

A Weekly Journal of the Mining & Mineral Industries

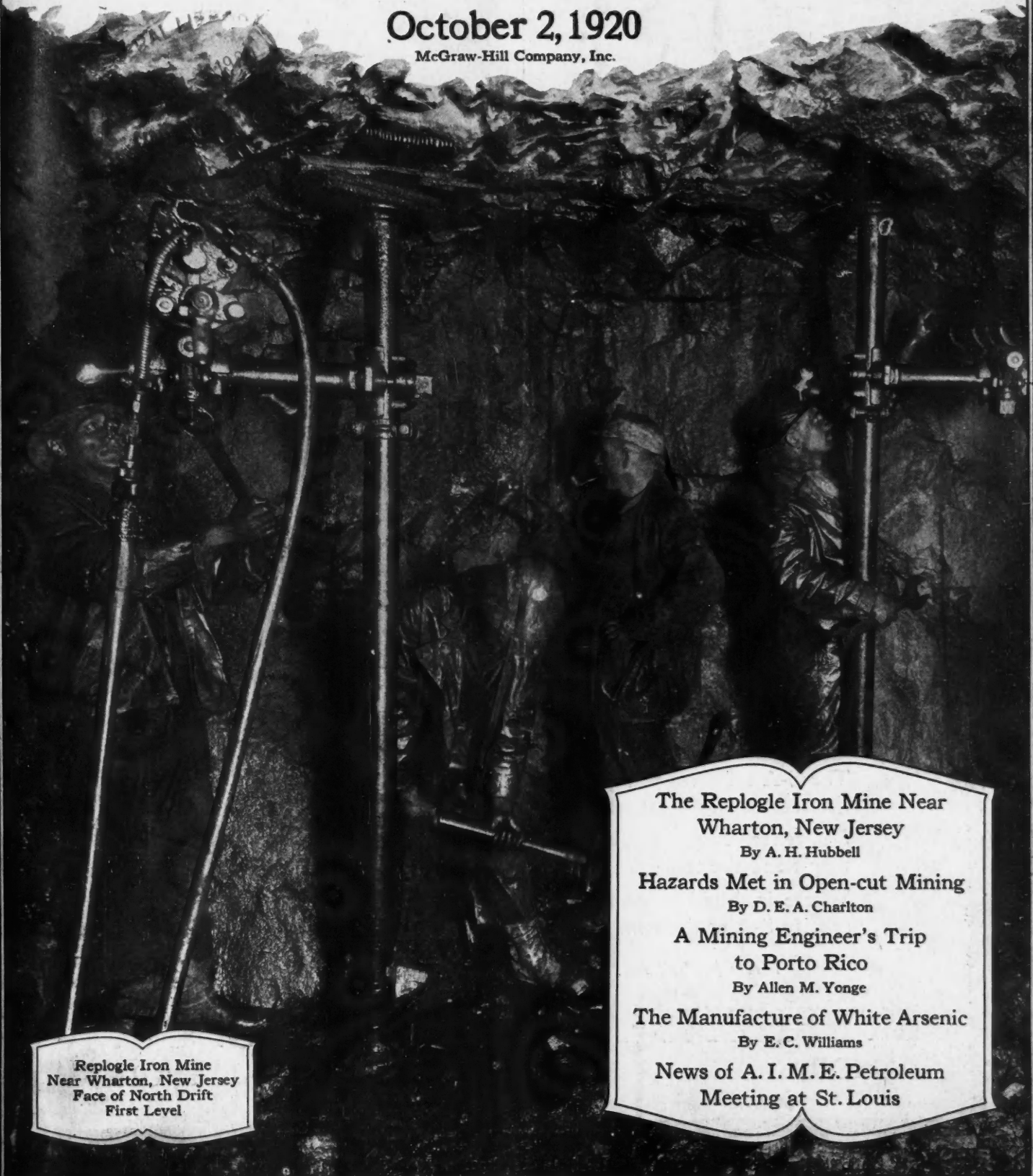
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# ENGINEERING AND MINING JOURNAL

October 2, 1920

McGraw-Hill Company, Inc.

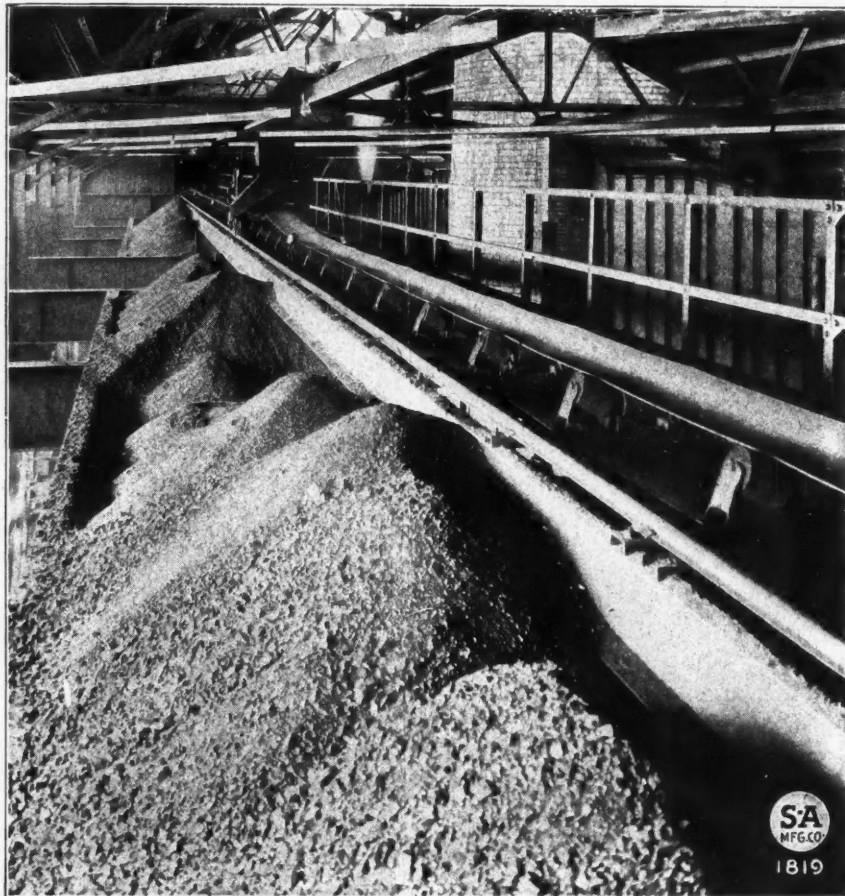


Replogle Iron Mine  
Near Wharton, New Jersey  
Face of North Drift  
First Level

- The Replogle Iron Mine Near Wharton, New Jersey  
By A. H. Hubbell
- Hazards Met in Open-cut Mining  
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By E. C. Williams
- News of A. I. M. E. Petroleum Meeting at St. Louis



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# Engineering and Mining Journal

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

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Volume 110

New York, October 2, 1920

Number 14

## The Relation of Mining to International Politics

WE of the mining industry at least cannot for a moment ignore our dependence for prosperity on trade relations broader than those of our own comfortable boundaries. The present trying condition of mining, we know, is bound up closely with world politics—more especially with the still grievously tangled European situation. Why are we producing copper at cost when producers of most non-metallic necessities are riding undisturbed on the crest of the still existing inflation and enjoying the fattest of profits? Because the scale of our copper mining and smelting industry is adjusted to the world needs, for supplying Europe as well as America. The researches of our special market editor have shown that the American absorption of copper, so far from being abnormally low, is markedly greater than before the war. But Europe, our old and stable customer, is not buying adequately and cannot do so. She has only enough for her necessities and her luxuries. She is, according to the Spanish writer, Ibañez, now going through the same post-war dementia of extravagance and cheap and easy money from which we are first in trying to emerge. With Europe the war fever was longer and harder, and the compensating devil's-humor of gayety and throwing dull care and dreary common sense to the winds may well be correspondingly deeper and more prolonged. Therefore, they can buy only bread and wine, only firewood and silk stockings, and have only a slight residue for solid improvements such as metals are used for. More than that, their money is no good. With all our bankers' theories as to the solidity of paper or demi-paper currency, they shun paper in practice. We will not sell our copper to Germany for paper marks, nor to Austria for paper krone, nor to France for paper francs. We demand, instead, the good old gold and silver—may Heaven bless them and protect them, and the vital American industries they represent! And the real stuff they do not have. Therefore, with our copper-producing machinery tuned to the world consumption scale, we perforce, to keep the wheels running, produce so much that the supply overtakes the temporary demand, and the price of metal and the cost of metal walk in too close company for our prosperity as miners. And what is true of our mining industry is, of course, true of the world's mining industry.

Therefore, the only remedy is the stabilization of Europe, and that is why our next and chief interest is in European and Americo-European politics, because it is undeniable that just as mad policies have shattered Europe, wise policies can heal her. And Europe least of all is blind to the fact that the policies which dominate her future and well-being are not only those of her own continent and neighboring islands, but those of America. Now, as never before, we need for our happiness and that of the world an intelligent, strong,

and wise foreign policy. Now, as never before, we of the mining industry realize that we are simply one of the world's great states, and not to study and act with relation to the other states is in a sense a species of anarchy. From this point of view, the inactivity in international affairs of the United States since the armistice has been criminal negligence—a failure of discharge of duty which in military circles would call for a court-martial of the offenders. As it is, the deadlock apparently will not be thus broken, but only by the Presidential elections. Should these result in a return of democratic rule, of the principle of the submission of the individual and the minority to the need as seen by the majority, of the prudent compromise between different opinions instead of the stubborn deadlock, then we may expect to see such adjustments gradually made that Europe will be assisted to buy and to recuperate. The war is over—let our Government so proclaim it at the earliest moment. Our mining industry needs the markets of all of Europe, on both sides of the line of battle, for its prosperity, provided they have either metal or satisfactory credit to pay with, and provided their governments are fundamentally sound and reliable. This, in general, is true of all western and central Europe. Only, and of course, we shall gain nothing by dealing with freebooters and outlaws, and in this category, by all the evidence, we must place the present government of Russia.

## The Attitude of the Banks Toward the Gold Bonus

THE AMERICAN BANKERS' ASSOCIATION recently issued a report of a committee appointed by it to study the proposed bonus on newly mined gold, and in that report the committee was of the unanimous opinion that the contemplated legislation embodied in the McFadden bill would work to the detriment of the public's interest. In view of the fact that the American Bankers' Association is an influential body expressing the financial sentiment of perhaps a goodly majority of banks and bankers in the country, it is surprising to come across a paid advertisement in one of our evening papers by a prominent local bank entitled "The Cost of Gold," which devotes several paragraphs to elucidate the serious decline in United States gold production and the importance of an adequate gold reserve. The concluding paragraph states, "The Harriman National Bank would favor a premium on the use of gold for jewelry, dental needs, window lettering, decoration and a hundred other ways. With this premium upon such uses of gold paid as a subsidy to the mine owner, he could undoubtedly make both ends meet and have legitimate profits wherewith to pay taxes."

This statement is not in keeping with the declaration of the American Bankers' Association and shows out-

spoken dissension from the conclusion reached by that organization. It is pleasing to note such disapproval, and although we have known all along that many bankers, through mature consideration of the McFadden bill, have stamped it as deserving of support, the voices from such quarters have been distressingly silent ever since the A. B. A. issued its report.

It is noticeable that all the adverse criticism directed upon the gold bonus has been destructive in character. It has sought to tear the legislation to pieces, magnifying the untried and supposedly weak points of the measure. If any constructive suggestion has been ventured at all, the statement that deflation would cure existing ills has been stressed the most. Anyone will grant such a statement—when conditions get back to normal the gold miner no doubt will again be able to take up his pick and single-jack—but when will this be? Some economists are of the impression that we shall never again see prices of labor and commodities on the pre-war scale, whereas others estimate a period upward of five years before the situation will be comparable to the pre-war stage. And what of the interval? Is irreparable injury to be done to the highly developed and important gold industry? If not, some arrangement must be made to tide over the gold mines. Perhaps the McFadden bill in its present form is imperfect, perhaps amendments and changes should be incorporated to perfect it—or perhaps other legislation may better meet the circumstances. If so, it is high time to find this out—we need constructive not destructive criticism. The McFadden bill is the best plan so far advanced to assist the gold industry and to strengthen the financial system of the country. Some banks are finding this out and have the courage to air their opinions. More power to their elbows!

#### Vacationing on the Comstock

IT IS DISAPPOINTING, though not surprising, to hear of the strike that took place at Virginia City, Nev., quite recently when about five hundred workmen employed in the various mines on the Comstock lode quit work after having been refused a dollar increase in pay. Strictly speaking it was not a strike but a "vacation," according to the men themselves, who, feeling sure of their power to make the wheels stop turning, are pleased to jest, doubtless laughing up their sleeves at the neat way in which they get around their contracts and still, to their own way of thinking, preserve their honor.

The strike as a weapon of industrial warfare has become so common that this particular occurrence would ordinarily attract but little comment. The workman in his regal way once more chooses to play the fool. One is reminded of that line in a familiar poem:

Art thou the king? The king's jester thou.

When will the miner, mucker, or whoever he be come to realize that the strike is a two-edged sword, cutting both ways, injuring not only his employer and the public but himself as well? This is a platitude to all except the striker, who cannot or will not see it.

There is an additional reason, in this recent Comstock strike, for annoyance and disappointment. To those who are interested in the future of the Comstock, the action of the men will seem most inopportune. A new chapter appears to be opening in the history of the famous lode, which of recent years has seemed gradually settling into obscurity. The newly organized United

Comstock Mines Co., of which Bulkeley Wells is president, has undertaken the development of low-grade ores at Gold Hill on an extensive scale. Deep diamond drilling is under way at another point on the lode. There has been a shake-up in the management of one important group of mines. A period of change has apparently set in, the chance being that it is for the better and not the worse. And then the workmen strike. If they would have an increased share of the profit they had better wait until it were earned. The companies can scarcely stand an increase in wages with costs already so high. An optimist writes us that the trouble will probably be settled amicably, as is customary on the Comstock. Truly, the striker here is the ass in this bit of asininity. The trouble is said to have a "wobbly" origin. No doubt. Virginia City was once called a place of "Ophirs, gophers and loafers." The last named are evidently still there, as their work is readily apparent.

#### Concerning Prophecy

WE LIVE in a wonderful age, whose unexpected miracles of science tend to make us broad, receptive and tolerant. Yet, with this there goes hand in hand the scientific caution of waiting for evidence, of not jumping to unwarranted conclusions and beliefs. The bulk of our intelligent citizens do not as of old spring lightly from electricity to "animal magnetism," thence by way of hypnotism and abnormal or unusual psychic conditions to spiritualism, second-sight or prophecy. Our best citizens come from Missouri, and they want to be shown.

We do wrong in these days to speak of the occult and the supernatural. Nothing is supernatural, and if anything is occult, the nature and manifestations of what we call electricity are that; yet electricity has become a familiar demon to us, and gives us none of the terrified thrills its manifestations used to give our forefathers. Psychic phenomena are not occult—they are phenomena illustrative of the set laws of a very well-known system of nerve and brain organs.

Scientifically speaking, the case for prophecy, as we understand it, seems to date to be a poor one. It would be a fine thing—perhaps—were prophecy possible. "Give me a tip on the stock market. I need the money," pleaded a young man to a well-known Wall Street operator. "But I have no knowledge of what the market will do; I can only guess," replied the wizard. "Oh, yes, you do," was the rejoinder. "You know in advance when the market will go up and when it will go down." "Why, you ———," exploded the wizard, "if I knew that 60 per cent of the time, don't you know that I would have had all the money there is in the world before now?" Generally speaking, prophecies make poor reading, both before and after—they are vague and wild, and evidently without moorings.

So far as we can judge, the best forecasts are still scientific, and depend upon the logical reasoning out of results from established facts—of the order of the prophecies of the astronomers who calculate and foretell so accurately the eclipses and the tides. This is supernatural to the savage, but we do not call it "occult."

The forecasts of science in many branches are equally accurate and marvelous. The skilled geological engineer may and often does calculate out, from the geological factors of his problem, the location of a lost or undis-



covered orebody, and shape the course of development in the blind earth so as to uncover it after months or years of burrowing. The same scientific method may be applied with a gratifying amount of success to more variable and elusive problems, even those governing human affairs, and the possession of these ratiocinative and foreseeing qualities distinguishes statesmen from politicians. The man who observes that "one man can see into the ground as far as another" is an ignoramus; and the politician who does not lean on the man capable of drawing future deductions from past and contemporary events, and the application of all the sciences thereto, is in the same foolish category. The forecast of the World War made by H. G. Wells was a famous and accurate one. The sketchy accuracy of Tennyson's vision of a world war fought partly in the air, and a subsequent League of Nations, written nearly eighty years before the war, is astonishing. In his vision of the "world-wide whisper—of the standards of the peoples" rushing to war, he

Heard the heavens filled with shouting, and there rained a  
ghastly dew  
From the nations' airy navies grappling in the central blue.  
Till the war-drum throbbed no longer, and the battle flags  
were furled  
In the Parliament of Man, the Federation of the World.

We wonder. Inshallah! as the Arabs say—May God grant it. Yet Tennyson saw something else in the vision.

Slowly comes a hungry people, as a lion creeping nigher  
Glares at one that nods and winks behind a slowly-dying fire.

Had the Czar of All the Russias, for example, pinned this under his study lamp as a true prophecy, we should all be happier today.

On the other hand, take imagination unguided by science and logic. Poe is reputed the most imaginative of writers, but he has no reputation for balance or logic. In one of his "Tales" he presents an imaginary diary of a balloon voyager, dated a thousand years ahead. It is one of those attempts to construct imaginatively the future, at which Jules Verne did so well. According to Poe, in the year 2800 and something A.D., the principal method of travel would be balloon voyaging, drifting in air currents and with drag-anchors. The imaginary writer gets news of the outside world through newspapers thrown into her balloon from a passing balloon, and when her balloon collapses she can only put her diary into a bottle and throw it into the sea! How flat, after only eighty years, does this "wild" imagination sound, when we are familiar with motor-driven airplanes, the wireless telegraph and telephone, and even know of the wireless-driven motor boats and airplanes!

### Sound Industrialism

THERE is something more than typographic and lithographic beauty in the pamphlet issued to commemorate the 175th anniversary of the Taylor-Wharton Iron & Steel Co., at High Bridge, New Jersey. In the present-day seething industrial world of America, beset with giant mushrooms of commerce which in a decade overshadow and perplex the country, with immense bond issues and gigantic bond defaults, with strikes and struggles between leaders and followers—so-called controversies between "capital" and "labor"—a dip into this pamphlet refreshes one as a shady fishing pool after a county fair. The present president is the fifth generation of his family who has directed the

mining of iron ore at High Bridge, without, so far as can be discerned, becoming trust magnates or plutocrats. In his address, the president, Mr. Knox Taylor, observes with proper pride:

"I know of no concern in the line of our great industry which can approach our successful and venerable record. Others may have started sooner, but unless there is some history about which we have been unable to learn, all such beginners have long since dropped out of the race. Since our beginning many have come and gone. Why have we lived on through so many generations? I say in all humility that it is because we have ever been faithful to our trust." . . . "We are, as I have said, so far as we know, the oldest in our line. We are not the biggest; we have never aspired to be. With us it has not been quantity but rather quality." . . . "Such work as ours is not accomplished by great masses of automatic machinery. We need the individual and intelligent and resourceful worker. We need workers who take individual pride in their jobs and the company as a whole. That's the kind of business we do, and that's the kind of employees we are—men and women both."

Among the employees, the president pointed out four groups of three generations each, and twenty men who had served the company close to fifty years, mainly or all of them being representatives of solid old-fashioned American families.

