percentage stocks were obtained only by the grinding down, in the finishing plants, of the graphite contained in the low-percentage concentrates then being made, but with proper ball-mill practice, more especially with peripheral-discharge mills, the size of particle will more nearly be maintained, and with oil-flotation, and the further treatment on wet tables, the resultant finished stock will be larger.

Experiments and test runs have proved that it is commercially possible to produce stocks from Buckingham ores assaying over 90 per cent of graphite, the screen test of which shows that over 50 per cent will remain on 50 mesh and over 15 per cent on 30 mesh, thus bringing the crucible stock to a parity with the product prepared from the Ceylon material, with which it is equal in every other regard.

Lead pencils, as is generally known, are not made of lead but of graphite. The percentage of carbon, says C. A. Mitchell in *Journ. Soc. Chem. Ind.* for Nov. 29, 1919, varies from 65 per cent in the very soft black leads to 16 per cent in the 6H Koh-i-Noor. Most of the remainder is made up of silicates, and the whole must be ground exceedingly fine at least eight days to secure best results. Too rapid drying causes the inner portion of the lead to become porous, and the lead will then break easily. Four to six months are required for making the best pencils, fifty or sixty separate operations being involved. Natural graphite is used, the artificial variety being too expensive.

South Africa—Then and Now

Railways Have Solved Many of the Difficulties of the Earlier Days, but Other Troubles Are Still Encountered— The Native Labor Problem and Obstacles Arising From Different Races

BY POLHEMUS LYON,
Written exclusively for *Engineering and Mining Journal*

THE day of my first arrival at Cape Town, in 1891, I asked if a daily paper was published there, which query shows how the city appeared at that time to an American business traveler. As a matter of fact, both a morning and evening paper were published, and a Dutch paper three days a week (still continued), which is often enough, for the Dutch are not great readers, and the paper has never had a large circulation.

Previous to 1891, and until 1894-96, the railways starting from four or five ports were not permitted to enter the Transvaal (South African Republic). Paul Kruger used to say that the railways ate no fodder, and, besides, would put a great number of his people out of business, for the Dutch teamsters found trekking for the miners and merchants very attractive. As to fodder, Kruger did not realize that the great coal fields in his dominion, hardly touched at that date, were capable of yielding more than a million dollars a year, and now, for some time, have been exporting a million tons or more of these "black diamonds," besides supplying greatly increased domestic demands.

A few years earlier, the railways had, it is true, reached the Kimberley diamond fields, 650 miles from Cape Town, but Kimberley was built of material that had been trekked by ox team from railhead 500 miles away. The teams consisted of seven to ten yoke of oxen and traveled at night, grazing during the day. These treks lasted several weeks, as the oxen never traveled more than fifteen miles a day over the mountains, fording dry and occasionally flood streams.

Kimberley, until the beginning of this century, was a lively mining camp, but Johannesburg attracted a much larger white population, and, though starting fifteen years later, early assumed a more permanent character, many good two- and three-story buildings having been erected before the coming of the railway.

No thoughtful man with a knowledge of the country could be otherwise than deeply impressed by the stupendous task of bringing all supplies, building, mining, and merchandising, from railhead to Johannesburg. The distance was perhaps 300 miles at first and 100 later, and the Golden City is 6,000 ft. above sea level. Mountains had to be climbed, valleys crossed, and rivers forded with a load of three tons or more to each ox team. All who roamed over South Africa twenty-five years ago and more have interesting tales to unfold of coaching from the coast or railhead to either mining center, the coaches often making virtually non-stop runs of four hundred miles or thereabouts.

I was frequently told that, prior to 1891, Olive Shreiner's "Story of a South African Farm" gave a true picture of inland life. Sheep farming was the only industry, so little grain (corn) being raised for market as to be negligible. In fact, from 1891 to 1900, and even later, great quantities of corn were imported both from North and South America. Now, and for some years, about 200,000 tons a year has been exported to Europe.

Mining woke up South Africa. Diamonds were discovered in 1867-1870, and gave a shock to the somnolent, easy-going people, but when gold was discovered about 1887 this shock soon became something like an earth quake, entirely metamorphosing the lives of the people, both white and black. In spite of the Dutch, who held the reins of government in the Transvaal, where all the gold fields were, the rush from all over the world grew fast and furious. Many of the Kimberley miners moved up 250 miles to the new fields. All the leaders went, Rhodes, Barnato, Robinson, Rudd, and numerous others. The capital they had acquired at Kimberley availed them well at Johannesburg, and they early got control of the gold mines, the richest in the world. About 40 per cent of the world's gold output is mined within thirty miles of the Johannesburg City Hall.

The American mining engineer was in great demand. His education, experience and resourcefulness during all those years of development placed him in the forefront, salaries ranging all the way from $15,000 to $50,000, with extras, for group mine managers and consulting engineers. And how they did live! Their Sunday night suppers, with delicacies ordered from London for the specific occasion, were something better than that city of 100,000 white people had ever dreamed of. They were It! These engineers deserved and needed the relaxation. What with Cornish miners, native helpers of all sorts and barbarian nationalities, frequent factional fights, miners phthisis, government taxes and restrictions, theirs was no bed of roses—a decided contrast to a Western American mine manager who can obtain fresh supplies in a few days.

The gold mines of the Transvaal employ about 20,000 white skilled labor and about 200,000 natives. To get these latter the mining companies employ labor recruiting agents, white men, facetiously called slave-drivers, with liberal salaries, who travel through the native territories in South and East Africa, and anywhere else, endeavoring to win the natives to work. Some job! The several groups of mines have now found it necessary to eliminate competition for these laborers, and carry on this recruiting work through one native labor agency controlled jointly. Never has the supply exceeded the demand.

The mining companies have built good barracks within a compound or stockade inclosing possibly five acres or more, have built and equipped good native hospitals, furnished chapels or preaching places, and done what they could to make life much more comfortable from the civilized point of view than the native ever obtained in his home kraal. Besides this, the new recruit receives about fifteen dollars per month and board as a beginning, with advancement as he learns to do better work so far as he is permitted. I say "permitted" because the white miner, be he Cornishman or local Dutchman, objects strenuously to the natives being given skilled work, and although some of them handle the Ingersoll

drill and do a little semi-skilled labor, it is in a very limited way and under direct control of the white miner.

Much of the native miner's wages is now paid to his family or headman, but at the expiration of twelve months he frequently returns to his tribe, able to live in idleness many years with his accumulated wealth, which perhaps buys another wife. Thus the work of the recruiting agent is never ended.

Many of the gold mines of the Transvaal have grown to be unprofitable and are no longer being worked. Their number is increasing every year, but new mines, chiefly on what is termed the East Rand, are developing.

It has been asserted by the mining companies that it costs 4 per cent to send bullion from the Transvaal to London, which doubtless includes all costs. On account of its request for more gold, and in view of the greatly increased cost of mining, an earnest effort has been made to get the British government to absorb all or part of this transfer charge, but this effort has proved futile.

Just what will be the future of gold mining is difficult to forecast. All costs, government taxation and restrictions have greatly increased, but the price of an ounce of gold remains at the old standard. More mines may be forced to close down, and smaller dividends surely will be paid. The average dividend today is not large.

Suggestions for Separating Colloids From Flotation Feed

Feed Water Must Be Kept Clean for Good Results—Use of Large Thickener or Proper Classifier Advocated

BY BENNETT R. BATES

JACKSON A. PEARCE has brought out in an article published in 1918[1] the suggestion that enough importance has not been given to colloids in flotation. To this I agree, especially in the treatment of silver-gold ores.

About two years ago I had much difficulty in treating a silver-gold ore at Guanajuato, Mexico, by flotation.[2] One of the main sources of trouble, as previously mentioned, was dirty water. A second, as brought out by Mr. Pearce, was no doubt due to the current colloids in the ore itself. To a limited extent the flotation machine used, the "Hynes Disk," carried out the principle of Mr. Pearce's new machine. That is, the discharge from the machine was taken off at the top, thus enabling the colloidal material to pass through the machine quicker than the granular part.

The best recovery of silver ever obtained in actual operation on this Guanajuato ore during my connection with the property during the years 1917 and 1918 was made on the first day. The number of samples taken at this time eliminated any possibility of a mistake having been made in the sampling or assaying. The recovery of silver was 12 per cent above that of the third day and fully 15 per cent above the average for the last half of 1918. The results on the first day were satisfactory. The work checked that of the laboratory very closely, but, try as one might, the first day's run was never duplicated, although it was decided that the principal trouble was due to the colloids in the flotation circuit.

During the first day's operation the mill water was crystal clear. The flotation feed was drawn from a freshly filled Dorr thickener. Unquestionably, in starting to fill the thickener, clean granular material settled to the bottom first, and during the first day the flotation department received only this clean, granular pulp. By the third day, equilibrium had been established in the thickener; that is, the light colloidal material leaving the thickener approximately equaled that entering. By the third day, also, the supply of crystal-clear water had been exhausted, and milling was done with a mixture of dirty creek water, dirty mine water, and a murky overflow from the thickeners.

Lime was detrimental to the successful treatment of the ore by flotation. Without its use the thickening capacity was not sufficient to handle the tonnage. It was found that whenever the thickener overflow became extremely dirty, and this dirty water was used in milling, the silver recovery would drop to as low as 30 per cent. It was possible to predict the day's results, to a certain degree of accuracy, by noting the color of the mill water.

Due to the uncertainty of continuing with flotation, or of returning to cyanidation, many schemes were tried to insure a supply of clear water for the mill without going to the expense of additional equipment. Nothing that was tried proved wholly successful. To have overcome thoroughly the difficulties, it would have been necessary first to secure a clean water supply for the mill; second, to remove the current colloidal material from the pulp, treating the two products separately. It is possible that, by the addition of certain electrolytes, the colloidal material could have been successfully floated. The tonnage of this product would have been so small that the cost of electrolytes might not have been a serious factor. Recoveries were improved by milling in a small amount of lime, insuring a clear thickener overflow. Soda-ash was then added just before the flotation machines, to precipitate the lime as calcium carbonate, the soda forming the hydrate. Three pounds of soda-ash per ton, at ten cents per pound, were required to obtain this result. It is possible that this treatment would have been successful with the colloidal material treated separately. Thirty cents a ton for this proportion of the ore would not then have been a serious factor when distributed against the total tonnage.

There are two ways at least of successfully clearing the flotation feed from colloidal material. One, mentioned by Mr. Pearce, is by passing the pulp through a small thickener, forcing the latter to run "dirty." A special thickener is made for just this work, known as the Dorr Hydro-Separator, which would probably be preferable to the straight thickener. The second and more efficient method would be to use a Dorr Bowl Classifier. This classifier can be regulated to make an extremely fine separation, and the back flow of clear water assures the removal of all colloidal material.

The granular product from either of the above machines could be delivered at the proper dilution direct to the flotation cells. The overflow from either system would go to a thickener of sufficient area to insure its settling. The thickened product would then go to its special flotation department, or in case of a silver-gold ore, would possibly be further dewatered on a filter and treated by cyanidation.

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[1] *Min. and Sci. Press*, Vol. 117, p. 491. "Colloids in Flotation."
[2] *Min. and Sci. Press*, Vol. 117, p. 277. "Flotation and Other Troubles in Mexico."

Use and Abuse of Superintendents

Various Kinds That Are Encountered in Mining Camps—Methods of Spending the Stockholders' Money—Insight Into Peculiar Difficulties Some Mines Have To Overcome

BY HARRY E. SCOTT,
Written exclusively for *Engineering and Mining Journal*

THERE are times in the metal-mining industry that the supply of miners, machine-men and timbermen is not equal to the demand. The crop of muckers and trammers not being ripe, they cannot be picked for these jobs, and the mining companies have trouble in trying to keep up the output. At other times, as was the case during the war, all departments are short of experienced men, with one exception, that is, the superintendent. There is always a surplus of superintendents, near-superintendents, want-to-be-superintendents, and the young fellow just out of school (not all of them, of course) who has an idea he knows all about the game and feels offended if he is offered anything less than a position of this kind. How sad the awakening at the end of four or five years, when he finds out he is just beginning to learn a little about it!

In the course of a number of years' traveling from one mining camp to another and working in the mines, one will come in contact with all kinds of superintendents, some whose own importance overshadows everything else. They care nothing for the welfare of the men working for them. All they want is a certain number of hours' work each shift, and they do not know whether the men work those hours or not unless they are watching them, as they do not know what a shift's work is. The men can sleep under a sage brush and drink water out of the sump for all they care. This class is always unpopular with the men. Such superintendents are generally short-handed, and the tonnage their mines produce is small considering the number of men employed. They never speak to an employee, underground or on the surface, unless it is to tell him to get out of the way. A few cases are on record where men of this kind have been made good bosses by the use of a pick handle, but this treatment is not advocated.

The most revered class of superintendents is the one which is almost extinct and in a few years will be obsolete. This class is made up of the old-time Irishman or Irish-American who has come up the line from a mucker. He may not be able to read a blueprint or use a pencil as fast as the up-to-date man, but he is the "Old Man" who always comes around with a "Good mornin' byes," and as a rule has time to listen to a good story. He is almost sure to roast you every time he comes in the stope or drift in which you are working, for something you did or something you did not do. If you are of the class that does not get scared every time a boss comes around, and start to argue with him, he will sit down on the muck pile while you do the same thing. When the question is settled and he is gone, you throw the throttle wide open and drill a round from six inches to a foot deeper that shift, but after one of the first-mentioned class goes by, as a rule the machine man pulls the drill out of the hole with the remark "She's deep enough," cutting the round short.

Many of the wealthy mining men of the East and Middle West seem to think the position of superintendent was just made for them to support their sons and sons-in-law at the expense of the stockholders. Cases of this kind are more noticeable on the small properties than on the larger ones. In the latter, where experienced foremen and shift bosses have direct charge of the work, the inexperience of this class of men is not so conspicuous.

A few years ago a railroad president in the East had a son who was going too fast to suit the wealthy parent, playing the races, Broadway, the beaches, and many more things that took the money faster than "Dad" thought a young man should spend it; so the father worked him in as superintendent of a prospect in the West, in which he was interested. The boy came to the little mining camp and made a hit with all of the miners at once. Apparently everybody was his equal and his pocketbook had no strings; it was out first, regardless of whether it was two drinks or wine for the town. The prospect was a new one, and no machinery had been erected; therefore, the first thing was to get that installed. He set a fine electric bell up on a post; then the shaft was started and hoist set up, both lined to the bell. His mining ability was zero, but at spending the stockholders' money he was 100 per cent. He built a $5,000 house out on the desert, five miles from the little town, and had two fast horses shipped to him; also many pens of fancy chickens, a valet, and a negro porter. This was all very nice for two years, when the company quit. From the miners' view he was a fine man to work for, but the shaft went down less than 200 ft., with air drills, in the time mentioned.

Another case. An ex-naval officer married the daughter of a wealthy mining man who was interested in many properties. "Dad" had to foot the bills, so he sent the son-in-law to one of the mines as superintendent. The latter did not post any rules when he arrived on the job, but treated every one as his inferior and acted as though he thought every man should stand at attention and salute him when he passed. Of course he had bad luck. The property was a wet one, and the pumps had to be kept running continuously. In a few days he had run all of the experienced men off of the job. He then got new pump men whose only recommendation was that they had at times run a pump with a handle on it to pump water into the kitchen for washing the dishes. The inevitable happened, and the pumps were drowned. After the water had risen about one hundred feet above the pumps, the superintendent began to get excited. He could see no way of getting to them except with diving suits, which he wanted to send for at once, then go down and disconnect them and bring them up the shaft. He was persuaded not to try this, and one of the older methods was used to recover the pumps.

Not long ago a small mine in the Southwest shut down after it had been running about four years without producing a pound of ore. The money to operate

this property was being raised by a young man selling stock in the East. His father was superintendent and had charge of all operations at the mine. The first work was to pick out a good mill site and build a ten-stamp mill. Then they started to look for the ore by sinking a shaft in a place that would fit the mill so that they could start milling as soon as the ore was found.

For three years a fair-sized force was worked, but the last year there was only one drill runner at $4 a day and one mucker at $3.50 underground. On the surface there was a hoist engineer at $4.50, a compressor man at $5, a blacksmith at $5, a blacksmith's helper at $3.50, and a roustabout at $3. This was a fine place to work for those on the surface, but a poor place to spend money looking for ore. A blacksmith and the compressor man could have done all of the work without hurting themselves much, but what is the use of going on a strike because you have not enough work to do?

The work was not progressing fast enough underground to suit the superintendent, so he employed a foreman at $6 a day, whose only work was to look after the drill runner and the mucker. Neither the father nor the son knew anything about mining, but they made good positions for themselves and work for a few miners for four years. The stockholders still have the stock, with a nice bright seal on it. These are not the only cases of this kind; there are hundreds of them.

When a "wildcat" scheme is exposed, the stockholders rush in and want to hang everybody from the shift boss to the president of the company; the press of the country gives it great publicity, somebody is arrested, and if the company has enough of the stockholders' money left, the managers hire a good lawyer and get out of it. If they have spent the money, and are broke, they may have to spend six months in jail. Is this "wildcatter" any worse than the manager or president of a company who will put his inexperienced relative, with no executive ability, in charge of a mine to throw away the stockholders' money? He certainly is not doing any more harm to the mining game.

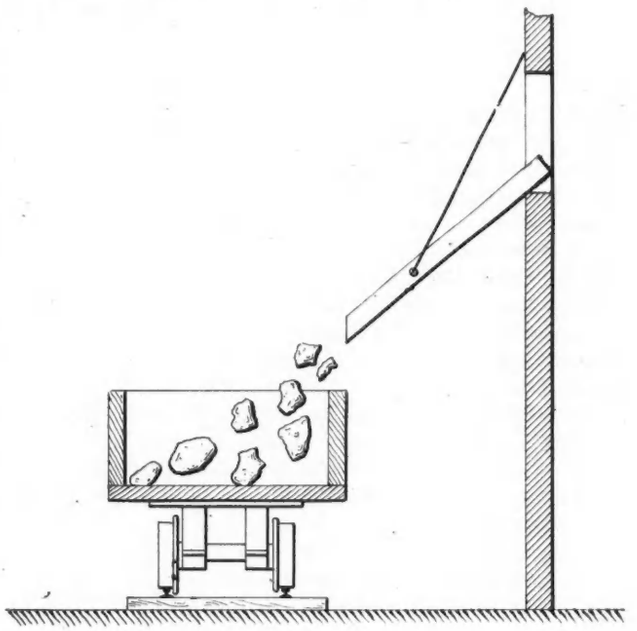
Loading Chute for Heavy Material

BY JOHN S. WATTS

For loading railway cars with rock or ore at the quarry it is usual to make the loading chute about as shown in Fig. 1. This arrangement, when used for loading large pieces of rock, is very destructive to the cars, the lumps striking the car sides and bottom with such force as to destroy the car rapidly. The chute arrangement shown in Fig. 2 overcomes this defect, as the delivery end of the chute can be lowered onto the bottom of the car, and then raised as the car fills. The rock just slides off the chute onto the car bottom and does not fall from a considerable height. The car can be loaded more evenly, too, by reason of the curved or helical end of the chute, which leads the material into the center of the car and avoids spilling.

The sketch Fig. 2 shows the chute in dotted lines at its lowest position, resting on the bottom of the car; also in full lines when the car is loaded, and again in dotted lines when raised up to allow the locomotive to pass underneath it. The guy ropes perform two functions. One is to hold the chute in place against the pressure of the wind and the other to restrain the chute, when being raised, in a path that will keep the delivery end at approximately the center of the car.

The receiving end of the chute, having to travel in and out, as shown, cannot be hung on a hinge as usual, but rests on a roller, which allows for the movement due to the radius of the guy ropes. The hoisting rope must be inclined from the vertical, as indicated, an amount sufficient to keep the guy ropes taut.



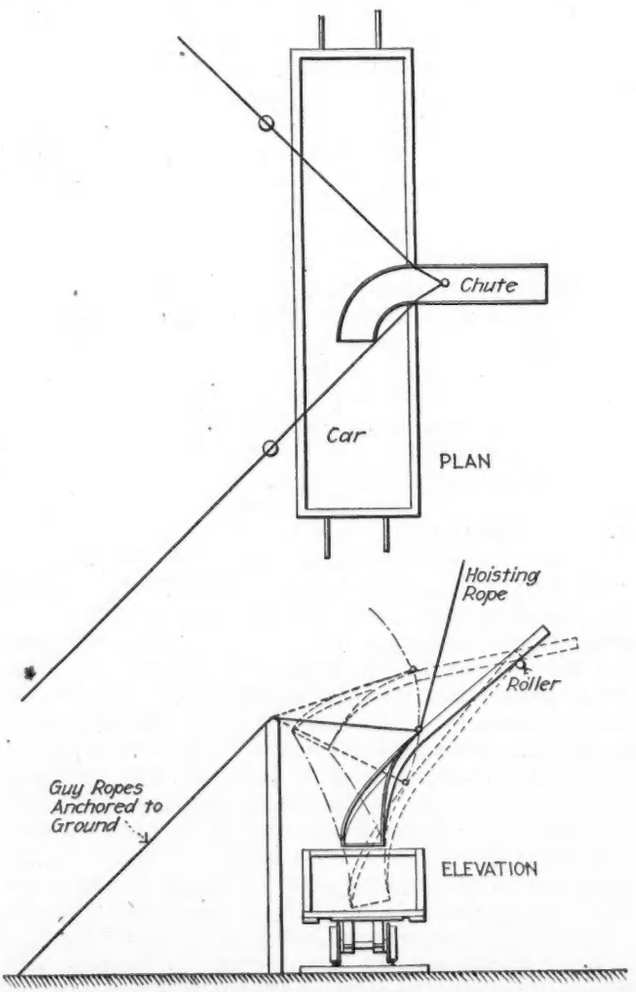


FIG. 1 UPPER, FIG. 2 LOWER DRAWING

Need of Sound Money

Remonetization of Silver Urgent—Double Standard Only Cure for Present Economic Ills of the World—Effect of Bimetallism on Commodity Prices, Production, And on Foreign Exchanges

BY SRINIVAS R. WAGEL
Written exclusively for *Engineering and Mining Journal*

THE large decline in the European exchanges and the great advance in the Eastern exchanges, as they have been accompanied by frequent and heavy fluctuations, have created a situation which is in every sense abnormal. It was expected that the cessation of hostilities would immediately bring forth a condition of affairs which would help stabilize exchanges, prices and wages throughout the world. Actually, however, prices and wages have advanced in a much larger proportion during fourteen months of peace than during four years of war. The Index Number of Great Britain shows that commodity prices advanced from 122.6 in August, 1914, to 282.6 in November, 1918, when the armistice was signed. At the close of December, 1919, the prices advanced to 353.1. Wages have not increased at the same rate, but they increased during 1919, despite the fact that, throughout the world, armies have been demobilizing and there ought, under normal circumstances, to have been a surplus of labor.

It is needless to go into the details of the course of events during the past twelve months. Suffice it to say that everything has become unstable, including the governments of many countries; trade is almost a gamble as a result of the fluctuations in exchange. Governments are tottering, not only in the defeated Central European countries, but also in victorious France and Italy.

PRODUCTION DECLINES

The situation needs a remedy, and the most pressing of all ills of the body politic is the one relating to money. There is several times as much money in the world today as there was before 1914. Nevertheless, everything is unstable. Rumblings of discontent are heard everywhere, and the whole credit of the world is on the verge of collapse.

In the first place, prices have increased threefold. The cause of the increase in prices was primarily reduced production. During the period of the war, all countries converted factories manufacturing peace goods into those manufacturing war goods. Capital was employed to put up and work plants, the outputs of which were destroyed immediately. The exigencies of war did not permit of calculations as to cost, profit, depreciation, and such other considerations which generally enter into the ordinary manufacturing business; it was necessary to produce war goods at any cost in the quickest possible time.

With the conclusion of the war, it was found that it was not so easy to return to peace vocations as expected. Change of occupations and war conditions not only destroyed capital in the form of machinery and plants, but also the skill of the workmen. Markets have been radically changed. New developments, even in countries which were not in the war, did not permit of drawing ordinary conclusions. Central Europe and many other countries have been compelled by force of circumstances to remain idle to such an extent as not even to be able to produce the necessary food. The net result is that production of all commodities, including food products, has declined throughout the world.

PRICES ADVANCE

It is an economic law that scarcity increases values, and the less there is of any kind of goods the greater will be their value. The price of any commodity is the correspondence between the total quantity available and the total of money, both reserve and in circulation. In other words, increase or decrease in production alone does not always decrease or increase prices. There have been instances where, even though the total quantities of commodities available for sale have remained unchanged, prices have varied because of the increase or decrease of the total money available. At present both factors are operative. There has been not only a reduction in the output of all goods, but also a large increase in money throughout the world.

RISE IN WAGES

A general advance in the price of goods must necessarily be followed by a rise in wages. Wages are based on the cost of living. When the cost of living increases because of the increased prices of goods, the result is an all-round advance in wages; otherwise, there would be no incentive for labor to help in the production of goods. This factor has been further complicated during the war by the level of wages granted to working men and women in factories which produced war goods. The different countries engaged in the war were anxious for a speedy output of war materials; they did not calculate the cost in any sense whatsoever. Consequently, very high wages were paid. This, in its turn, again tended to raise wages in other departments of production. The result has been that when the war was over it was found impossible to bring either wages or prices down, or to increase production with a margin of profit conducive to general well-being. In short, it has become an argument in a vicious circle.

HIGH WAGES AND EXTRAVAGANCE

When high wages were obtainable, it is a natural corollary that extravagance should prevail. High wages have meant high profits for comparatively few. Consequently, a section of both capital and labor indulged in wild extravagance. When it was found almost impossible to increase production, and profits and wages had to be cut down, there was a deadlock.

In spite of all these factors, extravagance both in private and public spending would have been impossible but for the increase in money. If the governments of the various countries had not printed paper in such large quantities, and stamped it as money, they would have at least effected a partial cure. In normal times,

each country manufactured goods to sell to others, and the latter exchanged their own manufactures or agricultural products with the outputs of the former. During the war, manufactures in each country were almost solely for the purpose of sale within the country itself; even external trade was solely for the purpose of facilitating victory in the conflict. All production was for immediate consumption and not for the purpose of augmenting the wealth of the country, as in normal times. The governments being the largest purchasers in each country, and themselves not producing anything, the only commodity they could give in exchange for their purchases was money created artificially. The governments created money on a large scale and put it in circulation. The crux of the situation is that the world is suffering from a plethora of money.

Money and Precious Metals

There is, however, a wide difference between money as it was known in civilized countries before the war and money created by the warring countries. Before the war, in most of the great industrial nations money was concomitant with wealth and value. Money was a measure of value, and was needed primarily for payment of balances on exchanges of commodities, both nationally and internationally.

I do not propose entering into a dissertation upon money and credit. Suffice it to say that both money and credit are based on values in the form of goods, and that, both in internal and foreign trade of all countries, what is loosely termed as "money" was used for payment of balances. When money was a measure of value it was also a standard, and that standard was in metal. In ancient times people used several commodities as money; gold, silver, iron, silk, and even leather have been used as standards at various periods of history in various countries. In recent times, however, only gold and silver have been used as money, or the commodity with which individuals and nations settled balances.

Money and Value

It may be taken for granted that the basis of money has always been metal, and that money has always been identified with value. Value, on the other hand, has been the essence of wealth. The popular statement that a person is wealthy because he has money is based on this presumption. If money does not have value, then it is no longer wealth. For instance, the Russian ruble, which was worth 50c. in normal times, is not saleable at all at present. The person who owned the ruble in 1914 had wealth to the extent of 50c.; now the person who owns the ruble has no wealth. Therefore, it is essential that money should not be created out of a commodity that has no value; the moment it has no commodity backing it is no longer wealth. Today, the different governments have printed paper, stamped it, and issued it as money. The more they continue to do so, the less becomes the value of such money. If an individual performed such an operation, nobody would attach any value to the paper so printed and circulated by him. But a government can carry that operation for a certain length of time, and for a certain amount, because it owns certain properties and rights in the state and has the power to levy taxation; in other words, it has credit. But when it continues to issue obligations, it creates wealth without value; and such wealth in the form of money is gradually becoming less valuable.