### We Always Did Beat the Dutch!

THE Germans who are promoting a company for the extraction of gold from sea water, with a plant to be located on the southeast coast of the United States, had better read up on the history of our country. Like the small boy apropos of scarlet fever, and the high-school girl who was advised to read Shakespeare, we "have had that," and we can't have it again. We have had it, out on our northeast coast, even on the coast of Maine; and does our Berlin friend imagine that what a Yankee clergyman failed to put over he can get away with? Possibly Hans will bite and dig up a few pitchforkfuls of paper marks. He will unless, as we begin to surmise, he is cured of his faith in German efficiency. But this all goes to show that the German genius is to trail along behind the Yankee; though doubtless now they will lay claim to the evolution of the idea. Extry! Great German discovery!

What the "technical and hydrographical reasons" for locating on the southeast coast of the United States are we can only surmise. Probably the United States was selected because it is the only country that still contains a considerable quantity of gold, and the waves that lap the shores of the North Sea contain only a recoverable extract of paper and printer's ink. Doubtless the southeastern coast was selected in order to get as far away as possible from Maine, where the Arctic current proved unfavorable in the Yankee attempt. Moreover, in the vicinity of Palm Beach, what with the higher solvent power of the Gulf Stream, the saline oceanic solutions should be appreciably richer. We suggest to our German friends that if they drive a cross-cut under Washington, raise up under the Treasury and flood the vaults with cyanide solution, the waters of Chesapeake Bay and the neighboring high seas will be enriched by the natural convection currents.

## WHAT OTHERS THINK

### Protect American Citizens

Why not do some propaganda work and agitation for the protection of American citizens and their property in foreign countries rather than so much effort, time, and space in the advertising of the mineral resources of foreign lands? Especially now it seems to be the proper, popular thing of some of our Government departments to advise Americans to go to foreign countries to prospect and develop oil, because our known and prospective resources will be exhausted within the next twenty years.

Judging from the past, what guarantee have we of being able to realize on the investment? Our Government will not protect our lives, to say nothing of our property rights. It is not alone the present administration that refuses to do it, but have we ever done it? Not in Mexico within the last twenty years to my knowledge.

Is there any valid reason why an American in foreign countries is not entitled to protection as much as an Englishman? He is protected and respected in all parts of the world. Over 600 lives of Americans have been lost in Mexico, since 1910, besides many millions of dollars in property, and not a thing has been done. Not only is this true in Mexico but all over the world.

It is more than probable that if, during the past twenty-five years, we as a government had pursued the same policy as Great Britain—a chip on our shoulder, ready to fight to protect our citizens and their property, in all parts of the world—that we as a nation would not have been drawn into the World War.

Germany had no idea that we would fight. Why could not engineers in all classes of each profession and society agitate and work for their own protection in foreign lands as well as for other citizens?

Why not as an organization ask their Congressmen and Senators to define their position on this question? The farmer, as a class, gets what he wants because he has the votes. This is an important subject to the mining profession. Is it not high time that some action was taken?

Organized efforts can accomplish much.

Denver, Col.

G. L. SHELDON.

### Missouri's Cobalt Industry

I noticed an article in the *Engineering and Mining Journal* of Sept. 4, page 478, referring to Cobalt-Nickel Smelters, in which it is mentioned that a former cobalt-nickel refinery at Fredericktown, Mo., was shut down in 1909, and to the best of your knowledge was not operating at the present time. You will, I am sure, be pleased to hear that the cobalt-nickel industry in Missouri was revived in 1917, and a mill built capable of handling 300 tons of ore per day, with a smelter and refinery for treating the resultant concentrates, and recovering in marketable form the lead, copper, cobalt, and nickel contained. During 1917 and 1918 the plant was under construction, although during the latter part

of 1918 some metals were marketed. The main production began in 1919, and the plant is now on a fair operating basis.

The ore milled assays approximately 2.3 per cent copper, 1.5 per cent lead, 0.75 per cent nickel, and 0.55 per cent cobalt. The plant is designed to make a fair recovery on all these metals, so the process is naturally complicated.

The lead is marketed in the form of concentrates from the mill, and as a sludge from the subsequent refining processes; the copper as electrolytic copper; the nickel as metal, or as oxide for the manufacture of nickel salts; and the cobalt as cobalt oxide or as crude hydrate.

The cobalt is the most important product of this plant, as it is an essential raw material of the enameling and ceramic industries, and has lately come into considerable use in the manufacture of driers for the paint industry. It is also the main metal in the alloy stellite, and has a limited market in the manufacture of steel alloys.

The Missouri Cobalt Co. is the only cobalt producer in the United States today, and in view of the increasing demands and the decreasing foreign supply of this metal from the former source, viz., the Cobalt camp of Ontario, Canada, it would appear that the Missouri ores should prove an important asset in the industries of the United States.

S. F. KIRKPATRICK,

Managing Director, Missouri Cobalt Co.

Fredericktown, Mo.

[We are glad to publish this letter supplementing the information given in our issue of Sept. 4. It indicates a renewal of an attempt to develop domestic cobalt resources.—EDITOR.]

### Smelting Without Fluxes

One does not have to go back to 1851, as is done in the "By the Way" column of Sept. 11, 1920, for an example of smelting without fluxing the ore. In 1905 the citizens of one of our Western towns raised nearly \$250,000 to build a local smelting plant. Their ores were highly siliceous—so, to avoid the expense of bringing in basic ores from a distance, their technical advisers, consisting of a lawyer, a dentist and a broker, as I remember it, decided to try a process then being exploited in New Jersey. This consisted of heating the ore in a vertical kiln and then dropping it into cold water (preferably iced.) "The shock of the cold water on the heated ore caused the mineral particles to agglomerate and detach themselves from the gangue. (This is the explanation given to me, and not mine.) "Carbonates and oxides were reduced to metallic form, sulphides were partly roasted and reduced, but might remain unchanged. The entire mass, shattered and disintegrated, was then easily crushed, put over a concentrating table and the rich product sent to Eastern refiners."

Why so plausible a process didn't work seems incomprehensible, but I have never been able to find out that



any bullion or concentrates have ever been shipped from the plant erected to operate under these patents. I believe the original idea of the inventors was to treat the low-grade copper carbonate ores of New Jersey, but New Jersey still figures more as a refiner than as a producer of copper.

DONALD M. LIDDELL.

New York, N. Y.

### Concerning the Statements of Mining Engineers Abroad

You will not find my name on your list of subscribers for several years past. Constant travel makes it almost impossible to secure your much valued journal when mailed to me direct, so I purchase from the house of Lemare and others and who keep same for me, and I am quite proud of my file extending for more than four years, with only one or two missing numbers.

In the issue of June 26, 1920, appears an article sired by a Mr. Bruhl stated to be a mining engineer, whose reputation must have been sufficient to allow an excellent half-tone of himself on mule-back "somewhere in Bolivia or S. A." to be published.

It is difficult for us who live our lives in these countries to understand why a journal with the deserved reputation you enjoy can be cajoled into publishing such a sneeringly cynical conglomeration of misstatements as are displayed in this article.

So far as what he says is concerned, dressed in different verbiage it might not hurt. It is possible the celebrated engineer was suffering from liver or "puno" (high altitude) while he was in Bolivia and North Chile, yet he was able to note the "beautiful sunset."

The *Engineering and Mining Journal* is subscribed to and purchased by a large number of Latin-American engineers who are naturally loyal to their own countries. These same acknowledge certain deficiencies in the way of enlightenment, give the hand of fellowship to all foreigners and yearn for information gained by experience and collegiate instruction not obtainable in their own countries. Many of them have studied in the universities of our country, also in Germany and Great Britain, but no one likes to have himself or his people exhibited in print as a group of crooks or dampools as Mr. Bruhl presents them. If Mr. Bruhl presents in his mining reports the same perspicuity as in his Munchausenlike yarn, it is a certainty that he never found anything but country rock and gangue.

Five different Chilean gentlemen brought this article to my attention after I myself had read same, and one of them suggested that had the said Bruhl been less "modest," in place of his own photo he might have shown one taken in our city which he says "is unattractive and in some places smells bad" (*vide* Pell and Mott Streets and some of the N. Y. tenement districts). Not a word about the cleanest, healthiest port on the west coast. No mention of its 64 kilometers of asphaltum paved streets, its wide sidewalks, its 120 kilometers of sewer system, all put down in solid rock, as we have little or no soil here—making it very costly. Nothing is said of its well-lighted streets which would be a credit to any town in the world, of a dozen or more substantial banking and commercial buildings, of the street cleaning department and our own "white wings," compressed-air street-washing machines. Furthermore, there is more than half a mile of a beautiful driveway, to say nothing of an excellent supply of water, brought 327

kilometers by the Antofagasta & Bolivia Ry. Co., and from an elevation of 13,600 ft.

On his trip he also rode in comfortable sleeping cars, not quite as luxurious as the Twentieth Century Limited, but clean and comfortable and with an excellent dining car service provided.

All of this to arrive at just *one* thing. We who live in these countries, and especially in Chile, are kept busy trying to sustain amicable relations with the natives. You never heard of an engineer of English, German, French or Italian extraction breaking into print and offering insults to several countries in one article.

For his one trip as described I have personally made a dozen. In twenty years in Mexico, Peru, Bolivia and Chile I have never locked the door to my room or rooms, have never been robbed of a *cobre*, nor was I ever held up or mulcted by a customs officer in any one of the countries named.

Such an article as this can do more harm than all the beneficent influence of such people as Pope Yeatman, W. S. Morse, W. L. Hamilton, T. S. Hamilton, Frank Aller, H. W. Bellinger, and many others. Why? For the same reason that the good that men do lies buried with their bones and their evil deeds live after them.

If you care to publish this for the "pro amistad" end of the game I will be very glad.

Antofagasta, Chile.

ATWOOD BENTON.

### Pronunciation

Your Bolshevik editor, as you call him in your issue of Aug. 14, makes a reasonable suggestion in accenting "assay" on the first syllable when used as a noun, and on the last syllable when used as a verb, conforming thus with "essay," which is substantially the same word. This principle also conforms with the double pronunciation of such words as the following list, the accent being shifted as the noun, verb, or adjective form is used: permit, contrast, accent, perfect, project, expert, conduct, frequent, export, import, combat, subject, protest, contest, produce, purport, escort, refuse, abstract, present, record, compound, progress, traverse, survey, etc. A few words like "address," which keeps the accent on the last syllable, are exceptions.

However, I stand with your correspondent Roswheel and against the Bolshevik editor in their contention about the word "ain't." This unpleasing word has too bad a reputation, I think, ever to become accepted as good form.

At the end of the note under "By The Way" you say that it is a fool thing to use "rime" for "rhyme," but I believe the shorter form is the older and is a perfectly good word.

P. B. McDONALD.

New York University.

### How Do You Assay Bauxite?

The discussion of the proper pronunciation of "assay" makes me think of another word, "bauxite," of which the dictionary pronunciation is miles away from that heard out in the open air. According to the authorities (?) it should be called "boze-ite," as if it came from Bozeman, Mont. But whoever heard it called that? Why, even professors of mineralogy call it "baux-ite," or at least mine did.

AL. U. MINUM.

New York, N. Y.



PART OF CREW AT REPLOGLE MINE AT COLLAR OF MAIN SHAFT. RECONSTRUCTION OF HEADFRAME TO PERMIT HOISTING FROM THREE COMPARTMENTS UNDER WAY (NOW COMPLETED)

## The Replogle Iron Mine Near Wharton, N. J.

Practically Abandoned for Almost Forty Years, Property Now Has Over 300,000 Tons of Ore Broken in Stopes With Development Progressing Rapidly—Two Concentrators Running and Modern Furnaces and Sintering Plant Under Construction

BY A. H. HUBBELL

**A**BOUT three miles west of Dover, in the highlands of northern New Jersey, and approximately forty miles from New York, the Wharton Steel Co., or Replogle Steel Co., is opening up one of the numerous deposits of magnetite ore that occur in this region. The work is being done on a large scale with the most up-to-date methods and equipment. The ore is lean and high in silica, running about 36 per cent in iron. It is being concentrated, first in a dry mill by magnetic separators, the tailings then being treated in a wet mill on tables. At Wharton, one and a half miles away, two new blast furnaces are in course of erection, each capable of making 500 tons of pig iron daily. The concentrates from the mills at the mine, which is known as the Replogle mine, are being stored at the furnaces together with Lake ores from the Marquette and Cuyuna ranges, awaiting the completion of the plant. The Wharton company, together with the Wharton & Northern R.R., is entirely owned by the Replogle Steel Co., that was incorporated on Oct. 30, 1919. The last is merely the holding company.

New Jersey was formerly far more important as a producer of iron ore than at present, the peak of production having been reached in 1882, when the output was about 932,000 tons. The decline since then was owing to Lake ore competition at the then low freight tariffs and also to the fact that magnetic separation and other methods of concentration had not been developed to today's high efficiency. At the present time, operations in the state are confined to five companies, including the Wharton (or Replogle) company. The other four are: The Ringwood company, with mines at Ringwood; the Empire Steel & Iron Co., operating at Mount Hope and

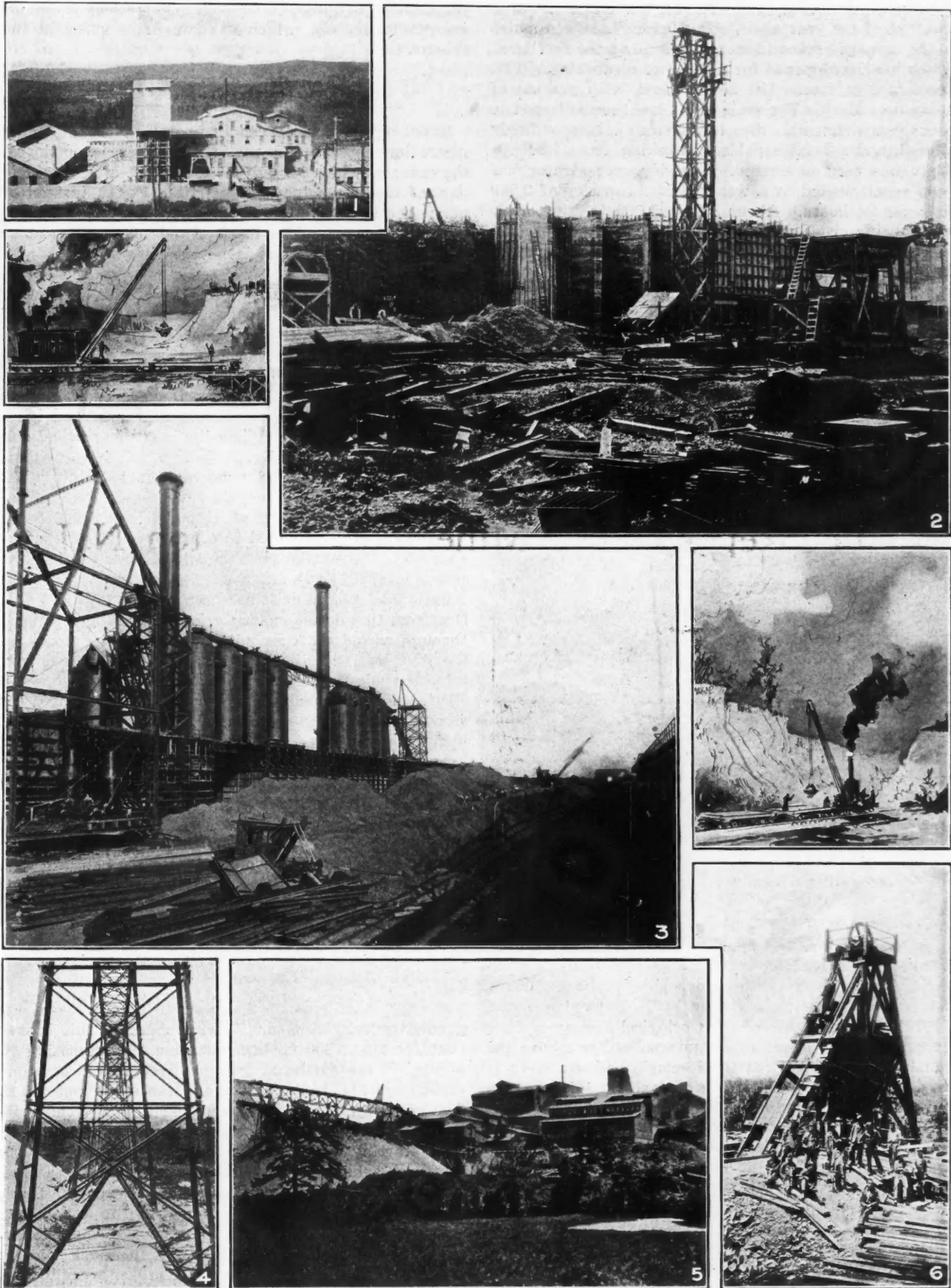
Oxford; the Thomas Iron Co., working the Richard mine at Wharton, and the Beech Glen mines.

The holdings of the Wharton Steel Co. comprise about 5,000 acres in Randolph and Rockaway townships, of which the fee is owned by the company, and the mineral rights on an additional extensive acreage. In this tract are included about twenty-nine old mines or workings, which with one exception, the Replogle, are closed down. The old Richard mine of the Wharton company, which has been worked for over sixty years and has produced approximately 4,000,000 tons, has been sold to the Thomas Iron Co. Of the properties still included in the holdings the Hibernia has produced over 5,000,000 tons. The Dickerson tract of 385 acres has recently been acquired.

Before the Replogle company took over the Wharton Steel Co. the mine it is now working was known as the Scrub Oaks. The first shallow shafts on this deposit, according to W. S. Bayley, of the New Jersey Geological Survey, were sunk prior to 1868. By 1881 the mine had yielded about 56,000 tons of ore, from which date it remained practically abandoned until July, 1917, when the Wharton company undertook to prospect the ground with the diamond drill. Since then this deposit has been proven to a depth of 1,240 ft. and the probable existence of nearly 27,000,000 tons of iron ore demonstrated. Compared with the present workings and plans the old stope existing prior to July, 1917, is negligible. By the end of 1919, two and a half years later, when the Replogle company took control, the Wharton company had 109,000 tons of ore broken in stopes, no shipments having been made.

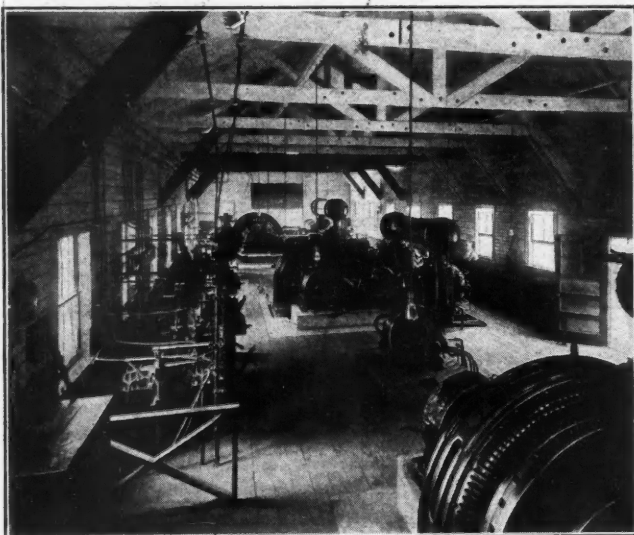
Some idea may be gained of the way in which opera-





1. REPLOGLE MINE PLANT, SHOWING ENLARGED HEADFRAME AT NO. 1 SHAFT. 2. DWIGHT-LLOYD SINTERING PLANT (SEPT. 15) UNDER CONSTRUCTION AT WHARTON FURNACES. 3. FURNACES AND ORE YARD AT WHARTON, N. J. 4. TAILINGS RECLAMATION PLANT AT REPLOGLE MINE. 5. GENERAL VIEW OF CONCENTRATORS AND CRUSHING PLANT AT MINE, NO. 1 HEADFRAME IN BACKGROUND. 6. NO. 2 SHAFT AND SINKING CREW

tions are now being conducted by the fact that since the first of the year about 200,000 tons has been added to the tonnage broken in stopes, this all on the first level, which has been opened for a distance of about 2,500 ft. from face to face. The second level is in process of being opened up. The main shaft has been enlarged to four compartments, the headframe correspondingly altered, and a hoist capable of working from 1,800 ft. depth has been purchased. The dry concentrator has been supplemented by a wet mill of a capacity of 2,000 tons per 24 hours. About 875 to 1,000 tons of crude ore is being crushed per day at present, which production was doubled commencing Oct. 1. A modern change house to accommodate 500 men is being erected at the mine. Three old furnaces at Wharton have been torn down, one of them scrapped and the two others completely rebuilt on new foundations, at a cost of nearly \$3,000,000. The equipment that is being installed is thoroughly up to date. The present operators apparently are optimistic as to the possibilities, all things



COMPRESSOR BUILDING AT REPLOGLE MINE

considered, of these lean ores and are planning on broad lines for the future.

The orebody of the Replogle mine is a lens, or vein, of magnetite in gneiss. It strikes N. 33 deg. 7 min. E., dipping 55 deg. southeast, and pitches 18 deg. northeast. The geology of these deposits of the highlands is discussed at great length by W. S. Bayley in Vol. 7 (1910) of the Reports of the Geological Survey of New Jersey. All the lenses in the mineralized belt have the same general strike. In the Replogle orebody there is no definite contact between the ore and the gneiss, there being instead a gradual change from one to the other. It is claimed that as the magnetite becomes more and more disseminated it is possible to distinguish commercial ore without resorting to systematic sampling.

Considerable diamond drilling has been done by the Wharton company before and since it was taken over by the Replogle interests. The orebody, as stated before, pitches 18 deg. northeast. A hole put down to the southwest has cut ore at a depth of 1,240 ft. measured on the dip. Considering the pitch of the deposit, this represents deeper ore than any yet proved elsewhere. On the Brevoort vein the last hole drilled showed ore at a depth of 600 ft. on the dip and other holes are being put down.

All diamond drilling is done under contract by the Sullivan Machinery Co., which has two drills going at the present time.

#### NON-MAGNETIC ORE COMPELLED ERECTION OF WET MILL

Trouble was experienced in operating the dry mill, where low intensity magnetic separation is employed, the cause of which turned out to be that a considerable part of the iron mineral is martite ( $\text{Fe}_2\text{O}_3$ ) instead of magnetite ( $\text{Fe}_3\text{O}_4$ ). It was for this reason that the wet mill was erected. The martite and magnetite are so mixed in the ore that it is not possible to mine them separately.

The deposit is opened through two shafts, No. 1 and No. 2, both following the approximate 55-deg. dip of the orebody. No. 1, the main shaft, is now down 311 ft., or 80 ft. below the first level, and is located 100 ft. in the foot wall. It has four compartments, each 6 x 6 ft. in the clear, 10-in. oak timber being used. Sinking is under way on two compartments to the second level, 275 ft. below the first. When the latter is reached and connection made with No. 2 shaft, shaft No. 1 will be completed to this level by raising the remaining two compartments.

No. 2 shaft has two compartments, each 6 x 6 ft. in the clear, and was started in ore about 1,400 ft. southwest along the strike from No. 1. It has reached the second level at 506 ft. depth after passing partly through country rock, and a drift has been started toward No. 1. Ore from this development work is hoisted and dumped through an old shaft near by into one of the stopes on the first level. Both shafts are timbered with square sets. In addition, No. 1 shaft is concreted for about 70 ft. below the collar. Aside from the timber used for stope chutes and in the shafts but little of it is used underground.

Shrinkage stoping is employed, stopes being driven the full width of the vein and 400 ft. in length with 50 to 80-ft. pillars in between, in which the manways are carried. There are three such stopes on the first level southwest of No. 1 shaft. In some places the stopes are over 100 ft. wide from foot to hanging wall. Beyond them in the same direction a series of block faults is met which will make stoping difficult where they occur.

#### SECOND OREBODY PROVED PARALLEL TO REPLOGLE VEIN

On the other side of the shaft to the northeast the ground is badly broken. After traversing this broken zone for about 800 ft. in a direction approximating N. 65 deg. E. the northeast drift has recently cut a second orebody parallel to the first at a distance of about 400 ft. The existence of this had been shown by diamond drilling. It is known as the Brevoort vein.

In starting a stope a ten-foot pillar is left over the drift. A sublevel drift is then driven close to the foot wall. Chutes are spaced about 40 ft. apart. Chute grizzlies are made of 105-lb. rails spaced to leave a 10½-in. opening. Subdrifts were not employed when stoping was first started on this level, so that the muck from the older portions of the stopes must be broken when loading the cars. To obviate the delay in tramping thus caused, the main drift, formerly single track under the stopes, was widened to accommodate two tracks.

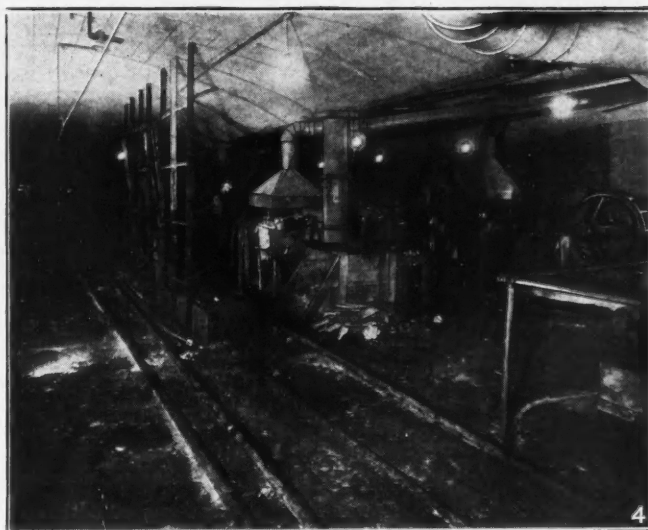
At the stope chutes the ore is loaded into 4-ton



70-cu.ft. gable-bottom side-dump mine cars, made by the Easton Car Co., and hauled by electric locomotives to No. 1 shaft, where they are dumped into a 5-ton loading pocket. The grizzly over this consists of 24-in. I-beams cut in half and spaced so as to leave an 11-in. opening.

Three locomotives are in use, one of them being a G. E. 6-ton trolley locomotive. The remaining two are Baldwin-Westinghouse 5½-ton storage battery locomotives which were only recently installed. From six to twelve cars are hauled in a train, the average haul being

2,300-v., a.c. motor and will handle two 5-ton skips in balance. A car for handling men will be installed in the third compartment and will be moved by a single-drum hoist, of 60-in. diameter, and operated by a 140-hp. d.c. motor. Near the shaft, the main drift as it approaches from the southwest branches into two with a pillar between. One track continues straight ahead over the loading pocket. The other passes on the foot-wall side of the pillar and past the underground blacksmith shop and station, connecting again with the first track beyond the pillar. From here the drift runs northeast



UNDERGROUND VIEWS AT REPLOGLÉ MINE. 1. MOTOR TRAIN ON FIRST LEVEL (STORAGE BATTERY LOCOMOTIVES ARE ALSO USED). 2. LOADING 4-TON MINE CAR AT STOPE CHUTE. 3. DUMPING INTO LOADING POCKET AT NO. 1 SHAFT. 4. BLACKSMITH SHOP AT FIRST LEVEL STATION

about 800 ft. Storage batteries are charged once a day under present conditions. The main track is 36-in. gage laid with a grade of 0.5 per cent in favor of the load. Stub switches are used.

All ore is hoisted through No. 1 shaft. The loading pocket is equipped with a measuring box discharging into counterbalanced 2½-ton skips. Hoisting at present is done by a small double-drum geared electric hoist. Equipment is on the way for a new hoisting plant capable of working to 1,800 ft. depth. This will include a Wellman-Seaver-Morgan double-drum hoist, drums being 72 in. in diameter and 60-in. face, with a rope speed of 800 ft. per min. This will be operated by a 350-hp.

through the broken ground towards the Brevoort vein previously referred to.

In driving this north (or northeast) drift especially good time was made over a length of 261 ft., which was driven in twenty-six drilling shifts, the formation here being granite. The drift is 9 x 8 ft. in cross section and the work was done with two I-R 248 drills working one shift per day. A wedge cut was used consisting of eight 12-ft. cut holes, the remaining eight holes in the round being 11 ft. long. Sixty per cent gelatine was used in the cut holes and 40 per cent gelatine in the rest. No. 8 caps were used and the round shot with fuse. In drilling, a 24-in. starter was used with a one-eighth-inch

drop in gage and an 18-in. run. A view of the set up in the heading is shown on the front cover of this issue. Powder used averaged 19 lb. per ft. advance. The cut holes were started as close to the rib as possible, the drills being mounted on columns.

All drilling is done by machine. Water Leyners, Denver Turbro and I-R 248 drills are used in drifting, Waugh 73 and I-R—CC 10 drills in stoping, and DDR 13 Jackhammers in sinking. In sinking No. 1 shaft an ordinary pyramid cut is employed, one-inch hex. steel being used with a one-eighth-inch drop and a 1-ft. run. Water for the drills is obtained from a diamond-drill hole from which it is piped to a tank. Compressed air is used to raise the water pressure. The mine makes but little

The equipment of the power house, which serves the mine and the two mills, includes three motor-driven compressors, namely, one I-R 3,400-ft., 20 $\frac{1}{2}$ —32 x 24 in.; one I-R 1,900-ft., 15 $\frac{3}{4}$ —25 x 18 in.; and one Chicago-Pneumatic 1,700-ft., 23—13 x 16 in.; also a 150-kw. 250-v. 60-cycle rotary converter and a synchronous motor generator set consisting of 200-kw., 125-250-v. generator and 290-hp., 2,300-v., 60-cycle motor.

Electric power is supplied by the New Jersey Power & Light Co. Current at 440 v. is used for pumping, at 110 v. for lights and signal system, and at 250 v., d.c., for the electric locomotives and magnetic separators. Mine telephones are in use.

At present about 300 men are employed on operation and construction work at Replogle mine. The mine and crushing plant are running two 8-hour shifts and both mills are working three shifts. About fifteen men are employed on crushing and concentration on two shifts and seven men on the third shift.

The present capacity of the dry mill is 100 tons per hour and of the wet mill 80 tons. Eventually the former will be able to treat 120 tons per hour. The ratio of concentration of both mills combined is 2:1, though the wet mill, considered by itself, is working under a more favorable ratio. Roughly speaking, out of every 100 tons of crude ore fed to the dry mill 30 tons is removed as dry concentrates, the balance going to the wet plant.

The dry concentrator was built in September, 1918, and has been in commission since then, except for a period of five months in 1919. Poor recovery resulting from the presence of non-magnetic martite, as stated before, led to the building of the wet concentrator, which was placed in operation in March of this year and was run on an experimental basis until June, since when it had been on an operating basis. The flow sheets of both mills and crushing plant are shown in the accompanying illustration. With reference to the crushing plant flow sheet it is planned to install a second Mitchell screen and two more drum separators. It is also intended to do the coarse crushing underground, where a 30 x 42-in. crusher will be installed on the second level.

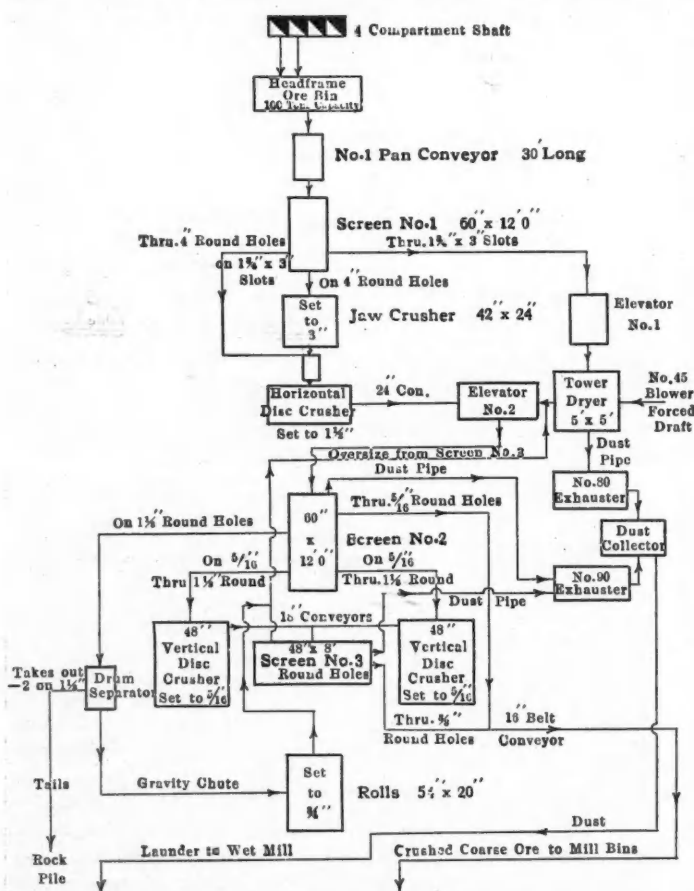
The wet mill is laid out in eight units, each of which follows the flow sheet given. Every unit is independent of the others. The type of drag employed is the Federal Esperanto. The magnetic separators used in the dry concentrator are of the Ball Norton type and were constructed by the company itself.

Wet and dry concentrates were shipped separately to the furnace until Aug. 1, when they were mixed. For the first eight months of 1920 the concentrates produced ran 0.057 P, 60.18 Fe and 12.07 SiO<sub>2</sub>. It is planned to re-treat the tailings that were made by the dry mill before the wet concentrator was installed, the final tailings being expected to run 8 per cent Fe.

In a statement issued with the report of the Replogle Steel Co. for the half year ended June 30, W. H. Brevoort, president, said: "The new freight tariffs will increase the cost of delivery alone on 50 per cent Lake ore to the Eastern District to approximately \$5 per ton, which sum is more than sufficient to cover the entire cost of producing Replogle 60 per cent iron concentrate."

#### MUCH NEW CONSTRUCTION WORK IN PROGRESS

Considerable new construction is under way at the surface plant at Replogle mine. A change house that will



FLOW SHEET OF CRUSHING PLANT AT REPLOGLE MINE

water, in all about 50 gal. per min., which is pumped out twice daily with a Worthington 4-stage direct-connected electric driven pump, having a capacity of 1,000 gal. per minute. A second pump of the reciprocating type is held in reserve. An Armstrong "Shuveloder" has recently been installed.

Powder is stored underground in a concrete-lined magazine, lighted and heated with electricity. It is kept in separate racks according to grade. Three grades are used, namely 60 per cent gelatine for cut holes in development work, 40 per cent 1 $\frac{1}{2}$  in. in stopes, and 40 per cent 1 in. in block holes.

The blacksmith shop is underground. Space has been made for it at the station on No. 1 level. Its equipment includes two I-R 50 sharpeners, two punchers and two Case oil forges (at present using coke). The oil used in tempering the steel is cooled by being pumped through the tank of water used for quenching. The latter is kept cool by being constantly renewed.

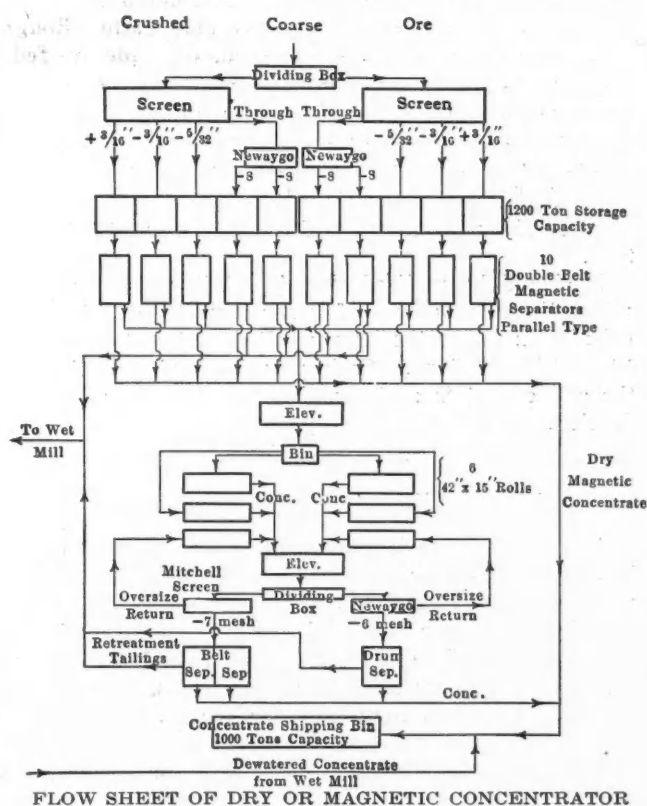


accommodate 500 men and will be as up to date as possible is already partly constructed. A tailings reclamation plant, shown in the photograph, is nearing completion. By means of this it will be possible to draw off the tailings at any point of the dump by means of a belt conveyor that runs the length of the concrete conduit at the base of the trestle. This conveyor will discharge directly into railroad cars. The tailings sands are said to have proved excellent for making concrete, and have been used in the construction work in progress at the Wharton furnaces. It is believed that they can be readily marketed in competition with the output of local sand pits.

Installation of a primary water system is almost complete. By it will be afforded a supply of 300,000 gal. water per 24 hours taken from the mine and a canal in the vicinity. A new system for reclaiming the mill water has also been installed.

STOCKING LAKE ORES AT FURNACES

The concentrates are hauled to the Wharton yards to be weighed and thence to the furnaces, a total distance of 2½ miles. The rail distance to the furnace direct is but 1.3 miles. In the ore yard about 23,000 tons of



FLOW SHEET OF DRY OR MAGNETIC CONCENTRATOR

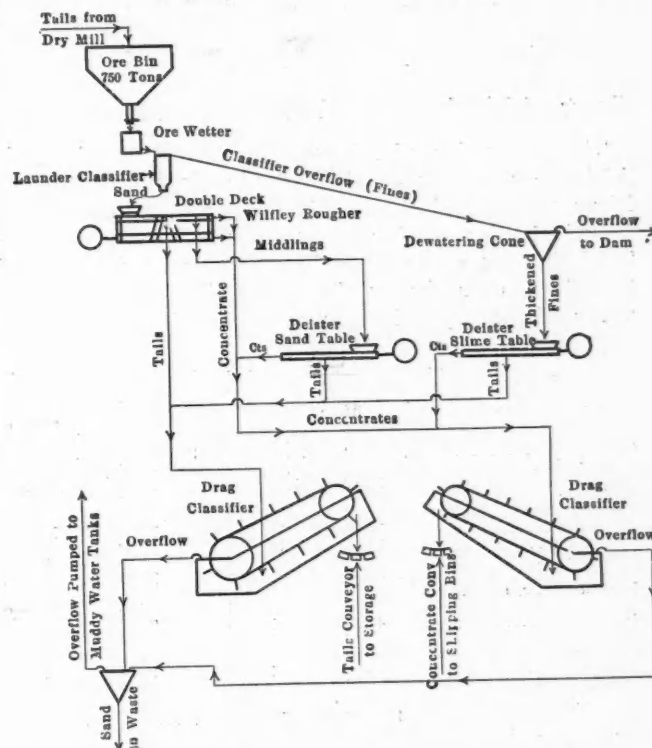
concentrates is stocked at present. Lake ores are also being accumulated, about 75,000 tons having been stocked to date. These are of a non-bessemer grade for foundry irons and run about 50 per cent iron.

Remodeling the furnaces at Wharton was started Dec. 12, 1919. The superintendent in charge of construction is S. C. Carter. Prior to the date given the plant comprised two blast furnaces, nominally rated at 500 tons capacity each but actually of smaller output, and one old hand-filled furnace which has been scrapped. The two blast furnaces are being completely rebuilt on new foundations. When completed the plant will have an actual capacity of 1,000 tons of pig iron per 24 hours.