So there is a difference between money and money. As I have already stated, money must always be based on value, and such value is to be found only in goods. For very cogent reasons the precious metals have been chosen as the only commodities which can be used as money. Consequently, we make the following distinction: sound money in the form of gold and silver, and unsound money in the form of paper or inflated credit. It is important to make it clear that at all times what has generally been known as credit has been based on metal money, which in its turn has been based on commodities. At no period in the history of the world has credit been based on obligations without any backing whatsoever, like the paper money of the present day. Once we begin to base credit on such paper issues as have been made by the different governments of Europe, we simply pyramid obligations, the whole structure having no foundation whatsoever.

Sound and Unsound Money

The present situation with regard to prices is complicated by two factors. The first is that there is too much of what is known as "money" in the world. Consequently, prices have gone up, irrespective of the condition of production. The second is that, though there has been an increase of unsound money, there is an insufficiency of sound money—sound money being based on metallic currencies. There are two different levels of prices, in other words; one is the price in actual gold, and the other is the price in currency. Such a situation is not anomalous or unknown. We have such a condition of affairs prevailing in South America, principally in Argentina, even today.

Broaden the Basis of Money

There must be a remedy. Though it is only fair to state that various other factors have an important bearing on present price levels, unsettlement of exchanges, and the economic evils generally, the most important of all is with reference to money. The fall in the different exchanges is only the symptom of the unacceptability in varying degrees of the moneys of the different countries of the world. The lower the decline in the rate of exchange of a country's money, the less it is acceptable in the world's markets. Such unacceptability is shown even within the boundaries of such countries by the advances in prices of different commodities and the premium paid for metallic money. Therefore, the first effort in the regulation of the present condition must be made toward making money in all parts of the world nationally and internationally acceptable.

It is needless to state that the moneys created out of whole cloth, as it were, by simply printing paper, will never be acceptable. Up to recent times, gold has been internationally accepted as the basis of money. The only sound money available so far has been gold money. We have to create more sound money, and the only manner in which it can be done is to broaden the basis by making silver also the basis of sound money.

Gold Alone Will Not Do

The condition of the body politic is serious, and heroic remedies are needed. Those who have been thinking in terms of 1914 are still fondly hoping to return to the pre-war gold standard. The gold standard has failed miserably. It was not a success even when it was generally accepted. The main reason why it was not pos-

sible to contest and prove the falsity of the gold standard was that it was adopted by all the creditor nations of the world, and the debtor nations were obliged to submit to the iniquities of such a standard. Today the creditor nations of the past are no longer so. Even countries like the United States and Japan, which are really creditor nations, are faced by an internal situation nearly as serious as that of other countries. In any case, a large supply of sound money is urgent; it is the only way in which the evils arising out of the increase of more or less valueless paper money can be remedied. It may be argued that the production of gold can be increased. Even granting that the maintenance of the gold standard would be a panacea for all ills, it will take a long time before there is sufficient production to meet our needs.

I will not go in detail into some of the remedies proposed for the adjustment of the monetary chaos of today. Only the one proposed by Prof. Irving Fisher needs even passing mention. His proposal to standardize the dollar by varying the weight of gold in the dollar from time to time on the basis of the Index Numbers is not practicable, even in less strenuous times. It does not go to the root of the evil, and will not serve the purpose of creating sound money today.

Remonetization of Silver Practicable, as Formerly Nearly All Nations Had Double Standard

No great effort is needed to prove that the remonetization of silver will double the quantity of sound money in the world, and we badly need a large increase in sound money. The remonetization of silver is not similar in plan to the maintenance of the gold standard, because of the fact that the production of silver in the world is decreasing just as much as that of gold. The reason is simply this: There is a large stock of silver money in the world which can immediately be made available if silver is remonetized. This remedy is not one proposed for all time, and it is not revolutionary, either. Up to 1872 practically all nations of the world had maintained a double standard for centuries. The gold standard was an innovation. Even granting that it was perfect—which it was not—the war has changed conditions so radically that it is practically impossible to maintain the gold standard, even by such a well organized country as England. Further, it must be remembered that monetary as well as economic changes must be based on actual conditions and not on any theory which may be advanced.

Advantages of Bimetalism

I understand that a proposal to the return of any kind of bimetallism may be considered in many quarters which have been steeped in the superstition of the efficacy of the gold standard, as too absurd for words. Bimetallism has been mixed up with unsavory politics in many countries, especially in the United States. Bimetallism is not proposed as a panacea for all evils; but it may be confidently stated that a modified form of it is the only remedy possible under the present circumstances for the monetary evils which we are suffering from today.

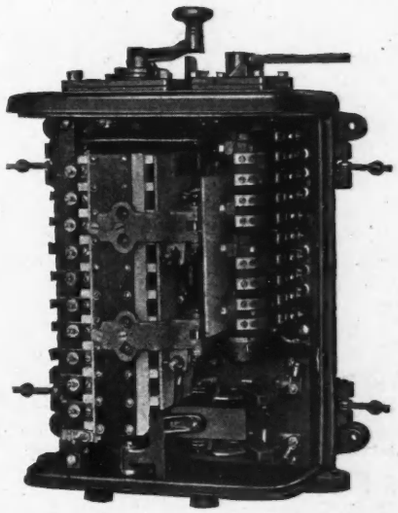
The first of the benefits of bimetallism will be to increase the amount of sound money, which again can be made the reserve for the large circulation in all countries. Consequently, it will increase the value of paper money to an appreciable extent. Such increase in the value of paper money will make exchanges easier and bring down the level of commodity prices. With prices and wages better adjusted, increased production will be facilitated, and this increased production again will facilitate the withdrawal of paper money from circulation.

The restoration of exchanges alone will augment the foreign trade of the different countries, effecting thereby a large advance in national trade and output. But the most important effect will be the stoppage of the drain of silver and gold to the Eastern countries. At present, trade with the Eastern countries is much hampered by the necessity of remitting gold and silver. The volume of trade is shrinking from day to day, because this drain is an ill wind that blows nobody good. Furthermore, the remonetization of silver will have the effect of making the large stock of silver held in India and China flow back to Europe and America, and thus stabilize the monetary conditions of the world.

Drum Controller for Series-Parallel Operation of Locomotive Motors

A drum-type controller for series-parallel control of two-series motors is one of the new products of the Cutler-Hammer Manufacturing Co., of Milwaukee, Wis. This controller, which is provided with both a main cylinder and a reverse cylinder, is for use on storage-battery locomotives or on trolley locomotives using 250 volts or less.

The motors are accelerated by the main cylinder, which has seven points of control. A star wheel provides an interrupted motion to the lever, so the operator readily feels the speed points.



A NEW TWO-MOTOR BATTERY LOCOMOTIVE CONTROLLER WHICH HAS ALL PARTS LIBERALLY PROPORTIONED AND READILY ACCESSIBLE

A dust-tight and weatherproof construction is obtained by fitting the sheet-metal cover under a ledge in the top and providing a rubber gasket between the edges of the cover and the cast-iron frame.

Most mine-duty apparatus is employed where the service conditions are severe and delays in operation costly. The manufacturers state that this new controller has its parts liberally proportioned to prevent wear and breakage, and that those parts which do wear are made accessible and so designed that they may easily be renewed.

Photographs From the Field

Iron Mining in China

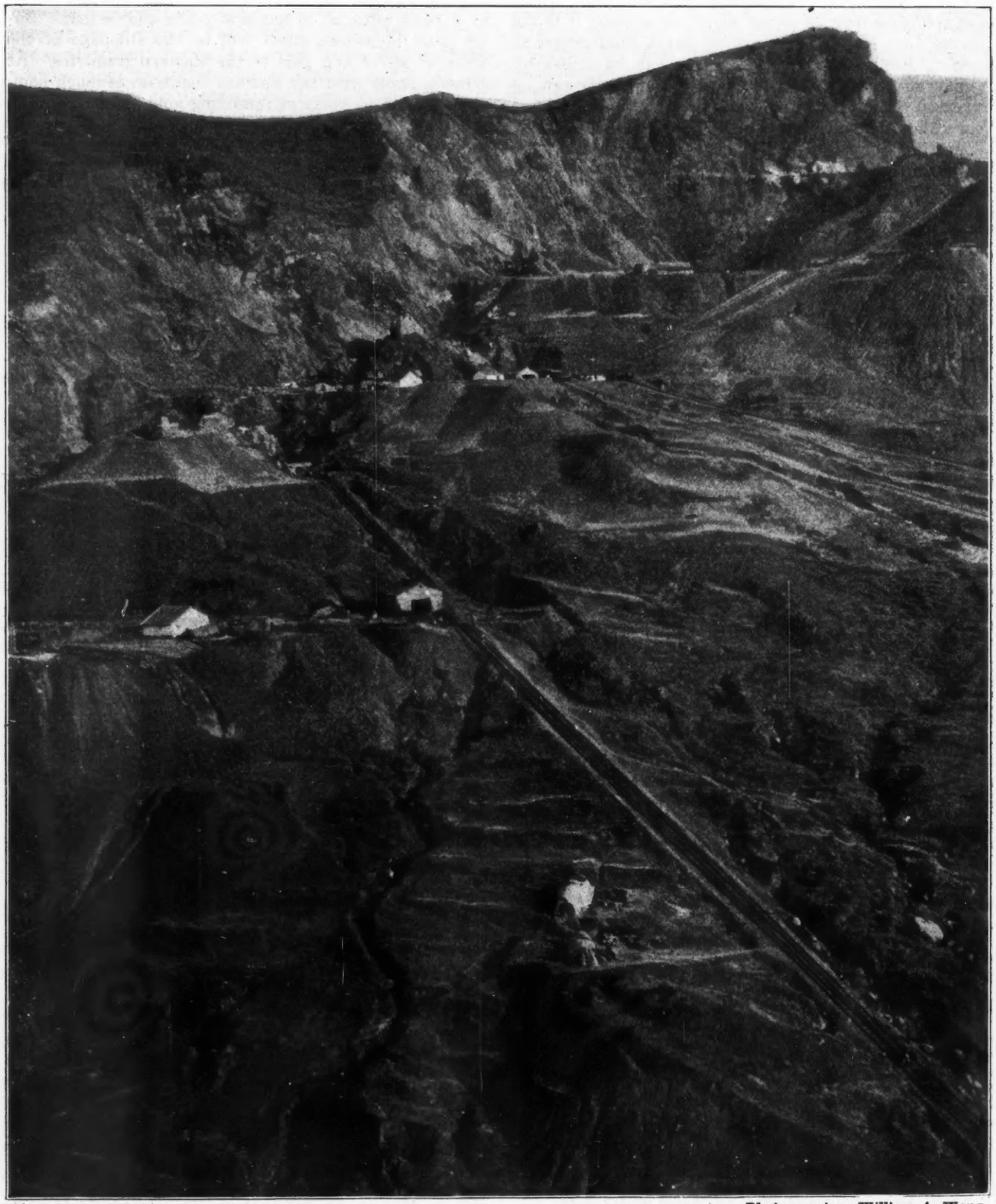


Photo courtesy William A. Wong.

SYSTEM OF LOWERING IRON ORE FROM THE PHEASANT HILL MINE, TAYEH, CHINA. THREE LOADED CARS COUPLED WILL BE LOWERED, WHICH OPERATION BRINGS UP THREE EMPTY ONES. THE TOTAL VERTICAL DISTANCE LOWERED IS 500 FT.; ALL DONE BY GRAVITY AND MANUAL LABOR FOR LESS THAN 2½C. PER TON

Aerial Tramways

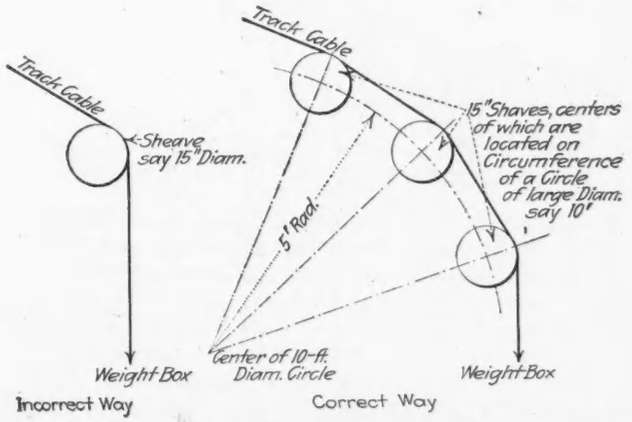
Turning of Cables To Equalize Wear Advocated—Angles of Deflection Important and Large Sheaves or Groups of Small Sheaves Necessary—Location Of Supporting Towers

BY DOUGLAS LAY
Written exclusively for *Engineering and Mining Journal*

TO INSURE even distribution of wear over the surface of track cables, it is important that the cables should be turned periodically. It is essential that the process be one of actual rotation and not consist of mere twisting. Consequently, both ends of the cable must be free to rotate. This is accomplished by inserting swivels in both ends of the cables at the upper and lower terminals, respectively. Inasmuch as the lower end of the cable is attached to a weight box, in all probability, no swivel will be required at this end, if tension is slackened during the turning process, so that this end is free to rotate. On the other hand, if it is desired to turn the cable with the tension on, a swivel will be required at the lower as well as the upper end.

CABLES SHOULD BE TURNED AT SWIVELS

In any event, during the turning process, it is essential to see that the cables are turning *at the swivels*, and that the turn is not being prevented by pressure, on the upper and lower terminal saddles for instance. If the ends are free to turn, application of stilson wrenches will bring about an actual rotation, and there will be no tendency on the part of the cable to return to its former position. More often than not, the so-called "turning" simply amounts to putting a twist in the cable, which unless clamped in the new position, speedily reverts to its old position, and the wear resulting from the trolley sheaves goes on in the same places as before. The swivels mentioned should of course be inserted when the tram is under construction.



FIGS. 1 AND 2. CORRECT AND INCORRECT ATTACHMENT OF TRACK CABLES TO WEIGHT BOXES

It is common knowledge that the wear of track cables is by far the greatest in the immediate vicinity of towers. This is inevitable, but much can be done to reduce wear to a minimum by generous oiling, and close watching of trolley sheaves. The latter is very important. A sheave with a worn tread does much harm in a very short time, and must not be allowed. Wear near towers is reduced by using rocking saddles instead of the rigid type.

In the case of most tramways, tension is usually applied to track cables by means of weight boxes, each cable being deflected over one saddle and one sheave. As the cable is entirely free to move over both sheave and saddle (if, as is frequently the case, a long span is next the lower terminal, this movement of the cables is appreciable), obviously the angles of deflection are of the utmost importance, and should be as small as possible. Nevertheless, one frequently runs across instances where the greatest attention is paid to deflection angles at towers, but where the track cables are deflected comparatively sharply at the lower terminal saddles, and weight boxes hung over sheaves of quite inadequate diameter, say 15 or 18 in., as in Fig. 1. Either is a particularly insidious piece of mischief, because the effect is to cause weakening of the wires, and although no wear may be noticeable, sooner or later the cable snaps suddenly. It was my fortune to be walking under a tram line on one occasion when this accident occurred, and to obtain first hand evidence of the damage likely to result.

Large sheaves are expensive, and it is not practicable to make use of them in connection with the suspension of weight boxes. An excellent substitute for a sheave of large diameter is a group of small sheaves, not less than three in number, placed on the circumference of a circle of large diameter, say ten feet, as illustrated in Fig. 2.

OILING TRACK CABLES

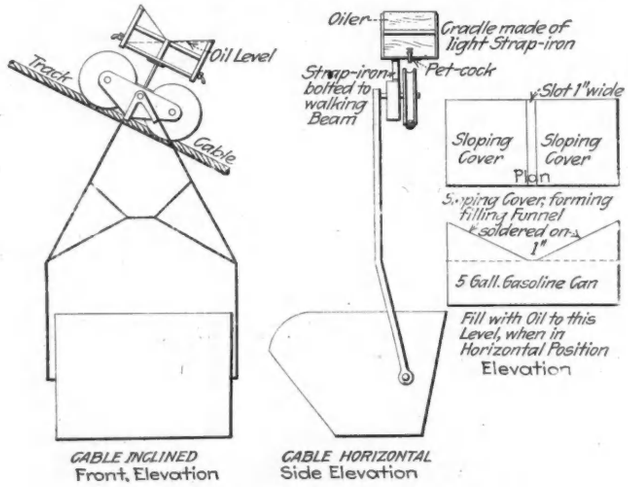
It cannot be questioned that generous oiling, in addition to preventing external corrosion and internal friction, greatly lessens surface wear due to trolley sheaves. I had one tram under constant observation for a period of seven years. Great attention was paid to oiling. At the end of that time, the cables were taken down and put on another tram. This afforded an excellent opportunity of observing their condition. Wear was of course distinctly noticeable in the vicinity of towers, but by cutting out one or two bad places they seemed likely to serve for another seven years. They were 6 x 7 lang-lay crucible cast steel, and approximately one mile long, their diameters being one inch and seven-eighths inch, respectively. In the seven years, they served for the transport of approximately 300,000 tons of material. It is perhaps not altogether a digression to remark that in spite of locked coil and smooth coil cable, the ordinary lang-lay cable finds few real competitors for small installations.

The best track cable oiler I have observed in my experience can be made out of a five-gallon gasoline can, as illustrated in Figs. 3, 4, 5 and 6. It is carried in a small strap-iron cradle, which is bolted to the walking beam of a bucket trolley. Two small petcocks (the faucets on gasoline cans answer well for the purpose) are soldered on, one at the bottom of either end. These are opened so that there is a

steady drip of oil on the trolley sheaves, which distribute it over the cable. The oiler is filled to the level indicated, and oil cannot spill whether the bucket is going up or down grade. As the whole top of the oiler forms a funnel the ease with which it can be filled will be obvious. In cold weather, it is well to warm the oil or dope before filling the oiler, in order to reduce the viscosity of the fluid.

Tower Installations

Many towers have to be placed on more or less steep hillsides and must be designed accordingly. In the case of the smaller installations, they are, for obvious reasons, generally constructed of wood, saddle caps being of square timber 8 x 8 in., and legs usually of round timber procured on the tramway site. Two



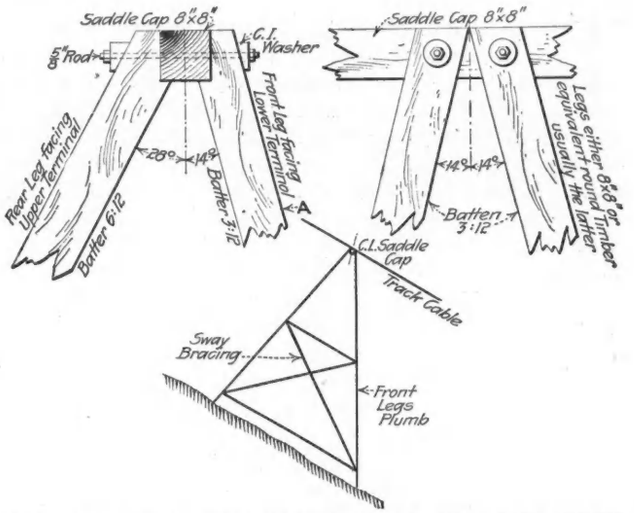
FIGS. 3, 4, 5 AND 6. SIMPLE CABLE OILER

types of towers are commonly constructed, known as the "pyramid" and "through" types respectively. The framing of angle and sway bracing is obvious from any illustration, but the framing of the legs, although in reality simple enough, is generally a bit of a mystery to the average carpenter unless he has had previous tramway experience. The framing of each type will be described.

Pyramid Type of Towers

In side elevation, the front legs of the pyramid type of tower (that is, the pair facing lower terminal) are framed with a batter of 3 inches in 12 inches (that is, an angle of approximately fourteen degrees) with respect to the centre line of the saddle cap. In side elevation, the rear legs (that is, those facing upper terminal) are framed with a batter of six inches in twelve inches (an angle of approximately twenty-eight degrees) with respect to the centre line of the saddle cap. Therefore, in side elevation, the angle between the front and rear legs is approximately forty-two degrees. In front or rear elevation, each leg is framed with a batter of three inches in twelve inches with respect to the centre line of the saddle cap, so that the angle between the individual legs of either front or rear pair is approximately twenty-eight degrees. Lastly, the length of the legs must be such that, when the tower is raised in position, the front legs are vertical, in side elevation. Reference to Figs. 7, 8, and 9 will render the foregoing clear. Angle bracing between legs and saddle cap is not shown in these sketches, because it presents no difficulty.

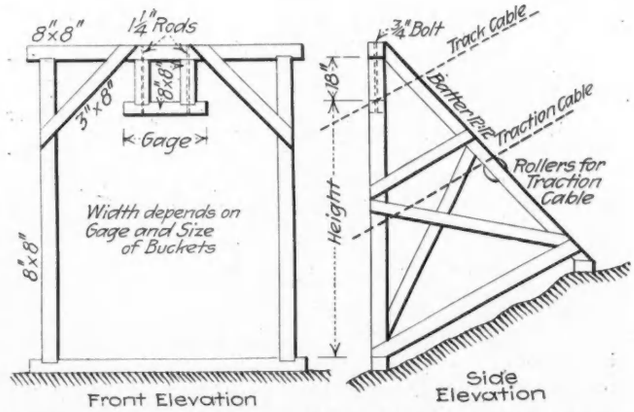
Obviously, a tower must be so designed that the line of pressure falls within the base. One occasionally sees evidence in the way of bracing the front legs, which rather suggests that the idea is held that towers on a steep hillside are likely to fall down hill; whereas, as a matter of fact, the tendency is to cause a tower in such a position to fall over backward toward the upper terminal.



FIGS. 7, 8 AND 9. FRAMING, IN SIDE ELEVATION—FRONT OR REAR ELEVATION—TOWER IN POSITION, SIDE ELEVATION

Through Type of Tower

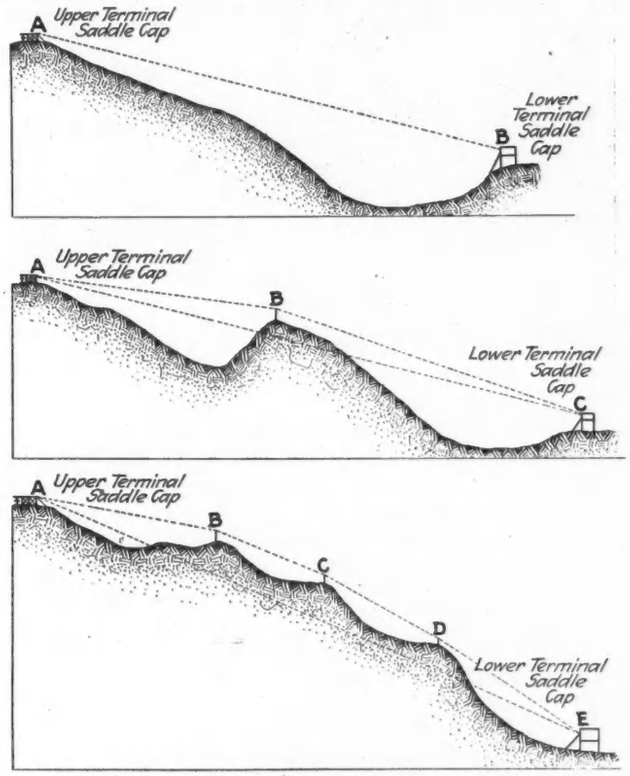
In Figs. 10 and 11 there is illustrated simple through type of tower, which will be found efficient for two-bucket trams. The front legs are vertical, and the rear legs are framed with a batter of one in one with respect to the front legs. The saddle cap is hung from the front leg cap by 1¼ in. rods through pieces of 8 x 8 in. timber. The traction cable is carried on rollers. The roller frame is fixed to the rear legs.



FIGS. 10 AND 11. THROUGH TOWER, TWO-BUCKET TRAMWAY TYPE

Though ideal construction with reference to the situation of the towers does not permit a deflection of the unloaded track cable of more than 2.86 deg. at each tower, it must be observed that this requirement necessitates a large number of towers, each of which figures in the construction cost to the extent of probably $200. A tramway with less than the ideal number of towers, and consequently greater cable-wear, may be a better investment for the small mine. It depends upon the

life of the small mine. This consideration will naturally influence the mining engineer in designing a tramway, whereas it is a factor which will not enter into the calculations of the tramway engineer. The matter of the situation and heights of respective towers does, however, offer pitfalls for the unwary. It is disconcerting to find that when cables are stretched they do not lie on all towers. To avoid anything of the sort happening, it is a good plan, when an accurate survey has been made, to draw a straight line on the profile joining the upper terminal saddle cap and the lower terminal saddle cap, or the cap of the next tension station below the upper terminal. All towers the respective bases of which lie below this line may be regarded for the moment as critical. If the profile is such that bases of all towers lie below this line,



FIGS. 12, 13 AND 14. PROFILES OF TRAMWAYS

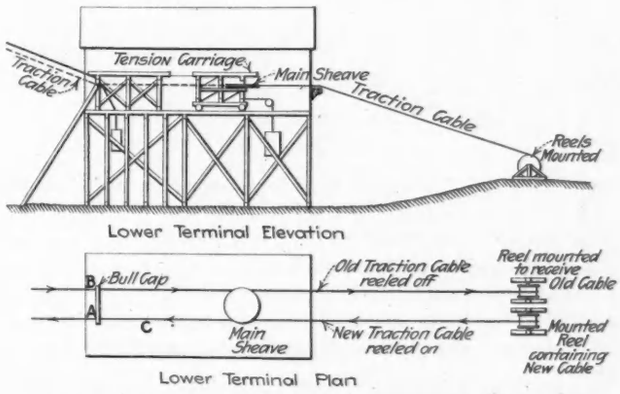
as shown in Fig. 12, then assume a span equal to the distance between upper and lower terminal saddle caps (in this case the distance AB) and a tension fifty per cent greater than the working tension, and draw the deflection curve. The tops of the towers are then brought up to touch this curve.

With respect to the cases where one or more portions of the profile lie above the straight line joining upper and lower terminal saddle caps, exemplified in the profiles of Figs. 13 and 14, proceed as follows: At the highest point of each crest, assume a tower of minimum height required to insure buckets clearing snow line, and draw a straight line between each tower top and from each terminal saddle cap to the top of the nearest tower. This gives the deflection points of the cables, which are B in the profiles of Fig. 13, and B, C, and D in Fig. 14. Any towers between deflection points must be located with reference to the span between the deflection points between which they occur. Thus, in profile Fig. 13, the tops of any towers between A and B must touch the deflection curve of a cable extending from A to B. Tops of towers between B and C must touch the deflection curve of a cable extending from B to C. Similarly, in the case of Fig. 14, the spans AB, BC, CD and DE will respectively govern the heights of towers between A and B, B and C, C and D, and D and E.

It is rarely possible to "break over" a crest with only one tower, inasmuch as this may cause too great an angle of deflection. It may be necessary to insert several towers to reduce this. Again, if a tower must be unduly high to reach the deflection curve, it is obviously not required from the point of view of preventing the load touching the ground. On the other hand, its omission may mean an excessive deflection of the loaded cable. These are factors wherein the life of the mine must be considered. The mining engineer in laying out a tramway will perhaps be too prone to reduce the number of the towers and their height. On the other hand, the tramway engineer will perhaps think too much about the wear of the cables, and his construction will be more elaborate than the life of the mine warrants.

PUTTING ON A NEW TRACTION CABLE

The life of a traction cable is necessarily much shorter than that of the track cables, especially so in those cases where buckets are permanently attached to the traction cable and pass round the upper and lower terminal sheaves. Owing to their economy in labor, tramways of this type are usually preferred for small properties. In the case of a tramway of this sort, which was under my observation for a period of seven years, a new traction cable was required about every six months, whereas, as has been mentioned, the track



FIGS. 15 AND 16. PUTTING ON NEW TRACTION CABLE

cables after seven years' service were evidently good for several years more. A life of six months for the traction cable was only secured by splicing it several times during the six months.