A casting machine made by the Pittsburgh Coal Washer Co. will be used. There will be three 100-ton mixer type ladles made by the Treadwell Engineering Co. The ore yard storage capacity is 275,000 tons and an ore bridge is being erected.

A sintering plant of 800-900 tons capacity per 24 hours is under construction. Two Dwight-Lloyd type "B" roasters, each of 400-450 tons capacity, will be installed. These will sinter part of the Replogle concentrates, as well as flue dust from the furnaces. An accumulation of flue dust from several years' operation of the old plant will also be treated.

Twenty 350-hp. gas-fired Sterling boilers are being



FLOW SHEET OF WET CONCENTRATOR

installed in the new boiler plant. The engine room equipment includes six Southwark engines with Iverson air heads, each with a capacity of 384 cu.ft. of air per revolution. These can be speeded up to 50 r.p.m. A new 1,000-kw. Corliss-driven Westinghouse generator is also being installed. The pumping equipment will include one Laidlaw-Dunn-Gordon 1,000,000-gal. pump and three 1,500,000-gal. Worthington pumps.

In all, about 200 men will be employed at the furnaces when the plant is completed. Lime for fluxing will be obtained from the company's quarry at Ogdensburg, N. J., which has a 1,000-ft. face 70 ft. high.

WELFARE WORK NOT NEGLECTED

The Replogle Steel Co. is paying due attention to welfare work. This is supervised by a welfare superintendent, who divides his time between the furnaces and the mine. In the course of his duties he keeps check on living conditions and follows up injured cases. First aid lectures are given once a month at the mine office by the company doctor. A short distance from the mine plant forty houses, constituting the village of Replogle, have been erected. These are four-room structures and are rented to employees at a nominal sum.

The president of the Replogle Steel Co., as well as of

the Wharton Steel Co., is W. H. Brevoort. J. Leonard Replogle is chairman of the board of the Replogle company. L. P. Ross, the vice-president of the Wharton company, is the blast furnace engineer who is to take charge of furnace operations. The members of the mine staff are as follows: A. B. Menefee, superintendent of mines; L. L. Kirtley, assistant superintendent in charge of mills; Warren Davenport, mill foreman; Mr. Van Falkenburg, mine foreman, and William Dressler, master machanic. L. A. Blackner is chief engineer at the mine and W. R. Canton mill clerk. H. J. Briney is furnace superintendent at Wharton. The data given in this article and most of the photographs were readily obtained through the courtesy of the company and the administrative staff at the time of my visits to the property.

### South Africa's Mineral Production Increasing

The production of minerals in the Union of South Africa for 1919, according to Vice-Consul Charles J. Pisar, was valued at \$247,418,338, or \$17,624,484 more than in 1918, when the production was valued at \$229,793,854. The production of gold showed a decrease of 86,566 oz. over the previous year, but the output of silver, diamonds, and coal was slightly increased. The

Minerals	1918		1919	
	Tons	Value	Tons	Value
Gold	(a) 8,418,217	\$174,017,845	(a) 8,331,651	\$172,228,498
Silver	(a) 877,498	772,873	(a) 891,304	991,043
Diamonds	(b) 2,543,735	33,876,008	(b) 2,592,099	54,688,647
Coal	9,878,382	15,801,776	10,261,859	16,693,852
Copper	821	1,745,258	4,904	1,016,622
Tin	2,230	2,179,958	1,629	1,338,829
Antimony	99	12,599	32	2,706
Arsenic, white	18	8,560	8	3,226
Asbestos	3,674	262,971	3,934	323,262
Corundum	3,876	127,794	179	7,232
Graphite	79	11,164	86	12,799
Iron ore	4,879	13,281	3,601	5,261
Mineral paints, iron oxide, ochers	736	6,945	240	2,784
Iron pyrites	4,630	34,075	5,532	43,283
Talc	670	8,336	757	10,560
Lead ore	162	9,178	736	24,201
Magnesite	835	10,628	1,024	13,251
Manganese ore	544	9,565	155	3,776
Mica	5	5,767	3	1,796
Lime	102,372	770,099	.....	.....
Soda	764	54,013	52	3,664
Tungsten	12	11,606	4	3,046
Flint	220	7,256	.....	.....
Gypsum	2,638	33,301	.....	.....
Totals	.....	\$229,793,854	.....	\$247,418,338

(a) Fine ounces. (b) Carats.

copper output recorded a further decline of nearly 2,000 tons over 1918, and about 15,000 tons over 1917. This was due principally to the closing down in May, 1919, of the mines operated by the Cape Copper Co., in Namaqua Land, on account of the increased operating expenses, the difficulty in obtaining freights, and the fall in the price of copper. The table is a detailed summary of the mineral output for South Africa for 1918 and 1919.

### Silver Prices Lower in Canada

The quantity of silver marketed during the first half of 1920 in Ontario, according to the Ontario Department of Mines, was considerably less than the output. An average price of \$1.30 per fine ounce was obtained for the first quarter of 1920. For the half year the average New York price was \$1.17 for silver in the open market, as distinguished from the fixed price, retroactive to May 13, of \$1 per oz. (1,000 fine) under the Pittman Act for metal produced, smelted, and refined exclusively within the United States. For the month of June the average open market price in New York was 90.84c.

This disadvantage to the Ontario producer, however, was more than offset by the exchange rate. Since June the export price of silver has risen gradually, until it approaches the quotation for domestic silver.

During the period a total of 4,474,322 oz., worth \$5,077,028, was marketed. Of this total 225,513 oz. came from the Miller Lake-O'Brien and Castle properties, at Gowanda, 23,414 oz. from nickel-copper refining operations, and 49,156 oz. from gold ores. Some producers of silver were paid for the cobalt content of ores, concentrates, and residues marketed. In all, \$138,317 was received for 296,116 lb.

### Extensive Rumanian Salt Deposits

The majority of the Rumanian salt mines adjoin the oil fields, and are situated in the region of the Lower Carpathians, from the Bucovina to the west of Oltenic, a stretch of over 250 square miles. There is sufficient salt to provide for the needs of all the Balkan countries for several centuries. The quality is good.

The Rumanian salt-mining industry, a state monopoly since 1863, is carried on in the following areas, according to *Commerce Reports*: (a) Ocna, in the Bakau district, employs about 200 workmen, chiefly prisoners condemned to terms of hard labor. Its pre-war production was about 28,000 tons, at 12 lei per ton. These mines are said to be capable of a total output of at least 400,000,000 tons. (b) Oculea Mari, in the Valcea district, had a pre-war output of 26,000 tons. (c) The Slanic mines extend almost unbrokenly for 10 kilometers, and produced before the war 90,000 tons annually. These mines are said to contain about 7,700,000 tons.

It should be realized that in addition to the above mines there are others of lesser importance. A recent calculation places the known salt deposits at more than 10,000,000,000 tons. Owing to lack of organization, the salt export is entirely disproportionate to the production.

### Upper Silesia's Metal Production

According to statistics issued by the Upper Silesian Mining & Smelting Syndicate, the number of iron-ore producing undertakings is seven; the production of iron ore, including ore obtained from the lead and zinc mines, amounted in 1919 to 61,469 tonnes, the average price realized being 15.26 marks per tonne. The tonnage produced was less than half the output for the year 1913. The production of calamine was 40,791 tonnes, zinc blende 196,880 tonnes, lead ore 21,950 tonnes, and sulphur pyrites 3,321 tonnes. The output of pig iron amounted to 459,954 tonnes at a cost of 1,581 tonnes of coke per tonne, which compares with 696,146 tonnes pig iron at a cost of 1,395 tonnes of coke per tonne in 1918. The output of the foundries was 20,534 tonnes (29.9 per cent) below that for the preceding year. The production of 50-deg. sulphuric acid in thirteen of the establishments amounted to 121,171 tonnes, as against 260,166 tonnes in 1918. The output of raw zinc was 74,023 tonnes, as compared with 122,961 tonnes in the previous year. The production of lead and litharge was 3,992 tonnes less than the quantity produced in 1918, a fall of 17.7 per cent, and there was also a reduction of 1,098 kilos, equal to 27.1 per cent, in the production of silver.



# Hazards Met in Open-Cut Mining

Fewer Dangers at Open-Pit Properties Than Generally Found in Underground Mines—Methods Of Accident Prevention Mainly Those Which Depend on Instruction, Although Safety Appliances Are Used on All Machinery

BY D. E. A. CHARLTON\*

SOME years ago, when I was actively engaged in safety work, I made the statement—I do not admit that it was entirely original—that the best beginning that could be made in the development of an accident-prevention program was a careful and systematic study of the accidents which had occurred over a certain period of time at the particular operation or operations where the installation of preventative methods is contemplated. It is to be assumed, of course, that every advantage is to be taken of methods already in practice at similar operations, and for that reason the safety engineer can follow a well-defined plan which will apply to his general problems; but his specific problems, those which are peculiar to his individual operation, will be best determined by the study of the accidents that have occurred about his plant, shop, mine, or whatever the operation engaged in. Having determined the cause, it is then up to the safety engineer to suggest the manner of prevention. Oftentimes it is within his province to put this directly into effect, but at any rate his judgment should be

of illustration: During the recent trip of the American Institute of Mining and Metallurgical Engineers to the Lake Superior region it was most noticeable that the visiting engineers were interested in methods which differed from their own, and the comparison of practices was frequently discussed. This example of course applies to the various branches of mining, but it may well be extended to other industries, any one of which includes features common to all of them.

### OPEN-PIT ACCIDENT PERCENTAGE LOWER THAN OTHER MINING

Open-pit or open-cut mining is free from many of the accidents peculiar to other methods of mining. Although the sources of many open-pit accidents are not present in underground mines, they are, in comparison, in the minority, and it may be said in general that a lower accident rate prevails in open-pit than in underground mines. This is not only true of the average which is based on the number of men employed but also of that obtained on a tonnage basis, for open-pit opera-

FATALITIES AND INJURIES AT STEAM SHOVEL OPEN PITS, 1914-1918

Cause	Killed				Injured					
	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918
Falls of rock.....	5	4	5	9	11	425	449	402	380	346
Run or fall of rock or ore in loading.....	8	1	7	4	9	107	38	41	17	5
Explosives.....	8	16	11	13	13	271	194	287	304	336
Haulage.....	3	3	4	3	5	238	179	129	223	189
Falls of persons.....	3	3	4	3	5	1,256	1,040	1,548	1,288	1,352
Miscellaneous.....										
Shaft.....										
Total.....	24	24	27	29	39	2,297	1,908	2,416	2,287	2,285
Per one thousand 300-day workers.....	2.73	3.16	3.15	2.81	3.66	261.00	250.79	281.58	221.39	214.27
By all methods.....	4.92	4.25	4.06	3.97	4.58	331.38	358.73	398.52	318.52	322.91

such that possibility a recurrence of a similar accident is reduced to a minimum.

The thoroughness of accident-prevention work in all lines of industry needs no comment here, and it is not the intent of this paper to emphasize what has already been done in the different fields. Those engaged in safety work are all working for a common purpose—the elimination of injury. However, there is the great opportunity for co-operation that we should not lose sight of. If we do so, we become provincial and place ourselves in the class of the man who believes himself sufficient to himself, refuses to accept suggestions, and thereby places limitations upon his accomplishments which are bounded by his own often narrow capabilities. There has been, still is, and will continue to be an immense amount of study given to safety work in every branch of industry, so that it behooves the safety engineer to not only give heed to his own type of accidents and the method of prevention but to those conditions in other fields as well. The idea is simply one which is carried out in any line of work, and its application has been largely responsible for the success that has attended America's industrial progress. By way

tions as a rule permit of a greater removal of material than that obtainable through underground methods. The outstanding advantage is, of course, the daylight feature and the relation of this in connection with accident prevention is too well known to the safety engineer to require further comment. It is true that night operations are conducted so that perhaps an additional hazard is introduced. The lighting problem, however, does not present such a serious obstacle as is found in other systems of mining, and present practices have reached a high stage of development, so that there is little difference between the number and seriousness of accidents occurring in the night time and the day time.

In order to obtain an idea of the comparison of the accident rate at open-pit mines and that which holds for all other methods I have reproduced a table which appeared in Technical Paper 252 of the Bureau of Mines, "Metal Mine Accidents in the United States During the Calendar Year 1918," compiled by Albert H. Fay. This shows the number killed and injured in open-pit mines where the ore was mined by steam shovel during the years 1914 to 1918 and includes the returns from typical companies employing about 10,000 men and operating open pits in Minnesota, Alabama,

\*A paper read at the Ninth Annual Safety Congress of the National Safety Council, Milwaukee, Wis., Sept. 27 to Oct. 1, 1920.

Nevada, New Mexico and Utah. I have also added the number killed and injured in all methods of mining, (including open pits) per 1,000 300-day workers, for the respective years, these figures being obtained from the same source.

The comparison used is entirely an arbitrary one but sufficiently accurate to show that open-pit mining is not so hazardous as other methods.

It should be understood that the term open-pit mining includes not only those operations where steam shovels are used but those in which other methods of excavation are employed. For our purposes, I shall deal with the former, as I believe all of the hazards met with in the latter will be included in such a consideration. It might be well also, in connection with the above explanation, to add that the development of the electrically-operated shovel will preclude the designation "steam shovel open pits" in any treatment that may be made of open-pit accidents, for the success which has attended the installation of these excavators has demonstrated that they will play a considerable part in the future of the open pits and earth removal.

#### GENERAL CAUSES OF OPEN-PIT ACCIDENTS

In order to consider the various hazards met in open pits, the following classification of causes may be used and each subject can be treated with its relation to the operation as a whole. The scheme of classification follows the subdivision of accident causes which is used by the Bureau of Mines, and it is to the best of my knowledge adaptable to most open pits. All of the accidents can be traced directly or indirectly to all of these causes and a further elaboration will only complicate the study which will be made from the operative standpoint:

- Falls or slides of rock or ore.
- Explosives.
- Haulage accidents (locomotives, etc.).
- Steam shovels.
- Falls of persons.
- Falls of derricks, booms, etc.
- Machinery (other than locomotives or steam shovels).
- Electricity.
- Hand Tools.
- Other causes.

Accidents resulting from falls or slides of rock or ore in open pits do not constitute as large a percentage of the total open-pit accidents as do those attributed to a similar cause in a study of those accidents relating to underground mining. The reason for this is quite obvious, inasmuch as the nature of the operation permits better accessibility to the dangerous condition. Not infrequently is ample warning given, the men may be removed to a place of safety, and the necessary steps taken to make the bank safe.

#### BANK TRIMMING PREVENTS ACCIDENTS FROM FALLS OF GROUND

I believe the average slope for stripping banks is  $1\frac{1}{2} : 1$  and it is approximately the same for ore, that is where the overburden is composed of glacial till and the ore is soft such as may be found at the open pits on the Mesabi Range. Rock banks or ore which are of denser structure of course permit of steeper slopes unless the pitch of the strata is such that exceptions must be made. In any event the principal preventive

measures which must be taken to avoid this type of accident consist of careful inspection of the banks and proper trimming when necessary. Several factors, such as frosts, blasting, removal of rock or ore from other sections of the pit, etc., may influence falls of banks, but all of these must be carefully guarded against. Several companies employ special men on regular bank inspection work and the results have proved that such precautions have entirely justified the expenditures made. Among the rules which are prescribed by many of the companies who are engaged in open-pit operation is to be found a clause relating to workmen at the front and the bank side of a steam shovel. Although perhaps the rule may apply more particularly to steam-shovel operation, it is most applicable in connection with falls of rock or ore. By remaining on the free sides of the shovel during its operation, the men are assured of safety, and should their work require them to occupy positions between the shovel and the bank a rigid watch should be kept and the men advised of any movements of ground. Such precautions are easily obtainable during the daytime. During the night shift, unless sufficient illumination is procurable, the difficulty is necessarily increased.

#### THE USE OF SHELTER HOUSES IN OPEN PITS

Accidents attributable to explosives are many and varied. Before taking up the subject of the handling and treatment of powder, it may be well to consider the dangers resulting from blasting and some of the precautions necessary. It is most essential at all times that men working in the pit are given adequate protection from flying pieces of rock and ore, which often travel considerable distances. There should be ample provision made to properly warn the men, and this is usually done by means of warning whistles which are blown—a series of short blasts from either the steam shovel or locomotive whistles—for some time previous to the blasting. Following this it should be the duty of the foreman and the underbosses to see that all of the men seek proper shelter. There are a number of types of shelter houses which are in use in open pits. These consist of steel frames lined with ties or houses built of steel plate and reinforced. The latter are undoubtedly more serviceable and can be transported from one place to another without much difficulty. In addition to affording protection to the men the shelter also serves as a point from which the blaster may, if he is using an electric battery, explode the charge, and so perform that operation in perfect safety.

#### PRIMITIVE THAWING METHODS TABOOED

The lists of "don't's" which have been given publicity by the manufacturers of blasting powders and which appear in every safety rule book should have adequate perusal and digestion, for they have all been written with a purpose, and apply in open-pit mining as well as in any operation where blasting powder is used.

It is quite essential that proper storage be provided for explosives. Powder magazines must be kept dry and well ventilated, separate houses being maintained for the storage of black powder and dynamite and also for blasting caps, electric fuses and exploders. It is generally specified that these should be located not less than 300 ft. from the thawing house or any occupied building. Standard types of thawing houses are pro-



vided by powder manufacturers and these are in general use where climatic conditions require that the dynamite be properly prepared before using. Their specifications provide a separate housing for the heating, which is done by hot water, steam, or exhaust steam, and the thawing house proper where the explosives are stored. Certain precautions regarding the proper care of the thawing house, such as the removal of drawers etc., are stipulated. The many accidents which have resulted from attempts to thaw dynamite by primitive and foolhardy methods have caused rigid rules to be made concerning this particular proceeding, and there are, fortunately, few instances today where attempts are made to thaw powder by methods other than those stipulated by powder manufacturers or operators.

The transportation of powder from the magazine or thawer house to the working place must be accomplished safely and in a convenient manner. At several mines a special slide or lowering device is provided and from the lower end of this the men in special charge of that part of the work convey the powder to the various points where it is to be used. Properly marked boxes should be used and separate boxes provided for dynamite and for caps and exploders.

#### GOPHER HOLE PRACTICE ON THE MESABI RANGE

The general practice as relating to the charging of dynamite does not differ appreciably in open-pit work and is too well known to warrant discussion in this paper. The use of black powder is perhaps not as familiar. In this connection, I am sure the following description<sup>1</sup> of "gopher holing" as used in the open pits will be of interest:

"Stripping banks 15 ft. or more in height are shaken up ahead of the shovel by blasting 'gopher' holes. These holes are started at the toe of the bank and are pointed downward at angles of 5° to 10° from the horizontal. 'Gopher' holing, when first used, consisted in making the holes large enough to permit a man to enter and work, but frequent accident caused this method to be abandoned, and 'gopher' holes at the present time have an average diameter of about 15 in. Loose ground is removed with a No. 2 round-pointed shovel blade, the edges of which are slightly turned up, fitted with a 25-ft. handle of 2- or 3-in. diameter. When a hard seam is encountered, it is drilled with a long auger or with a moil and one or two sticks of dynamite are pushed in with a pointed loading stick and fired with a blasting machine. The loose ground is then removed with the shovel. If a boulder is struck while the 'gopher' is being driven, repeated blasting with 60 per cent dynamite will often shatter it sufficiently to allow the hole to be continued. Where it is impossible to blast through a boulder, the hole is bottomed against it, or new hole is begun, few feet away, depending on the length attained. The limit of length of a 'gopher' hole is about 25 ft."

After the "gopher" has been prepared dynamite is used to chamber the hole, and when sufficient time has been allowed for the interior to cool so that no premature explosion may take place, the hole is loaded with black powder, from five to ten kegs of 25 lb. being used. In order to avoid danger from sparks and other sources the powder is poured into the hole by means of a launder device which is provided with a covered

hopper. Usually the blasting is done by battery. This and the foregoing description represents Mesabi Range practice and has, from a safety standpoint, proved most satisfactory.