It is, however, a simple matter to put on a new traction cable. At a convenient spot behind the lower terminal, set up the reel containing the new cable in line with the up-going side of the traction cables. Set up also an empty reel, in line with the down-coming side of the traction cable, to receive the old traction cable. See Figs. 15 and 16. Clamp the traction cable securely at the points A and B to each end of the bull cap. Then take the tension off the tension carriage and allow the traction cable to drop out of the bull wheel or main sheave. Cut the traction cable on the up-going side at some convenient point, such as C. Splice one end of the new cable to the up-going

end of the old cable at C, by means of a short splice. Attach the other end of the old cable to the reel mounted to receive it.

Reference to Figs. 15 and 16 will render the foregoing explanation clearer. Now release the slings at A and B, and operate the tramway as usual from the upper terminal, but run slowly, reeling off the old cable, keeping pace with the speed of the tramway, and similarly reeling on the new cable. As buckets come into the lower terminal, after dumping, they are detached from the old cable, wheeled round the track, and attached to the new cable. When the end of the latter returns to the terminal, the new cable is clamped at A and B and the two ends are joined by a long splice, after the cable has been placed in the bull wheel or main sheave. It is of course important that the tension carriage be run completely in before splicing, so that the whole of its travel may be rendered available for the new cable. Operation of the tramway will reveal what adjustment of the buckets is necessary, and when this is done the tramway is ready for normal running.

To facilitate reeling off the old cable onto the reel, nail radial wooden cleats on the ends of the latter to serve as handles, after the fashion of a ship's steering wheel, so that the reel may be easily turned. If the tramway is a long one, several men may be required to turn the reel, especially toward the end of the operation, when the reel is reaching its maximum weight.

Some rough-and-ready means of braking the reel containing the new cable must be provided, as it is desirable that this should be unreeled under slight tension. A suitable brake can readily be improvised on the ground.

The Automatic Dumping of Ore Cars

Rotary Device Designed and Used by the Woodward Iron Co. Dumps and Rights Itself By Its Own Power

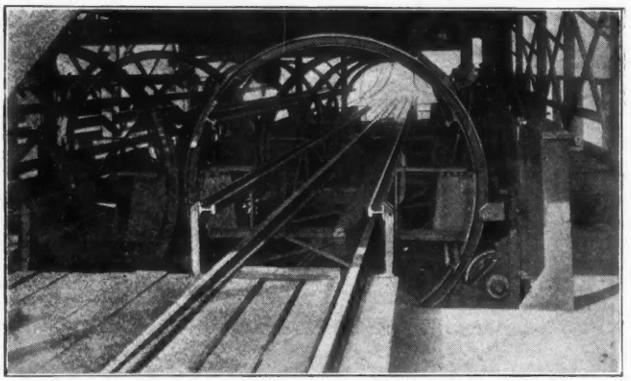
AUTOMATIC dumping of ore from cars into bins is accomplished by a scheme in use by the Woodward Iron Co., of Woodward, Ala. At one mine are two rotary dumping appliances, each of which will accommodate four cars, and at another mine are two five-car dumps. The cars are dumped and then brought back to their original position without the use of extraneous power.

Automatic operation is attained by utilizing the flywheel principle to store up sufficient energy during the initial movement of the loaded dump, when it is heavily unbalanced, to supply the power needed for restoring the unloaded dump to the upright position. The inertia of the flywheels resists and retards the starting movement, causing the cars to dump the contained material with less breakage and to operate with less strain. Suitable braking and stopping means are provided to hold the mechanism in place after it rights itself and during the transfer of the mine cars.

The machines are constructed of metal and comprise a number of circular steel rails, which serve the double purpose of frame and rolling device. The rails are arranged with their heads, or treads, facing outwardly. These tire rails are further connected with two other rails extending horizontally lengthwise through the dump cage and having their base flanges riveted to the bases of the tire rails. The horizontal rails form the connecting ribs of the main body or skeleton frame of the dump, and these ribs are again laced with angles extending from tire to tire, and forming a construction similar in principle to the lattice girder.

The treads of the rolled steel tires ride on trunnion wheels, the frames of which are fitted with short shafts that turn in roller bearings. The flywheels are connected to the overhung ends of each of these shafts, the size and weight of the flywheels being determined by calculating the flywheel load for the required speed.

Track rails extend through each dump cage to form a runway on which the cars are held either in their upper or lower position. Thrust trunnion rollers, which are mounted to turn in a vertical bearing, take care of end thrust from the dump cages.



THE WOODWARD AUTOMATIC ORE-DUMPING APPARATUS

In operation, after the cars have been delivered to the dumping machine, pawls are released by raising a handle, and the weight of the cars and the material therein is heavy enough to cause immediate rotation. The pawls, being counterweighted by the lever arm, right themselves as soon as released, and stand in position to prevent the dump from returning past its initial position.

These dumping mechanisms were designed and built by the Woodward Iron Co., and application has been made for patents.

Welding Aluminum Castings

At a recent meeting in New York the subject of welding broken aluminum castings came up for discussion. The general opinion seemed to be that cast aluminum cannot be successfully welded by electrical means, as a coarsely crystalline bond is formed which does not possess much strength. For heavy work, the oxyacetylene flame is perfectly satisfactory, and on thin work oxyhydrogen or any oxy-gas flame will make a satisfactory weld. A good flux is a necessity, and for this purpose any one of a number of published formulas, the bases of which are alkaline fluorides, may be used. The idea is to have a flux whose melting point is just a trifle below that of the alloy which is welded. Soldering with tin-zinc or other solders is not altogether satisfactory.

One of the Earliest Labor Unions was formed by English footmen shortly after the year 1700. Its members refused to work for less than a prescribed minimum wage, refused to do certain kinds of work, and took care of those members who lost their positions because of their adherence to the rules of the organization.

CONSULTATION

Einstein's Theory of Relativity

"Will you please give me some information on Einstein's theory of relativity?"

On Jan. 10, 1920, this subject was discussed editorially in the *Electric World* as follows:

Much attention has been devoted of late in the scientific and technical press to a discussion of Einstein's theory of relativity and its consequences. This subject formed the principal topic of discussion at a meeting in London of the Royal Society, various abstracts concerning which have recently been reported.

The subject of relativity first came into notice some years ago when Michelson and Morley announced the results of a careful series of optical experiments they had made for detecting, if possible, the effect of the earth's tangential motion of rotation in aiding or opposing the transmission of light in the laboratory. The effect of the earth's superficial velocity on the apparent velocity of light in the air could not be detected, although the sensitiveness of the apparatus was amply sufficient for the purpose. In order to account for the absence of the earth's velocity component in the observations, two suggestions were offered, which later crystallized into opposing schools of thought. One was that any bar, rod, or prism of substances would be subjected to internal electromagnetic stresses when subjected to motion; because, according to the theory of electrons, considered either in a crowd or pair by pair, their mutual attractions are altered by their velocity through the ether. Consequently, a metallic bar set in the direction of the earth's tangential velocity does not have exactly the same length as when it is set perpendicularly thereto. The difference should be extremely small at the greatest value of the earth's rotational surface velocity, and would be undiscoverable by any known laboratory methods; but it has been asserted to be sufficient to account for the nonsuccess of the Michelson-Morley experiments. The other suggestion was the doctrine of relativity, a principal in virtue of which absolute velocities should be incapable of being detected in a universe constructed like ours.

One school of thought thus argued that if the sensitiveness of the Michelson-Morley apparatus were greatly increased, a residual effect of the earth's velocity should be found, in spite of the electronic forces and their effect on the mechanism in masking the phenomenon sought. The other school of thought argued that such a phenomenon could not exist, by reason of the inherent nature of things.

Following up the doctrine of relativity, by a long process of mathematical reasoning Einstein and his followers have been led to enunciate certain remarkable theorems concerning space and time. These theorems are interesting as philosophical speculations. From the standpoint of engineering, they are at present too minute in their effects to have any bearing on practice, although, from the standpoint of philosophy they are of great importance. More recently, however, certain practical deductions have been stated by the relativists which are quite worthy of examination by astronomers. One is that the perihelion of Mercury's orbit should advance at a small but definitely measureable rate, not yet required by Newtonian principles. A second is that rays of light should bend very slightly in passing through the sun's gravitational field, and third, that the red rays of the spectrum should be measurably deflected in such a field. The first two predictions are now stated to have been confirmed reasonably well. The third has not yet been confirmed, although carefully looked for.

The newly awakened interest in the subject has come from the recent confirmation of the second prediction, on the occasion of last May's total solar eclipse. Astronomers appear to be satisfied that such an effect has been discerned. Assuming that both the first and second predictions have been verified, the question arises whether the doctrine of relativity is really fundamental, or whether it is a mere secondary consequence of a yet more fundamental electromagnetic law. We shall probably have to wait for the answer to this question. The mathematical theory is very complicated, and very few persons appear to understand it. Discussion is interfered with, because the doctrine of relativity assumes, in some minds, the nature of a fetish. Nevertheless, if, as is claimed by some, that doctrine denies the existence of a space-filling ether and substitutes an emission theory for the accepted undulatory theory of light, it is worthy of careful examination.

Dr. Einstein wrote of his work in *The Times* (London), and the article was reprinted in *Science* (New York, Jan. 2).

Mining Stock Speculation

"I heard indirectly that you were authority on mining stocks, and I write to ask if you will be good enough to tell me what you think of Tonopah Extension stock at the present market value, and also Consolidated Arizona Copper stock? Are they owned by reliable people, and would it be advisable to purchase stock now? I would be interested to know of any other good stocks you think worth while taking a risk on."

The *Engineering and Mining Journal* is a strictly technical publication, and does not give advice on investment problems of any kind. We publish weekly a metal market report, and we intend to supply our subscribers with a report of mining-stock quotations, which we will make as complete as our readers desire, but we cannot assume to give any advice regarding mining investment or speculation.

There are many sources of such information as you desire, and we take pleasure in referring you to such publications as the *Magazine of Wall Street*, 42 Broadway, N. Y. We regret that we are unable to serve you in this matter, and trust that you will appreciate our position.

Niobium and Columbium Wanted

"Can you advise us from whom we could make purchases of fair-sized quantities of niobium and columbium? If you cannot give us this information, and will place us in touch with someone who you think can, we shall appreciate your doing so."

We suggest that you communicate with one or more of the following:

American Metal Co., Ltd., 61 Broadway, N. Y.

The Foote Mineral Co., 111 North 19th St., Philadelphia, Pa.

The Welsbach Co., Gloucester City, N. J.

E. J. Lavino & Co., Bullitt Building, Philadelphia, Pa.

A. D. Mackay, 130 Pearl St., N. Y.

Primos Chemical Co., Primos, Pa.

William T. Finkell, 103 Maiden Lane, New York.

American Smelting & Refining Co., 120 Broadway, New York.

If you do not get the desired results from the above firms, kindly advise us, and we will try to be of further assistance.

Northwest Mining Convention at Spokane

Exhibits of Mining Machinery—Over Two Hundred Mining Men in Attendance—Resolutions Favoring Americanism and Repeal of Excess-Profits and Corporation Tax Acts Passed—Proceedings Against Minerals Separation Advocated

THE Northwest Mining Convention for 1920 opened on Monday, Feb. 16, at Spokane, Wash., where many former conventions have been held. Delegates were present from Washington, Oregon, Idaho, Montana, and British Columbia. The morning was occupied with registration and a study of the exhibits. In the afternoon, Mayor Charles A. Fleming gave an address of welcome on behalf of the city of Spokane. He was followed by Sidney Norman, who spoke for the Northwest Mining Association; James Ford, secretary of the Chamber of Commerce, and T. Griffith, of Orangeville, Idaho, who responded. F. A. Ross, president of the association, presided at the opening meeting.

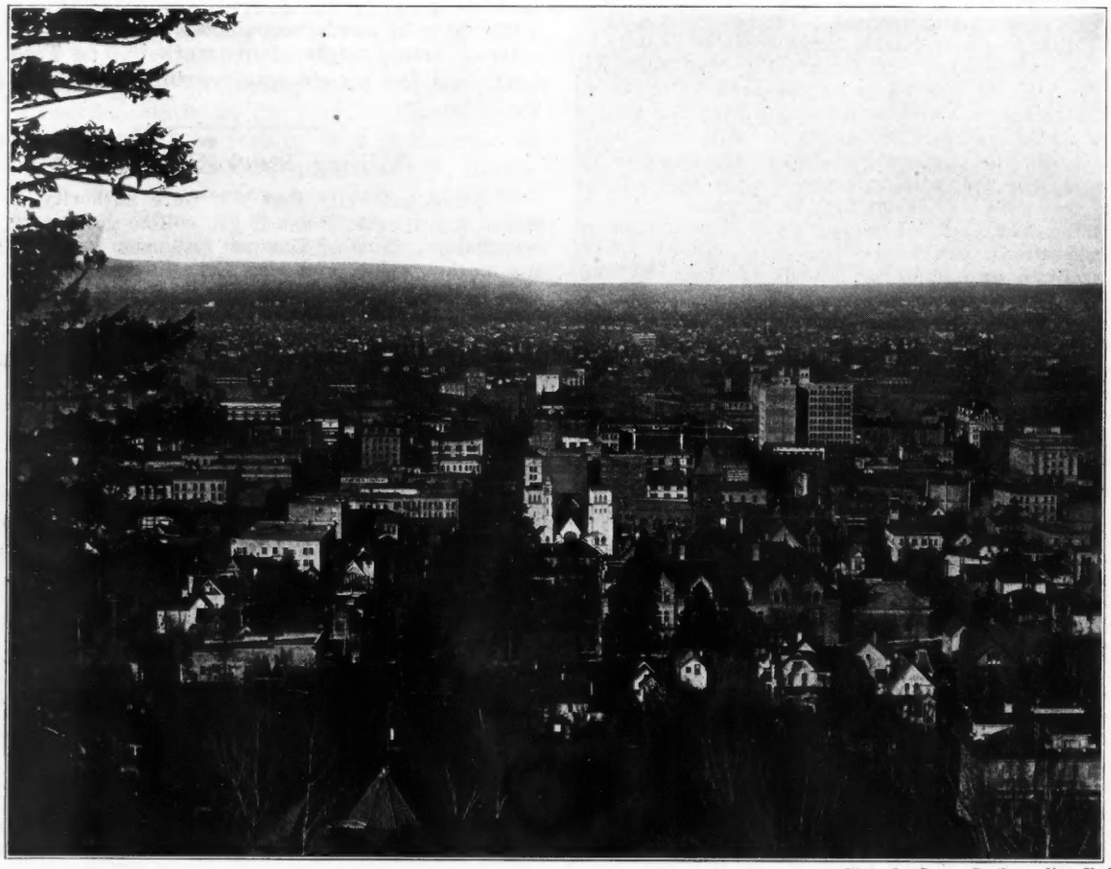


Photo by Brown Brothers, New York.

BIRD'S-EYE VIEW OF BUSINESS DISTRICT OF SPOKANE, WASH., FROM SOUTHERN PART OF CITY

The first technical session of the convention was held on Tuesday, Feb. 17, which was designated Associated Engineers' Day. Columbia Section of the American Institute of Mining and Metallurgical Engineers had prepared the program, which was in charge of R. S. Ord, acting for James F. McCarthy. L. K. Armstrong, whose name has been linked with brilliant gatherings of mining men in past years, acted as secretary of the meetings and read a paper by F. Cushing Moore on "The Cement Gun." After a discussion, a letter of greeting and commendation from the American Mining Congress was read. W. L. Penick, northwestern representative of the Hardinge Conical Mill Co., then presented a paper on "Crushing and Grinding," in which he summarized present practice as consisting of preliminary breaking in jaw or gyratory breakers or in the Telsmith, followed by stamps (wherever they are already installed), crushing to 3 or 4 mesh, or by rolls or Symons disk crushers. For primary grinders he selected ball mills and rod mills, preferring the former, on account of their costing less for labor for operation and repairs. For secondary grinding the same types of mills would be used, but pebbles as well as balls would be available for crushing. W. H. Agens, representing the Traylor Engineering Co., discussed the paper fully.

An interesting paper and informal talk that should lead to improved conditions for the shippers of lead and dry ores throughout the Pacific Northwest was given by Frank M. Smith, manager of the smelting plant of the Bunker Hill & Sullivan Mining & Concentrating Co. at Kellogg, Idaho. Mr. Smith outlined the receiving and sampling of an ore lot at the smeltery, and explained the choice of methods of sampling. The Bunker Hill and the Selby smelting plants have their own refineries, but most other lead plants in the West ship their lead East for refining. The Bunker Hill plant pays for its ores on the basis of *Engineering and Mining Journal* quotations. In closing, Mr. Smith pointed out that no through freight rates on ores were now in effect to Kellogg. He

advised the members of the convention to use their efforts to have such rates established as soon as the railroads were restored to private ownership.

At the Chamber of Commerce luncheon, held in honor of the visiting delegates, Governor Louis F. Hart of Washington made a ringing speech, the keynote of which was Americanism. Governor Hart stated that the future was beginning to look much brighter. The murder of ex-service men at Centralia last fall had been a hard blow, but three recent cases were quoted in which juries in the State of Washington had convicted groups of I. W. W. The Governor closed with an earnest appeal to citizens to stamp out anarchy whenever and in whatever form it showed itself. The "Development of the Rock Drill" was outlined by R. T. Banks, of the Sullivan Machinery Co. The speaker explained the necessities that had led to the development of the self-rotating, water-type stoping drill. He recommended standardization, for purposes of economy, in the selection of drills, in the choice of a round of holes, and in drill steel.

"Public Service of the U. S. Bureau of Mines" was presented by Dean Milnor Roberts of the College of Mines, University of Washington. The origin of the Bureau in a definite need of the mining industry, its growth and the establishment of stations throughout the country were briefly sketched; also the methods of the Bureau in selecting problems and in co-operating with state and private organizations in efforts to solve them. Dean Roberts explained that he was presenting his own views of the Bureau, which he had obtained as a consulting engineer working in co-operation with it since its establishment in 1910. He made a special appeal to engineers to co-operate with the Bureau of Mines in the selection of problems to be investigated by the Bureau, and said: "We should go farther and co-operate in carrying out not only the program we ourselves have had a part in chosing, but also whatever other program the country as a whole may be interested in."

Chairman Ord, Secretary Armstrong and others discussed the paper and quoted examples of the efficient service of the Bureau of Mines.

Three resolutions, adopted in committee and presented by Sidney Norman, chairman, were passed by the Northwest Mining Convention. The first resolution was one expressing sympathy with Judge George Turner, a prominent figure in northwestern mining history and a friend of the association, who is at present seriously ill. The second resolution placed the convention on record as opposed to disloyalty in any form and urged enforcement of existing laws dealing with sedition and treasonable acts. Resolution No. 3, demanding repeal of excess profits and corporation tax acts, follows:

Whereas, The excess-profits and corporation taxes are difficult and cumbersome to collect and vicious in effect, bearing inequitably and constituting in effect a premium upon inflated capitalization and a penalty upon conservative financing; and

Whereas, The operation of these taxes has resulted in serious discrimination against conservative Northwest dividend-paying corporations, which have been obliged to retain great sums from earnings awaiting interpretation of the measures by those responsible for their enactment; and

Whereas, The working of these acts led to burdensome direct taxation upon the consumer, thus adding very largely to the high cost of living, now, therefore,

Be it Resolved, That we, mining men of the Northwest, in annual convention assembled at Spokane, Wash., Feb. 16-21, 1920, call for the speedy repeal of these acts and the substitution of taxation measures that will be equitable in their operation and permit of the distribution of corporation earnings upon a fair basis; and

Be it Further Resolved, That copies of this resolution shall be forwarded to the Secretary of the Treasury and to members of all Congressional delegations from Northwestern states.

On Tuesday evening a reception to the visiting delegates by local members of the Northwest Mining Association was held at the Spokane Hotel.

THIRD DAY OF CONVENTION

The third day of convention was set apart for Idaho Day, the program having been prepared by the University of Idaho. The morning session opened with an address, illustrated by lantern slides, by R. B. Elder, of the University of Idaho. Mr. Elder showed a series of views of mining in Korea. Quartz mines and dredging operations were illustrated fully, as well as the native methods of labor and the living conditions of Koreans. Prof. D. C. Livingston was chairman.

The resolutions committee presented the following resolutions, which were discussed by the convention and passed unanimously:

Resolution No. 7, commends the stand taken by the American Mining Congress in directing attention to the monopolistic character of Minerals Separation, Ltd., and calls for the prosecution to a successful conclusion of the proceedings brought through the Federal Trade Commission against that corporation.

Resolution No. 8 contains the following significant paragraph:

Resolved, by the Northwest Mining Association, in convention assembled, that the establishment of reasonable freight rates to the Bunker Hill smelter is not only desirable, but necessary in order to enable that plant to compete with more distant smelters and to give the miners of this district an opportunity to market low-grade ores which would not stand shipment elsewhere. While we appreciate the situation of the railroads at this time is such that immediate action cannot well be taken, yet we urge that the various railroads give this matter earnest consideration, to the end that as soon as possible after the roads are restored to private ownership, equitable freight rates on ore be established from all points in this territory to Bradley, Idaho.

Resolution No. 9 calls for the protection of American citizens in foreign countries and directs attention in particular to the need for the Government to take such steps as will insure that every American citizen residing or having property in any foreign country shall receive the full protection of the United States.

Resolution No. 12 asks for the establishment of an experimental metallurgical station by the U. S. Bureau of Mines at Moscow, Idaho.

The Associated Engineers of Spokane held a luncheon in honor of visiting delegates in the Hall of the Doges at the Hotel Davenport. F. K. Armstrong, president of the association, presided at the luncheon. J. C. Ralston, recently returned from New York, reported the action of the founder engineering societies at meetings which he had attended on the subject of the proposed National Department of Public Works. Mr. Ralston's report of progress toward the establishment of the new department elicited much interest from all present.

Robert N. Bell, State Mining Inspector of Idaho, described the recent opening of the immense low-grade copper deposit of the Idaho Copper Co. at Cuddy Mountain, in the Heath mining district. The property, which was recently described in full in *Engineering and Mining Journal*, is about thirty-six miles south of the Iron Dike mine, in the canyon of Snake River. The

phosphate beds of southeastern Idaho, according to Mr. Bell, bid fair to bring wealth to the state. Already three companies have undertaken development, and one of these is producing 2,000 tons monthly. Another company has erected a mill of 500 tons daily capacity and has built three miles of railway. All of these operations are in Valley County.

At the afternoon session A. W. Fahrenwald, metallurgist of the Idaho Bureau of Mines and Geology, presented a comprehensive discussion of the various types of flotation machines now on the market. Each type was illustrated by a large diagram, with the aid of which the speaker demonstrated the manner of agitatating and aerating the pulp and withdrawing the froth. The machines were classified into groups according to a system devised by the speaker.

"Clays of Idaho" were described by F. H. Skeels, who spent the summer of 1919 in field investigations for the Idaho Bureau of Mines and Geology. The areas examined are on the western border of the granite batholith of northern Idaho and in the southern part of the state.

A general paper on gold dredging was presented by D. H. Ferry, manager of the operations of the Yukon Gold Company, at Murray, Idaho. Topics discussed were the relation of dredging to farming, types of ground suitable for dredging, percentage recovery of gold, failures in dredging and the reasons for them.

On Wednesday evening Dean Milnor Roberts exhibited moving-picture reels, illustrating safety methods in metal mines. The reels were loaned by the United States Bureau of Mines for demonstration at the Northwest Mining Convention.

The attendance had been growing steadily during the convention. More than two hundred mining men were registered and a large number of others attended the sessions without registering. Many prominent operators, owners of properties, and prospectors attended.

The fourth day was designated Washington Day. Papers and discussions of interest to the mining men of the state were presented at both morning and afternoon sessions. At the close of the announced program the gold question was discussed with much vigor. Four resolutions were put before the convention in committee of the whole for simultaneous consideration. Views were expressed on all of the resolutions, but no conclusions were reached.

"Physical and Topographical Features of Washington," with details of the Cascade Range, were presented by Prof. Solon Shedd, head of the Department of Geology at the State College of Washington. Prof. C. G. Warfel, of the State College, presented a paper on "Some Metallurgical Possibilities of Northwestern Washington," dwelling especially on the possibilities of developing tungsten, molybdenum, aluminum, and magnesium industries. In the discussion Dean Milnor Roberts pointed out the opportunity that exists for carrying out tests in the laboratories of the College of Mines, University of Washington, with the co-operation of the staff of the United States Bureau of Mines, Seattle station. The new superintendent of the Seattle station, taking office on March 15, will be O. C. Ralston, who, for the past three years, has been engaged in electrochemical work at Niagara Falls. The assistant metallurgist of the station will be Clyde R. Williams, an electric furnace expert.

The last paper of the morning, entitled "Ceramic Possibilities in the Pacific Northwest," was given by Prof. Hewitt Wilson, of the College of Mines, University of Washington. Prof. Wilson is engaged upon a survey of the clay and cement resources of the region, in which work he is co-operating with the Bureau of Mines and the State Geological Survey. Charts were exhibited to show the importance of ceramic industries throughout the country and especially in the Western states.

At the afternoon session Colonel Charles R. Forbes, manager Hurley Mason Co., Spokane, presented a paper on highways. Arguments were presented to show the advantages of concrete roads over those of bithulithic and asphalt construction. "State Aid in Prospecting" was the title of a paper by Dean Henry Landes of the College of Science, University of Washington.

At 3 o'clock the convention went into committee of the whole to consider subjects which the resolutions committee wished to present for open discussion. Sidney Norman acted as chairman and D. M. Drumheller, Jr., as secretary. The convention at once adopted a resolution favoring Federal aid for a road into central Idaho. Four resolutions were then presented in succession on the gold question, the committee explaining that it had been unable to sift these down to the point where a single resolution could be presented.

The first resolution was prepared by Colonel Chester T. Kennan, of Murray and Sumpter, Ore. It called for a readjustment of monetary standards which, as Colonel Kennan explained later in a paper, might require the establishing of a basis of, say $35, as the value of an ounce of gold. The second resolution was practically a full endorsement of the gold resolution passed by the American Mining Congress in November, 1919, at its St. Louis meeting. This resolution was presented by J. W. McBride. The third resolution, presented by E. M. Griffith, of Grangeville, Idaho, recommended an international council to discuss the monetary standards of the world and to consider the introduction of bimetallism. F. A. Ross, president of the Northwest Mining Association, presented a resolution that called for a conference of international experts, but did not make positive recommendations.

When the four resolutions were before the convention a lively discussion took place. Colonel Kennan read his paper in full, presenting a unique viewpoint which proved interesting to his hearers. On Thursday evening the banquet of the convention was held. F. A. Ross, president of the association, presided. At the banquet, G. A. Collins and M. J. Carrigan called attention to the International Mining Convention to be held April 7 to 10, at Seattle.

The closing day of the convention was divided into Prospector's Day in the morning and British Columbia Day in the afternoon. At 3 o'clock the convention give final attention to the resolutions and passed the following, given in abstract:

A resolution asking the President to call a conference of qualified international experts to devise ways for safeguarding the world's credits by increasing the world's metallic gold reserves, and endorsing the American Mining Congress plan of providing a premium of $10 per oz. upon new gold, such premium to be raised in part by an excise tax of the same amount upon all gold used in the arts; also asking Congress to relieve the gold-mining industry from excess profits, corporation, and income taxes.

A resolution suggesting that the proposed international gold conference give consideration to the remonetization of silver.

A resolution calling attention to the need of transportation facilities in central Idaho and asking Governmental agencies to direct their attention to the needs of this area.

THE PETROLEUM INDUSTRY

Killing the Goose

The overdevelopment of the Burkburnett field, in Texas, should be a lesson to oil investors and drillers alike. When this field was brought in there was a great scarcity of means for marketing the crude, and many of the wells had to be shut in. Production was not great, but every well appeared to have big possibilities for this very reason,—the pressure of the whole pool was behind it. The drilling of new wells was carried on without any idea of the potential production of the field. Suitable spacing of wells was ignored. As a result of this the thin oil strata has been drained of its valuable contents all too quickly. Production per well is constantly decreasing, and the initial investments will soon prove almost worthless. Several wells will give little more oil in a short term than one well would have produced in several years. The economic waste is obvious.

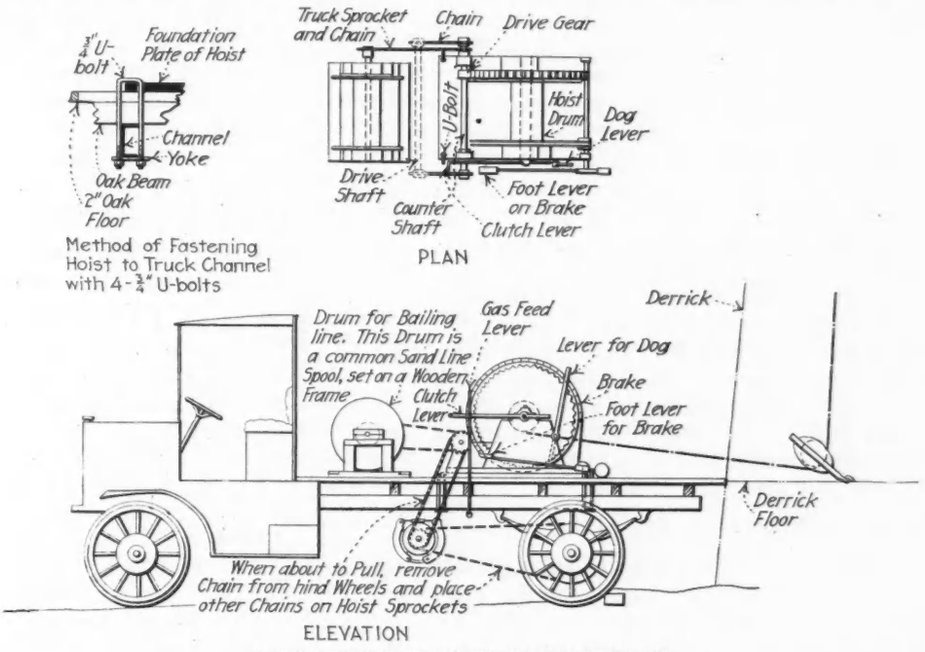
The Ranger, Caddo, and Desdemona fields are also not meeting the enthusiastic promises of the promoters. In the first two districts, the wells must be drilled to a depth of about 3,500 ft., which involves an investment of about $50,000, and the oil supply is limited.

The Homer field, in Louisiana, appears more promising. The shallow oil sand has been supplemented by another pay streak at about 2,100 ft., which supplies oil of about 40 deg. Bé. The proved production area is nearly 2,000 acres, and has not yet been delimited. The potential production is, of course, not yet known, but it is hoped that the mistake will not be made of sinking a large number of useless wells, as has been done in Texas. The intending investor should carefully look into the future as far as possible before handing his money over to the numerous small stock-selling concerns.

Auto Truck Hoist for Oil Wells

BY S. S. LANGLEY

Auto trucks serve a wide field of usefulness in the petroleum districts, but heretofore they have been used principally for the haulage of supplies and equipment for well-drilling outfits in the field. A novel use of the truck is shown in the accompanying illustration. Upon the chassis of the truck, a platform is mounted, and on this a single-drum gear-driven hoist, together with a rope drum. The hoist drum is used for pulling tubing in oil wells and the rope drum for bailing.



AUTO TRUCK ADAPTED FOR HOISTING

The arrangement is used for producing wells where tubing and pump rods require attention. The truck is backed up to the derrick, secured in position by blocking the wheels or by fastening to "dead men." The hoist is driven by a sprocket chain, which is placed upon the driving sprocket of the truck, the driving chains being removed. The arrangement is a compact, easily portable hoisting plant. It can be readily constructed in the ordinary repair shop, and the principal parts are usually carried in stock by supply houses.

Lane To Join Doheny Interests

E. L. Doheny, president of the Pan American Petroleum & Transport Co. and the Mexican Petroleum Co. has announced that Franklin K. Lane, until March 1 Secretary of the Interior, will become vice-president and legal adviser of the two companies mentioned, at a salary of approximately $50,000 a year. Mr. Lane's headquarters will be in New York City. Joseph J. Cotter, who assisted the Secretary in the Interior Department, will act in a similar capacity with his former chief in the new work.

The Oil-Land Leasing Bill

Leases Are on a Royalty Basis, Restricted to a Single Section, and Provision Is Made for Development in the New Law, Which Only Awaits the Signature Of President Wilson

THE Oil-Land Leasing bill is not yet a law; nevertheless, it has passed both the Senate and the House and only awaits the signature of the President. The most important provisions of the act covering the prospecting and leasing of oil and gas lands are summarized in the following, which has been prepared from the second conference report (S. 2775):

Section 13 of the bill provides for the granting of a prospecting permit which gives the exclusive right for two years to an individual to prospect an area of land not exceeding 2,560 acres, and not included within any known geological structure of a producing oil or gas field. The restrictions are that drilling must begin within six months; within one year, one or more wells, not less than 500 ft. deep, must be drilled unless oil or gas be struck sooner; and within two years the aggregate depth of drilling must be not less than 2,000 ft., with the same proviso. The time of the permit may be extended not exceeding two years, under such restrictions as the Secretary of the Interior may see fit to impose. Specific requirement is also made for the selection of the tract in a compact piece conforming to public land surveys, if surveyed, and, if not surveyed, of approximately square or rectangular form. In the territory of Alaska, no one person can receive more than five permits for periods not exceeding four years, actual drilling to begin within two years, similar conditions as to depth of drilling being imposed, but the time being increased to three and four years respectively.

Leases Restricted to 640 Acres

Section 14 provides that after discovering valuable deposits of oil and gas within the limits of the area, the permitee is allowed to lease one-quarter of the land (640 acres) or 160 acres provided the original area included in the permit reduced the acreage below the last-named figure. The lease is for a term of twenty years, at a royalty of 5 per cent in amount or value of the production and the annual payment, in advance, of a rental of $1 per acre, the rental paid in any one year to be credited against the royalties as they accrue for the year. The permitee is entitled to a preference right to lease the remainder of the land covered in his prospecting permit at a royalty of not less than 12½ per cent in amount and value of production, the royalty to be determined by competitive bidding or by the Secretary of the Interior's regulation. Until the permitee applies for a lease he must pay to the United States 20 per cent of the gross value of oil or gas produced from land within his permit.

All permits and land leases are subject to the condition that no wells be drilled within 200 ft. of boundaries, unless adjoining lands have been patented or are held in private ownership. Operators are also required to prevent waste and entrance of vagrant waters into oil measures.

Section 17 provides that all unappropriated deposits of oil or gas within known geologic structure of a producing field and the unentered lands (not subject to preferential lease) may be leased by the Secretary of the Interior to the highest responsible bidder by competitive bidding. The area so leased is not to exceed 640 acres, the length of tract not exceeding two and one-half times its width, such leases to be conditioned upon payment by the lessee of such bonus as may be accepted and of such royalty as may be fixed in the lease. The royalty is to be not less than 12½ per cent of the value of production, the payment in advance to be not less than $1 per acre per year, the rental for any one year to be credited against royalties for the year as they accrue for that year. The lease is for a period of twenty years, and the lessee is given the preferential right to renew for successive periods of ten years. Where the average daily production of any one oil well does not exceed ten barrels per day, the royalty on future production may be reduced by the Secretary of the Interior, if, in his judgment, the lease cannot be successfully operated upon the royalty fixed therein.

Oil Lands Within Areas Withdrawn by Presidential Action

Section 18 covers oil lands situated in areas withdrawn by Presidential proclamation, and provides that on lands withdrawn by Executive order issued Sept. 27, 1909, and not within any naval reserve, claimants who acquired title under the placer mining law, and on which one or more wells have been drilled to discovery, may file a relinquishment of title of such lands, to the United States, within six months of the approval of the present act, and, on payment of royalty to the United States of one-eighth of all the oil and gas produced (excepting loss and that used for production purposes), shall be entitled to a lease thereon for twenty years at a royalty of not less than 12½ per cent of all oil and gas produced.

The leased area must not exceed one-half the claimed area and in no case to exceed 3,200 acres within the geologic oil or gas structure of a producing field. Upon claims of like nature, situated within any naval petroleum reserve, the producing wells only can be leased. No wells are to be drilled within 660 ft. of any such leased well without the consent of the lessee, although the President may, at his discretion, lease the remainder or any part of such claim upon which wells have been drilled. In such cases, however, the claimant will have a preference right to such lease. A claimant guilty of fraud, or who has not acted in good faith, will not be entitled to any of the benefits of this section.

Upon delivery and acceptance of the lease described in the foregoing paragraph, all suits brought by the Government may be settled and adjusted and all moneys impounded in such suits will be paid to the parties entitled thereto. In cases of conflicting claimants, the Secretary of the Interior is authorized to grant leases to one or more of them as justice dictates.

Section 19 provides that any person who on Oct. 1, 1919, was a bona fide occupant or claimant of oil or gas lands whose claim was initiated when such lands were not withdrawn, and who had a valid location (except-

ing discovery), will be entitled to a prospecting permit under the same terms as other permits (providing claimant has expended an aggregate of $250 for each location, and he makes application within six months). Where a discovery has been made, claimant is entitled to a lease under the same conditions as mentioned before. If the prospecting permit is granted upon land known to be within a producing field, the royalty in any lease will not be less than 12½ per cent of all oil or gas produced, excepting that used for production purposes. This section, however, does not apply to lands reserved for the use of the Navy.

Section 20 provides for lands bona fide entered as agricultural, not withdrawn or classified as mineral at the time of entry (excluding lands claimed under railroad grant), and gives the patentee or his assigns, where assignment was made prior to Jan. 1, 1918, if the patent reserved the mineral right, a preference right to a permit and a lease, in case of discovery. The patentees or assigns holding restricted patents may combine their holdings, not to exceed 2,560 acres, for the purpose of making joint application. Under this section the royalty is to be not less than 12½ per cent except in the case of the discovery lease.

Section 21 covers oil-shale lands. The Secretary of the Interior is authorized to lease any oil-shale lands belonging to the Government in units not to exceed 5,120 acres. Leases may be for indeterminate periods, the royalty to be specified in the lease, and for an annual rental at the rate of 50c. per acre, the rental paid for any one year to be credited against the royalties accruing for that year. The Secretary may waive the royalty and rental during the first five years of any lease. A claimant having a valid claim to oil-shale land under existing laws on Jan. 1, 1919, will, on relinquishment of such claim, be entitled to a lease under the foregoing provisions to the area relinquished, provided that such area does not exceed the maximum area authorized. No more than one lease will be granted to any one person, association or corporation.

Section 22 applies specifically to Alaska and gives to any bona fide occupant or claimant of oil or gas land who may not have made a discovery, but who has expended not less than $250 in improvements on each location, upon relinquishment to the United States within one year of the date of the act, or six months after final denial or withdrawal of patent application, a prospecting permit, lease, or permits and leases in number not exceeding five, and not exceeding an aggregate of 1,280 acres in each, the rentals and royalties to be specified by the Secretary of the Interior and subject to readjustment at the end of each twenty-year period of the lease. The Secretary may waive payment of any rental or royalty not exceeding the first five years of any lease.

British Oil Men Seek 12,000,000 Acres in Peru

An application for a concession to a twelve-million-acre petroleum tract on the Huallaga and Ucayali rivers, made by V. H. Solaini on behalf of Sir Frank Newnes and a powerful group of British capitalists, was approved on Jan. 29 by President Leguia, of Peru, according to the N. Y. *Herald*. The concession, which would run for five years, will soon be brought before the Peruvian Congress.

The Huallaga and Ucayali rivers are tributaries of the Amazon, rising on the eastern slope of the Andes, in Northeastern Peru.

How Oil Fuel Is Displacing Coal

The world is rapidly adopting the oil-burning ship, according to "Lloyd's Register of Shipping," which shows that of 3,801,221 tons classed in all countries of the world, 1,193,659 tons, or 211 vessels, were equipped to use oil for fuel, in addition to 63 oil tankers of 360,405 tons. The use of oil by the United States merchant marine is growing by leaps and bounds, as evidenced by the fact that this country already has 438 oil-burning steel ships, and of 720 vessels now under construction 636 are to be oil burners. The Shipping Board estimates that 60,000,000 bbl. of oil will be required in 1920 to supply its own vessels.

A recent press bulletin prepared by the Division of Statistics, Bureau of Foreign and Domestic Commerce, states that many industrial plants are substituting petroleum for coal, the movement having gained considerable headway in the large textile and paper mills, and even in small industries in the New England section. Besides a large saving in labor, there is an actual saving in the cost of fuel at the present prices of coal and oil. The substitution of petroleum as a fuel may even extend to the home, for New York City now permits the use, properly regulated, of fuel oil for firing heating plants in skyscrapers, apartment houses, and private dwellings.

The Sunset-Midway Oil Field of California

The United States Government has just issued a 100-page, 9 x 12 book, by G. S. Rogers, describing in considerable detail the geochemical relations of the oil, gas, and water of this field. The publication contains analyses of the oil, gas, and oil-field waters and a discussion of their composition in relation to their geologic occurrence; some figures on the geothermal gradient; and a brief paper on the invasion of oil sands by water. Copies may be had at 15c. each by requesting Part II of Professional Paper 117, U. S. Geological Survey, from the Superintendent of Documents, Government Printing Office, Washington, D. C.

California Oil Industry in 1919

The total oil production for California for 1919 amounted to approximately 100,000,000 barrels, according to estimates made by the State Mining Bureau. The value at the wells was about $133,000,000, which is five or six millions greater than the total value of the oil produced in 1918. The increase in value is due more to the increase in price than increase in production.

The amount of oil in storage has shown a decrease during the year, but to offset this discouraging feature of the oil industry the acreage of proved oil land has been materially increased by developments in the Elk Hills in Kern County, and in the Richfield fields in Orange County.

Freight Rate on Mid-Continent Petroleum to Minnesota Adjudged Unfair

The railroad rate on petroleum and its products, in carloads, from the Mid-continent field to certain Minnesota points has been found to be unreasonable by the Interstate Commerce Commission. The rate should be 5c. per 100 lb. less than the rate on refined oil, and it was found that this charge had been exceeded.

NEWS FROM THE OIL FIELDS

Will Try To Prove Oil Deposits of Northern Ontario This Year

Vast Area South of James Bay Offers Attractive Possibilities—Rich Oil Shales Found

In 1919, the Canadian Geological Survey sent Joseph Keele and Dr. M. Y. Williams into the territory between Cochrane and James Bay to seek for oil in this region. The report of Dr. Williams has not yet been made public, but it is understood that the possibilities of the region are great and that one of the big Canadian oil companies is planning on doing some exploration work there this year.

Magistrate C. M. McCarthy, of Elk Lake, according to the "Sudbury Star," states that some shale found is so full of oil that it will burst into flame when touched with a match. Claims have been located at Grand Falls, on the Metagami River. It is understood that a strong syndicate, which for the most part includes Toronto speculators and oil men, has put up the money. Mr. McCarthy will have charge of the work, and he intends to go into his property as soon after the spring break-up as possible.

The prospective area extends from east of the Abitibi River to west of the Albany, and from the shores of James Bay south for a hundred miles. So far, little is known of the structure of the area, and for this reason Dr. Williams' report is eagerly awaited.

Oil Fever Spreads to Angelina County, Tex.

In Angelina County, Tex., there is much activity and a feeling of more to come. Scouts from all the big oil companies have been in this section of the Gulf Coast field, and considerable acreage has been leased. The Lufkin Oil & Gas Co. has acquired 4,000 acres, and will drill three deep test wells at once. The first will be near the old Kinney gas well, eight miles north of Lufkin, where gas was formerly produced; the well however, was not deepened in an effort to get oil.

Oklahoma interests have, it is stated, leased 8,000 acres in the southern part of this county, and will drill three wells on the John Renfro property. A well being drilled near Zavalla has an oil showing at 986 ft. This will be drilled deeper.

Retorting of Oil Shales Not Yet on a Commercial Basis

Considerable experimental work on a small scale has been done in the retorting of oil shales in this country, but no plants for handling a large tonnage have yet been constructed. Four or five companies, using as many different systems, are, however, operating with considerable success, and when some of the difficulties incident to any new process are surmounted, units treating several thousand tons a day will no doubt be erected. The Continental Oil Shale Mining & Refining Co. on Piceance Creek, about two miles from Rio Blanco, Col., is reported to have started a continuous oil-shale retort since the first of the year.

The Bureau of Mines and the State of Colorado are co-operating on investigations of the Colorado shales, for which work $10,000 has been appropriated. The experiments will be carried on at the University of Colorado, at Boulder, and the investigation will be under the direction of Martin J. Gavin, of the Bureau of Mines, a specialist on oil refining. The work should provide fundamental data which will be of great aid in the development of commercial processes of retorting and refining.

TEXAS NOTES

Orders have been sent out by the Texas Co. not to waste any gas found in drilling wells for oil on its properties. This is believed to indicate a disposition on the part of this company to enter the natural-gas business. Great quantities of gas are known to exist in west Texas, and in other parts of the state, but no concerted effort has been made to conserve this natural resource, maintain a regular supply, or establish a market for it.

Eagle Pass may be the scene of the next Texas oil boom. Many wells are being started near there. Among the companies preparing to work is the International Oil & Gas Co., which has all its material on the ground.

A gas and oil showing is reported at a depth of 1,300 ft. in a well being drilled by the Hueco Basin Oil Co., forty miles east of El Paso.

New oil-well locations are being made in all parts of Texas, especially where there is any indication of oil or gas. Drilling on the farm of B. H. Rogers, near Brenham, Washington County, will begin soon. Sulphur water and oil indications were reported found. Boring for oil in the vicinity of Hearn, Robertson County, will also begin soon. A car load of drilling machinery has been shipped to Davis switch, a few miles south of that place.

Construction of the new refinery of the White Oil Corporation to be built at Texas City, Galveston County, is expected to start some time in March. This oil refinery will have a capacity of 15,000 bbl. daily, and will be supplied by an 8-in. pipe line from the Ranger field.

Production in McKeesport, Pa., Gas Pool Will Decline Fast

Meanwhile, the Wily Stock Promoter Is Flourishing in True Western Style —Area Is Being Overdrilled

The field of the glib-tongued oil stock promoter is not confined to the southwest; even staid old Pennsylvania has lately been invaded on the discovery of the McKeesport gas pool. The first gushers made thousands of dollars for the lucky owners, but the honeycombing of the field with drill holes has brought about the inevitable decline in production. George H. Ashley, State Geologist, recently published in the Pittsburgh *Post* a report warning intending investors of the risk they are taking. In commenting on this bulletin in the *Philadelphia Record*, Mr. Ashley says:

"There are three unfortunate things connected with the McKeesport gas situation: First is the fact that promoters have gone into that field and are using McKeesport as an advertising shibboleth. The result will be, I fear, when the bubble bursts, as it is certain to do within a month or two, that those who have invested and lost money will fail to distinguish between honest promoters at McKeesport and others who are simply capitalizing the reputation of the McKeesport pool.

"Second, is the character of the advertising now being indulged in by the promoters of the McKeesport gas pool. As I have hinted in my bulletin, the statements regarding production that are made in the advertisements and being published in certain of the newspapers are away above the clouds, and have little relation to the facts. They are apt to be given credence by individuals who cannot interpret the actual facts.

"Figures on production that are being quoted in the advertising are very commonly the estimated production at the time the wells came in. Actual production has been anywhere from one-half to one-sixth of the estimated production at the beginning, and practically all wells have fallen from that first production, depending upon how long they have been flowing, most of them today having a flow which is only a fraction of their initial actual production.

"Third is that so much good money is actually being spent in drilling in an area that cannot possibly hope to yield enough gas to repay for the drilling now in progress, while the needs of the state for gas make it most desirable that a large amount of prospecting be carried on in other fields as yet untested or only partly tested. To invest money in drilling at McKeesport today, or to invest in stock for drilling, is a little like betting on the dead bulldog just before the fight."

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Ore Deposits of the Mogollon District, New Mexico

Silver and Gold Occurrence Characterizes All Viens in the District—Mineralization Is Well Defined

In a paper presented before the American Institute of Mining & Metallurgical Engineers, at the New York meeting, David B. Scott describes the Mogollon District, New Mexico, which has been the leading silver producer of the state. Its activities have usually been limited to the operations of two or three companies. The value of the total production of the district in the forty-four years of its history has been estimated at $15,000,000. For the years 1904 to 1917, inclusive, the output was: Gold, $4,370,000; silver, 10,042,000 oz.; copper, 874,862 lb.; total value, approximately $10,500,000.

The town of Mogollon is seventy-five miles by a poorly located highway from the nearest railroad terminals at Silver City and Tyrone. All supplies are transported by motor trucks and teams.

The area lies on the western flank of the Mogollon Mountains, which occupy the western part of Socorro County. The mineralized zone is 3½ miles long and 5½ miles wide.

During the last few years, operations have been limited practically to the Socorro Mining & Milling Co., and the Mogollon Mines Co., although some work has been conducted by development companies, of which the Oaks company, and the Alberta Development Co., have been the most important.

The rocks of the district are exclusively igneous, and all are varieties of andesitic and rhyolitic flows. It seems highly probable that the rhyolites are younger than the andesites in this district.

The ore deposits are Tertiary mineralizations in rhyolite and andesite. The veins are all of the fault-fissure type, and the predominant filling is quartz and calcite.

Practically all of the profitable mining has been limited to those veins which have a general east-west strike. A few of the minor north-south veins have been exploited to some extent, and on one of them a small mine, the Pacific, was developed. The period of fissuring was evidently closely followed by the appearance of mineralizing solutions. The dip of the veins is rarely less than 65 deg., the principal veins being all close to 70 deg.

The vertical range of exploration thus far attained is approximately 1,700 ft., but there is reason to believe that mineralization extends to depths below the present workings. Many of the richest orebodies, notably in the Last Chance mine of the Mogollon Mines Co., and in the Fanny mine of the Socorro Mining & Milling Co., did not reach the outcrop. Conversely, some promising surface deposits on the strong Enterprise or King vein, in the western part, gave evidence of failing in depth. Many of the profitable veins are oxidized to such an extent that the erosion of their outcrops easily keeps pace with the disintegration of the wall rocks.

The vein filling is fairly uniform through the entire district, being composed of quartz, calcite, and fluorite, in order of relative abundance. The Fanny, Last Chance, and Queen veins, especially, show a marked regularity in dip and persistence to a depth of at least 1,200 feet.

Both silver and gold are found in all the veins in the district. The principal silver-bearing veins are the Last Chance, Maud S., Little Fanny, Independence, Johnson, Cooney, and Floride. Between these veins, occasionally having a strike nearly at right angles to them, are others of less importance, notably the Pacific and the Comet. At present, mining is confined to the east-west veins, which, with one exception, dip to the north.

The Cooney vein is the only prominent example of copper mineralization yet developed in the district.

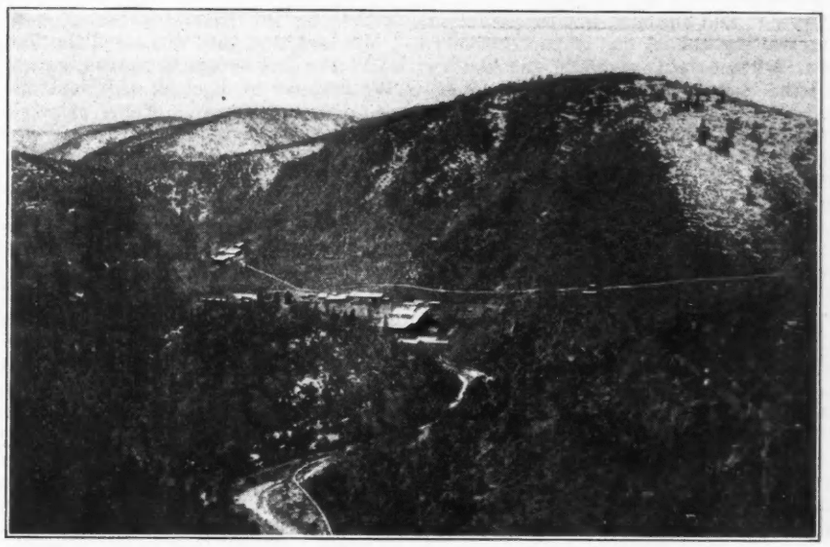
The principal silver mineral is argentite, which is usually finely divided. Native silver, cerargyrite, bromyrite, and stromeyerite have also been noted. Fluorite, calcite, and quartz are found in crystals; the fluorite, which is present in all of the east-west veins, is green and purple in color.

Various orebodies have produced many thousand tons of ore running well above 30 oz. The vein material is either very low-grade, having a silver content of 2 to 3 oz., or it runs above 7 or 8 oz. per ton.

The ratio of silver to gold, by weight, ranges from 33:1 to 84:1; the average may be regarded as 50:1.

The zones of profitable mineralization are rather well defined; they are often as long as they are deep; they are irregularly distributed throughout the veins; and they bear no definite relation to one another. Many of them have been from 300 to 400 ft. in length, and some of these long shoots have bottomed nearly horizontally along their entire length.

The orebodies in both of the principal mines are notable in one particular; they are situated at a horizon which contains a change and a reversal of the wall rocks. That is, they are found in greatest development, where the rhyolite is succeeded by andesite on the foot wall and where the hanging-wall andesite is underlain with rhyolite. Above and below this change in wall rocks, and at no great distance from it, have been found the best orebodies of the district. This change in opposing wall rocks is due, of course, to faulting, the throw of the principal faults being from 450 ft. to nearly 700 ft. The principal deposits have been found under two conditions: with the upper andesite as hanging wall and rhyolite as foot wall; or with the lower andesite for foot wall and a rhyolite hanging wall. This reversed condition, as noted before, has been caused in part by faulting.



LOOKING SOUTH IN THE MOGOLLON MINES. PLANT OF THE MOGOLLON IN THE CENTER

The Engineer as a Citizen

Mass Meeting of Engineers in Support of National Department of Public Works—M. O. Leighton Speaks

On the evening of Feb. 19, 1920, a mass meeting of engineers in support of the National Department of Public Works was called to order by Charles Whiting Baker. Mr. Baker said that there was no class in the community more zealous than the engineer. He has failed in the past in meeting his full obligations as a citizen.

The present situation may be likened, Mr. Baker said, to the occurrence of a huge boulder in the middle of a road. One kind of citizen may find the boulder, stop, curse and then go on, conscious of having done his duty as he sees it. Another will hunt around and find a crossbar and, after prying at the boulder, will depart also with the feeling that he has done his duty. If he were an engineer he would get a derrick and get the rock out of the way. Our Government, said Mr. Baker, is in a somewhat similar situation. There has been a lot of "cursing," a little "prying" and shifting, but the situation is awaiting the efforts of the engineer. Mr. Baker briefly reviewed the history of the movement directed toward securing a National Department of Public Works and then introduced the speaker of the evening, Marshall O. Leighton, chairman of the National Public Works Department Association.

Mr. Leighton used as his text, "Let no wise man estrange himself from the government of the state." He said directly to the engineers present: "You do estrange yourself from the government of the state by your policy of aloofness. Your training and experience, your study and research, have made you more proficient along certain lines than any other men. Your proficiency is greatly needed by the public, your family, your neighbors. Your country needs your help in its affairs. It needs it personally, and not by proxy. Your Government is stricken, men in high places are running around in circles. For years we have made caustic comment about the affairs of Government. We have chosen to govern ill rather than well. Now, we are appalled because we see evidences of political and social instability. Who is more to blame? The man who rocks the boat or the man who stands idly by?

"Influence means a flowing into—in the war you flowed into things, you went where you were needed, you did not quibble, nor ask questions. Shall it be said now that you flow into things only when they are spectacular? No. You are going to do it, you are going to take your place."