#### ROLLING STOCK SHOULD BE CAREFULLY SAFEGUARDED

In considering the hazards which may be involved in the use of locomotives and other rolling stock and the prevention of accidents from those causes, open-pit operators have been guided to a great degree by practices which have been standardized by railroads and other industrial enterprises of a similar nature. The Interstate Commerce Commission in 1910 adopted a number of regulations governing safety appliance standards on locomotives and these are in effect at practically all open pits. They relate to sill steps, hand holds, uncoupling levers, hand rails, hand brakes, running boards and other appurtenances. It is, of course, essential that a well-arranged system of inspection be maintained in order that the proper persons be advised of any breach of regulations in this particular, and constant work is necessary to keep all rolling stock in a safe condition, as the usage to which it is subjected is by no means one that defies wear and tear. There is considerable variety to the equipment used, and the manner of safeguarding locomotives, stripping cars, ore cars, etc., will be governed by the adaptability of safety devices to the certain types. Having specified the mechanical means for the prevention of haulage accidents, it is further necessary to adopt certain regulations and provisions which will make for the avoidance of accident from other than mechanical sources. In Bulletin 75,<sup>2</sup> issued by the Bureau of Mines, the following rules have been suggested as governing safe practices for the operation of locomotives and ore and stripping trains:

"Precautions are necessary against collisions, against runaway trains on the steep grades and sharp curves that usually exist, and against the danger of running down men who may be walking on the track. To avoid this last danger trails and walks should be provided apart from the railroad tracks and their use insisted upon. Dangerous methods of coupling and dangerous methods of boarding cars or engines should be forbidden. Nobody should be allowed to ride the ore trains except the train crews. Proper clearances over cars and on the sides should be provided and material should not be allowed to be piled so close to the track as to be dangerous. The men selected to work on the track should be intelligent and alert and should be taught extraordinary caution in looking out for trains. Frogs should be blocked and signs provided at crossings. There should be a strict adherence to safe practice in regard to the use of headlights and rear lights on locomotives and trains, to the sounding of whistles, and the ringing of bells." . . . "There is a certain amount of danger attached to dumping the stripping cars, and somewhat less to discharging the ore cars when the contents are frozen or sticky. Dangerous practices in performing these operations should be specifically prohibited."

These provisions are generally carried out in open-pit practice and modifications to fit specific conditions have been made by the various companies.

<sup>1</sup>"Steam Shovel Mining on the Mesabi Range," by L. D. Davenport, *Engineering and Mining Journal*, March 2, 1918.

<sup>2</sup>"Rules and Regulations for Metal Mines," by W. R. Ingalls, James Douglas, J. R. Finlay, J. Parke Channing and John Hays Hammond. Govt. Ptg. Office, Washington, D. C., 1915.

It was stated earlier in this paper that the recent advances made in earth excavation practice admitted of a broader term than that of "steam shovel." The steam shovel still holds its own and steam as a motive force remains a dominant feature. With the increasing use of electricity and other forms of power, and the adoption of the drag-line excavator and other mechanical means for earth removal the more general term of "power shovels" or "power excavators" might be more acceptable. However, with a few exceptions, the safeguarding of power excavators is very much the same and follows the lines carried out in any shop scheme wherein all moving parts are covered; that is, where it is possible to do so. It is hardly necessary to state that the construction of guards must be particularly rugged to withstand the hard usage which the machinery must undergo. A regular plan of inspection, such as is carried out in machine-shops and other plants where mechanical devices are safeguarded, should be instituted and rigidly followed.

It is quite necessary that the area which is occupied by the shovel be kept clear of material. This is not always possible and particularly so where the shovel is "moving up," but it will be found an excellent rule and one which will be the means of preventing a number of slight accidents. Orderliness in open-pit operation is as necessary for accident prevention as in any other work and should not be neglected.

#### ACCIDENTS FROM FALLS OF PERSONS

The responsibility of mining companies for injuries which occur on their property not only includes the safeguarding of their employees but also extends to those who may have no connection whatever with the company. For this reason it is not only necessary to maintain a careful watch around the entrances and banks of open pits but also to see that sufficient fencing and guard-railing is done. Stairways should be substantially built and provided with hand rails. Test pits or other openings should be properly covered. The practice of bank-trimming, which was referred to in an earlier paragraph, is often carried out under hazardous conditions, as it is sometimes necessary that the men, in order to properly trim a bank or slope, must place themselves in a position where a movement of the ground might cause them to fall or perhaps be buried in a run of rock or ore. To safeguard against this the men are provided with ropes which are placed around their bodies and substantially fastened to some safe point above. This practice is also extensively used in the milling method of mining, which may be regarded as a modification of open-pit operation. In the winter it is especially necessary to keep stairways and other such places free of accumulations of ice which may cause falls of persons.

Under the subject, "Falls of derricks, booms, etc." will be included hazards that are somewhat limited in number. The construction of stripping dumps requires that considerable trestle work be done, and it will be found that accidents result from carelessness in the handling of the timbers used in the trestles. At coal-loading stations, water tanks, and other such appurtenances to open-pit mines, arrangements must be made to properly safeguard all devices used, and instructions must be issued as to the proper methods of operation.

There is little machinery used in open-pit mines other than that included under the head of steam shovels and

rolling stock. There is, of course, the machine shop, the blacksmith shop, and the other departments at which the necessary repair work must be done, but the hazards to be found at any of these are well known and do not differ from those met with in general shop practice. The same efforts which are applied in the latter should be the rule in the shops of the open pit. Small hoists, compressors, machine drills, or other auxiliary machinery used in open pits should receive the same attention, both as to operation and safeguarding, as in underground or general surface operation.

#### HIGH-VOLTAGE ELECTRICITY NOT GENERAL IN OPEN PITS

Electricity as a motive power, either in driving a shovel or hauling ore or stripping trains, is not as yet in general use, so that the dangers resulting from the transmission of high voltage have not become to any great extent a problem of the safety engineer. In open pits which have reached the stage where steam-shovel removal of ore has been replaced by scrambling operations and the ore is removed through a shaft, motor haulage is frequent and here it is necessary that the same precautions used in underground mining be observed. In some instances electricity is used as the motive power for pumps and considerable lighting is done by means of electricity, but in both of these instances methods of safeguarding are well defined and follow the trend of general practice.

#### HAND TOOLS CAUSE MANY SLIGHT ACCIDENTS

There are few serious accidents which may be attributed to the improper use or condition of hand tools, but as a source of the slight accident they are prolific. The prevention of this type of accident can be brought about mainly by inspection and instruction in the proper use of the tools. There is always the mushroom-head drill to be found, the loose or broken hammer handle, the stilson wrench that is not working properly and any number of small defects which should not be permitted if the men are to do their work safely and properly.

Under "Other Causes" may be included a miscellaneous lot of accidents which result from improper handling of material, explosions (other than those due to blasting powder) and others which do not properly fall into those causes already mentioned. It may be well at this point to mention one factor which has a considerable bearing on the frequency of open-pit accidents. That has to do with labor and, as each operator and engineer knows, with the dependence that can be placed on each workman to look out for his own safety. Open-pit labor, with the exception of the foremen, shovel operators, locomotive engineers, train crews, and such men as are required for certain classes of skilled work, is not required to be of the standard usually employed underground, and it has been drawn largely from foreign fields. In some cases there is, or has been, an unfamiliarity with the English language, a certain sluggishness that has been due to either indifference or timidity, and a rather detrimental effect in so far as the best conditions for obtaining prevention of accidents were concerned. In many instances, this condition has been counteracted by the further employment of such men who would serve as instructors, as bosses, and a lower percentage of accidents to the class of unskilled labor has resulted.

The safety engineer will find much to interest him



in the study of accident prevention and the hazards as met with in open-pit mines. The mechanical safeguarding which can be done is limited, but the opportunity for "safety psychology" presents ever an absorbing problem. Such details as "breaking in" a man on the day shift before he is permitted to work at night, transferring one workman to another place for which he is better fitted and following out other plans which can be determined co-operatively with the foremen, are some of the interesting studies that are open to the safety engineer.

#### PRESENT SYSTEM OF LIGHTING IN OPEN PITS IS IMPROVEMENT OVER EARLIER METHODS

The matter of illumination in open pits is receiving considerable attention. Formerly the practice consisted of obtaining only such light as was possible from the locomotives, lanterns, and gasoline burners on the steam shovels. Later the gasoline burners were discarded as being unsafe and the steam shovels were wired and provided with a small dynamo. This practice exists today and is supplemented by the use of carbide flare lights which provide excellent light. The practice of extending wiring into pits for illumination purposes has not met general acceptance, due to the fact that frequent blasting causes breakage of the globes and arc lights.

All open-pit mines make use of signals which are given from the shovels or locomotives. A specified code is used and by means of this the men in charge may be notified of any happening at the particular point where the shovel or locomotive is situated. The value of such a system to accident prevention methods as used at open pits is undeniable.

A treatise on the subject of safety in open-pit mining would be incomplete without pointing out the use for warning signs, safety bulletins and safety rules. These will necessarily be a large part of any safety campaign, but are too well known to warrant further discussion.

In conclusion, the hazards met in open-pit mines are less than those that may be expected from other types of mines. In general it may be said that the three big causes of accidents in open pits are from falls of ground, explosives, and those due to haulage. Similarly these same causes make up the bulk of underground mine accidents, but the manner of prevention in each case is, by reason of the difference in the mode of operation, different.

I realize that much of the information will doubtless be an old story, particularly to those who have had the opportunity to be in touch with open-pit work. The last few years have brought about notable changes. We have today bigger shovels, bigger stripping cars, methods for handling materials on the stripping dumps, compressed-air tie tampers, and other devices which are producing more effective results. All of these are given close scrutiny from the safety standpoint, and so far as their mechanical make-up is concerned, the operator may rest assured that the manufacturers have considered the necessary points to make them safe for the workman. With improved machinery and devices must come the higher type of workman, so that as a higher intelligence is demanded the possibility of accident from causes due to ignorance, indifference, and lack of understanding is decreased. And this in short should mean a marked decrease in the number of open-pit accidents.

#### Encouraging Outlook for South African Iron Industry

Considerable importance was attached to the establishment of a blast furnace at Pretoria, South Africa, in 1918, according to a report of the Bureau of Foreign and Domestic Commerce, for the purpose of producing pig iron from domestic ore. This furnace has a daily capacity of ten to fifteen tons; and though it was in the nature of an experiment, the results obtained were so successful that the promoters now intend to place the industry on a firm and permanent basis. Several other furnaces began operations in the Transvaal, and a company for the same purpose was organized in Natal during 1919.

In pre-war days nearly all of the pig iron used in South Africa was imported from Great Britain, the price there being so low that it was not profitable to exploit the local resources. The war conditions induced local capitalists to exploit the iron deposits in South Africa, but for a time considerable doubt was expressed as to whether it was economically feasible to produce pig iron in the country.

The industry is said to have passed now beyond the experimental stage, and it is claimed that pig iron can be turned out in South Africa at a lower cost than in the United States or Great Britain under post-war conditions. The promoters express great confidence in being able to supply the domestic demand, besides competing in foreign markets.

#### Fuller's Earth Production Increased in 1919

About 106,000 short tons of fuller's earth, valued at \$2,000,000, or \$18.87 a ton, was produced in the United States in 1919, as shown by preliminary returns made by the producers to the U. S. Geological Survey. These figures are the highest yet recorded by the Geological Survey, and show an increase of 217 per cent in quantity and of 563 per cent in value in ten years. The increase in quantity in 1919 compared with 1918 was 25 per cent and the increase in value was 74 per cent. The average price per ton increased from \$13.57 in 1918 to \$18.87 in 1919. Florida, which has long been the leading producer, made nearly nine-tenths of the output in 1919.

The imports of fuller's earth in 1919 were 13,873 short tons, valued at the port of shipment at \$189,711, or \$13.67 a ton, an increase of 10 per cent in quantity and of 15 per cent in value compared with those in 1918. The increase in the average price per ton was 54c. The imports in 1919 compared with those of the year of greatest imports, 1914, when the entries amounted to 24,977 tons, valued at \$195,083, or \$7.81 a ton, show a decrease of 44 per cent in quantity and of 3 per cent in value.

#### South Australian Barytes Deposits

Important deposits of barytes (99 per cent barium sulphate) are reported by Consul Starrett, Adelaide, as now being developed at Noarlunga, about 25 miles from Adelaide. Certified analysis of samples of this product has proved it to be of unsurpassed purity. Barium sulphate is an established ingredient for many kinds of paints, and the exploitation of these extensive deposits should greatly relieve the prevailing shortage of paint supplies.

## A Trip to Porto Rico

Island a Motorist's Paradise, but No Place for Mining Engineers Except on Vacations

BY ALLEN MURRAY YONGE

Written for *Engineering and Mining Journal*

THE policy of the Spaniards who first came to the rich little island of Porto Rico was heartless from the start. According to historical accounts, they enslaved the natives for field and mine work and drove them so cruelly that, at the end of fifty years, the entire race had either died from overwork or fled from its fate. From this, one would naturally suppose that the island abounded in mineral wealth and especially in the precious metal, gold, but such, however, is not the case, although some mineral does exist and along several rivers of the island placers were once worked. One is led to surmise that the first Spaniards practically made "a clean-up" of all the gold early in the sixteenth century, although the peons living along the rivers named Corozal, Negro Mavilla and Morovis wash the sands of these streams when they have no agriculture



ROAD FROM CARFAÑO TO BAYAMON, PORTO RICO

work. Their recovery of the metal, however, is very small.

There are some small deposits of iron on the island, though none of magnitude, and good copper specimens may also be found. But there is nothing to indicate anything of promise. The occurrences referred to are in the states of Naguabo, on the east, and in San German, on the west. Lignite has also been discovered in the central range of mountains reaching from the town of Moco to Corozal.

My trip to Porto Rico was for the purpose of examining the supposedly large manganese deposits of Juana Diaz, which lie on the southern slope of the mountains, 950 ft. above the sea and about fourteen miles north of Ponce, the southern seaport. Two miles away is the Camino Real, or military road connecting San Juan, the capital of the island, and Ponce.

The ore at Juana Diaz lies on or near the surface in the form of manganese oxides, running from 48 to 56 per cent Mn and occurring in pockets containing from 10 to 1,000 tons. These pockets, or kidneys, are entirely imbedded in the weathered marble, the latter making up the very mountains themselves.



HARBOR OF SAN JUAN, PORTO RICO

The extent of the pockets can only be approximated, and little development can be done in advance of actual mining of the ores. It is my belief that but a small tonnage yet remains to be won, as extensive prospecting has been done and nothing of promise found. About 5,000 tons of manganese ore has been mined, and perhaps an equal amount may yet be taken out. The actual mining is cheap, and workmen are plentiful at from \$1.50 to \$2 per day. The cost of a ton of the ore delivered in the United States is as follows: Stripping and mining, \$2; sacking ore, 75c; sacks, 75c; transportation, pack animals to foot of mountain, \$7.50; truck to Ponce, \$1.25; lighterage to ship, \$2; and ocean freight, \$8.50; a total of \$22.75. About thirty tons per working day is being mined and shipped to port, but indications are that the ore will be exhausted soon.

Porto Rico is a motorists' paradise, with its network of perfect roads from one end of the island to the other. One can go anywhere beneath an arch of beautiful laurel that also borders a perfectly made macadam road, passing between fields of tobacco and sugar cane, or along cliffs where superb views of the little valleys and picturesque villages below are to be had. The roads are alive with motors and trucks of many kinds and days can be devoted to delightful trips.

Americans should experience great satisfaction in visiting Porto Rico, for they may take a just pride in the evidence of prosperity and contentment to be seen on every hand. Cleanliness prevails everywhere. Through the efficiency and good administration of the resident United States and native officials a new and efficient sanitary system, water supply, electric lights, street cars, schools and wharves have been created.



ONE OF PORTO RICO'S HOTELS, THE VANDERBILT



# The Manufacture of White Arsenic

Details of Experimental Work Carried On in an Effort To Obtain a Dense White Product Free From Antimony and Lead—Proper Draft Regulation And Deep Cooling Chambers Found Essential

By E. C. WILLIAMS

Written for *Engineering and Mining Journal*

THE objective, in the work to be described, was a dense white arsenic, but in experiments made to secure this, a method for producing refined  $As_2O_3$  (over 99 per cent) in one operation was developed.

The name arsenic furnace will be made to do double duty. Properly, it consists of a small reverberatory furnace connected to cooling chambers. The furnaces were fired with coke and charged with blast-furnace flue dust and Cottrell plant product, assaying as shown in Table I.

TABLE I. ANALYSES OF FLUE DUST AND COTTRELL PRODUCT

Per Cent	Pb	Cu	SiO <sub>2</sub>	Fe	CaO	S	Sb	As
B.F. flue dust.....	7.0	0.02	5.0	9.0	3.9	3.0	1.2	24.0
to	29.0	10.0	10.0	4.0	3.4	2.0	40.0	
Cottrell Product.....	1.5	0.06	0.40	0.8	1.0	1.6	1.0	54.0
to	19.0	11.3	1.0	1.2	2.3	2.0	74.0	

Three different types of cooling chambers were experimented with. One which will be referred to as No. 1 type consisted of a straight flue 115 ft. long from which five wings, each 33 ft. long, extended at right angles, the first wing having two furnaces connected, the last two double decked. The straight flue had no baffle walls but a butterfly door deflected the fumes through the wings. Each wing was divided by a wall, the fumes entering one side and passing out the other to the straight flue again, giving a travel of 66 ft. in the single- and 132 ft. in the double-decked wings. The wings had baffle walls 5 ft. 6 in. apart, making rooms 54 in. high x 34 in. x 66 in. Whenever height is mentioned, that over 3 ft. 6 in. is meant, this being the height of an archway which the cars passed under to receive the  $As_2O_3$ . These "rooms" will from time to time be referred to by the door numbers, each room having a door and each door numbered in rotation, starting at the furnace.

The type of furnace described gave very unsatisfactory results. The fumes had to pass through a tortuous passage, 600 ft. long, before reaching the main smelter flue chamber. As a result, the draft, which was created by motor-driven fans at the outlet, had to be very strong to have the proper effect back at the furnace. The  $As_2O_3$  derived from this furnace carried high impurities, Sb averaging from 1 to 7.50, and Pb 2.0 per cent.

Another furnace, No. 2, had a straight chamber 155 ft. long, 8 ft. 10 in. high x 8 ft. wide; the baffle walls were 4 ft. 6 in. apart, the passageway for the fumes being 30 in. wide and the height of the chambers.

No. 3 furnace was a composite of the other two. The first 65 ft. of the chambers measured 9 ft. high x 7 ft., then sloped down to 6 ft. x 7 ft. for a length of 200 ft. The first part had no baffle walls, whereas the latter part did.

The products of all three furnaces were mixed in one bin and conveyed by a screw-and-belt elevator to the ball mills of the barreling machine. The barrels were of 30-gal. capacity, the average net shipping

weight being about 190 kg. The individual barrel weights showed a wide discrepancy, varying from 120 to 250 kg. net. As a first step in an effort to increase the density of the product, a sample barrel was taken from each furnace for several days. No. 2 type showed a consistently high figure, varying from 211 to 242 kg.; No. 1 from 140 to 206, and No. 3 from 170 to 208 kg.

## PRODUCT VARIED CONSIDERABLY IN DENSITY

It was soon evident that the density of  $As_2O_3$  varied in different parts of the chambers, so for several succeeding days the sample barrel was taken from the same door, and far less variation resulted, but each furnace gave different results. Further investigation showed—as was to be expected—that the  $As_2O_3$  which was deposited the quickest, i.e., nearest the furnace and in the greatest heat, was the denser, and the farther it was carried, the lighter it became. This statement, of course, is confined to chamber limits.

Next, the total product from each furnace was weighed separately. No. 1 gave a general average of 167 kg. net per barrel, No. 2, 236, and No. 3, 190 kg.