Mr. Leighton added: "We are now up to our eyes in taxes. The aggregate departmental estimates reach the staggering total of $5,000,000,000; there is a Treasury deficit of $3,000,000,000. We must pare this down. We are poor folks; we must skimp and save. As practical men, what is the first thing that you would do? You would fine-comb your organization. You would examine every detail; you would reorganize and co-ordinate."

Mr. Leighton then described a shoe factory organized into five separate departments, each with its own management, purchasing department, its own power plant and each operating independently of the other. "You can well imagine the outcome," he continued. "In contrast with this lack of co-ordination, consider the case of our Government, where there are nine departments engaged in civil public works, each of which competes for materials and labor. Within these departments there are bureaus, each complete within itself. Summed up, there are thirty-nine units, each of which performs the same or similar functions, and all are self-contained. When you think of thirty-nine such units do you consider that the parallel with the shoe factory is overdrawn? In the case of the shoe factory, your treatment would be obvious. Functional organization is the basis of successful industry today. Can you conceive of any different treatment in handling the affairs of the Government?"

Mr. Leighton then discussed the Public Works bill before Congress, saying, "We are yet to discover any real man who does not approve of the principle. It is doubtful whether any other proposal to Congress has met with so little opposition. Herein is the great danger to the successful completion of this legislation. Without active interest and your influence, the bill might fail of enactment, and you men in the room and millions like you will be to blame."

After briefly discussing the proposed Governmental budget system, and indicating that it was also a co-ordinating force, Mr. Leighton closed his address with the following quotation from Herbert Hoover's recent address: "We have in this country probably one hundred thousand professional engineers. The events of the last few years have greatly stirred their interest in national problems. This has taken practical form in the maintenance of joint committees for discussion of these problems and support to a free advisory bureau in Washington. The engineers want nothing for themselves from Congress. They want efficiency in government, and you contribute to the maintenance of this bureau out of sheer idealism."

A number of questions were asked by different members of the audience and answered by Mr. Leighton. J. Parke Channing said that Mr. Hoover has been unable to attend the meeting, but had sent the following message to give to the engineers: "I approve of a National Department of Public Works to co-ordinate the construction agencies of the Government; to eliminate the duplication and waste and to increase efficiency. This is a non-partisan movement organized by engineers and of which I approve, and, as I said before, I am not a candidate for the Presidency and this movement is not political."

The Metric System and Our Foreign Trade

The World Trade Club of San Francisco is calling attention to the importance of the metric system's standards for all who would engage successfully in foreign trade, particularly with the Latin countries of Europe and America. It points out that there are now on file at the U. S. Bureau of Standards, Washington, over 70,000 petitions on the subject of metric standardization, 99 per cent of which favor metric standards. The little 4-page *Weekly Metergram* presents many aspects of the subject which deserve to be carefully considered. Among them may be mentioned the fact that the new Republic of Poland has made the metric system obligatory even to the extent of subjecting to confiscation all goods sold there by any other measure. The Government of India has recently accorded permanent recognition to the metric system by requiring the Chinese authorities to recognize the metric system of count in marking and describing woolen and silk yarns, because the principal consumers of those commodities decline to accept yarn made up otherwise. Brazil adopted the system over 30 years ago.

Joint Committee on Safety Codes

In accordance with the recommendation of the conference on industrial safety codes, made at Washington on Dec. 8 last, and at the request of the American Engineering Standards Committee, the International Association of Industrial Accidents Boards & Commissions, the U. S. Bureau of Standards, and the National Safety Council organized a joint committee on safety codes, which includes representatives of these and of other selected bodies. This joint committee at present embraces fifteen members, representing the leading safety, industrial, and insurance organizations of the country, and it is planned to add two more members, one each from the Ohio and California commissions. The committee held its first meeting in Washington on Jan. 9, 1920, and formulated tentative recommendations for about thirty safety codes.

Map-Makers To Meet in Washington

The interdepartmental Government board of surveys and maps will hold a conference on March 9 with the representatives of all non-governmental interests concerned with map making. As the Government's topographical mapping has a bearing on practically every branch of engineering, a large number of engineers are expected to be present at the meeting.

The Cambria Steel Co. announced a 10 per cent increase in wages for common labor on Feb. 10. The new rate, effective Feb. 1, allows 44c. an hour. The wages of other classes of labor will be readjusted on a similar basis, it is said.

THE MINING NEWS

LEADING EVENTS

General Wage Increase Granted by Homestake Company

Miners To Receive from $4.50 to $5 Per Day—Raise Given in Face of Recognized Difficulties

A new wage scale, effective March 1, has been announced by the Homestake Mining Co., operating at Lead, S. D. The following wages will be paid under the new schedule: Underground miners, $5; open cut miners, $4.75; surface miners, $4.50; underground shovelers, $4.50; underground laborers, $4 to $4.25, and surface laborers, $3.75. Other surface employees will receive from 25 to 50 cents per day increase. The announcement of the new scale was made by Bruce C. Yates, superintendent.

In putting in force the foregoing wage scale the Homestake company has lived up to its reputation based upon a consistent record of forty years of fair and liberal dealings with its employees. The increases are made in the face of recognized difficulties. It is prompted by a sense of justice and appreciation of the present increased cost of living. While the increase in the company payroll will benefit not only the employees but the entire community as well, it is understood that local merchants will continue their past policy of selling staples and necessaries upon the same margin of profit as heretofore.

Mining in Colorado Aided by High Silver Price

The soaring price for silver is being reflected in increased activity throughout the silver districts of Colorado, and is resulting in many promising strikes in various parts of the state. Work was started late last year on the Early Bird group, located on the divide between Ouray and Animas Forks in San Juan County. After extending a tunnel 20 ft., ore was encountered which showed high values in silver and about 10 per cent copper. A pack train has been employed to bring out the ore and the first car load will go to the smelter early in March. At Leadville, new discoveries of ore in the Matchless, the Linda shaft on Breece Hill, and the old Ibex promise to very materially increase the output from that camp during 1920. In San Miguel County in the old Ophir district, seven mining properties are being worked where one year ago only one was operated. Clear Creek and Gilpin counties show a very marked increase over last year in the number of properties operated, while Park, Mineral, Pitkin and Summit counties all are sending out increasing shipments.

Propose To License Engineers in Arizona

Bill To Be Introduced at Next Session of State Legislature—G. M. Butler, of Tucson, Sponsor

A bill requiring a special license for any one who proposes to practice engineering in Arizona is to be introduced in the next session of the Arizona State Legislature. It is sponsored by G. M. Butler, dean of the State School of Mines at Tucson. This action, it is stated, has become necessary "to protect the legitimate engineer from the horde of promoters in the mining game, who grab the title of mining engineer and who not only disgrace the mining game but drag into the mud the standing of men qualified by experience and education." It is claimed that a code of ethics should be established and enforced. At present it is believed that there are far too few mining engineers in private practice in the Southwest. At the recent convention in Ajo barely 5 per cent of those in attendance were engineers outside of the employ of the large mining companies.

Natives Strike on Witwatersrand in South Africa

According to a press dispatch from Pretoria there is serious labor trouble on the Witwatersrand in South Africa. The dispatch dated Feb. 23 runs as follows:

"Lieutenant General Jan Christiaan Smuts, British member of the League of Nations Commission, in a speech at Pretoria on Feb. 23 referred to native troubles in the Witwatersrand gold fields, which he characterized as dangerous. Between 30,000 and 40,000 negroes are striking, General Smuts said, and by means of organized picketing are doing things of which he deemed them incapable. The speaker declared he had seen portents that a tremendous change was coming over South Africa. The nonsense which the whites have been talking of republics of blood and tears will be put into practice by the natives," General Smuts said, "and too late it will be found that this idle talk has put these mischievous ideas into the heads of the natives."

All mines and mills in the Tonopah district, which have been closed for some time by a strike, resumed operations Feb. 14, following the signing of a new wage agreement for one year, retroactive to Feb. 8. The new agreement provides a minimum daily wage of $5.50 and continuance of the commissary store by the employers for the benefit of the employees.

Lake Superior Iron Ores To Be Shipped to New Furnaces

St. Louis, Sparrow's Point and Bethlehem To Get Tonnage from Minnesota and Michigan Ranges

One of the interesting features of Lake Superior iron ore shipments for the coming season will be those to the Atlantic seaboard and to St. Louis. The natural limitation for Lake ores has been the crests of the Alleghanies, and it has been, and still is, an unusual occurrence for any considerable quantities of ores to go beyond them. But this year not less than 2,000,000 tons of Lake ore, from the Mesabi and Gogebic ranges, will be delivered at Sparrow's Point and Bethlehem. Also there will be shipments from Gogebic and Cuyuna range points to St. Louis.

In the former case the situation as to Cuban ores and their present costs for nodulizing and ocean freights, make it economy for Sparrow's Point to receive this very large quantity from the Lake. It is evident that the receipts there from either Cuba or Chile will be meager. It is a subject for speculation as to when freight and other conditions will so change as to permit free shipment from the vast reserves of either Mayari in Cuba or Tofo in Chile. Within the last two years the Bethlehem Steel Co. has become heavily interested in large and high grade mines on both the ranges from which shipments to the east will be made this season, and many operators in the Lake district expect that this long distance business will continue for many years.

Iron ore reserves in Missouri consist largely of brown residual deposits, and the type of these deposits is well known to ore men; they do not lend themselves to a ready approximation of tonnage, nor are they, generally speaking as far as Missouri is concerned, such as to be favorable for extensive operations at low costs, although doubtless there is a great tonnage of these ores in the state. Small shipments have been made to St. Louis from the Cuyuna Range, in an experimental way, and under exceptionally favorable arrangements with the U. S. Government, which seems to be interesting itself in the furtherance of blast-furnace operators there. It has built several boats for carrying this ore, and is building more. The routing is from the Cuyuna to St. Paul, and from there down river to St. Louis. There is no suitable docking facility at St. Paul, and what ore was sent was dumped into barges through one of the Mississippi River bridges. Low water has interfered with reasonable dispatch of these cargoes.

With the great demand for ore that is developed by recent purchases by furnaces in the Lake district, and with the above and other outside requirements, it is now believed that the production from Lake mines this year will amount to not less than 65,000,000 tons. If there are no serious labor disturbances at mine or mill this total can be attained with comparative ease, although lake vessel capacity is actually materially less than it was in the peak year of 1916, when the total was 66,658,000 tons, and though there has been no increase in ore-road rolling stock. It is probable that the Mesabi alone will produce at least as much as all ranges combined did in 1919.

Railways are preparing for extensive additions and betterments; the Duluth, Missabe & Northern, for instance, is to spend $3,000,000 at its Duluth shops and in bridges and other improvements along its line. This work must go on. Other roads are in about the same situation.

Colorado Mine Taxation Committee Named

The personnel of the committee selected through a movement inaugurated by the Colorado Tax Commission to prepare and have submitted at the November election a bill to repeal the present mine taxation laws of the state, has been announced. The organization meeting will be held early in March. The Tax Commission will be represented by C. P. Link; the State Grange by Rudolph Johnson, of Boulder; the State Assessors Association by J. W. Klein, of Jefferson County; the Colorado Metal Mining Association by George L. Nye, of Denver, and the Stockgrowers' Association by John P. Klug, of Greeley. The Tax Commission claims that mining interests are not paying their just proportion of taxes. Mine owners affirm that they are already bearing more than their share of the burden and will vigorously oppose any material change in the law.

Want to Abolish Federal Assay Office at Salt Lake City

The question of the continuance of the Federal Assay Office and the office of the Surveyor General at Salt Lake City, which has come up from time to time in past years, has been renewed and appropriations necessary for the maintenance of these offices are omitted from the legislative appropriation bill now pending. This is in a line with the present effort at curtailment of expenses, and the reasons given are that the Assay Office is not self-supporting and that the work of the Land Office could be done more cheaply in Washington. Both offices are run efficiently and economically. There are at present pending in the Land Office requests for the survey of more than 3,000,000 acres, and the Surveyor General is seeking an appropriation of about $200,000 for work during the coming season.

Labor Unsettled at Tonopah and Divide

Agreement Made Last November Not Satisfactory to All—Recent Amendments Must Be Ratified by Unions

Labor conditions in the Tonopah and Divide mining districts remain unsettled. The contract agreement, entered into between the operators and the miners and crafts unions on Nov. 7, 1919, called for the payment of a bonus of 50c. per shift from that date until the company commissary should be declared functioning by the Federal Mediator, Joseph Lord. The commissary was declared functioning and Feb. 8 set as the date for the removal of the bonus. A considerable number of men stopped work as soon as the bonus was removed, and many left camp. The crafts unions stood by their contract as a body, as did the miners, but a noticeable number of the miners quit work. This quitting of the miners was due mostly to threats on the part of the radical element in camp, and consequent fear of property damage or bodily harm.

Representatives from the operators and the crafts and miners unions have been in close consultation and, while all labor representatives consider the contract fulfilled by the operators, they also expressed the opinion that the general sentiment of the mine workers as a whole was that the terms of the agreement of Nov. 7 were not satisfactory, due to a misunderstanding of certain of its provisions by many of the men who were not familiar with the contract and its terms except by hearsay. In view of this fact the amendments published in last week's issue of *Engineering and Mining Journal* were presented to the executive committees of the mine workers on Feb. 11 by the operators.

This proposal will have to be ratified by the separate labor organizations. It is expected that it will be and that industrial peace in the Tonopah and Divide districts will result.

During the last six months the radical element has caused large losses to both mining companies and employees in the camps of Tonopah and Divide. While the companies have been put to extra expense and production has been curtailed, their losses have been small compared to that of the employees themselves, and more especially of the miners.

The Silver Lake Mining Co., financed by Kansas City and Tulsa bankers, is preparing to erect a modern cyanide plant at Seligman, Barry County, Missouri. The contract has been awarded and construction will start as soon as weather conditions make it seem practical. It will be the first serious attempt to mine for precious metals in Missouri, the drill tests having shown dirt with a fair content of silver, gold and tin. Officers of the company include J. H. Kelley, Seligman, president; L. O. Kelley, Guthrie, Okla., secretary-treasurer.

British Columbia Placer Mining Act To Be Amended

Present Session of Legislature To Be Asked To Make Needed Changes —Much Ground Tied Up

BY ROBERT DUNN

The Placer Mining Act of British Columbia will receive attention during the present session of the British Columbia Legislature. The exact character of the proposed amendments cannot be stated, but it is known that some important changes are contemplated and, although William Sloan, Minister of Mines, has not yet placed his bill before the house, there already has been considerable speculation as to his policy.

At present there are over 1,100 placer mining leases outstanding and the rentals have been fully paid up on only about 170. The annual fee for a creek claim is $75, that for a bench claim $50, and $1,000 assessment is required to be recorded every year on each lease.

The amendments, it is expected, will provide for a reduction both in fees and in the value of assessment insisted upon. Under the Mineral Act of this province only $100 worth of assessment work per annum is asked for on a lode claim and it is thought likely that the Placer Act will be brought somewhat in line with this legislation. It is probable, too, that some machinery will be provided whereby those who are in arrears may pay up in easy instalments, provided they meet their current liabilities and a fair proportion of that previously owing. Of this, however, there is no doubt—that the Minister of Mines will provide for the cancellation of those leases which are in arrears and the holders of which show no disposition to operate.

During the war the terms of the Placer Act were very leniently interpreted. Conditions were hard, both as to the cost of supplies and as to the obtaining of labor, and full advantage was taken of a provision permitting leases to run on providing the owners could show reasonable cause for their inability to pay. No doubt individual miners and companies still are faced with difficult problems, but the position the Minister of Mines, as well as the mining men of the Province as a whole, take is that there must be some finality somewhere; that altogether too great an area of the placer ground of the Province is being held up; and that everything possible must be done to clean up the present unsatisfactory state, giving lease holders every reasonable chance, but insisting as far as practical that the placer areas be made productive.

Prices of pig iron in the Birmingham district still continue to rise. Charcoal iron is in strong demand and is selling at $50 to $55 per ton. Cast iron pipe is also due to advance; 4-in. pipe is expected to bring $69 per ton and the 6-in. water and gas pipe is expected to reach $66 per ton.

Boston & Arkansas Co. Will Open Davis Zinc Property

Deposit in Southwest Arkansas, Discovered Forty Years Ago, To Be Worked—New Mill Erected

The Davis mine in the western part of Sevier County, Ark., is to be placed in operation about Apr. 1, next. The property is owned by the Boston & Arkansas Mining Co. of Okmulgee, Okla. which has spent more than $180,000 so far. A mill has been installed with modern equipment and a road has been built from the mine to Mineral, a station on the Kansas City Southern Railroad, four miles away. The property is 15 miles north of De Queen, in southwestern Arkansas, and 6 miles northwest of Gilham, the nearest railroad station. There is no other mining project in the vicinity C. L. Larson is manager, Ernest W. Ellis mill superintendent, and Joe J. Sanford mine superintendent.

The mineralization occurs on a shale-sandstone contact which has been faulted. The zone varies in width up to 40 ft. and contains large deposits of sphalerite, chalcopyrite and galena. The zinc ore is in shoots following the foot wall, and the copper and lead are disseminated. The main shaft has been sunk to a depth of 170 ft. and several drifts have been driven. The mill is equipped with jigs and Wilfley tables, and the company is planning to install flotation for treating the slimes. About 40 men are now employed, which number it is expected will be increased to 100 as soon as mining operations are begun.

The directors of the Boston & Arkansas Co. are John W. Hammond, O. F. Dickenson and W. M. Hodsdon, of Okmulgee; F. P. Snider and Villiard Martin, of Muskogee, Charles Popkin, of Sapulpa, Okla; Dr. J. A. Seekatz, of Tulsa, Okla., and N. Lambertson and Milo Brown, of Haskell, Okla. The company is said to be fully financed with no stock for sale.

Hancock Consolidated Makes First Shipment to Mill

The Hancock Consolidated Mining Company in northern Michigan has made its first shipment of copper "rock" to the stamp mill. It totalled 1,700 tons. It is reasonably expected that this material will show 14 lb. of copper to the ton. This is all that is expected from this character of "rock." It was all taken out in the course of development of the various east veins that now are under investigation. The underground instructions were to send all of the material to the surface that could be milled at a profit. There was no selection at all. The shipment went to the Osceola Consolidated mill. A second shipment will be made Mar. 1. The "rock" now being mined is stocked in the rock house.

None of the openings upon which the Hancock is now operating is in the Pewabic lode proper. The underground operations to date are in a broken area east of the true Pewabic lode. Drifting is now under way on No. 12 amygdaloid. This was cut from a crosscut from the 44th level. The values which showed at the point of contact have continued into the drifts both ways. The general physical characteristic at this time is the same as that of No. 3 lode.

The underground working force is being maintained and exploration work is in progress at twelve different points, all of them indicating fair evidences of mineralization.

Oklahoma's New School of Mines To Open in September

The new state school of mines of Oklahoma will open at Miami on Monday, Sept. 6, according to an announcement of State Superintendent R. H. Wilson, made at a meeting of the board of regents held in Miami Feb. 2. At this meeting the abstract and title to a 40-acre tract in the northwestern part of the town was turned over to the state by Miami citizens. Superintendent Wilson announced that construction of two buildings on this site will begin at once, one to be the main building in which class rooms will be situated and the other to house the equipment.

A president to head the new institution has not yet been selected, but will be named at a meeting of the board of regents to be held in Miami July 1. The president will be authorized to select a faculty for the school, and while his appointment will not be confirmed before the date mentioned it is believed that he will be chosen much sooner. It is reported that the regents are inclined to select H. A. Buehler, state geologist for Missouri, if he is obtainable.

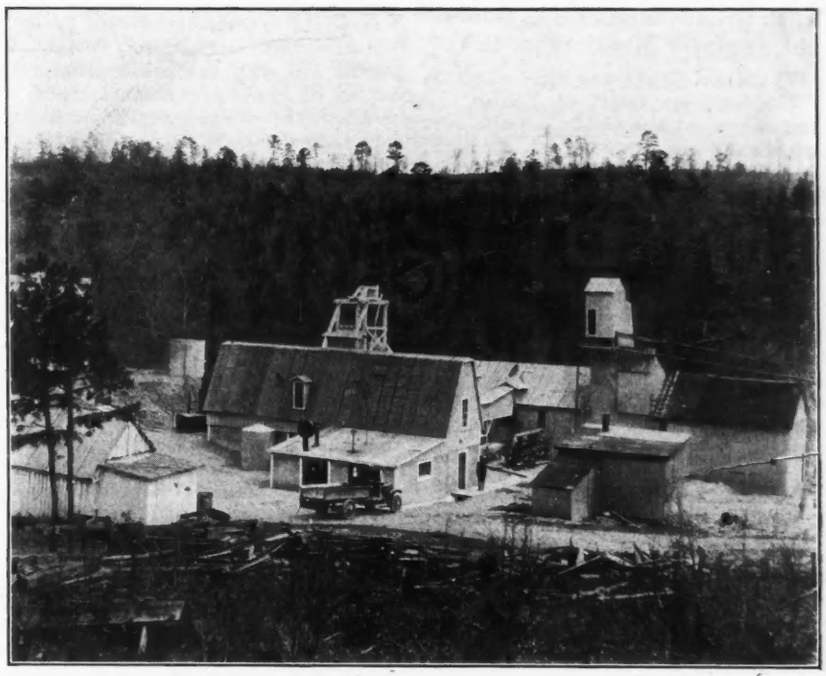
Mining Reviving at Chloride, Arizona

New Projects Starting and Some Shipments Being Made—Problem of Complex Ores a Handicap

BY S. FORD EATON

After a number of years of comparative inactivity, the camp of Chloride, Mojave County, Ariz., is taking on new life. A decade or more ago, Chloride suffered a relapse from which it has never fully recovered, though about 1916 interest in the district was again aroused and a boom resulted.

During the earlier and liveliest period of the camp's history, quite a number of the mines produced considerable ore. A great deal of this was high grade, came from or near the surface and was shipped to the smelters. As the various operations attained greater depth (few shafts were driven deeper than three or four hundred feet) sulphides of lower grade and of a more complex nature were encountered.



PLANT AT DAVIS MINE FIFTEEN MILES NORTH OF DE QUEEN, SOUTHWEST ARKANSAS, OPERATED BY BOSTON & ARKANSAS MINING CO., OF OKMULGEE, OKLA.

At this stage some mills were erected and a certain amount of effort was made to solve the metallurgical problems. These experiments resulted in failure. Gradually these mines were forced to close down, many having considerable ore in sight, but before reaching this point some had more than expended the profits gained from the high grade shipping ore.

The later activity consisted more of the opening up of new prospects. In two or three cases mills were erected. However, one is forced to believe that the majority of these efforts were guided by men with little knowledge of either mining or metallurgy. That heavily handicapping factor in all legitimate mining ventures, the stock jobber,

also made his presence felt and today one can view a number of monuments erected to mismanagement and unintelligent money-spending.

Recently renewed and inaugurated projects are along more conservative lines. Work in the westerly portion of the district is opening up orebodies readily amenable to treatment. Experienced miners are handling more of the operations, and let us hope that real metallurgists will be called upon in connection with milling problems.

A modest amount of shipping is now going on. Each month sees the starting of new ventures. The high price of silver is having its effect. Unquestionably the coming of capable metallurgists, backed by intelligent capital, will bring about the reopening of many of the old properties and in all probability Chloride's bugaboo, "complex ores," will be a thing of the past.

W. P. Grant Claims Fifth Interest in Engineer Mine, Atlin, B. C.

W. Pollard Grant has started action in the Supreme Court of British Columbia against the Gold Commissioner and the Mining Recorder at Atlin, B. C., claiming a one-fifth interest in the Engineer mine at that place. Mr. Grant alleges that the mine is about to be sold for $3,000,000. Very rich gold has been taken from the Engineer mine. The property was examined by the Mining Corporation of Canada in the fall of 1918, and the examining engineers and owner, Captain Alexander, lost their lives while returning to Vancouver on the ill-fated "Princess Sophia." The mine was examined again last fall for an eastern syndicate.

Federal Company's Engineers Surveying Hecla Ground

Engineers for the Federal Mining & Smelting Co. are engaged in making underground surveys in the Hecla mine in preparation for the trial involving the apex of what is commonly referred to as the Hecla "east orebody," which is entirely independent of the main Hecla vein. There have been rumors that negotiations are pending to settle this case out of court, but so far as can be learned there is no foundation for these reports. This is the case in which the Marsh Mines Consolidated is also concerned as lessee of the ground owned by the Federal company in which the apex is alleged to have been found. As if one suit involving ownership of orebodies in the Hecla mine is not enough at one time, the Gertie Mining company has applied to the court for an order requiring the Hecla Mining Co. to permit its engineers to inspect the underground workings, alleging that Hecla has trespassed upon its ground, which is presumed to cover the eastern extension of the Hecla vein.

The Admiral line of steamships, plying between Californian and Alaskan ports, has announced that it will make Hyder, Alaska, a port of call during the coming spring and summer.

Stimulation of Colorado's Mining Industry Sought

Mine Operators and A. S. & R. Officials To Study Ways of Obtaining Lower Costs and More Efficiency

Calling attention to the depressed condition of the metal mining industry in Colorado, as evidenced by production figures compiled by the Federal Government, the mine operators of the state at the recent annual meeting of the Colorado Metal Mining Association, adopted a resolution asking that the board of directors of the American Smelting & Refining Co. delegate one of its members familiar with conditions in Colorado to visit the state and confer with a committee, selected by the organization, to consider plans for reviving the industry.

The resolution asked that a survey be undertaken "with the purpose of devising ways and means for a more economical treatment of ore, the substitution of mechanical devices to handle ore with the consequent elimination of expensive manual labor; to consider the advisability of establishing custom mills in connection with the smelters of ore, with the object of securing important economies by proper preparation of the ores preparatory to smelting; to consider any other plans that will enable the miners of the state profitably to produce the low-grade ores now unsalable."

The resolution was taken up at a meeting of the executive committee of the American Smelting & Refining Co. in New York, and the Association has been advised that the "directors feel that they should do everything in conjunction with the miners of Colorado to promote mutual interests and encourage increased production" and that L. G. Eakins and C. A. H. de Saulles would come to Colorado and with E. C. Gilbert, the Colorado manager, would comprise a committee to confer with Colorado operators to that end.

The Association is arranging for a series of meetings, and conferences to begin about March 15, where shippers will present concrete plans for encouraging the production of low-grade ores.

Propose to Advertise Utah Mining Undertakings

The establishment of a publicity fund to make Utah mining undertakings more familiar to the eastern public is proposed by the vice president of the Salt Lake Stock and Mining Exchange, W. H. Child. The money for such a campaign of publicity to be provided by assessments of one-tenth of one per cent on the volume of business transacted by brokers on the exchange. In this way the expense would be so divided as to fall upon the members proportionally to the amount of business done by each. It is said that such a plan, if carried out, would be a curb on so-called wash sales, in as much in determining the volume of business it would be necessary to keep track of all sales.

Will Extend Dolly Varden Road to Wolf Group

New Construction Will Also Benefit Other Properties in Alice Arm District of British Columbia

A. J. T. Taylor, managing director of the Taylor Mining Co., that is operating the Dolly Varden mine in the Alice Arm district of British Columbia, has announced that the railway from Alice Arm to the Dolly Varden mine will be extended to the Wolf group of claims, a distance of about two and one-half miles. This summer a camp is to be opened at Wolf, which is a part of the company's holdings, for the purpose of development and a water compressor is to be installed. New equipment is to be provided for the Dolly Varden mine to permit extension of operations and the rolling stock of the railway is to be augmented. The North Star, Toric, Tiger and Muskateer are among the properties benefited by the proposed railroad construction.

D. J. Hancock, an operator of the Alice Arm district, states that Major General Sir John Carson, president of the Crown Reserve Mining Co., of Cobalt, Ont., has promised to bring two engineers with him for inspection of the Alice Arm section with a view to investment.

Holding Butte & Superior Hearing at Great Falls

Accounting and Contempt Cases Both Come Before Judge George M. Bourquin, Presiding

The hearing on the accounting made by the Butte & Superior Mining Co. in connection with the suit of the Minerals Separation, Ltd., of London, is in progress at Great Falls, Mont., Federal Judge G. M. Bourquin presiding. The contempt hearing was also held, the plaintiff alleging that the Butte & Superior had violated the court's injunction against employment of one-half of one per cent or less of oil in the flotation method of concentration. The defense rested with the testimony of one witness, who testified that the amount of oil actually used by the Butte & Superior was not half of one per cent and did not constitute contempt.

Butte & Superior in its statement on accounting contends that it should not be required to pay at the very most more than $451,000, and does not admit that it should pay that. The Separation company asserts that damages amount to as high as $18,000,000, asking for the profits made by the Butte & Superior by reason of the employment of the flotation process in addition to other claims.

Recent Production Reports

Union Miniere du Haut Katanga, Elisabethville, Belgian Congo, produced in January 4,519,430 lb. copper.

Granby Consolidated Mining, Smelting & Power Co. produced 1,975,439 lb. copper in January compared with 1,544,446 lb. in December.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Compulsory Adoption of Metric System Now Held Unwise

Not Compatible With Demand for Increased Production—Representative Vestal Withholds Bill

In view of representations from various sources that the present is not an opportune time to consider metric system legislation, Representative Vestal, the chairman of the Committee on Coinage, Weights and Measures, has consented to withhold the proposed metric system bill until a brief may be filed by the American Institute of Weights and Measures. This brief will set forth, it is understood, various reasons why the agitation of the much mooted question of making the metric system compulsory should not be agitated at this time. When industrial interests are doing their best to comply with the Federal Reserve Board's mandate that there must be increased production, it is argued that the heads of these industries should not be distracted to fight a radical change in a system so extensively used in all industrial activities.

The recent suggestion by Representative Vestal that a bill would be introduced and hearings begun in the near future has created such a furor that it will not be surprising if the Republican steering committee takes a hand in the situation on the ground that the effort by a Republican Congress to make the metric system compulsory throughout the country might alienate many friends of the party.

Survey's Work in Alaska

The work which will be done by the U. S. Geological Survey in Alaska during the fiscal year beginning July 1, 1920, will be concentrated largely in the territory tributary to the Government railroad and in searching more actively for formations favorable to the occurrence of oil. The work intended to assist those engaged in mining gold, copper, silver, and tin is not to be dropped. Some new indications of tungsten in the Seward Peninsula are to be followed up. These plans were outlined by Dr. George Otis Smith in explaining to the Appropriations Committee of the House the nature of the work being conducted by the Survey in an effort to stimulate mining.

The petroleum work, Dr. Smith explained, will be increased on the eastern side of the Alaskan Peninsula, where there are many oil seepages.

The General Leasing Bill, otherwise known as the Oil-Land Leasing Bill, was signed by President Wilson at 3 p.m. on Feb. 25.

Work of Liberalizing War Minerals Relief Act Begun by Committee on Mines and Mining

Testimony Ended, Members Consider Amendments Proposed by Chestatee Attorney—Commission's Friends Resent Attacks Upon It—American Mining Congress Heard

Work of drafting amendments to the War Minerals Relief Act has begun in the Committee on Mines and Mining of the House of Representatives. No further witnesses will be heard.

As a result of the publicity given the attacks on the engineering of the procedure of the War Minerals Relief Commission the committee is hearing from those who resent these attacks and who point out that losses and damage in mining operations must be worked out in a technical manner if any equity is maintained as between claimants, and if the public's interest is safeguarded. It is being pointed out also that it is unique to have a committee of Congress apparently critical in its attitude of a government agency for its efforts looking to the safeguarding of public expenditures.

The amendments proposed to the committee by W. S. Howard, the attorney for the Chestatee Pyrite & Chemical Co., reads in its substantial portions as follows:

"That Section 5 of the Act to provide relief in cases of contracts connected with the prosecution of the war, and for other purposes, be and is hereby amended by striking out the words 'That the decision of said Secretary shall be conclusive and final, subject to the limitations hereinafter provided' wherever they may occur in said section; and the words 'That nothing in this section shall be construed to confer jurisdiction upon any court to entertain a suit against the United States' wherever they may occur in said section, and insert as new section, the following:

"Section 6—That the Court of Claims is hereby given jurisdiction on petition of any individual, firm, company or corporation referred to in Section 5 hereof, to find and award fair and just compensation in the cases specified in said section in the event that such individual, firm, company, or corporation shall not be willing to accept the adjustment, payment or compensation so offered or paid by the Secretary of the Interior as provided by said Section 5, or in the event that the said Secretary of the Interior has failed or refused or shall fail or refuse to offer a satisfactory adjustment, payment or compensation as provided for in said section.

"Provided, That no payment heretofore made by the said Secretary of the Interior, or the acceptance thereof by any claimant shall bar said claimant from the right of appeal as herein before provided.

"Provided, further, That the findings and awards in each case so determined by the Court of Claims, shall be paid upon certification by the Clerk of the Court of Claims of the amount of such finding, to the Secretary of the Interior, by the said Secretary, from any balance of the sum of eight million five hundred thousand dollars herein before appropriated by Section 5 hereof."

In discussing the legislation which may be enacted as a result of the revelations of the hearing, Representative Wingo, the ranking Democratic member of the committee, suggested that "it would do no harm to put in a proviso, stating that the Court of Claims may proceed to try de nova, either upon a written original petition or upon an appeal from the decision of the Secretary of the Interior and that in either case the Court of Claims, upon the request of the claimant, or upon its own motion, may call for the records on file in the office of the Secretary of the Interior, together with all papers and memoranda."

In making an argument before the committee in the claim of Dr. J. F. Readey of Medford, Ore., Frank Healy, his attorney, made this statement:

"The doctor came back here with a claim for $122,000 and having a number of obligations coming due, he came before the commission and urged an early payment of his claim. Mr. Commissioner Moore after several consultations with Dr. Readey required him to put into an envelope the amount of money he would take for his claim. Mr. Moore put into the envelope the amount he was willing to give. Then through some process of elimination, trade or compromise, they arrived at $55,000. I can find nothing in the law which shows that Congress contemplated such a method of arriving at a settlement."

In presenting its case in behalf of the war minerals claimants, the American Mining Congress was represented by Herbert Wilson Smith, chief of its War Minerals Division. Mr. Smith first explained the position of the Mining Congress in its appearance before the committee, in the statement that the Mining Congress represented the equitable interests of all the claimants, under the law but did not represent any individual claimants as attorney.

NEWS BY MINING DISTRICTS

ARIZONA

Clifton—The directors of the Arizona Copper Co., Ltd., intimate that in consequence of the large stock of unsold copper held by the company it is impossible at present to make up the accounts for the year to Sept. 30 last.

Globe—The Superior & Boston Copper Co. has cut the Footwall vein on the 600-ft. level, about 350 ft. east of the upper workings, and has started drifting west to explore the vein and to get under the 454 drift. The vein is about 7 ft. wide, and carries one to two feet of good copper ore, averaging between 6 per cent and 12 per cent. The silver values are low, but the management expects improvement between the levels and toward the west. Regular production from stoping operations will be started after the two levels are connected.

Jerome—The annual report of the United Verde Extension Mining Co. for last year shows a deficit, after charges, of $235,156, as compared with a surplus of $3,331,054 in the preceding year, which was equivalent to $3.17 a share on the capital stock. The gross revenues were $5,058,669.

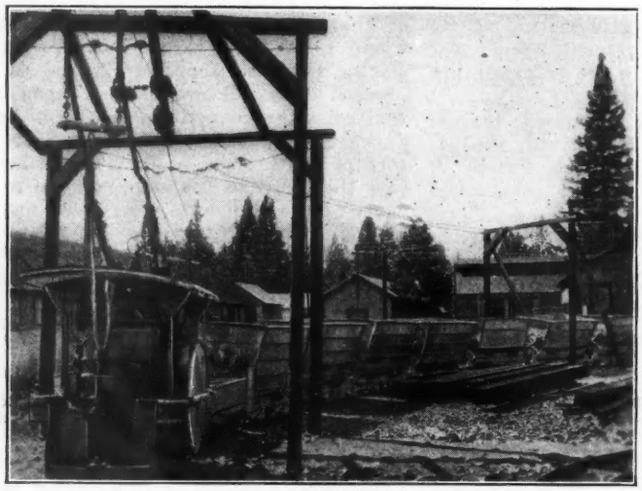
Good ore is being opened up in the shaft on the Garibaldi claim. The grade of ore is improving with depth.

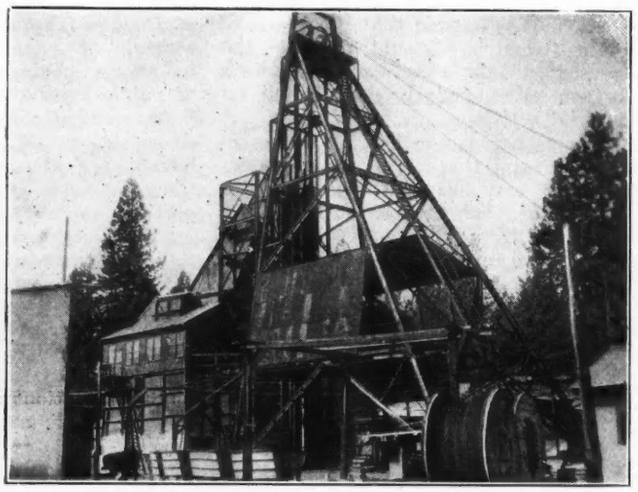
The Keystone Mining Co., of Amador City, has levied a 10c. assessment on the 468,005 shares of outstanding stock. The company expects to resume active operations in the near future.

San Andreas.—Extensive development work is being carried on at the Valentine mine near Glencoe, by W. W. Guest. Three mills, with a capacity of 40 tons in 24 hours, are being installed; a 500-ton ore bin has been constructed, and a large tonnage of $3—3.50 ore has been blocked out.

At the Eureka mine a 500-ft. tunnel has been completed, exposing a considerable tonnage of good gravel which is to be extracted.

Bakersfield.—The Blue Mountain company, near Woody, is now down 450 ft., and has 20,000 tons of ore blocked out. Some very rich ore is reported to have been struck in the mine.





LEFT—ELECTRIC HAULAGE AT NORTH STAR MINES, GRASS VALLEY, CAL., BETWEEN CENTRAL SHAFT AND STAMP MILL. RIGHT—CENTRAL SHAFT, NORTH STAR MINES (PHOTOGRAPHS PUBLISHED IN LAST ISSUE OVER FOREGOING CAPTION WERE VIEWS OF EMPIRE MINES AT GRASS VALLEY AND NOT OF NORTH STAR MINES AS STATED)

CALIFORNIA

Addition to Empire Mill Nearing Completion—Keystone Levies Ten-Cent Assessment

Jackson.—The Central Eureka's mine report for the week ended Feb. 7, shows that the mill crushed 831 tons of ore of a much higher grade than the previous week. Concentrates amounting to 14,151 tons, with an average value of over $139 per ton, were produced.

The Argonaut mine continues to develop excellent ore in new territory on the lower levels. The 60-stamp mill is running to capacity.

Nevada City.—Operations at the Delhi mine in Columbia Hill mining district are to be resumed in the near future.

Grass Valley—The Empire Mines Co.'s 20-stamp addition to its mill is rapidly nearing completion. The building has been completed, the stamps placed, and installation of the separators is now going on. Construction of the electric railway from the Pennsylvania mine to the Empire mill has been practically completed. The rails are in place, the power line strung, and cars are running.

Auburn.—The Voss mine, near Pilot Hill, has been taken over by the Gold & Copper Holdings Co. of Nevada, of which Dr. A. M. Knapp is the head. Work will begin immediately.

Engelmine.—The Feather River Copper Co. recently received and installed a shipment of transformers that will greatly speed up the work of driving the 2500-ft. tunnel. The tunnel, heretofore driven by hand work, is now in 340 ft. With the new machinery it is expected to advance the tunnel at the rate of 300 ft. a month. When the tunnel is in 1000 ft., it is planned to crosscut by machine drill or by diamond drill and explore a large area of altered ground at this point. A Sullivan two-stage compressor, driven by a 50-hp. motor, will supply 300 cu.ft. of air; while ventilation for the tunnel will be furnished by an electrically-driven Sturtevant fan.

Quincy.—The Australian Placer mine, on Wauponsee Creek, has completed the pipe lines connecting the ditch and the monitors, and has the dam almost completed. The ground formerly worked by drift mining will now be worked by the hydraulic process.

Tuolumne.—The Buchanan mine has been taken over and will be reopened shortly by New York capitalists. An initial payment of $10,000 has been made.

Sonora.—The Patterson & Atlas mines have been taken over by H. L. Huston and associates, of San Francisco. The work of reopening the Patterson will start immediately.

The Springfield Tunnel Co. is at present employing three 8-hour shifts in pushing ahead the work on the tunnel. The work is being done on the main shaft on the former Richards property. The shaft has been sunk 225 ft. to the main tunnel level and a drift is being run back to connect with the main tunnel.

Jamestown.—The Clio Mine & Milling Co., operating near Jacksonville, increased the wages of all employees 10 per cent on Feb. 1. The working days were also cut to six days a week.

COLORADO

Eurades Mining Co. To Reopen Des Ouray and Benack Mines—Red Mountain District Active—Gold King Extension Mill Running

Ouray—The Des Ouray and Benack mines are to be reopened at once by the Eurades Mining Co. This is the old company rejuvenated by new capital which comes, it is understood, from a certain financial circle of high class in Chicago, with no public offering of stock. The two mines are close neighbors, with an interesting system of silver veins that has not been much developed. Very good shipments were made a few years ago from the Benack by B. H. DuPraw, and his development indicated a good body of milling ore. The company has started shipments of machinery, intending to install a completely equipped mining plant. The principal development work will be accomplished in a short time and it is expected that this will result in the erection of a flotation mill this summer. W. E. Cuthbert has come from Chicago to take charge, and C. R. Wilfley has been retained as consulting engineer. This has the earmarks of competent financing and a good mining plan; it is the first substantial move in the revival of the famous Mineral Point and Poughkeepsie silver mining district.

The Red Mountain district is developing well and will be an active camp this summer. Red Mountain Mines Co. have opened considerable ore, some of it high grade, some of it good milling ore, in the old Red Mountain copper-silver mines and will probably operate their mill soon.

The White Cloud Mining Co., following up its recent strike of a large body of medium-grade but good ore, is opening the old Paymaster and will become an important producer before long.

The Silver Mountain Mines Co. have completed a very efficient and well equipped mining plant and begun their main crosscut; they have already encountered a good lead-silver vein, before reaching the main vein.

Lessees on the Barstow property have recently encountered good ore in their new shaft.

The winter has been more open than for many years, the road from Ouray to Silverton still being in good shape for sled traffic. Influenza was confined to the towns and the mines did not suffer, though a survey of the labor situation still reveals a shortage of men.

Gladstone—The new mill of the Gold King Extension Mining & Milling Co. at Gladstone, San Juan County, which began dropping forty of its eighty stamps Feb. 1, will have them all in commission early in March, according to W. Z. Kinney, general manager. It is claimed that there is enough ore in sight to keep the mill running for years, and that the operation of this property will add largely to the 1920 output from San Juan County.

IDAHO

Coeur d'Alene District

Wallace—The 75-ton mill being constructed by the Big Creek Mining Co. will be in operation by March 1, according to G. Scott Anderson, president and manager. The ore is lead-silver.

The Ajax Mining Co., near Burke, has developed a promising ore shoot for a distance of 120 ft., which varies in thickness from 12 to 20 in., much of it being of shipping grade. It appears to be the top of an important body of lead-silver ore. The control of the company is owned in Boston and Lynn, Mass.

Work was recently resumed by the National Copper Mining Co., the purpose being to explore certain ground in which it is hoped to develop a new ore-body. The mine was practically abandoned several months ago, but the action of the directors proved to be unsatisfactory to many stockholders, who insisted that further work be undertaken, particularly since the company has $50,000 in the treasury to be used for that purpose.

The Nabob company, which became involved in financial difficulties last summer, has effected a settlement with its creditors and will resume operations. The company had just completed a 150-ton mill at the mine on Pine Creek, and with a large amount of lead-silver and zinc ore available, it is expected that the company will soon be on a paying basis. Control of the Nabob is held by the Stewart Mining Co.

The Consolidated Interstate Callahan Mining Co. has declared a dividend of $2 per share payable in equal quarterly installments on the 30th of March, June, September and December. The books will close for each dividend fifteen days in advance of the payment dates.

MICHIGAN

Seneca To Make Third Shipment Soon —C. & N. W.'s New Iron Ore Handling Yard Started at Ironwood.

Calumet—Seneca's third shipment of "rock" will not be made for another week. At the present time the physical development of the property is confined to shaft sinking at No. 1. The lateral openings on the first level were completed to the boundary line several weeks ago. Those to the boundary lines on the second were finished last week. The third level openings in drifts have not been undertaken as yet and will not be until the concreting in the shaft is completed. When that is done (it will probably take several weeks) the underground opening in the Kearsarge lode will progress with greater speed than has been possible hitherto. It will include laterals both north and south from the third level and will include the crosscut to the lode at the fourth level. When that crosscut is finished it will permit laterals in two directions in the lode. These lower level openings will, of course, carry for greater distances and will permit more drift stopes than those above.

The average return on the copper "rock" so far sent to the stamp mill by the Seneca is 29.31 lb. The last shipment showed 35.73 in the final figures. This is quite a remarkable showing, but in accord with the record expected, as the mill return was 57 lb. to the ton. The general run of the Kearsarge lode in the Ahmeek, Mohawk, Osceola, Wolverine, Allouez and other properties where it shows mineral values is 25 lb. year in and year out.

At the Gratiot shaft, now being unwatered, the bailing has cleaned out the shaft to the seventh level and within a week it probably will be completely unwatered, for the work is progressing rapidly. It is a good many years since anything in the way of mining was done at the Gratiot property and it is impossible to guess at the condition in which the shaft may be found, because it was abandoned with no expectation of resumption. The equipment at the Gratiot is in good condition on the surface now and everything is in readiness to start general underground sinking operations in the shaft when conditions permit and to push them as rapidly as may be.

The third hole in the diamond drill development of the Calumet conglomerate lode is now being sunk, but at this particular point (this hole is the farthest to the northeast of all of the holes drilled by the Seneca) the standpipe is finding a very heavy ledge. They have gone through 40 ft. of boulders at this writing.

Houghton—The work now being conducted in the lateral from the bottom of the Mayflower-Old Colony is in the nature of exploration in a broken area that presents new geological and mining problems each day. The faulted mineralized territory must be examined minutely and painstakingly. Each fault must be traced, defined and developed. As the work continues there is likely to be opportunity for increasing the underground working force and additional machines will be started just as rapidly as there is a chance to put them in. But this work is necessarily slow and cannot be hustled. At the present time the quality of copper value is maintained in such of the new openings as are in the formation proper. No sinking is going forward at this time, all the work being in the formation to the north.

Gogebic Range

Ironwood — Construction work has begun on a new ore handling yard for the Chicago & Northwestern RR. at Ironwood. The new yard is in the valley immediately south of the "iron range" of hills and is near the Norrie mine. Five half-mile tracks are to be built together with the necessary coal shed, water tank, supply house, etc. This yard will handle only the ore coming from the mines in the city of Ironwood, which will be approached by tracks from the south. The tracks now

in use come in from the north and cross ground which is being caved by the mines so that they are no longer safe. The present yard near the center of the city is needed for the ore coming from Bessemer, Ramsay and Wakefield.

Iron ore prices for the coming season have been fixed at $1 per ton more than last year's prices. This means that Gogebic-Range ore of bessemer grade will bring $7.45 per ton based on 55 per cent natural iron, and non-bessemer will bring $6.70 per ton based on 51½ per cent natural iron. These are the highest prices paid in twenty years or more, and are about twice the unusually low prices in 1914 and 1915. It is understood that lake freight rate from Ashland will be 20c. per ton higher than last year.

L. P. Barrett, assistant state geologist of Michigan, is on the range making the annual inspection of the mines, on the results of which are based the valuations of the mines by the State Tax Commission.

MINNESOTA

Iron Country Operations

Mesabi Range

Grand Rapids—Tod-Stambaugh & Co. have secured an option on a fifty-year lease of the property they have been exploring about two miles west of Grand Rapids. If the option is exercised the operation of the property will involve hydraulic stripping and concentration of product. Experiments on concentration of samples are now being made at the Lake Superior experiment station of the U. S. Bureau of Mines at Minneapolis.

Coleraine—The Trout Lake concentrator of the Oliver Iron Mining Co. is being thoroughly overhauled preparatory to a large 1920 output.

Hibbing—Tod-Stambaugh & Co. are operating two drills exploring in section 9 west of the Warren mine.

The Oliver Iron Mining Co. has placed an order for a new 300-ton steam shovel for use in the Hibbing district. It will probably be used to load ore in the Hull-Rust pit during the coming summer.

Buhl—An innovation in stripping and ore mining methods on the Mesabi Range will be adopted by the Hanna Ore Mining Co. in the operation of its new Wabigon property in the form of a 300-ton electric shovel such as has been in service in the coal fields. The shovel will be of the one-man type with an 80-ft. boom, an 8-yd. dipper in overburden and a 6-yd. dipper in ore. Power will be secured by a continuation of the 2,300 volt line now serving the company's Frantz mine nearby.

Eveleth—The Oliver Iron Mining Co. will install an electrically driven air compressor at its Leonidas mine.

Gilbert—The Schley mine of the Republic Iron & Steel Co. will be reopened immediately according to an announcement by the company officials. The Schley has been closed since the slump in the ore market early in the 1919 season. Two hundred men will be employed as fast as they can be secured.

Vermilion Range

The La Rue prospect four miles northeast of the Soudan mine controlled by W. G. La Rue, of Duluth, and prospected by himself and associates has been leased to other interests who will sink a four-compartment shaft to 500 ft. as soon as materials can be laid on the ground.

Cuyuna Range

Development on the 200-ft. level has been completed at the Bonnie Bell and a shipment of 100,000 tons is expected during 1920. The mine produces straight iron ore for direct shipment to the Zenith furnace in Duluth.

E. N. Breitung & Co. have authorized Allis-Chalmers to erect a wash concentrator at the new mine now being developed by the Marquette Ore Co. on what has been known as the Adbar prospect. The plant will have a capacity of 3,000 tons daily. Hydraulic stripping equipment is now in place and ready to begin operations as soon as weather will permit. A crew of men are at work sinking an inclined shaft which will eventually be bottomed at 500 ft.

A. Guthrie & Co. have completed their contract with Clement K. Quinn & Co. for the removal of the overburden from the Mahnomen mine. The mining company has purchased the equipment used in stripping and will continue it in ore loading service.

The Omaha Iron Co., operators of the Wilcox mine, have filed a voluntary petition in bankruptcy. Liabilities are given as $334,327 with liquidated assets of $160,839.

MISSOURI-KANSAS-OKLAHOMA

Joplin-Miami District

Picher—The Hunt Mining Co. has announced that it will immediately rebuild the concentrator burned in February. C. C. Whittier is general manager, P. O. Box 67, Picher, Okla. Robert W. Hunt is the principal owner, 2200 Insurance Bldg., Chicago, Ill. A galvanized iron mill building will be erected in place of the frame building that burned. The new mill will be of approximately the same capacity as the old one, which was 300 tons per 10 hour shift.

Joplin—Considerable interest in the Joplin-Miami district is manifested in the rather abrupt changes in the executive staff of the Chanute Spelter Co., a subsidiary of the American Metal Co. W. H. Eardley, vice president and general manager for the Chanute company, and his brother, M. V. Eardley, assistant manager, resigned simultaneously about Feb. 9, and their resignations were accepted to take effect at once. J. F. Haley, who has been in charge of the company's Denver office, has been made manager, and G. B. Corless, who has been field man, has been made assistant manager. The Chanute company has a large acreage of land west of Baxter Springs, Kan., where drilling has indicated good orebodies, and it has erected a large mill on one site, which has been completed for approximately six months but has never been operated because heavy water prevented. Shafts have been sunk on five different properties and over 700 drill holes have been put down. It is understood the company has spent more than $1,000,000 without one cent as yet being realized. The fight against water at the property chosen for the first mill has been highly expensive, but only within the last few weeks has it appeared as if it were about to be won. Pumping had been going on for more than a year when the water had been lowered only 50 ft.

Treece—Texas investors recently took over the Crescent mine and mill, located north of Treece, Kan., and are sinking the mill shaft about 18 ft. below the 240-ft. level and will begin stoping.

Granby—Passing of winter will see a continuation of development work in the vicinity of Aroma, the new camp located directly south of Granby, Mo. Extensive drilling operations in this field have developed an unusually regular area of mineralization at a depth of about 270 feet, which is deeper by 100 feet than any previous operations, and several companies are now sinking shafts tapping this deposit. The St. George Mining Co., for which Warren Heaton of Neosho, Mo., is manager, some weeks ago purchased outright the fee to most of the acreage in this vicinity, and is constructing a 500-ton mill upon a shaft it sunk last fall. The Dallas Zinc Mining Co. has just begun the construction of derrick and hopper at its shaft, where it will erect a mill immediately. It is expected that at least three mills will be erected in this camp during the coming months, and possible twice that number.

MONTANA

Anaconda Shipping Manganese Ore to Chicago and Alabama Points—Operations in Other Districts

Butte—An increase in manganese ore shipments by Anaconda was a feature of the last week. Car lots of rhodochrosite ore are going forward to Chicago and Alabama points. This is coming from the Emma property, from which a production of 150 tons daily is now being made. Some of this is being shipped to the ferro-manganese plant at Great Falls.

Improvement in the face of the drift on the 3,400-ft. level of the Edith May fissure at the Granite Mountain mine of the North Butte company is reported. Within two weeks it is expected that the workings will be under the 3,200-ft. level where the orebody shows an increased width, running up to 24 ft.

The crosscut on the 2,700-ft. level of the Colorado mine of the Davis Daly company is being driven at the rate of 250 ft. monthly and 60 days should bring this working either to or close to the No. 2 vein in evidence on the 2,500-ft. level. Before this fissure is reached,

however, it is expected to cut two other ledges, all of which show ore on the 2,500 level.

The Hibernia property is making an improved showing, with daily shipments going to the East Helena plant of the American Smelting & Refining Company.

The Rory O'More fissure will be picked up by the crosscut being driven by the Tuolumne Copper Co. on the 1,200-ft level within three weeks, it is expected. The ore showing on the 1,200 level is improving, according to the local office, a considerable tonnage either being put into sight or indicated.

Clancy—Unconfirmed reports are in circulation that negotiations are in progress between the Legal Tender interests and those representing Thomas W. Lawson, of Boston, for taking over this property. Six inches of high-grade ruby silver ore in a body of high-grade ore 18 in. wide is reported on the 400-ft. level.

Ore shipments from the Liverpool Mines are continuing and are expected to more than meet operating expenses for February.

Development on the 300-ft. level of the Amalgamated Mines is progressing favorably.

Wickes—A daily output of 50 tons of silver-lead ore is being maintained by the Angelica Mining Co. The tonnage of concentrating ore is considerable.

Neihart—Ore shipments from the Ripple Consolidated during January amounted to more than $10,000 in value.

Net returns for January from the Cascade Silver M. & M. Co., were approximately $40,000. The ore showing is said to have been materially improved in the last 60 days.

Crosscutting by the Neihart Silver company through the Broadwater tunnel is expected to be nearing the principal orebody. Ore shipments are being made at fairly regular intervals to the Washoe works of the Anaconda.

Cataract District—Lessees at the Crystal Copper Co.'s property have opened promising mining ground, it is reported, from which occasional ore shipments are being made. This company virtually has abandoned further operations at the Goldsmith property in the Butte district.

Basin—Development work by the Jib Mining Co. is progressing in promising ground.

Marysville—The Bellboy property in the Marysville district is being opened up by L. S. Ropes, of Helena, and C. C. Sinnott, of Jefferson City, who have a lease and bond on the mine from Dr. O. M. Lanstrum and Owen Byrnes, of Helena.