## FAULTY FEEDING FOUND RESPONSIBLE

A great variation was found in the daily average weight per barrel from each furnace; also in the daily production. Most of the trouble was finally found to be in the feeding. The labor employed was thoroughly unreliable, with no sense of responsibility whatsoever. A wheelbarrow held 100 kg. of flue dust comfortably, yet, with the class of labor attracted to this kind of work, a hatful was preferable to a full barrow. From three to six wheelbarrows constituted a charge, and the furnaces were charged some two and some three times each eight-hour shift, but the laborers considered it their duty not to charge a furnace except under compulsion. Under these conditions furnace action was quite irregular.

The No. 1 type was charged for a time from the top by means of cars. A plate was removed and the charge dropped by pulling out a slide in the car bottom. This feed was very unsatisfactory, partly on account of enormous clouds of escaping fumes and partly from the fact that the dropped charge packed in the furnace.

When tests proved that the farther  $As_2O_3$  was carried before depositing, the lighter it became, the fact that draft affected density was indicated. Tests were therefore begun on the draft. Greater reliance could be placed on the actions of the No. 2 type, as it had but one furnace connected and consequently responded more accurately to changes.

## DRAFT FOUND TO INFLUENCE IMPURITIES

It had long been the custom to take samples of  $As_2O_3$  from certain doors of each furnace every morning and run them for Sb. This was to help distinguish between off- and high-grade  $As_2O_3$ . But every change of draft changed the Sb contents at the different doors,

so this indicated that the draft influenced the impurities as well as the density. The doors at which samples were taken were changed from time to time as indications prompted, until Nos. 7, 10, 14, and 20 were finally selected, corresponding to 39, 52, 70, and 95 ft. from where the fumes left the furnace and entered the cooling chambers. The reason for this was that the draft-changing experiments brought about the condensation of fumes at No. 7 door in greater quantity at No. 10; at No. 14 the height of condensation took place; from there on it decreased until beyond No. 20 there was so little it was unnecessary to clean out the chambers oftener than once a week. From No. 20 on, the  $As_2O_3$  always had to be returned, as it was of reddish color. This was long attributed to Se which was present, but it eventually developed that this reddish substance was only the fume carried in the hottest fire. Insufficient charging with a hot fire always produced reddish  $As_2O_3$  in the No. 1 type (shallow) cooling chambers.

When the fumes were condensed as already described, the  $As_2O_3$  showed a very low Sb content with the peculiarity of slightly higher Sb at No. 20 than at No. 14 door. For example:

Door Numbers	Sb	Sb	Sb
7 .....	0.44	0.39	0.40
10 .....	0.40	0.35	0.34
14 .....	0.34	0.34	0.28
20 .....	0.44	0.38	0.30

Working backward and with an easier and more definite guide, when the draft was set to produce the above-described deposit of Sb, the  $As_2O_3$  was condensed within well-defined limits and the net average weight per barrel was increased from 236 to 300 kg. In other words, the specific gravity was raised from 2 to 2.6. Shipments (carload lots) ran less than 0.35 per cent Sb, where formerly the high-grade had averaged 1.00 per cent Sb.

The interesting feature of draft experiments was that the Sb could be brought to so low a quantity in the chambers, whereas with the same material charged, an extreme like this had before presented itself:

Door Numbers	Sb
7 .....	7.05
10 .....	2.14
14 .....	1.08
20 .....	0.90

#### DRAFT CONTROLLED BY ANTIMONY PERCENTAGE

Such excellent results being obtained on the No. 2 type, the draft was adjusted on No. 3 to produce the same deposit of Sb. This reduced the quantity of Sb to the same as that of No. 2 and raised the specific gravity from 1.7 to 2.5. But No. 3 was not as tractable nor efficient as No. 2, which was attributed to the fact that it had several right-angle turns.

Working on the latter theory, experiments were recommenced on No. 1 type. The two double-decked wings were blocked off, which resulted in much improvement in furnace action. Then the other two wings were cut out; the butterfly doors formerly used to deflect fumes through the wings were set at an angle to aid in detaining fume passage; the draft was changed until the required low Sb was produced, so that this type then gave the same percentage of impurities as the others, and raised the specific gravity from 1.6 to 2.2. However, the hot gases passed so closely over the deposited  $As_2O_3$  that a slight failure in proper charging often blackened the product. Shallow cham-

bers required the closest attention to produce even a fair product.

The presence of 0.40 to 2.20 per cent Pb caused much complaint from consumers. Various efforts were made to overcome this—regulating the fire, reducing the amount of air admitted to the grates and leaving an opening of an inch or two in the second door of the furnace (the furnace was charged through the first door), for the admission of cold air to the fumes. The Pb decreased, but the exact reason is unknown.

#### LEAD IN PRODUCT REDUCED BY RESMELTING

Complaints over high Pb growing more persistent, refining was ordered. By this is meant putting the product through the furnace again. By this means Sb was brought down to 0.30 per cent and Pb to a trace. A pure white product resulted, heavily crystallized in the first half of the chambers. Brilliantly beautiful crystals were formed and would build up like the roofs of a Chinese pagoda, several inches high and often four inches in diameter. One roof would form on top of another with infinite precision and regularity.

In the efforts to secure high density in the product the Sb control for draft regulation was developed, which, along with better organization, automatically lowered the Pb impurities. At one time the morning samples were run for Pb with the following result:

Doors	Pb
7 .....	0.075
10 .....	0.076
14 .....	0.140
20 .....	1.020

It is plausible to think that if no Sb were present, Pb or some other impurity could be used with which to regulate the draft.

The Cottrell plant product was vicious stuff, catching fire seemingly spontaneously. From the time the plant was started, As took fire in the hoppers. At first it was attributed to chemical reactions induced by water sprays in the smelter flue chamber, but these had been used before with no bad results. One day a shovelful of the product was accidentally dropped in a passageway in a strong draft and soon caught fire. Noting this, the hoppers of the Cottrell plant were made airtight, which removed the fire trouble.

#### ARSENIC MIGHT BE DISTILLED ON A HEATED HEARTH

The combustibility of this material led to an attempt to distill it with its own heat. Fire was drawn from a furnace, and the furnace was then charged. It performed nicely—while the hearth was hot. This might lead to experiments to introduce heat from below instead of passing it over the charge.

Once, evidently through a demand for greater production, another furnace was built and connected to No. 1 type by a flue 2 ft. 6 in. x 3 ft. x 35 ft. On account of this irregularity experiments were made on it which gave excellent results in regard to density, this averaging as high as 2.5. This was before the draft regulation control was developed. Certain physical conditions caused the abandonment of this end of the plant, which prevented further experiments. Earnest efforts were made to test out this flue connection on the deeper type of chambers, but the management was not experimentally inclined.

Difficulty was once experienced with poor draft on No. 2 type of furnace. The furnace was shut down and many tons of crystallized  $As_2O_3$  barred off the baffle walls and ceiling. This did not give relief, so the fur-



nace was again shut down and a systematic search made. Trouble was located in an unlooked-for spot. A small shelf, a support for a fan bearing, had filled up with  $As_2O_3$ , thereby cutting off the draft. This cloud, however, had the proverbial silver lining. The back end of this furnace had two tiers of doors, and in the search for the draft obstruction it was noticed that the furnace had a fair draft when the last (top) door was open. Upon starting up again the smelter stack was depended on for draft, and it proved to be entirely sufficient. With slight changes the other types were placed on the same draft. Discontinuance of motor-driven fans seemed to take most of the "grief" from the plant, besides making considerable saving.

**BASIC PRINCIPLES OF FURNACE DESIGN AND OPERATION**

In summing up, the results obtained developed certain principles, namely, that draft controls impurities and, to a great extent, density; that deeper cooling chambers produced a denser, cleaner and whiter product; that cooling chambers and furnace should be in a straight line—the furnace possibly connected to the chambers by a flue 2 ft. 6 in. x 2 ft. 6 in. x 20 ft. (the length optional, but 20 ft. probably a mean). By a straight line is meant the elimination of all right-angle turns, thereby procuring as great a draft as is possible on the furnace with a minimum in the chambers, the velocity to decrease the farther the fumes travel from the furnace. To accomplish this, the cooling chamber should gradually be enlarged as it leads from the furnace. Taking No. 2 type as an excellent foundation, superior results could be obtained by applying these principles.

Before concluding, it would not be amiss to mention that the best remedy for arsenic fume burns was found to be boracic acid, either powder or saturated solution, though the powder was found the more effective.

**Ontario's Gold Production Increasing**

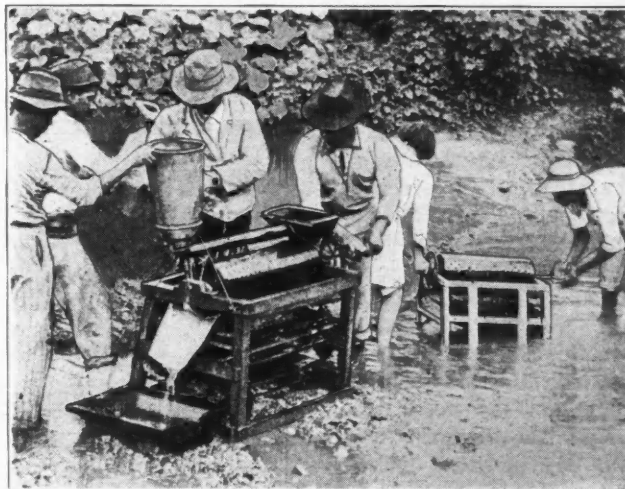
Ontario's position as a producer of gold is becoming increasingly important, according to the Ontario Department of Mines. For the first half of 1920 the output was nearly 22 per cent greater than the 1919 production. Production of gold by individual mines is presented herewith:

Porcupine		
Hollinger.....		\$2,928,079
McIntyre.....		1,085,298
Dome.....		989,566
Porcupine Crown.....		70,017
Dome Lake.....		46,809
North Crown.....		31,019
Davidson.....		13,489
Total.....		\$5,164,277
Kirkland Lake		
Lake Shore.....		243,977
Kirkland Lake.....		137,676
Teck-Hughes.....		125,137
Total.....		\$506,790

From miscellaneous mines the output was \$17,138, of which the Argonaut, in Gauthier Township, contributed \$16,938. There was also a recovery of gold worth \$2,498 from nickel-copper refining operations. In addition, gold mines produced 49,156 oz. of silver, worth \$56,364. During the period 673,694 tons of ore was milled. The milling capacity at Porcupine at the end of June was 5,296 tons and at Kirkland Lake 330 tons daily. The 150-ton mill of the Wright-Hargreaves mine at Kirkland Lake is nearing completion.

**A Miniature Gold-Washing Plant**

The accompanying photograph shows a gold-washing machine used in Cuyabá, which is the capital of the State of Matto Grosso, Brazil. It will be noted that the gold-bearing sands are washed through a contrivance similar to a sand-screen, which carries out the coarse



A 6-MANPOWER GOLD-WASHING PLANT

material, and then they pass downward through a series of sieves or screens, a crude form of various well-known types of mining equipment. The apparatus has the advantage of portability and is somewhat more pretentious than that sometimes found in use by the natives in the backwoods.

**Magnesite in New Mexico**

A deposit of magnesite that crops out on a steep hillside west of Ash Creek two miles above its junction with Gila River, about thirty miles north of Lordsburg, N. M., was recently examined by R. W. Stone, of the U. S. Geological Survey. The general alignment of the outcrops might indicate that it is a continuous body, 1,000 to 1,500 ft. long and 30 ft. thick, in limestone, but close examination shows that the limestone occurs as a number of detached blocks, none of them more than a few rods long, inclosed in granite and cut by dikes and sills of diabase older than the granite.

The magnesite has replaced certain beds of limestone, but at no place has it yet proved to be 30 ft. thick, as at first indicated. At one place where the deposit has been prospected and has since caved there appears to be a total thickness of 20 to 30 ft. of magnesite and limestone. The best exposure shows only 7 ft. of magnesite in a limestone block 5 or 6 rods long, in which the beds stand vertical. Not all the limestone blocks contain magnesite. The small quantity of magnesite available and the distance of the deposits from a railroad render them of little present commercial interest.

The magnesite is hard, amorphous, and pure white, resembling the variety common in California. It is believed to have been derived from the diabase.

**Manganese in Brazil**

Deposits of high grade manganese ore totaling 120,000,000 tons are available for development in the State of Matto Grosso, Brazil. The ore is reported to average 45 per cent.

## Mining Engineers of Note

### John Uno Sebenius

**I**N NORTHERN MINNESOTA, before the present-day status of open-pit mining was reached, the neophyte referred to the system of mining then in practice as "iron-ore farming." The visitor of today, whether he is familiar with the methods used on the Mesabi or totally ignorant of them, cannot fail to be impressed with the great strides that have been made and the wonderful improvements now in evidence. This is true not only of open-pit practice but in underground mining as well. It is not mentioned in all of the histories of the Mesabi that John Uno Sebenius was in a true sense a farmer—in addition to his other activities—but those who knew him in the early 90's, when the importance of the range was scarcely realized, still speak of the potato patch and the garden that formed a prominent part of his exploration camp at that time. He was one of the first to realize the tremendous possibilities of the district as an iron-ore field, and it is due in no small measure to his efforts and accomplishments that the Mesabi Range has far outlived the "farming"

stage and stands today as the greatest iron-ore producing region in the world.

Mr. Sebenius came to the United States in 1888 from Sweden, where he had been graduated from the Royal Institute of Technology and the School of Mines at Stockholm two years previous. The following year he was engaged as geologist and mining engineer for the Ayer estate, of Boston, Mass., and did considerable work in northern Michigan. In 1890, Mr. Sebenius was appointed assistant superintendent of the Witherbee, Sherman & Co. mines at Lake Champlain, N. Y., and for the two years following he had charge of the erection, installation, and operation of their magnetic concentration plant, which at that time was the largest and most successful installation of that type in existence. In the fall of 1892, he went to Minnesota and began a series of extensive trips through the Lake Superior ranges, and it was at this time that his first general examination of the Mesabi Range was made. After serving in a consulting capacity for the Rouchleu-Ray

Iron Co., and later for the Lake Superior Consolidated Iron Mines, he became, in 1901, identified with the Oliver Iron Mining Co., the iron mining subsidiary of the newly formed United States Steel Corporation, as mining engineer and superintendent of explorations.

In 1905, he received the title of general mining engineer of the Oliver Iron Mining Co. and has occupied the position since that time. During his work on the Mesabi Range, Mr. Sebenius has always been fully informed as to the geology, structure, and developments in that district. His travel and investigation in connection with mining operations have given him ample opportunity to observe practices in other sections, and he is recognized as one of the foremost authorities on iron-ore geology and mining. An evidence of this was his appointment, during last year, as a consulting engineer of the Bureau of Mines. Mr. Sebenius has always taken an active part in public affairs. During the administration of John A. Johnson as Governor of Minnesota he served as a major on his staff, and also held the rank of colonel on the staff of Governors



JOHN UNO SEBENIUS

Eberhardt, Hammond and Burnquist. He is a member of the American Institute of Mining and Metallurgical Engineers, the American Society of Swedish Engineers, the Lake Superior Mining Institute, and the Duluth Engineers Club. He also holds memberships in the following clubs: Kitchi Gammi, Commercial, Northland Country, Duluth Curling, Duluth Boat, and the Norroena (of which he is president) of Duluth, and the Minneapolis Athletic and Odin clubs of Minneapolis.

The strenuous out-door life which Mr. Sebenius followed in the early days fostered in him the love of the open, and even today the pleasure of his work is divided, when time permits, with hunting and fishing trips and other outdoor recreation that the North Country so well affords. Mr. Sebenius' keen interest not only in professional but in civic and industrial matters is an example which engineers may well emulate. He is a consistent booster for professional ethics, the bigger fields for the engineer, and the outdoor existence that keeps one physically fit and makes life worth while.



## BY THE WAY

### A New Use for Explosives

The *Official Gazette* of the Patent Office rivals the old oaken bucket as a source of innocent pleasure. There is always something novel in it. It is the shop window where the latest product of man's genius is laid before the public. Had it been published in Solomon's time he would never have written that there is nothing new under the sun. Everything has come its way or will come sooner or later. It has something in each issue that will appeal to every mood or fancy, whatever be the pursuit of the reader. Were it sold by subscription, what selling arguments were possible! Occasionally a critic may pause to exclaim "Can such things be!" but he immediately resumes, knowing well that they can or they would never have gotten into the *Gazette*. For example, patent No. 1,347,005 covers a device for the prevention of pocket picking. The inventor is Francesco Bini, of Milan, Italy. At once it comes to mind that pickpockets must be numerous in Italy. At any rate, Mr. Bini thinks so well of his invention that he is seeking a patent in the United States. Translating the description in the *Gazette* into English, as nearly as we are able, we find that the device carries an alarm consisting of a charge of detonating material that will go off when the pickpocket inserts his hand into his prospective victim's pocket. This is really clever. How one invention is but the stepping stone to another! Mankind progresses by degrees. This device was truly born of a depth bomb mated with a mouse trap. Let the libraries and archives perish so long as the *Gazette* be preserved and the history of human achievement can be rewritten from its pages.

### Dignity Wounded

Speaking of the recent bomb explosion, the *Evening Sun* says: "To destroy Wall Street would require a train of mining engineers." We protest. The phrase used is doubtless correct in a military sort of a way, but now that the great war is over let us have peace. A mining engineer creates and does not destroy. He makes the desert a habitable place and produces earth's riches. Is it not enough that he should be classed with engine drivers after having put in four arduous years at college and winning a beautiful sheepskin—is this not enough, we repeat, or should he now be publicly classified as a sapper or house wrecker simply because of his familiarity with explosives and blasting. The *Evening Sun's* intentions are good, but it should watch its step. It has many mining engineers among its readers and now that they are conscious of their own exceeding worth they are apt to start reading some other three-cent paper. Furthermore, they will have the sympathy and support of the F. A. E. S.—they are organized. Let the offender beware!

### Rings Like a Fake

Herr Simons, the German Foreign Minister, is reported to have stated to a correspondent of the *Evening Standard* (London) that a new metal had been discovered at Frankfurt. It was of high value, and likely to take the place of copper. In color it was white, like aluminum, and when struck had a "ring like steel."

### North Bloomfield Née Humbug

"One of the most noted hydraulic mines was that known as North Bloomfield, some eight or ten miles northeast of Nevada City," says Hittel's History of California. "It was situated near a little creek flowing into the South Fork of the Yuba and between it and the Middle Fork, where, about the year 1851, a prospecting party consisting of two Irishmen and a German discovered a rich deposit of gravel. After working it for some time and finding their provisions running low, they sent one of the Irishmen to Nevada with several hundred dollars' worth of dust for supplies but with strict injunctions to keep silent as to their fortunate strike. The Irishman sold his dust, purchased his supplies and a mule to pack them, and got ready to return. But having some money left, he could not resist the temptation of a little conviviality; and, as one glass led to another, he grew more and more loquacious and at length began to boast of the money he and his partners were making. When asked where his claim was situated, however, he seemed to remember his promises to be discreet and refused to disclose the locality. But the next morning, when he started off, he was followed at a distance by a hundred or more excited adventurers, who succeeded in tracking him to his camp. They prospected for several days along the creek and found a little gold but for some unexplained reason failed to find rich deposits and, returning disappointed to Nevada, unanimously pronounced the creek a humbug; and from that time forward, whenever the place was mentioned, it was called Humbug Creek. Subsequently, in 1853, when hydraulic mining commenced there and a town started, it was also called Humbug from the name of the creek. In 1856, after the place, on account of the great richness disclosed by the deep hydraulic diggings that had been opened, became one of the liveliest and most prosperous towns in the county, the citizens, on the occasion of procuring a post-office, had the name changed to that of North Bloomfield."