Elliston—The Monarch mine, operated under the direction of Eichelberger & Fryberger, of Helena, is again producing. The new mill at the property is in operation and is handling about 50 tons of ore daily. Nearby, the Julia mine is being operated by Butte capital. The Big Dick, North Pole and other small properties in the Elliston district are now making shipments.

NEVADA

Pioche—William D. Price and Alexander Lloyd have received returns from the car of ore shipped from their lease in the Pacific tunnel controlled by the Amalgamated Pioche Mines & Smelters Corp. The silver content of the high-grade ore was 60.1 oz. and the second class ore carried 17.0 oz.

William S. Carman, Frank Dolan and Angelo Lynch, who are leasing on the Deerfoot claim of the Amalgamated, also received returns on the initial car of silver fluxing ore recently shipped. The ore ran 31.7 oz. in silver with high iron and manganese.

Willoughby and Hosking received a satisfactory settlement on their fourth car of ore from the Zero lease. Further development work will be done.

The Irish Mountain Silver Mines Co., operating near Hiko, recently struck silver-lead ore on their Red Top No. 1 claim.

The Lake Valley Mining Co. will soon ship its third car of silver ore from the mine near Geyser. The heavy snow has tied up the trucks for the last week.

The Bristol Leasing Co., under the active management of Chester H. Cook, has struck a good body of silver-copper ore in the May Day fissure, and expects to ship its sixth car soon.

Stindt & Donohue, operating in the Harney territory, are taking out about the usual tonnage of ore from the stopes adjacent to the long inclined shaft. Two separate products are being made at present, a high-grade silver-lead product which will assay over $100 per ton and a low-grade silicious silver ore which carries 15 oz. in silver and $3.50 in gold.

Pioche ore shipments for the week ended Feb. 12 were as follows: Prince Consolidated, 1,550 tons; Virginia Louise, 650; Black Metals mine, 250; Con. Nevada Utah, 50; and the Pioche Assay Office, 50; total, 2,550 tons. Smaller operators were unable to get their product hauled owing to the severe storms, hence there was a decided decrease in tonnage for the week.

At the Virginia Louise the fifth level drift continues in good shipping ore and, passing approximately through the center of the orebody, assures a large stoping area for the future. The raise from this drift to the fourth level has been holed through giving needed ventilation. Ore was struck in this raise 22 ft. above the fifth level rails and the heading continued in ore to the level above.

With the installation of the Sterling boiler plant and necessary pumping facilities completed at the Prince Consolidated mine, sinking of the main working shaft has been resumed under the management of Walter Fitch, Jr., of Eureka, Utah, who also had charge of the previous contract for the first 500 ft. Three shifts are at present employed in this work and lately a set of timbers has been placed every day an average advance of 5 ft. The shaft is still in silicified lime and breaks well under the benching system employed. At present the water is easily handled by the sinking pumps. The usual tonnage of fluxing ore is going to the smelters. The new change room is rapidly nearing completion and will contain locker room for 72 men.

John Crowe, who with Charles Culverwell has a lease on the central sector of the property of the Stella Mines Co., opened up another good face of silver-lead ore.

NEW MEXICO

Eighty-five Mine's Flotation Plant Making Test Runs—Operations Near Deming and Tres Hermanas

Lordsburg—Permission to do a general mining business in New Mexico has been granted the Hidalgo Mining & Milling Co., an Arizona corporation, capital $200,000 of which $30,006 has been issued. The principal office is to be in Lordsburg. Officers are J. A. Rovelstad, vice-president, Robt. F. Fitz, secretary, J. H. Fitzpatrick, state agent. Mr. Fitz was the principal owner for many years of the Last Chance mine at Lordsburg, now successfully operated by Basil Prescott.

The Eighty-five Mining Co. is working 250 men and is producing 300 tons of ore daily. It has completed the rearrangement of its flotation mill and is making test runs of 150 tons daily, the recovery being 91 per cent, the balance of the ore is shipped to the smelter at Douglas, Ariz.

Work on the Robert E. Lee continues to show good copper sulphides at about 40 ft.

Deming — Warren and Hoagland have started a force of men at work on their silver-manganese property in the Little Floridas and have contracted for the delivery of 100 tons of ore a month. As soon as this work is well under way they will start operations upon their silver-lead property, the Waterloo, in the Tres Hermanas.

Tres Hermanas—The Tarzan Mines, Inc., expect to have 25 men at work upon the old Cincinnati mine recently taken over by them. The high price of silver and lead has put new life into this old district. Mahoney and Clark, whose property has ore high in lead, have put a force at work. Ores will be hauled to Columbus for shipment to the El Paso smelter.

Work on the Gymkhana property is being pushed with satisfactory results under the direction of J. M. Crump.

Manning Bros., whose property is on the extension of the big Waterloo vein, will continue their main shaft to the 200-ft. level. A good grade of concentrating ore carrying silver-lead has been exposed.

SOUTH DAKOTA

Deadwood—The shaft at the Echo property has gained a depth of 280 ft.; a 200-ft. lateral has been driven west from the shaft on the 200-ft. level. The shaft will be sunk to 500 ft. and connection made at that depth with the main shaft by driving an 1,100-ft. drift.

The shaft at the Cutting has reached a depth of 370 ft. This will be continued to 500 ft. before lateral work is started.

UTAH

Cardiff, Utah Salduro and Ophir Hill Con. Report to Equalization Board

Salt Lake City—The Cardiff Mining Co., operating in Big Cottonwood Canyon, has reported to the state board of equalization that its production during 1919 was 6,520 tons of ore, yielding 102,043 oz. silver; 3,111,000 lb. lead; 106,982 lb. copper, and 952,917 lb. zinc, gross returns from which were $240,697, with deductible expenses of $125,806.

The Utah Salduro Co., a subsidiary of the Solvay Process Co. and owning 543 acres of land in the Great Salt Lake desert as well as a plant for producing potash from brines collected, has rendered a report to the state board of equalization showing a total valuation of $701,057. This includes the land, valued at $2.50 an acre, general stores, plant, machinery, equipment and other property. It is not quite clear whether this undertaking is to be classed as a mining or as a manufacturing venture. If the former, taxation will be under the jurisdiction of the state board of equalization; if the latter under the jurisdiction of Tooele County.

The Ophir Hill Consolidated has filed a report with the state board of equalization stating that $155,633 was the net proceeds during 1919 from 33,895 tons of ore. The mineral content of the ore was 373,435 oz. silver; 6,595,743 lb. lead, and 210,241 lb. copper, which sold for $705,856. The cost of extraction was $262,736 and reduction $226,396, making with transportation cost a total deduction of $550,222.

CANADA

British Columbia

Consolidated M. & S. Co. To Increase Capacity of Copper Refinery; Wages Raised Feb. 16—Other Operations

Trail—In order to handle the Canada Copper Corporation's output, which the Consolidated Mining & Smelting Co., has made arrangements to treat, the latter will at once begin to increase the capacity of its copper refinery from 20 tons to 50 tons of refined copper per day. It is expected that the Canada Copper Corporation's concentrator, at Allenby, will have a daily production of about 130 tons of concentrates, carrying 25 per cent of copper and small gold and silver values. The Consolidated company, also, has started on the erection of a copper rod mill, which will cost in the vicinity of $200,000. Up to now Canada has imported all the rod copper it uses from the United States; the importation in 1918 totalling 14,796,200 lb., valued at $3,787,521. The company is pushing work on the plans for the big concentrator that is to treat the ores from its Rossland mines. It is not yet decided whether the concentrator will be erected at Rossland or Trail. An increase of 50 cents per shift in wages of all the company's employees went into force on Feb. 16.

Slocan—The Silversmith Mines, Ltd., in the Slocan, has called in its 7 per cent preferred stock and will issue common in its place. The amount of preferred that had been issued up to the end of last year was $165,192.80. The company has had an unusually prosperous year; 14,558 tons of ore has been mined, 325 tons of which was sent directly to the Trail smelter; the rest of the ore was milled, and the resulting concentrates were sold to Trail and to United States smelters. Trail got 19 cars of lead concentrates and 3 cars of zinc concentrates; 17 cars of lead concentrates and 21 cars of zinc concentrates went to smelters in the United States. The last shipment of 84 tons of silver-lead concentrates to the Midvale smelter brought a return of $14,931.

The Standard mine, in the Slocan, which was under development last year, though it did not start to ship until nearly the end of the year, made a profit of $37,800 during the last two months of the year. This mine has been one of the best producers in the Slocan.

Nelson—The vein at the Nugget mine, in the Nelson district, which recently was cut at a depth of 625 ft. by the 1,500 crosscut, continues to show up well. Rich free-milling gold ore has recently been cut at the Tango mine in the same district. The vein is 7 ft. wide.

Victoria—To the other Vancouver Island interests of the Consolidated Mining and Smelting Co. of Canada, which include the "Old Sport" Quatsino and the "Sunloch", Jordan River, has been added the "Big Interior" on which the company is authentically reported to have obtained a bond. This property is situated about ten miles from the head of Great Central Lake. Hitherto its possibilities have been handicapped through lack of transportation facilities, but, as the E. & N. Ry. is being extended from the town of Alberni to Great Central Lake, this difficulty, to a large extent, will disappear, should further development prove the merit of the Big Interior.

The Guggenheims and their associates are reported to have acquired a half interest in the Lucky Four group of copper claims, situated on the Cheam Range in the New Westminster mining division of British Columbia. In 1918 William M. Brewer, government mining engineer, prepared a favorable report on this property. He stated that "copper ore, almost exclusively chalcopyrite, occurred in a wide zone or stockwork of metamorphosed argillites in which occur many quartz veins."

Manitoba

Rice Lake—The report of R. W. Brigstocke on the Gold Pan and Gold Seal claims states that the fracture or sheared zone, some 2,500 ft. in length, has been thoroughly sampled and prospected by stripping, open cuts, a shaft down 191 ft. with a winze sunk from the second level 43 ft. and also by 105 ft. of drifting on the first level and 70 ft. on the second level. Rich patches of gold occur at irregular intervals, but the gold contained by the quartz outside these rich patches is of no economic importance. While such spots are alluring and helpful to increase profits when found in mines of fairly low grade which are being mined systematically for the fair grade ore, they are dangerous when relied on to pay profits. Outside of the rich patches the quartz is of too low a value to produce a profit, and up to date the only quartz found in the mine is only 20 to 25 ft. long and about 2 ft. wide, a negligible quantity. The conclusion reached is that sufficient exploration has been carried out and that no further expenditure should be made upon the claims.

Ontario

Porcupine—It is officially stated that the Hollinger Consolidated has now approximately 1,100 men employed, and is treating an average of about 2,300 tons of ore per day. At present from 170 to 180 stamps are being operated and tests show a recovery of approximately $4.77 per ton. It has been decided that instead of having a main haulage at more or less widely separated levels an electric haulage will be established at intervals of 150 ft. commencing with the 500-ft. level. The 500-ft. level is now converted into an electric haulage level. During the last year work was confined to the workings above the 800-ft. level, only a limited amount being done at that depth.

It is planned to start using electric power at the Clifton-Porcupine about Mar. 1. The development program provides for the driving of a crosscut nearly 800 ft. long at the 200-ft. level east and west from present workings to cut eleven veins which have been found to parallel each other. Much visible gold occurs and a considerable tonnage of ore has been blocked out.

Cobalt—The La Rose Consolidated has struck a new 4-in. vein near the 145-ft. level of its University property, the wall rock containing good ore.

The annual statement of the Temiskaming shows a considerable falling off in earnings, as the mill ran only 43.3 per cent of possible running time. Production amounted to 243,037 oz. of silver and earnings to $295,252, as compared with an output of 420,078 oz. and earnings of $425,014 in 1918. The surplus on mining account was $70,448, as compared with $135,394 the previous year. The total surplus at the end of the year was $864,016.

At the Genessee, in drifting west on No. 3 vein on the 500-ft. level, some patches of good ore including high grade have been encountered. The drift being about 100 ft. above the contact it is considered that these patches of ore may be above a shoot.

Matachewan—Preliminary work is being done in connection with the installation of the power plant at Indian Chute on the Montreal River for supplying the Matachewan and Gowganda camps. The site has been cleared and rock boring is being undertaken. Owing to the high cost of steam power the Matachewan mine management will defer further underground work until electric power is available.

MEN YOU SHOULD KNOW ABOUT

W. A. McGonagle has been re-elected president for the owners of the Duluth, Missabe & Northern Railroad.

W. J. Loring recently spent a week visiting the properties in which he is interested on the Mother Lode of California.

T. H. France, mining engineer, has returned to New York City, and now has his office at Room 3250, No. 120 Broadway.

W. H. Tappan, assistant general superintendent for the Oliver Iron Mining Co., Hibbing district, is on an extended vacation in southern California.

R. S. Walker, consulting engineer for M. A. Hanna & Co., has returned from a tour of the company's northern properties in connection with projected new equipment.

A. H. Fay, mining engineer in charge of accident and certain other statistics for the U. S. Bureau of Mines, since the foundation of the Bureau, has resigned to enter private employment.

Robert A. Kinzie, general manager of the Engels Copper Mining Co., of California, attended the winter meeting of the American Institute of Mining and Metallurgical Engineers held in New York City last week.

Charles Gitlan, 72 Trinity Place, New York City, is now independently established in an agency and brokerage business in non-ferrous metals and ores. Mr. Gitlan was formerly secretary of Wah Chang Trading Corp. and in charge of their sales.

William W. Adams, superintendent of the Providencia mine of the Cia. Minerales y Metales, a subsidiary of American Metals Co., who was kidnapped by Mexicans in Zacatecas on Feb. 15, is reported to have been released and was expected to reach the Saltillo office of the company on Thursday, Feb. 19.

Franklin K. Lane, who retires on March 1 as Secretary of the Interior, has accepted a position as vice president and legal advisor of the Pan American Petroleum & Transport Co. and the Mexican Petroleum Co. Mr. Lane will have offices in New York, and takes with him as executive assistant **Joseph J. Cotter**, who has been with him for some time in the same capacity. Mr. Lane's successor as Secretary of Interior is John Barton Payne, of Chicago, chairman of U. S. Shipping Board.

Among those who attended the banquet of the American Institute of Mining & Metallurgical Engineers, on Feb. 17, 1920, in New York were: W. H. Aldridge of New York, R. S. Botsford, recently from Petrograd; J. M. Boutwell of Santa Barbara, J. F. Callbreath of Washington, Jesse T. Boyd of Cleveland, Wm. R. Chedsey of State College, Pa., J. V. N. Dorr of New York, Rudolph Gahl of Denver, Prof. L. C. Glenn of Nashville, S. L. Goodale, U. S. A., Augustus Loke of San Francisco, Prof. Dr. Carl C. Plehn of University of California, Ralph H. Soper of Trinidad, B. W. I., H. N. Spicer of New York, W. G. Swart of Duluth, Arthur Thatcher, J. B. Tyrrell of Toronto, Canada.

INDUSTRIAL NEWS

Sprague Electric Works of the General Electric Co., New York City, announce that **H. M. Davis**, manager of their advertising department, died on Feb. 9, after a three-weeks illness. He had been with the Sprague works since December, 1899.

Collins & Webb, mining and industrial machinery, announce that the manager of their San Francisco office, **G. A. Fisher**, has purchased an interest in the company and will hereafter have his office in Los Angeles. **G. D. Chase** has been appointed their San Francisco manager, with offices in the Rialto Building.

Easton Car & Construction Co. announces the opening of a branch office in charge of **H. H. Siff**, Room 400, Penobscot Bldg., Detroit, Mich. Mr. Siff is district sales engineer and experienced in industrial railway matters. The branch office will carry a stock of spare parts as soon as the demand warrants it.

Automatic Primer Co., 420 Conway Bldg., Chicago, is making in quantity the "Apco" primer for centrifugal pumps, which is adapted to any condition where it is necessary to maintain a vacuum on a suction line. This system when once primed is always ready for use. It includes pump, connections, and a pair of superimposed tanks bearing a definite relation to the volume of gas in the suction line when under operating pressure.

TRADE CATALOGS

Air Compressors. National Compressed Air Mach. Co., Los Angeles, Cal., 9 x 6; 32p. illus. Catalog No. 17. A well illustrated pamphlet describing briefly the National line of compressed air machinery. It closes with two brief tables convenient for those who have to calculate lift and temperatures under compression.

The Dourte Valveless Pump. The Mine & Smelter Supply Co., 42 Broadway, New York. 7 x 10; 24 pages, illus. Describes a vertical, duplex, single-acting plunger pump, of special design for handling unusual pumping problems —waters with suspended matters, pulps, heavy liquids, tars, and sticky fluids. Made in capacities from 26 to 160 gal. per min., at pressures up to 100 lb. Its distinctive features are complete absence of valves, freedom from operating attention, and non-clogging action.

Condensing Apparatus. Worthington Pump & Machinery Corp., New York City. 9 x 6; 115p. illus. Jan., 1920. An unusually handsome booklet illustrating the wide range of condensing machinery manufactured, explaining the principles of their peculiar improvements, and concluding with 25 pages of "Useful Information on Condensing" that embrace simple graphs and fairly full tables on condensing surface, tube friction, and low pressure steam. The publication is useful for general reference.

NEW PATENTS

U. S. Patent specifications may be obtained from the Patent Office, Washington, D. C., at 5c each.

Drill—Rotary boring-drill. Granville Allison Humason. (1,326,509; Dec. 30, 1919.)

Drill Bit—Combination and drill-shank. Granville A. Humason. (1,326,506, 1,326,507; Dec. 30, 1919.)

Drilling—Fishing tool. Poetta Trent Boyd. (1,326,566; Dec. 30, 1919.)

Electric Furnace—Walter R. Clark, assignor to Bridgeport Brass Co. (1,328,713; Jan. 20, 1920.)

Furnace—Furnace-setting. Frank H. Nickle, St. Louis, Mo. (1,329,470; Feb. 3, 1920.)

Heat-Economizer. David S. Jacobus, Jersey City, N. J., assignor to The Babcock & Wilcox Company, Bayonne, N. J. (1,329,767; Feb. 3, 1920.)

Lubrication — Automatic apparatus for lubricating railway and tramway track wheels and rails. Alfred Hofmann, Zurich, Switzerland. (1,329,406; Feb. 3, 1920.)

Metallurgy—Machine for charging furnaces. Waldemar Dyrssen, New York, N. Y. (1,329,588; Feb. 3, 1920.)

Mine-car—Mine-car wheel. Leroy G. Binkley, Chicago, Ill., assignor to Railway & Mine Supply Company, Chicago, Ill. (1,329,496, 1,329,497, 1,329,498, 1,329,499; Feb. 3, 1920.)

Molybdenum—Recovery of Molybdenum from its ores. Henry Alfred Doerner, Meriden, Conn. (1,329,380; Feb. 3, 1920.)

Oil Shale—Apparatus for distilling oil-bearing shale. Halver R. Straight, Adel, Iowa. (1,330,014; Feb. 3, 1920.)

Separator—Apparatus for Extracting Minerals from Ores. George M. Shires. (1,328,210; Jan. 13, 1920.)

Sluice—Apparatus for Saving Metallic Values from Pulp. Lincoln C. Stockton and Charles F. Goddard, assignors to Metal Separation Co. (1,327,885; Jan. 13, 1920.)

Tunneling Machine. Frank L. Dana. (1,326,480; Dec. 30, 1919.)

NEW PUBLICATIONS

Recommended Specification for Basic Carbonate White Lead. Circular of the Bureau of Standards No. 84. Issued by the Government Printing Office, Dec. 27, 1919.

Bibliography of the Metals of the Platinum Group.—Platinum, Palladium, Iridium, Osmium, Ruthenium, 1748-1917: by Jas. Lewis Howe and H. C. Holtz; U. S. Geological Survey; pp. 487.

This is an exhausive bibliography and in its way monumental.

Boletin Minero (Mineral Bulletin) — The organ of the Mining Department, Mexico City, July, August, 1919, Vol. VII, Nos. 1 and 2, pp. 336.

This volume contains four sections: Technical, statistical, legislation and information. Under the first, data are given concerning the mines La Asuncion y Anexas, at Guanajuato; Ixtlàn y Anexas, at Ixtlán, in Oaxaca; Moctezuma at Mexicali, Lower California; and Panuco, in Sinaloa.

Mineral Resources of Alaska. Report of progress of investigations in 1917 by G. C. Martin and others: Bulletin 692, U. S. Geological Survey; Washington, D. C.; 408 pages.

This is the fourteenth of a series of annual bulletins treating of the mining industry of Alaska and intended as reference books for the year covered. The material is valuable and varied. Special consideration is given to platinum and gold-bearing gravels in the Christochina River, the Kahiltna Valley, the Tolstoi, and the Kowalik-Koyuk districts; tin in Seward Peninsula and in the Ruby district; graphite in Seward Peninsula; and chromite deposits.

It is trite to express regret at the delay in the appearance of the Geological Survey publications, especially such as this, which have an essential time element. As everyone knows, it is the fault of the Government Printing Office, or rather its misfortune, for it is congested with the urgent and copious documents of Congress. J. E. S.

Deposits of Manganese Ore in Arizona. By E. L. Jones, Jr., and F. L. Ransome. Paper, 6 x 9, pp. 184; Bulletin 710-D, U. S. Geological Survey, Washington, D. C., 1920.

According to this bulletin, Arizona made a total production of manganese ore up to Dec. 31, 1918, of 32,000 tons of 35 per cent manganese content or better. Of this, the Tombstone and Bisbee districts have yielded more than 27,000 tons since 1915, and the remainder has been produced since Jan. 1, 1917, from scattered deposits throughout the state. The iron content is low and the manganese content about 35 per cent. It is estimated that about 35,000 tons of ore remains, containing more than 35 per cent manganese, and a much larger amount of manganiferous ore containing less than 20 per cent of manganese is available. Economic conditions are unfavorable for extended development. Individual deposits are briefly described. The short general descriptions of the geology of the various districts in which the manganese ore occurs will be useful to an engineer who may have mine examinations to make in those districts.

A Catalogue of the Mesozoic and Cenozoic Plants of North America. By F. H. Knowlton. Paper 6 x 9, pp. 815, Bulletin 696, U. S. Geological Survey, Washington, D. C., 1920.

A catalogue is at best not exciting reading, and particularly a catalogue of plant forms, but a close inspection of this bulletin leaves one with an impression that the work has been well done and that a distinct advance in organized knowledge has been made. With the characteristic thoroughness of workers in the Survey, the author, F. H. Knowlton, has contributed a book which will put in his debt all workers in historical geology. That the catalogue has been needed by workers in this highly specialized field can be appreciated by the author's statement that twenty-two years have elapsed since the publication of his first catalogue in 1898. Since that time there has been much activity in the field covered by the bulletin.

The organization of this book is in brief an introduction, including a discussion of nomenclature and a correlation chart; a bibliography, the catalogue itself, a biologic classification of genera, an index of genera and families, and floral lists of North American Mesozoic and Cenozoic plant-bearing formations. G. T. Y.

Our Mineral Supplies. By H. D. McCaskey and E. F. Burchard. 6 x 9, pp. 278, Bulletin 666, U. S. Geological Survey, Washington, D. C., 1919.

Inventories of mineral resources have been published chiefly by the U. S. Geological Survey in "Mineral Resources of the United States." The war stimulated a desire for a more accurate estimate than had yet been made of the capacity of the country to meet its requirements of raw mineral products. Out of this grew a number of investigations, of which the present bulletin represents a condensed summary. Although most of the statistics quoted are for 1916, the data as a whole represents a bird's-eye view of the situation.

A surprising number of domestic mineral supplies is adequate for all probable peace and war needs (Class I, p. 8). Of Class II minerals, which satisfy to a considerable extent, but not wholly, the peace and war needs, there are only seven, and of domestic minerals, chiefly inadequate in quantity or quality, there are ten. The war need has happily disappeared, but the studies made are useful in determining tariff procedure and for general information about the mineral industry. The bulletin consists of a series of articles on the various minerals, each by an expert. Much of the information has appeared before in Mineral Resources but has not been presented in the condensed form in which it is given in this bulletin. The uses to which different minerals are put are briefly summarized.

Mineral Production of Canada—The annual report on the mineral production of Canada for 1918 has just been issued. The statistics are published in the usual form, and include data for several preceding years for most of the products discussed. The pamphlet is divided into metallic and nonmetallic products, and a further division is shown among the various provinces.

Potash—A forty-six page brochure entitled "Sources of Industrial Potash in Western Australia" has recently been received. The first twenty pages are devoted to the general sources and uses of potash, with a brief discussion of the potash situation as it existed during the war. The pamphlet should be of value to anyone interested in potash, and may be obtained (price unstated) by applying to the Geological Survey Office, Perth, Western Australia, for Bulletin No. 77.

Wulfenite—An interesting discussion of the milling of wulfenite by J. T. Bonardi was published in January by the Franklin Institute. The author gives qualitative tests and outlines the method for determining molybdenum in wulfenite ores. The paper has been published separately and copies may be obtained either from the Franklin Institute, Philadelphia, Pa., or from the author at Golden, Col.

Mining and Milling in Korea — We are indebted to T. A. Rickard for a volume containing reprints of a series of articles published in the *Mining and Scientific Press* on "Technical Operations on the Suan Concession, Korea," by A. R. Weigall and J. F. Mitchell-Roberts. The reprinting was well worth while, for rarely is a mining project described with the care and skill which have been given to the subject of these papers. The valuable metals in the ore are mainly gold and copper, although bismuth, silver, and tungsten occur in amounts of economic importance. For the mining and milling of such a complex ore many problems had to be solved, and the story is interesting. Many attractive photographs of Korean scenes add much to the appearance of the publication.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Junior Locator's Rights

The Abo and Blue Star Mining Claims —Grounds for Questioning—The Senior and Junior Location

A judgment in favor of George A. Blake, the original locator of the Abo lode mining claim, Dona Ana County, New Mexico, has been reversed and a new trial granted Vernon S. Calvin and one Prichard, and the Abo Canon Copper Mining Co. The land is situated in Abo Pass, Torrence County, but prior to 1893 this particular spot was then within the boundaries of Valencia County. In 1915 Calvin and Prichard located this claim, under the mining laws of the United States, as the Blue Star lode mining claim. They posted their location notice, marked the boundaries, and duly recorded the location notice. They discovered copper, and proceeded to develop their mine, opening up valuable deposits. In December, 1915, during the mining operations, Blake appeared and claimed ownership in the property and that he was entitled to possession under his location made in 1893.

Soon thereafter Blake filed his action of ejectment, and brought an injunction suit to prevent defendants from continuing mining operations and for damages. Before service was had upon Calvin or Prichard, they organized the Abo Canon Copper Mining Co. and transferred all their interests to this company. After about two years, a change of venue was had to Dona Ana County. A trial resulted in a verdict and judgment for Blake.

The principal question presented the Supreme Court of New Mexico was whether or not the location of a mining claim which covers land theretofore attempted to be located by another may be sustained upon these grounds: (1) That the original location of the contestant was invalid; (2) That the locator had failed to do his annual assessment work.

Now, where a subsequent locator states in his notice that it is a relocation of a prior claim, the courts universally hold that such locator is limited in his defense to proof of failure to do the annual assessment work by the original locator. No case was cited or found, however, upon this question, and the Supreme Court, in overruling the lower court, held that where the relocator does not state in his notice that he is relocating the prior claim, he should have a right to sustain the validity of his location upon the two grounds simultaneously, namely, invalidity of the first location and failure of the first locator to do the assessment work, without sacrificing one defense by interposing the other.

"Suppose, for example," said the court, "that the senior locator failed to monument his claim, as required by both the Federal and state statutes, or failed to make discovery of mineral in place, and likewise fails to do his annual assessment work; the junior locator knows that the senior locator has failed to do the required annual assessment work, and also knows that he has failed to comply with the law in the other respects named, by reason of which the land is subject to location. In other words by failure to monument his claim or to discover mineral, the land remains a part of the public domain of the United States, subject to entry. The junior locator thereupon files a location upon the land and does the acts requisite under the law to enable him to retain possession and work the claim. Is he not entitled in an action of ejectment by the senior locator to avail himself of both defenses? We think he is, and that by interposing the defense of the failure on the part of the senior locator to do the annual assessment work required, it does not deprive the junior locator of his right to question the validity of the senior locator's location."