### The Tommy-Knockers\*

When I die (said the mining engineer) do not bury me at all;  
Cache me on the bottom level, with a pick beside my pall;  
Leave a candlestick and matches, then cave the stopes and drifts,  
And I'll be a tommy-knocker for a hundred thousand shifts.  
Yes, a jolly tommy-knock, always starting for a walk;  
Always pounding on the rock, scaring honest Hunkies with  
my little tap, tap, tap—  
Always listening for the blast 'till the pumps are pulled  
at last,  
And the bloody surface tenderfoots are routed from their  
nap;  
Then the depths of earth will be lighted and we can see  
right through,  
And all the lost bonanzas will be nuts for me and you.  
Then we'll dig, dig, dig (If we've been good engineers)  
Ore shot with chunks of metal, through all the happy years.  
We'll have angels for muckers, who'll never ask for pay,  
And the ore will stope itself, over—under—anyway—  
Anyway you say!  
Oh, boy! Don't wake me up  
And say the men are striking and the tax-collector's here,  
And the bottom of the metal market's gone,  
And how you've lost the ore-shoot, and all the other grief;  
Jest let me snooze 'till Gabriel blows his hawn!

—SAMUEL B. ELLIS.

\*The tommy-knocker is the gnome of the underground. He is often heard tapping the rock in mines, and superstitious miners do not like to work alone for fear of meeting him.

## CONSULTATION

### Active Placer Operations

"If you have the information available will you please advise me if there is any placer mining for gold being done on this continent at the present time, and if so, where?"

There is still considerable placer mining being done on the North American continent at the present time in spite of the existing relatively high cost of placer mining compared with pre-war costs. However, the production of the various placer fields is gradually decreasing, due not only to the high cost of labor and supplies but also to the diminished reserves in the placer goldfields and their gradual exhaustion. Many placer mines in California are potential producing localities, but are prevented from operating by the anti-debris laws in effect in that state.

Although we have not a list of all the active placer mines in the country, the following list will give you an idea of the chief producing localities; the figures given represent 1918 production in troy ounces as given by the U. S. Geological Survey, and illustrate how much placer gold the various states produce:

Oz.	
12	Alabama and Georgia—small production.
38,334	Alaska—about 700 placer localities.
33	Arizona—small production, Yuma, Pima, Maricopa and Yavapai Counties.
29,909	California—Yuba, Sacramento, Butte, Calaveras, Amador, Merced, Stanislaus, Placer, Shasta, Siskiyou, San Joaquin, Nevada and Trinity Counties.
6,650	Colorado—Summit and Lake Counties.
3,283	Idaho—Boise and Shoshone Counties.
3,166	Montana—Silver Bow and Lewis and Clark Counties.
3,907	Nevada—Esmeralda and Nye Counties.
21	New Mexico—small production.
17	North Carolina—small production.
4,102	Oregon—Baker, Grant, Jackson, Curry, Douglas, Crook, Josephine and Malheur Counties.
	South Dakota—Lawrence and Pennington Counties produced negligible amounts.
15	Utah—small production.
45	Washington—small production.

In Canada placer gold is being recovered from operations chiefly in British Columbia and Yukon Territory. Mexico and Central America (chiefly Honduras) also produce placer gold.

### Silver Standard Countries

"I have heard it stated that China and India are the two chief silver standard countries of the world. What other nations have their currency systems based on a silver standard?"

China is a silver standard country. India is not, but uses what is known as the gold exchange standard which contemplates little or no circulation of the standard metal, gold, but a linking of the circulating medium, silver, to a gold basis. India is a great silver-consuming country, and uses large amounts in coinage, but it is incorrect to say the country is on a silver standard.

A comprehensive list of silver standard countries would include Abyssinia, Afghanistan, China, Eritrea, French Indo-China, Honduras, Morocco, Persia and San Salvador. Other nations that are chiefly using

silver in their circulating currency systems but which have a gold exchange standard are British East Africa, Ceylon, former German East Africa, India, Italian Somaliland, Federated Malay States, Nicaragua, Philippines, Siam, Straits Settlements, and Zanzibar. In addition to these countries, Mexico's chief money in circulation ordinarily is silver. It is to be noted that several of the nations listed, East Africa, Ceylon, Italian Somaliland and Zanzibar use the silver rupee, the common coin of India.

### Feldspar Potash in Connecticut

"We are interested in a large tract of land in Connecticut containing extensive deposits of feldspar and are informed that this deposit is valuable for its potash content. Will you kindly tell me what the possibilities are of developing such an industry in Connecticut and what attempts have been made to produce the material. What are your quotations on feldspar potash?"

The State of Connecticut does not produce any appreciable amount of potash. No doubt there are extensive geological formations which contain feldspar there, as this mineral is a common constituent of rocks in the East and is found abundantly in the North Atlantic States. However, the use of ground feldspar rich in potash as a fertilizer is only commercially feasible in exceptional circumstances. This has been emphatically demonstrated by tests of the Department of Agriculture. Attempts to extract potash from feldspar are still in the experimental stage, and many patents have been issued covering various processes. If you are endeavoring to develop a prospective potash producing area from feldspar deposits you are doing pioneer work in this line that is subject to the risks attendant upon most untried mining ventures.

Feldspar often contains as much as 14 per cent of potash ( $K_2O$ ), but a series of unpublished analyses of the U. S. Geological Survey indicates that the average quarry product rarely runs above 7 to 7.5 per cent. The potash feldspar resources of the country are known to be large, but due to the cheaper sources of potash from both domestic and foreign quarters, it appears to be many years before attention will be turned to them and they can be commercially used.

Owing to the fact that potash feldspar is not produced in commercial quantities, we do not quote prices on this material.

### Lubricating Grades of Graphite

"In your market report of Sept. 11 you quote lubricating grades of graphite with prices ranging from 11 cents to 30 and 40 cents for higher grades. Will you kindly inform us of the specifications and requirements of graphite that might be termed lubricating grades?"

Lubricating grades of graphite refer to a high grade of graphite of exceptional purity which does not contain any gritty matter such as quartz. As the grain size is immaterial, both amorphous and crystalline graphite can fall in this class. This is essentially the sense in which the term is used by the trade and in the *Engineering and Mining Journal* quotations.



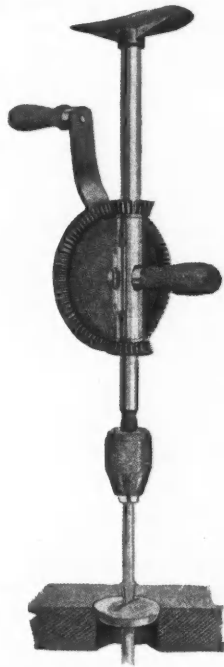
# HANDY KNOWLEDGE

## Grinding Valves With a Breast Drill

By C. NYE

Written for *Engineering and Mining Journal*

The common method of grinding valves by means of a screwdriver, oscillated by hand, is slow work and tires the wrist. A practical and mechanically superior manner of performing this operation is to insert the screwdriver blade in a breast drill and then turn the drill handle back and forth. A better result is easily obtained



USING BREAST DRILL TO GRIND VALVES

and in a fraction of the time required by the old method. The drill being geared up, the screwdriver blade turns several times to a single half-turn of the drill handle. Valves that average a half hour by the wrist method are ground with ease in an average of ten minutes by the drill method.

## Kerosene To Prevent Slacking of Carbide

That kerosene poured upon carbide will prevent the waste and loss of carbide through premature slacking is maintained by the *Queensland Government Mining Journal*. It is stated that this remedy for slacking is successful and that it takes only a little kerosene to "do the trick," as it spreads rapidly over the whole of the carbide in a tin. Subsequent generation of acetylene is not affected.

Moisture is the great enemy to the preservation of carbide, and it can be seen easily that kerosene or some similar light oil would prevent the moisture taking effect quickly; but kerosene is highly inflammable and what effect the combination of carbide, kerosene, acetylene and the metal of the container exerts on the safety of the combination would seem to us a matter warranting investigation.

## Motor-Haulage Block-Signal Protection

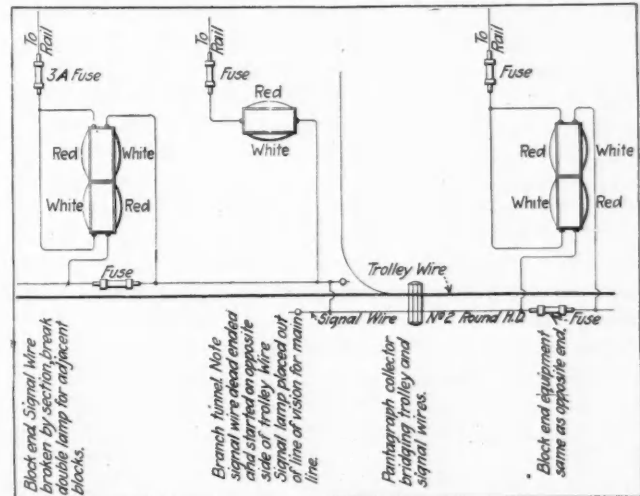
By T. H. ARNOLD

Written for *Engineering and Mining Journal*

For motor haulages underground where there is a considerable amount of moisture and wet track, a track-circuit signal system is impracticable, as the maintenance cost is excessive and the reliability considerably impaired.

In a simple system devised for the Arizona Copper Co. with pantagraph collectors, a wire of No. 2 hard-drawn round copper is strung parallel with the trolley wire and insulated from it, and spaced two or three inches away. The signal wire is connected at each end of the block to block lamps, which are also connected to the track. The pantagraph collector bridges the trolley wire, and the signal wire thus furnishes current for the block lamps. At frogs and crossings, the wire must be raised over the branch wire, or dead ended and another wire started on the opposite side. The two wires must be carefully aligned for vertical height, which is readily accomplished by means of a double hanger.

The block lamps are usually constructed of galvanized iron and use a 4-in. diameter semaphore lens. At the junction of two blocks a double lamp is used giving a red indication opposing and a white indication back into each block. For branch tunnels not protected with block signals a standard railroad switch lamp is used, giving a red and a white indication. For special uses, three and four signal lamps will be required.



WIRING DIAGRAM FOR MOTOR-HAULAGE BLOCK-SIGNAL PROTECTION

This system, though not giving absolute protection, has many desirable features. The installation cost is low; a moving train is indicated by a flicker of the block lamp; the indication of a train in the block is positive, and the maintenance is negligible. The main defect in the system is that a car standing on the track does not give a signal unless a locomotive is in the block; also, it does not give the direction in which a train is moving, but, on the whole, the operation has been satisfactory.

# THE PETROLEUM INDUSTRY

## Relation of the Bureau of Mines To the Oil Industry\*

**T**HE BUREAU OF MINES is one of three organizations provided by the Federal Government to bring about a greater efficiency in the production and utilization of precious petroleum resources. The Geological Survey provides information for a better understanding of the occurrence and the finding of petroleum; the Bureau of Standards provides means for standardizing instruments for use in the petroleum industry and means for testing and standardizing products manufactured by it.

The Bureau of Mines was established by act of Congress, in 1910, for the purpose of conducting scientific and technologic investigations concerning mining, its various branches and the production and utilization and conservation of petroleum and its products. In short, it has been commissioned by our Government to look after the public interests in the production, manufacture, and utilization of our natural mineral resources.

Its relations to the petroleum industry are advisory rather than supervisory, the only important exception at present being the supervision of drilling and producing operations on Government leased lands. It endeavors to do what is best for the public welfare and looks to ultimate good rather than to the immediate gain. It believes that the ultimate good for the public will prove to be also the ultimate good for the industry and that fundamentally the interests of the public and of the industry are one and the same.

It stands also as an intermediary between the industry and the various departments of the Government—as a sort of consulting board to which matters concerning petroleum and its products are referred by them. In order to faithfully fulfill this function the Bureau of Mines must cover the whole field of the industry and as far as possible those industries allied with the production and utilization of petroleum and its products.

The Bureau of Mines organization for carrying on this particular work is at present divided into four main subjects as follows: Production Technology, Engineering Technology, Chemical Technology, and Oil Shale Technology.

The section of Production Technology handles such problems as (1) methods for drilling wells whereby the various types of equipment may be most efficiently used, to the end that a maximum production may be secured from the sands. This involves the problem of protecting the sands against wastes of oil or gas and against infiltrating water by the use of mud-laden fluid, cements, and like substances; (2) the collection of various data covering the development work as it is carried on which will guide operators in future work;

enabling them to avoid serious and costly mistakes and supplying them with information of the repair of producing wells; (3) the collection of such data as the logs of wells, casing records, production records and complementary facts, in order to gain information which may increase the production of the present and future wells and prolong the life of the fields; (4) the valuation of oil lands along a basis which will assist the operator in determining a fair price for the purchase of oil and oil properties.

There are at present engineers of the Bureau who devote their entire time to production problems in Wyoming, California, Oklahoma, and Texas. Great savings already have been effected to the industry through their constructive advice and through the corrective measures that they have recommended.

Co-operative work which was carried on with the Indian Office, under an annual appropriation of only \$17,500, resulted, through the proper control of underground waters, in increasing the daily production of one group of oil wells in the Cushing field as much as 3,000 bbl. per day by cementing. At this rate, the increased production for the first year succeeding the repair of the wells amounted to approximately \$2,500,000. Operators in the Wyoming fields have recognized the value of the work that the Bureau is doing, and have recently renewed a co-operative agreement whereby \$30,000 a year is voluntarily contributed by them and is being spent under the direction of the Bureau for conserving oil and gas on their property.

The Legislature of the State of Oklahoma has recently renewed an agreement appropriating \$12,500 of state funds for co-operative work with the Bureau along similar lines. Just recently, an unsolicited fund of \$1,000 was proffered the Bureau by the operators of the Hewitt Field, Oklahoma, as a nucleus of a co-operative fund to be expended in conservation work in that field.

### OIL PROPERTY TAXATION

The Bureau of Internal Revenue of the Treasury Department, in endeavoring to arrive at a fair method for taxing oil properties in the United States, called upon engineers of the Bureau of Mines to work out a plan, and, as a result, the Bureau has devised and developed a new and equitable method for estimating the future and ultimate production of oil properties in the United States. This method has been used as a basis for assessing taxes imposed by acts of Congress.

Through its section of Engineering Technology, the Petroleum Division of the Bureau has made valuable recommendations for the transportation and storage of oil. Recently, investigations conducted by it have disclosed that, in many cases, 20 per cent of the volume of the gasoline content of crude oil is being lost by evaporation before it reaches the refinery. The investi-

\*Abstract of address delivered at the convention of the Independent Oil Men's Association at Denver, Col., on Thursday, Sept. 30, by F. G. Cottrell, director of the Bureau of Mines.



gation likewise disclosed that probably at least one-half of this loss may be economically saved, and various companies have been induced to make the effort. One tank company recently reported that it had received more inquiries on protection against evaporation losses within the last six months than in the ten years previous. During the ten-year period from January, 1908, to January, 1918, approximately 12,750,000 bbl. of oil and 5,024,506,000 cu.ft. of natural gas were destroyed by fire in the United States, entailing a total estimated property loss of more than \$25,000,000. Oil and gas fires had become so common, especially in parts of Oklahoma and Texas, that many people regarded them as an unavoidable evil. In one week, during the summer of 1914, in the Healdton and Cushing fields of Oklahoma, fire destroyed eighty-six tanks, ranging in size from 250 to 55,000 bbl. capacity, numerous oil rigs with equipment, several field pumping stations, besides reservoirs, entailing a total property loss of approximately \$1,000,000. As a result of detailed investigations carried on by the Bureau to ascertain, if possible, the causes of these fires, it was found that most of the more disastrous fires resulted from carelessness or from improper storage and transportation facilities. The Bureau has been able to suggest means for successfully combating the most disastrous fires and to entirely eliminate hundreds of lesser fires. Through the adoption of its recommendations, many thousands of dollars have been saved to the industry and enormous quantities of oil and gas have been conserved for use.

A study was also made of methods for increasing the efficiency of the utilization of natural gas. Engineers of the Bureau examined many plants for producing natural-gas gasoline, and through information gathered have been able to make recommendations that have greatly increased the proportion of gasoline recovered from the gas, thereby materially increasing the supply of gasoline. At present a study of the utilization of heavy oils ranging in gravity from 7 to 14 deg. Bé. is being made, and in the near future the Bureau may be able to make recommendation whereby the enormous quantity of tars, heavy oils, and oil-saturated sands known to exist in the United States may be made to yield useful petroleum products.

In the period of under-supply—a condition which is likely to become worse rather than better—when prices of petroleum products have gone up and there have developed serious shortages of gasoline, fuel oils, and other products, the industry is under critical examination and the public demands that justification be shown for these conditions. Without the crude-oil statistics of the Survey and the refined-oil statistics of the Bureau of Mines, there would be most serious misunderstandings between the public and the industry.

A monthly bibliography of petroleum and allied substances is being placed in the hands of trade journals and most of the larger libraries in the United States. In this way, the Bureau hopes to aid in assisting those interested in obtaining accurate and reliable information concerning petroleum and allied substances and to assist in keeping the public in close touch with literature dealing with this subject.

Through the section of Chemical Technology, chemists and chemical engineers of the Bureau are making, every six months, a complete survey of the motor gasoline sold throughout the United States. Samples of gasoline are collected from service stations

in various parts of the country, and these samples are analyzed and the results compiled and published. Through these reports, the public as well as the producing companies are kept informed of the quality of the gasoline sold to consumers. A study of the analysis of the most recent survey, July, shows that the volatility of the gasoline put on the market has decreased. This is because the increased demand for the product necessitated the refiner to "cut deeper" into the crude. As commercial gasoline no longer comes up to the Government specifications, the Bureau, believing that these specifications are too rigid, has recommended that they be changed.

At present, a survey is being made of all the crude oils produced in the United States. Results of the analyses will be compiled and published when the survey is completed.

An important activity of the chemical division has been the standardization of testing methods for petroleum products. The gasoline distillation tests adopted as standard by the American Society for Testing Materials were developed by the Bureau and much work has been done on standardizing other tests.

In the work on Oil-Shale Technology, the Bureau has been much handicapped by lack of funds. However, two of its engineers have been able to give most of their time to investigations and experiments connected with this work. The oil-shale industry is at present passing through a critical period. A relatively large amount of money has already been spent by private individuals in endeavors to determine the practical and commercial feasibility of retorting oil from oil shales. However, the industry is faced with a lack of essential fundamental information which it is the province of a government bureau to obtain. There are a multitude of technical problems which are yet to be solved.

The development of the oil-shale industry must necessarily be a matter of years, not only because there must be built up a fund of technical knowledge and practical experience, but because great amounts of capital and labor will be necessary before any considerable proportion of our present and future oil needs can be supplied from our shales. There is no doubt that the industry will be developed into one of the largest in the United States, and it is high time the Government hasten this development by starting immediately the necessary preliminary investigations.

The Bureau is requesting from Congress an appropriation of \$170,000 with which it contemplates the establishment of an oil-shale station in some suitable locality, including the necessary grounds, laboratory, and equipment. It contemplates the erection of a one-unit Scotch retort, the design and operation of which are already well understood, to provide a standard. By means of this standard retort it will be possible to compare various processes one with the other, also various methods of retorting, one with another, and various shales, one with another. This standardization will be invaluable to the industry and it is believed can best be done by a Federal agency.

The Bureau has from the first maintained that the production of oil from shale is not for the individual of small means. It is a manufacturing venture involving the handling of large amounts of low-grade raw material and should be undertaken only when substantial backing from capital is to be had and where the best technical skill can be obtained.

## NEWS FROM THE OIL FIELDS

### State Receipts Increased by the Development of Texas Oil Resources

*From Our Special Correspondent*

The report of the Texas State Land Commissioner, J. T. Robinson, for the two-year period ended Aug. 31 1920, will show receipts by the state of over \$7,750,000 from sales of school land and lease rentals and royalties. This is an increase of more than \$2,000,000 over the preceding period of two years, and was due to the great increase in the development of the oil resources of the state.