Accordingly, judgment in favor of the original locator was handed down.

Mining vs. General Partnership

Legal and Technical Distinction Explained—Right of Partner To Sell Firm Property

The Supreme Court of Kansas has held that in a case in which a partnership was organized to secure a block of oil and gas leases, and to drill a test well to develop the field and enable the partnership to dispose of the leases, the facts showed the existence of a general partnership and not a mining partnership. And in such a situation, where the test well produced only a small amount of gas, the mere abandonment of the well was held not to have been an abandonment of the general enterprise, and, therefore, a finding that the partnership was a mining partnership was in error. (185 Pac. 725.)

The court said that mining partnerships are recognized between co-owners only when they actually engage in working the property, and before actual operations begin, and after they cease the parties are simply co-tenants, unless an ordinary partnership has been formed. Wherever there is a general partnership, one of the partners has full authority to sell and dispose of the firm property.

In an action in replevin to recover casing for a gas and oil well sold to defendant by one partner of a general partnership, the buyer was entitled to whatever profits accrued to him by the purchase, and should have judgment for the value of the property, although greater than the purchase price.

Title to Timber Denied

Washington Mineral Lease Revised by Supreme Court—State Mineral Law on Leases Elucidated

In a Washington case, one C. L. Morris made application and paid the fees fixed by law, for a prospecting lease covering a certain eighty-acre tract of land belonging to the state, but the commissioner of said state refused to issue him such lease without inserting therein a reservation to the effect that "the state of Washington reserves . . . . the right to sell or otherwise dispose of any and all timber and valuable materials except the minerals which the lessee is hereby authorized to remove, with such rights and privileges for the production, use and removal thereof as may be authorized by law." A writ of mandamus was asked by Morris directing the commissioner to issue the lease without such reservation. (185 Pac. 597).

The Supreme Court of Washington said the commissioner was without discretion in a matter of this kind, that the claimant was entitled to a lease giving him all rights which the statute gives him in such cases and without any limitations except those which the statute imposes, and such have no basis for the reservation of timber and other materials, except the minerals. The state laws authorize the issuance of leases and contracts for the mining of precious metals. They further provided for the application by any citizen for a prospecting lease to cover not to exceed eighty acres according to the legal subdivisions; for the manner of locating such mineral claims; for the fees, the time the lease should run, and limit the amount of ore which may be removed while operating under the prospecting lease; for the use of timber found upon the premises for fuel and construction of such buildings as may be required in the operation of any mines on the premises, and that required for drains, tramways, supports for such mines, and for no other purposes.

The law also provides that any time prior to the expiration of such lease the holder or any assignee thereof shall have the right to obtain from the Commissioner of Public Lands a contract "to mine the land covered by said lease and extract and dispose of the minerals taken therefrom."

The court said the law did not reserve or require the lease to contain any words of reservation as to timber, and it, therefore, held that the commissioner was without authority to insert the reservation complained of in the lease issued to Morris, and the commissioner was directed by the court to issue a lease without any such reservation.

THE MARKET REPORT

Published simultaneously in San Francisco and mailed from there to our Western subscribers as a special service pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

Feb	Sterling Exchange	Silver		Feb.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
19	341½	130	83¾	23	....	....	82
20	347¼	130	82⅝	24	336¼	129	82
21	339½	130	82⅝	25	340¾	129¼	82⅜

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.

Daily Prices of Metals in New York

Feb.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
19	18½@18¾	59½	61¼@61½	8.75@8.85	8.60@8.75	8.80@8.85
20	18⅝@18¾	60 @60¼	62½@63	8.75@8.90	8.60@8.80	8.85@8.95
21	18⅜@18¾	60½	62	8.75@8.90	8.60@8.80	8.85@8.95
23	.....	.....	.....	.....	.....	.....
24	18¾@18.85	61½@62	64	9.00	8¾	8.90@9.00
25	18¾@18.85	62 @62½	63½@64	9.00	8¾	8.90@9.00

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 the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

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 special 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

Feb.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
19	119½	122	127	396	397½	52⅜	53⅜	63	65½
20	119½	122¼	127	401	402½	52⅜	53⅜	61¼	63¾
21	....	....	...	....	....	...	...	...	...
23	120½	123	128	410	412½	52¼	53⅛	61½	63½
24	121	123⅝	128	415½	418	52¼	53⅛	61½	63½
25	122	124½	128	419	421½	51⅞	52¾	61¼	63⅜

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

METAL MARKETS

New York, Feb. 25, 1920

The copper market continues quiet, with slightly higher average prices for the week. Lead advanced to 9c. New York and 8⅜c. St. Louis, with a shortage of pig lead apparent. Zinc advanced steadily during the week until it reached 9c. St. Louis on Feb. 24, considerable speculative trading being done. Transatlantic freights were unchanged. Transpacific freights remained at $12 from Hongkong and Kobe to San Francisco.

Copper

The copper market was quiet during the week, with buyers assuming a conservative and somewhat disinterested attitude, due to the fact that they were fairly well supplied for the first quarter. Deliveries are still hindered by car shortage and embargos resulting from the recent unfavorable weather conditions. Consumption of the metal is very good, and there is evidence that consumers' books are well supplied with orders for their products extending into the second quarter. Buyers of copper who are well supplied for the first quarter are absorbing some of their present copper before going ahead to purchase for second-quarter requirements. However, some buyers are beginning to think about purchasing for second-quarter delivery at prices a little below 19c.

Second-hands have not been so active during the week, and though metal is reported to have been sold at 18⅜c., some dealers have refused offers of 18⅜c. and are holding out for 19c. delivered. Sales have been reported during the week at 18⅜c. and at as high as 19⅜c. for April, May, and June delivery.

A better inquiry is reported from abroad. Export business is rather quiet but improving, with sales reported at 18⅜c.

Copper Sheets—No change in base price of 29½c. per lb set early in January. Wire 22@22½c. per lb.

Tin

The tin market was stronger during the last week, the price increasing materially over the holiday. Sellers found no difficulty in disposing of their product, and business was done around 61½@62½c. for 99 per cent tin, and around 64c. for Straits tin, yesterday and today. The London market exhibited the same features. Probably a large amount of the metal was picked up by speculators, who seemed to be anticipating a further advance.

Straits tin for future delivery was quoted as follows: Feb. 19, 62c.; Feb. 20, 63½c.; Feb. 21, 63c.; Feb. 24, 64½@65c.; Feb. 25, 64@64½c.

Arrivals of tin have been as follows: At Atlantic ports, 50 tons from Rotterdam on Feb. 16; from London 100 tons on Feb. 18, and 25 tons on Feb. 20. At Pacific ports, 50 tons from the Straits on Feb. 18.

Lead

The market has been stronger during the week, with rising prices. On Feb. 24, the A. S. & R. Co. advanced its official price from 8⅜c. to 9c. New York. There is a general scarcity of pig lead and an incentive toward increased production. Last Thursday, sales of carload lots were made at steadily advancing prices from 8.65 up to 8.75c. St. Louis, sales of 200 tons or more being reported at the latter figure. On Friday, substantial sales took place at 8.80c. St. Louis, and carload lots were disposed of at 8.90c. St. Louis, and 9.05c. New York. Yesterday high-grade lead was sold up to 9c. St. Louis.

During the past few days the demand is reported to be larger than at any time since last December. There is a strong demand for European consumption.

Zinc

The market has been firmer during the week, with sales at rising prices. Early in the week sales were made at 8.70c. St. Louis, whereas yesterday's sales were reported up to 9c., equivalent to 8.95c. after deduction of broker's commission. Substantial trading was recorded during the week at

prices ranging from 8.90c. to 8.95c. St. Louis. There has been considerable speculation in the metal, and it is believed that dealers who have the metal to sell would willingly accept offers of 9c., which is regarded as a good price.

High-grade zinc has been fairly active and shows an advancing tendency, with quotations at ¼c. or more above the price of Prime Western grade.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots. Slightly higher prices for export. Unchanged.

Gold, Silver and Platinum

Gold—Gold is being quoted in London as follows: Feb. 19, 121s.; Feb. 20, 119s. 6d.; Feb. 21, 119s. 6d.; Feb. 23, 122s. 8d.; Feb. 24, 122s.; Feb. 25, 120s. 8d.

Silver—Owing to the holidays preceding the Chinese New Year, the market in N. Y. has receded to $1.29 per oz. The important announcement has been made that gold imported into India will be acquired in future at the ratio of one rupee for each 11.30016 fine grains: and under the scheme advocated by the India Exchange Committee the gold contents of the sovereign would be exchangeable for 10 rupees.

Foreign Exchange—The market in this commodity is decidedly unsettled, with variations of 5c. in a day for sterling exchange by no means uncommon. On Tuesday the closing quotation was 3.40¼ for sterling, although a price of 3.35¼ was registered during the day. Francs closed on Tuesday at 14.09 to the dollar; German marks 1.04c.; Austrian kronen 0.4c.; Italian lire 18.12; and Spanish pesetas 17.40. Argentine checks were quoted at 43.07, and Brazilian checks at 26, these being the value of one escudo in U. S. currency.

A depressing factor on exchange during the week was the announced intention of the Federal Reserve Board to use all the resources at its command to check undue expansion and encourage proper liquidation by a closer regulation of the credit situation.

Canadian exchange is now at 14 per cent discount, and beginning March 1, the railroads will not accept prepaid shipments to United States points except where required to do so by tariff rules. Canadian post offices are cashing United States money orders at a 10 per cent premium.

Mexican dollars at New York: Feb. 19, 99⅛; Feb. 20, 99⅛; Feb. 21, 99⅛; Feb. 23, holiday; Feb. 24, 98¾; Feb. 25, 98¾.

Platinum—Market steady, $150@$155 per oz.

Palladium — $130@$135 per oz. Steady.

Iridium—Quoted nominally at $300.

Other Metals

Aluminum — 32@33c. per lb. Unchanged.

Antimony — Market is strong, with scarcity of metal. Sales of ordinary brands, both spot and futures, average about 11¾c.; W.C.C., 12c., and Cookson's spot, reported on resale, 15@16c.; futures, 13¼c.

Bismuth—Unchanged at $2.50 for 500-lb. lots.

Cadmium—Unchanged at $1.40@$1.50 per lb.

Nickel—Ingot, 43c.; shot, 43c; electrolytic, 45c. Unchanged.

Quicksilver—Good demand at $90 per 75-lb. flask. San Francisco telegraphs $85 firm. London reports unchanged at £23 5s.

Other Ores and Minerals

Fluorspar—Lump ore containing 85 per cent CaF_2 and not over 5 per cent SiO_2 is quoted unchanged at $16 f.o.b. mines at Tonuco, N. M.

Pyrites—Spanish pyrites is quoted at 16c. per unit for furnace-size ore, free from fines, c.i.f., Atlantic ports.

Sulphur—Prices average $18 per ton for domestic and $20 for export, f.o.b. Texas and Louisiana mines. Practically no change in past two or three months. Export demand falling off on account of exchange, and domestic consumers are largely booked for the year.

Chrome Ore—75c. per unit for ore 45 per cent and over.

Manganese Ore—Demand is active, with price up to 80c. per unit for high-grade ore. Business has been done at this figure.

Molybdenum Ore—70@75c. per lb. MoS_2 for high-grade concentrate. No change.

Tungsten Ore—Sellers are holding at $6.50 per ton and buyers offer $6.25 for Chinese wolframite. The market is practically dead, and will probably remain so until the question of tariff is settled. Bolivian ore is quoted at $9@$9.50 per ton. High-grade scheelite is quoted at $15.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 21—Zinc blende, per ton, high, $59.05; basis 60 per cent zinc, premium, $53.50; Prime Western, $52.50 @$50; fines and slimes, $50@$47.50; calamine, 40 per cent zinc, $35. Average prices: Blende, $51.77; calamine, $37; all zinc ores, $51.74.

Lead, high, $102.80; basis 80 per cent lead, $100; average settling price all grades of lead, $99.40 per ton.

Shipments the week: Blende, 12,756; calamine, 31; lead, 1,707 tons. Value, all ores the week, $831,300.

Settlements this week were made on ore purchased several weeks ago on $55@$57.50 basis, placing the high price of the week and the average settlement prices above this week's market quotations. Some ore was reported sold early this week on $50 basis, but sellers generally stood firm on a higher market, and the bulk of this week's sales were $52.50 Prime Western. Shippers are strenuously pushing loading operations, with a continually declining reserve stock the result. Shipments are around 1,000 to 1,500 tons more than the output.

Platteville, Wis., Feb. 21—Blende, basis 60 per cent zinc, $54. Base for premium and Prime Western grades, lead ore, basis 80 per cent lead, $100 per ton. Shipments are somewhat curtailed by partial embargo on cars. Shipments this week: Blende, 1,391; lead, 232; sulphur ore, 76 tons. Shipments this year to date: Blende, 11,932; calamine, 510; lead, 1,315; sulphur ore, 106 tons. Shipped during week to separating plants, 2,243 tons blende.

Iron Trade Review

Pittsburgh, Feb. 24

Still higher prices are being bid and paid for small lots of steel products for early deliveries. There seems to be no limit to the prices some consumers, particularly the automobile makers, are ready to pay for steel for early delivery, nor is there any limit to the prices the mills able to make early deliveries are disposed to ask. Conservative mills, those that decry a runaway market, are filled up, and are unable to make any early deliveries.

Though in regard to early deliveries the steel market is higher and stronger, there is more clearly marked a difference between early and late deliveries. For late deliveries, say after July 1, consumers are unwilling, apparently, to pay fancy prices, but on the other hand there are few sellers for late deliveries.

Pig Iron—It is the opinion of several conservative merchant pig-iron producers that the top of the pig-iron market has been reached, and at any rate there have been no further advances in the past week, and the market has been relatively quiet, prices for extended delivery being: Bessemer, $42; basic, $43; foundry; $42; f.o.b. Valley furnaces, with $1.40 freight to Pittsburgh.

Steel—Sheet bars have sold at $70, and cannot be had at less, with a possibility that $75 might have to be paid. Buyers have been chiefly sheet consumers, who arrange to have the sheet bars rolled by sheet mills that have spare rolling capacity, being themselves short of steel. The billet market is not so clearly defined, and may be quoted roughly at $55@$65, transactions being light.

Coke—The market is held by Government limits of $6 for furnace and $7 for foundry, per net ton at ovens, Connellsville region, and there is hardly any coke to be had in the open market, all the production going on contract. Several furnaces would willingly pay over $6 if permitted. Connellsville coke production has been very steady since the first of the year, but has scarcely increased at all, and is not adequate. Byproduct output continues to increase. While coke supplies are inadequate to requirements they are heavier than in the forepart of January, and pig-iron production is correspondingly increased.

Ferroalloys—Domestic ferromanganese continues to be quoted at $160, delivered, by producers, English being about $150, c.i.f.

MINING STOCKS

Week Ended Feb. 21, 1920

Stock	Exch.	High	Low	Last	Last	Div.
COPPER						
Adventure	Boston	*100	*95	*95		
Ahmeek	Boston	71½	69	71½	Dec. '19,	$1.00
Alaska-B.C.	N. Y. Curb	1	⅛	1		
Algomah	Boston			†35		
Alloues	Boston	34	33	34	Mar. '19,	1.00
Anaconda	N. Y.	59⅜	55½	59	Feb. '20,	1.00
Ariz. Com	Boston	12⅜	11½	12⅜	Oct. '18,	.50
Big Ledge	N. Y. Curb	⅛	⅜			
Bingham Mines	Boston	6½	....	†6	Sept. '19,	.25
Boston & Ely	Boston Curb	*90				
Butte & Bal	Boston	*30	*30	*30		
Butte & Lond	Boston Curb	16	10	†10		
Calaveras	Boston Curb	1⅛		½		
Calumet & Ariz	Boston	64½	59⅜	64½	Dec. '19,	.50
Calumet & Hecla	Boston	370	360	365	Dec. '19,	5.00
Calumet & Jerome	N. Y. Curb					
Can. Copper	N. Y. Curb	1½	1	1½		
Centennial	Boston	13	13	13	Dec. '18,	1.00
Cerro de Pasco	N. Y.	50⅜	48	50⅜	Dec. '19,	1.00
Con. Ariz	N. Y. Curb	⅜	⅜	⅜	Dec. '18,	.05
Con. Copper M	N. Y. Curb	4⅜	4	4⅜		
Chile Cop	N. Y.	18⅜	16½	17⅜		
Chino	N. Y.	37⅜	35	37½	Dec. '19,	.75
Cliff	Boston					
Cop. Range	Boston	44	42	44	Dec. '19,	.50
Crystal	Boston Curb	*9	*4	†*4		
Crystal Cop (old)	Boston Curb	*40	*30	†*30		
Daly-West	Boston	4	3½	4		
Davis-Daly	Boston	11⅞	10⅝	11⅛	Dec. '19,	.50
East Butte	Boston	14	12½	13⅜	Dec. '19,	.50
First Nat'l	Boston Curb	*1⅜	*1½	†*1½	Feb. '19,	.15
Franklin	Boston	3½	3	3		
Granby Consol	N. Y.	40	37	39	May '19,	1.25
Greene-Can	N. Y.	33	31	33	Feb. '19,	1.50
Hancock	Boston	5	4⅜	5		
Helvetia	Boston	3	2⅝	3		
Houghton	Boston Curb	*75½	*75	†*75		
Howe Sound	N. Y. Curb	4⅜	4	4⅜	Jan. '20,	.05
Indiana	Boston			†*70		
Inspiration Con	N. Y.	55⅛	52½	55⅜	Jan. '20,	1.50
Iron Cap	Boston Curb	12	10	†11	Feb. '19,	.25
Isle Royale	Boston	32⅜	30⅜	32	Sept. '19,	.50
Jerome Verde	N. Y. Curb	⅜	....	†⅞		
Kennecott	N. Y.	29⅜	30½	28½	Dec. '19,	.50
Keweenaw	Boston	1⅜	1⅛	1⅛		
Lake Copper	Boston	4	3⅞	3⅞		
La Salle	Boston	3	2¼	2¼		
Magma Chief	N. Y. Curb	25	21	25		
Magma Copper	N. Y. Curb	35⅛	35⅛	35⅛	Jan. '19	.50
Majestic	Boston Curb	*20	*15	†*15		
Mason Valley	N. Y. Curb	2⅜	2⅛	2⅜		
Mass Con	Boston	5⅛	4	5⅛	Nov. '17,	1.00
Mayflower	Boston	9¼	8	8⅞		
Miami	N. Y.	23	21⅞	23	Feb. '20,	.50
Michigan	Boston	7	....	†6½		
Mohawk	Boston	65	60	64½	Feb. 20,	1.50
Mother Lode(New)	N. Y. Curb	5	5	5		
Nev. Con	N. Y.	15⅞	14⅞	15⅜	Dec. '19,	.37½
Nixon Nev	N. Y. Curb	18	12	12		
Nev. Douglas	Boston Curb	*20	....	†*12		
New Arcadian	Boston	3⅜	3	3⅜		
New Baltic	Boston Curb	4	3⅜	†3⅜		
New Cornelia	Boston	21	19½	20⅜	Nov. '18,	.25
North Butte	Boston	18	15⅜	17⅜	Oct. '18,	.25
North Lake	Boston	*100	....	†*50		
Ohio Copper	N. Y. Curb	⅞		†⅞		
Oneco	Boston Curb	*100	*60	†*60		
Ojibway	Boston	2	2	2		
Old Dominion	Boston	33½	31⅜	33	Dec. '18,	1.00
Osceola	Boston	47½	47½	47½	Dec. '19,	1.00
Quincy	Boston	60	58	58	Dec. '19,	1.00
Ray Con	N. Y.	20⅜	19⅜	20⅛	Dec. '19,	.50
Ray Hercules	N. Y. Curb	1⅜	....	†1⅜		
St. Mary's M. L.	Boston	49	49	49	Dec. '19,	2.00
Seneca	Boston	15½	14	15		
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17,	.25
Shattuck Ariz	N. Y.	11⅛	10⅛	10⅜	Jan. '20,	.25
South Lake	Boston	1⅛	....	†1		
South Utah	Boston	*20	....	†*15		
Superior	Boston	5½	5	5½	Apr. '17,	1.00
Superior & Boston	Boston	5⅜	5	5		
Tenn. C & C	N. Y.	10½	9⅜	10½	May '18,	1.00
Trinity	Boston	2	1⅞	1⅞		
Tuolumne	Boston	*95	*85	*85		
United Verd. Ex	Boston Curb	*39	*37	†*37½	Feb. '20,	.50
Utah Cop	N. Y.	74	68⅜	74	Dec. '19,	1.50
Utah Con	Boston	9⅜	8⅜	9⅜	Sept. '18,	.25
Utah M. & T	Boston	2⅜	2	2⅜	Dec. '17,	.30
Victoria	Boston	3	3	3		
Winona	Boston	1⅜	1⅜	1⅜		
Wolverine	Boston	20	17	20	Jan. '20,	.50
LEAD						
Hecla	N. Y. Curb	4⅛	4⅛	4⅛	Dec. '19,	.15
St. Joseph Lead	N. Y.	16	15	15⅜	Dec. '19,	.25
Stewart	Boston Curb	*20	*15	†*15	Dec. '15,	.05
Utah Apex	Boston	2⅜	2⅜	2⅜	Nov. '18,	.25

Stock	Exch.	High	Low	Last	Last	Div.
ZINC						
Am. Z. L. & S	N. Y.	19¼	16	18¼	May '17,	1.00
Am. Z. L. & S. pf	N. Y.	54	50	53	Feb. '20,	1.50
Butte C. & Z	N. Y.	10⅜	8	10	Jul. '18,	.50
Butte & N. Y	N. Y. Curb	⅜	⅛	⅜		
Butte & Superior	N. Y.	27⅛	23½	26½	Sept. '17,	1.25
Natl. Z. & L	Boston Curb	*10	*8	†*7	May '17,	.02
Success	N. Y. Curb	*7	*5	*6½	July '16,	.03
GOLD						
Alaska Gold	N. Y.	1⅞	1⅛	1⅞		
Alaska Juneau	N. Y.	2	1⅛	2		
Booth	N. Y. Curb	*6	*5	*6		
Carson Hill	N. Y. Curb	25½	20	24⅜		
Cresson Gold	N. Y. Curb	2	1⅞	1⅞	Dec. '19,	.10
Dome Ex	Toronto	30	28	29½		
Dome Lake	Toronto			13		
Dome Mines	N. Y.	11⅜	10⅜	11⅜	Jan. '20,	.25
Goldfield Con	N. Y. Curb	*14	*12	*13	Dec. '19,	.05
Hedley	Boston				June '19,	.10
Hollinger	Toronto	6.85	6.70	†6.75	Dec. '19,	.05
Homestake	N. Y.	61½	61	61	Sept. '19,	.50
Kewanas	N. Y. Curb	*4	*3	*4		
McIntyre Porcupine	Toronto	2.07	2.04	†2.05	Jan. '20	.05
Silver Pick	N. Y. Curb	*23	*10	*23		
Teck-Hughes	Toronto			18		
United Eastern	N. Y. Curb	4	3⅛	3⅛	Jan. '20,	.21
West Dome	Toronto					
White Caps	N. Y. Curb	12	10	12		
Yukon Gold	Boston Curb	*1⅜	*1½	†*1½	June '18,	.02½
SILVER						
Adanac	Toronto	4	2⅞	3⅜		
Bailey	Toronto	6	5½	†5⅜	Apr. '16,	.05
Beaver Con	Toronto	65	61½	†64		
Coniagas	Toronto			3.00	Nov. '19,	.12½
Crown Reserve	Toronto	40	37	†38	Jan. '17,	.05
Hargraves	Toronto	4	3½	†3⅞		
Kerr Lake	Boston	4⅛	3⅜	4⅛	Sept. '19,	1.00
La Rose	N. Y. Curb	⅜	⅜	⅜	Apr. '18,	.02
McKinley-Dar	N. Y. Curb			‡*65	Jan. '20,	.03
Nipissing	N. Y. Curb	10⅜	9⅜	10⅜	Jan. '20,	.50
Ontario Silver	N. Y.	8	6½	8	Jan. '19,	.50
Ophir Silver	N. Y. Curb	1⅜	1⅛	1⅜		
Peterson Lake	Toronto			20⅜	Jan. '17,	.01½
Sil. King Ariz	N. Y. Curb	⅜	⅜	⅜		
Temiskaming	Toronto	44	42	†42	Jan. '20,	.04
Trethewey	Toronto	48	44	†46½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*3	*2	*2⅛		
Batopilas	Boston	1⅛	....	†1⅛		
Bost. & Mont	N. Y. Curb	*69	*67	*69		
El Salvador	N. Y. Curb	3⅜	2⅜	3⅛		
Goldfield Merger	N. Y. Curb	*4	*3⅜	*3⅜		
Jim Butler	N. Y. Curb	*24	*22	*24	Aug. '18,	.07
Jumbo Extension	N. Y. Curb	*7	*6	*6	June '16,	.05
Louisiana Con	N. Y. Curb	⅛	⅛	⅛		
McNamara	N. Y. Curb	*½	*⅜	*½		
Nev. Packard	Boston Curb	*25	....	....	Apr. '19,	.02
Rochester Mines	N. Y. Curb	*20	....	†*18	Oct. '18,	.02
Tonopah-Belmont	N. Y. Curb	3⅛	2⅞	3	Jan. '20,	.05
Tonopah-Divide	N. Y. Curb	2⅜	2⅛	2⅜		
Tonopah Ex	N. Y. Curb	2⅜	2⅜	2⅜	Jan. '20,	.05
Tonopah Mining	N. Y. Curb	2⅜	2⅜	2⅜	Oct. '19,	.15
West End Con	N. Y. Curb	2	1⅞	1⅞	Dec. '19,	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*37	*33	*35	Jan. '20,	.01
Fed. M. & S	N. Y.	13⅛	11	13⅛	Jan. '09,	1.50
Fed. M. & S. pf	N. Y.	31	28⅛	31	Dec. '19,	.50
Iron Blossom	N. Y. Curb	⅜	⅜	⅜	Jan. '20,	.02½
Marsh Mines	N. Y. Curb	*22	*20	*20		
Rex Con	N. Y. Curb	*8	*8	*8		
Simon S. L	N. Y. Curb	*1⅜	....	†*1½		
Stand. S. L	N. Y. Curb	⅛	⅛	⅛	Oct. '17,	.05
Wilbert	N. Y. Curb	*7	*6	*7	Nov. '17,	.10
NICKEL-COPPER						
Internat'l Nickel	N. Y.	21⅜	20⅜	21⅜	Mar. '19,	.50
Internat'l Nick. pf	N. Y.	....	....	87	Feb. '20,	1.50
QUICKSILVER						
New Idria	Boston	6	5⅜	5⅜	Jan. '19,	.25
MANGANESE						
Man. M. of Am	N. Y. Curb					
TUNGSTEN						
Mojave Tungsten	Boston Curb	*15	*5	†*10		
VANADIUM						
Vanadium Corpn	N. Y.	49⅜	45½	48⅜		
GOLD AND PLATINUM						
So. Am. G. & P.	N. Y. Curb	8½	8	8½		
MINING, SMELTING AND REFINING						
A. S. & R	N. Y.	64⅜	60⅜	63⅜	Dec. '19,	1.00
A. S. & R., pf	N. Y.	95⅜	94⅜	95⅜	Dec. '19,	1.75
Am. Sm. pf., A	N. Y.	80	80	80	Jan. '20,	1.50
Natl. Lead	N. Y.	83	75⅜	80	Dec. '19,	1.25½
Natl. Lead, pf	N. Y.	107⅜	106⅛	106⅛	Dec. '19,	1.75
U. S. Sm. R. & M.	N. Y.	66	63½	65½	Jan. '20,	1.50
U. S. Sm. R. & M., pf	N. Y.	46	45½	46	Jan. '20,	.87½

*Cents per share. † Bid price on Feb. 21.