The States Oil Corporation, of Eastland, brought in a tremendous gas well on Sept. 18 on the J. M. Radford farm, seven miles north of Eastland. It is claimed that the well came in producing over 50,000,000 cu.ft. daily. Steps were taken at once to prevent undue waste.

The new tank farm, oil-ship unloading, and railway distributing station of the National Oil Corporation, near Galveston, will it is stated be completed and in operation by the middle of October. Three 55,000-bbl. tanks, a 24-tank car-loading rack and trackage have been completed. The 14-in. pipe line from the unloading pier to the tank farm is being pushed to completion.

The most important oil-well completion in the coastal fields recently was the No. 2 Gallagher of the Humble Oil & Refining Co. at Damon Mound, Brazoria County. This well came in flowing 1,000 bbl. by heads from 3,211 ft., and is not only the deepest well in the field but extends the field one quarter mile to the south. At Hull, small producing wells were completed by the Phoenix Development Co., Theis, Wilherson & Parker, and the Humble Oil & Refining Co. The daily production of the field is now over 14,000 bbl. At West Columbia the "big well," No. 1 Abrams of the Texas Co., is still flowing at the rate of approximately 8,000 bbl. daily through the drill stem. It is expected several new wells will be completed in this field soon. One well was completed in the Spindle Top field, the original salt-dome field, by Wilson & Broach, pumping 15 bbl. from about 750 ft.

### Homer Field Still Largest Producer in Louisiana

*From Our Special Correspondent*

Nearly one-half of the Louisiana oil production of about 100,000 bbl. weekly comes from the Homer field. The shallow sand in this field is holding up well, making a steady production and showing little salt water. Some deep wells in the lower sand have made large productions for a short time, but nearly all rapidly sanded up. A well of this nature completed recently was the No.

B-1 Shaw of the Oklahoma Gas & Oil Co., which came in making 2,000 bbl. and which rapidly increased to double that amount when bottom sediment began to show.

The Union Petroleum Co., a subsidiary of the Sinclair Consolidated Oil Corporation, is building a compounding plant of 500,000-bbl. capacity and steel storage tanks of large capacity at its Westwego station.

Vinton, Calcasieu Parish, continues to be the largest producer in the Louisiana coastal fields. The Gulf Production Co. recently completed a 100-bbl. pumping well in its No. 34 Vincent well in this section.

### Lee County Ranks First as Kentucky Oil Producer

*From Our Special Correspondent*

Complete reports for August show that Lee County continues to hold first rank in the production of oil in Kentucky. Of the 775,004 bbl. for the entire state its oil runs showed 465,532 bbl. Estill County was next, with 92,693, Allen third, with 86,843, Warren fourth, with 31,393, and Powell fifth, with 26,326 bbl. The price of oil in the state increased recently from \$4 to \$4.25 a barrel.

Warren County continues to lead in new production, and drilling operations are still centralized there. A flowing well was drilled in on the Phelps lease, six miles south of Bowling Green, on B-1 Shaw of the Oklahoma Gas & Oil air. It was capped after numerous attempts, and is producing 500 bbl. a day.

A second big well was brought in on the Kister lease, in the White Stone Quarry district, Warren County, estimated at 100 to 150 bbl. a day. Johnson, Kerstetter & Stein have drilled in No. 1 on the Briggs lease at 1,155 ft. Oil stood 240 ft. in the hole. A well on the Jefferson lease was shot on Sept. 24 at 1,101 ft. No. 1 on the Porter lease was shot the same day at 1,025 ft. and has an estimated production of 50 bbl.

Well No. 20 on the George Sledge lease, in Allen County, was brought in on Sept. 21 at 292 ft., good for 100 bbl. daily or better. This well proves up the entire acreage of 399 acres.

Lively development is reported in Johnson County. The Seminole Oil Co. brought in its first well in the Weir sand this week. It will be drilled to the Berea sand.

The Heilbron Oil Co. of Tulsa, Okla., has contracted to drill a well before Dec. 1 on the holdings of S. S. Langley and the Eagle Lumber Co. near Ramsey, Dallas County, Ark.

### Refinery at Laramie, Wyo., Making Good Progress

*From Our Special Correspondent*

Construction of the refinery of the Standard Oil Co. at Laramie is progressing rapidly. Eight of the ten stills have been set in place, and the construction work is nearly completed.

The Producers & Refiners' Corporation struck oil at the Wertz camp, Carbon County, on Sec. 7-26-79. Considerable gas pressure was obtained between 3,200 and 3,400 ft. The quantity of oil has not been determined.

No. 2 well of the Iowa-Wyoming Oil Co., in the Bolton Creek field, was completed at a depth of 2,050 ft. and came in flowing considerable oil with the well water. Sufficient gas came with the oil and water to necessitate the moving back of the field boiler to prevent danger from fire. This field is about thirty miles southwest of Casper. Other companies having holdings close to this producing well are the Chappell, Mike Henry, San Juan, and Victor-Wyoming.

In the Piney field, the Petrograd Oil Co. has spudded in and the Associated Oil Co. is preparing to drill a deep test well. The latter company will drill its first well on the C. Freer ranch, and work will be carried on throughout the winter.

The Sand Hills Oil Co. is setting casing in its test well in the Ferris district preparatory to drilling in below 3,100 ft. It is stated that oil is standing in the hole.

### Crude-Oil Production Costs in California Show Large Increase

The cost of field operations in the production of crude oil in California has increased 200 per cent, or possibly 300 per cent, during the last five years, according to statistics recently published by the State Mining Bureau. In 1915 the operating cost was generally less than 20c. per bbl., whereas in 1919 the figure was 40c. or more. Decrease in productiveness of wells, coupled with advanced cost of labor and material, are the underlying reasons. The total capital invested in the oil industry is about \$320,000,000, upon which dividends of \$35,418,851 were paid, or at a rate of about 11 per cent. About two-thirds of the total output of crude oil is refinable, or about a gravity of 18 deg. Bé. The total area of proven oil land is 91,792 acres, or about 143 square miles. Upon this land there are 8,928 producing wells, slightly more than ten acres per well. Future drilling will probably increase the number of wells, until the average amount of land drained by a single well will be seven or eight acres.



# COURT DECISIONS IN MINING CASES

By Wellington Gustin

## "Implied" Contract Legal and Enforceable

Oklahoma Supreme Court Sustains Gilchrist Drilling Co. in Action Against Tulsa Fuel & Manufacturing Co.

The status of an implied contract is decided in the judgment of the Supreme Court of Oklahoma in favor of the Gilchrist Drilling Co. against the Tulsa Fuel & Manufacturing Co. The Lynna Oil Co. was the owner of an oil lease, and the Tulsa company was the owner of a gas lease on the same land near Tulsa. The Tulsa gas lease was prior to the oil lease, and there seems to have been some agreement between the Tulsa company and the former original owners of the oil lease that either party had the right to drill wells upon the leasehold estate, the oil-lease holder taking over all oil wells, and the gas-lease holder taking over any gas wells, the party so taking a well to pay the expense of drilling.

After the Lynna Oil Co. purchased the oil lease, the Gilchrist Drilling Co. drilled a test well for gas and oil to the depth of 1,275 ft. The well proved to be dry, and the Lynna company paid one-half of the bill and refused to pay the balance, claiming the Tulsa company was liable therefor. The latter refused to pay, and this action was brought to recover.

It was admitted there was no written or oral agreement between the oil and lease holders as to the drilling of the well. However, the testimony showed that the manager for the gas company knew of the drilling and was at the well during the operations; that frequent reports were made him, and that he was consulted as to the best place to drill the well. It appears that the oil company furnished the casing for the well and also the gas to run the machinery.

As there was no express contract between the parties, the plaintiff must rely upon what is known as an "implied contract." The intention of the parties to an "implied contract" is to be gathered from their acts in connection with the surrounding circumstances, and what was said between the parties at the time, the nature of the work done, and as to how the interest of the parties sought to be charged is effected thereby.

It was said the only distinction in this species of contract and express contracts rests in the mode of proof. Both are founded on the mutual agreement of the parties. One must be proved by an actual agreement, whereas in the case of the other it will be implied that the party did make such an agreement; as, under the circumstances disclosed, he ought to have made.

Contracts implied in fact must be a reasonable deduction from all the cir-

cumstances and relations of the parties, although they need not be evidenced by any precise words, and may result from random statements and uncertain language.

Judgment against the gas company was affirmed.

## Texas Court Sustains Legality Of Unilateral Lease

Holds Agreement Not Invalid Through Allowing Lessees To Pay Rent Instead of Drilling Well.

The Supreme Court of Texas has reversed the Court of Civil Appeals in the suit brought against the Corsicana Petroleum Co. for the cancellation of a mineral or oil lease. The lessors contended that the lease was unilateral and therefore void, and that the lessee company had forfeited it by failing to complete an oil well on the premises within one year.

The lease covered "all the oil, gas, coal, and other minerals," with the "exclusive right to drill, mine, and operate on the lands for producing gas, oil, coal, and other minerals." The lessee agreed in the instrument to complete a well on the premises within one year or pay to the lessors a specified lease rental quarterly to the end of the term of ten years, or until the well was completed, or the lease surrendered as provided. A further clause gave the lessee an option either to surrender the lease upon certain payment or to continue it in full force and effect for quarter to quarter by making the quarterly payments.

The court found there was nothing unlawful about such a contract. Acceptance of payments instead of the completion of a well was a matter of agreement and the lease covered the point. But it was contended that such a lease was unilateral and therefore unenforceable. The court said a contract for the grant of an option is necessarily unilateral. An option is granted for the purpose of enabling the lessee to exercise the particular right or not, as he may elect. The value of it consists in that privilege. Owners of property have the unquestioned power to grant such rights with respect to it. They are free to validly make such contracts, and when so made the courts will uphold and enforce them.

In many valid contracts the promise is only on one side. They are unilateral. The inquiry as to such is whether such promise is supported by a consideration. In return for the payment made the lessors herein agreed that the lessee should have the right to surrender the lease on the terms stated. The presence of this provision in the lease did not invalidate it as contended.

Judgment for the Corsicana Petroleum Co. was ordered.

## Casinghead Gas Does Not Make A Gas Well

Federal District Court of Oklahoma Rules That It Is a Component Part of Oil

In the action by the Twin Hills Gasoline Co. against the Bradford Oil Corporation, removed from the Oklahoma courts to the Federal District Court, Judge Williams has entered judgment for the Twin Hills company.

The action was based on an oil and gas lease, the controversy arising over the construction of certain paragraphs of such lease relating to "gas wells" and "casinghead gas." The lease provided that the lessor should receive one-eighth part of all the oil produced, that the lessee should pay \$200 per annum on each gas-producing well, and that the lessee should have the right to use casinghead gas for the purpose of operating the wells. And the court held that "casinghead gas," which is a component part of oil being produced from wet gas existing only with oil, would not make a well a "gas well" so as to entitle the lessor to \$200 per annum, but the lessor would be entitled to his one-eighth part of the casinghead gas separated from the oil and saved.

In construing an oil and gas lease which is ambiguous the court will look to the intent of the parties and the surrounding circumstances.

The court found in favor of the Bradford Oil Corporation as to the plaintiff's claim for \$200 for each well produced on the property because the wells were found to be oil wells and not gas-producing wells. But it found plaintiff was entitled to recover one-eighth part of all oil produced on the property, including the casinghead gas.

## Reservations of Coal and Mineral Include Oil, Petroleum and Gas

The Court of Civil Appeals of Texas, at El Paso, has denied a rehearing on its judgment in the suit brought by W. L. Parmer against J. E. Luse and another to quiet title to certain mineral claims in Eastland County, Tex. Reservations in the deeds of J. E. Luse to realty "excepting and reserving all coal and mineral and the right to prospect, mine, and remove the same," and "the coal and mineral in said described land and the right to work and remove the same is especially retained" to the grantor, were construed by the court to be reservations of oil, petroleum, and gas. And under such a conveyance reserving oil and gas rights in the grantor, Luse, the grantee, Parmer, is entitled to the ordinary possession of the surface, and such possession alone will not defeat by the statute of limitations the title to the minerals which were reserved.

# ECHOES FROM THE FRATERNITY

## Future of the United States Zinc Industry\*

### Unit Cost, Not Furnace Recovery, Plant Manager's Proper Objective—How To Establish Foreign Market

None of us can afford to be deceived about our own affairs. Every zinc man in the United States knows that the stabilization of his industry depends upon increased home consumption and increased foreign demand. Every member of the American Zinc Institute knows if he reads the Institute *Bulletin*, what has been done toward increasing home consumption. Likewise, he knows what remains to be done; in fact, what must be done if that consumption is to be maintained and ultimately increased.

Simply telling other people, orally or through a bulletin, to "Make It of Zinc" is akin to mining for zinc with a sledge-hammer hand-drill crowbar outfit. Neither will the publication and the distribution of architectural service sheets alone create a demand for zinc roofing material. That demand can only be created through backing those service sheets with a substantial amount of advertising, with the publication of a zinc worker's handbook, and with the adoption of all the other methods which are making an ever widening and more unassailable market for other forms of roofing.

So far as increasing the foreign demand is concerned, let us not delude ourselves regarding our European business. Plainly stated, supply war-shackled nations and then competing with war-crippled nations have merely given the zinc men of the United States an incidental European zinc market. Those nations, however, are rapidly returning to a condition of comparative normality.

Trying to measure England's recovery from the war by the daily rates in a disorganized exchange market is about as satisfactory as looking through the wrong end of a telescope. That country, through a series of corporate mergers, is fast transforming and remoulding the fundamentals of world trade. By the end of 1920 Belgium will probably be producing zinc at one-half of her 1913 rate. Even Germany, suffice to say at this time, has begun her renaissance in zinc. These nations must eventually discharge their large financial obligations to this country. As far as possible their payments will be made not in money, but in goods of their own manufacture. Such goods will include zinc unless the zinc industry of the United States does not forthwith reform itself.

An export market as tender as our present one has shown itself to be is not an export market in the world's understanding of that term. When world-market conditions recently favored a return of a considerable quantity of United States-made slab zinc no small concern was exhibited by some of the zinc men in this country, and the menace of such dumping was strongly reflected in home-market quotations. This concern and this reflection were by no means unwarranted, for in the world's commodity markets the law of supply and demand inexorably governs.

Frankly, how can an industry expect to prosper even at home when it is guilty of the wasteful practices exposed in Mr. Stone's admirable paper, entitled "Differences in European and American Smelting Practices," read at the 1920 Annual Meeting of the Institute.<sup>1</sup>

Quoting from the summing up of the studies of that authority: "To make the same amount of zinc (432,000 tons) from the same ores with European recoveries and fuel consumption would take 1,084,800 tons of ore and 1,084,800 tons of fuel, a saving of 37,000 tons of ore and 1,000,000 tons of fuel. If we wish to hold our own, and even to avoid going backward, we must do more economical work and reduce our costs below those of other nations." Mr. Stone has clearly pointed out the only way in which the zinc men of the United States can permanently compete in the world's zinc markets, namely, by reducing their costs.

Mr. Schwab said at the 1920 annual dinner of the Institute that he believed "the real returns in business are derived from the economies practiced in that business." It is certain that he had the zinc business as well as the steel and other business in mind when he uttered that modern business truth.

Slab zinc manufacturers are prone to dwell upon the "furnace recovery" element in their work. That factor, though, is only an integral part of their big problem, namely, reduction of their costs. There are some zinc men who must learn that economy is not only the saving, but also the spending of time, money or anything else to the best possible advantage. There are also some zinc men who must stop thinking that a thing is not right because they do not do it, that a method is not good because they do not use it, and that equipment is not the best because they do not own it; in other words, these zinc men must awaken to the fact that the wisest of us has much to learn.

The modern formula for reducing costs is: (1) Gathering and classifying

all that is to be learned about each operation; (2) carefully selecting and progressively developing men for the work to be done; (3) bringing the men and the work together.

Is that the formula generally followed in the zinc industry in the United States? It is not! Unit cost, not merely furnace recovery, must henceforth be the objective of the zinc plant manager. The study of materials used, including their handling and conversion, is one of the most important problems confronting the zinc industry of the United States today, as is lucidly set forth in Mr. Stone's paper.

One of the leading zinc companies of the United States quoted in a recent advertisement: "Research is a financial asset. If industry is to continue to guarantee prosperity, it must keep in direct touch with the vanguard of technical knowledge and skill. Modern industry no longer has to take whatever is available. It decides what characteristics are needed in the metals or chemicals, and then delegates the research laboratory to provide the necessary element." That zinc company practices what it commends by reproduction, and prospers accordingly.

The foregoing briefly outlines the fundamental principles underlying the work which must be done to establish and maintain a foreign market for United States-made zinc. This is a work which peculiarly belongs to the American zinc Institute. As the representative of the zinc industry of the United States, therefore, the Institute stands ready to co-operate through its Development of Industry Committee with the zinc manufacturers of the United States in studying, analyzing, charting, diagramming and putting each and every operation in their plants to a test in the light of world practice with a view of reducing their zinc costs below those of other nations.

The zinc men of the United States can reduce their unit cost through such a co-operative movement. If they will do so they will be able profitably to compete in the world's zinc markets when the economic conditions in the other nations return to normal. If they will not do so they will simply continue to supply for a time what will eventually prove to have been an incidental European market. *The future of the zinc industry in the United States of America is in the hands of the members of the American Zinc Institute.*

The Engineers' Club of Northern Minnesota met at the Mohami Club, Virginia, Minn., on Sept. 25. Graham Bright, of the Westinghouse Electric & Manufacturing Co., gave an illustrated talk on the modern electric hoist.

\*This article is the leading article in the October issue of the American Zinc Institute *Bulletin*.

<sup>1</sup>American Zinc Institute, 1920 Annual Meeting *Bulletin*, p. 29 et seq.



## Technical Papers

**Mining Law**—A series of volumes on mining law, embracing the mining law of the British Empire and foreign countries, will shortly be published for the Imperial Mineral Resources Bureau. Address H. M. Stationery Office, Westminster, London, S. W. 1. The purpose of the series is to provide an up-to-date and authoritative exposition of the mining laws in force in different parts of the world, available both for the legal profession and for all those who are in any way interested in mining and minerals. In the first place the mining laws of the British Empire will be discussed and a commencement has already been made with those of Nigeria and of the Gold Coast, which form the first two volumes of the series and will shortly be issued. The price of the former will be 15s. 6d. postpaid. The third volume, which will deal with the Transvaal, is in course of preparation. Each volume will contain a critical analysis of the statute and case law, and will include the full text of the laws, ordinances, proclamations, regulations, rules and notices, which are directly or indirectly material to the subject matter of the work. The volumes will be revised and brought up to date periodically by the issue of supplements.

**Molybdenum**—Molybdenum has become much more important than formerly. Accurate methods of assaying are necessary, as the old methods left much to be desired. The Bureau of Mines has investigated the subject and has just issued Technical Paper 230 (obtainable from the Superintendent of Documents, Washington, D. C., for 5c.) entitled "Determination of Molybdenum." Improved volumetric and gravimetric methods, more accurate than any previously devised, are described.

**Gold in Black Sand**—Some tests were carried out by the Alaska station of the Bureau of Mines on the separation of gold from a black sand containing over 90 per cent of magnetite and garnet. The most satisfactory method of treatment was found to be barrel amalgamation in the presence of caustic soda. U. S. Bureau of Mines *Reports of Investigations*, Serial No. 2,158 (five pages), obtainable on request from the Bureau at Washington, tells about the work.

**Mineral Statistics**—The following separate sections of "Mineral Resources of the United States" have recently been issued by the U. S. Geological Survey, Washington, D. C., and may be obtained without charge: "Clay-working Industries, Silica Brick, etc., in 1918" (pp. 90); "Platinum and Allied Metals in 1919" (pp. 12); "Lithium Minerals in 1919" (pp. 6); "Abrasive Materials in 1918" (pp. 17); and "Cobalt, Molybdenum, Nickel, Titanium, Tungsten, Radium, Uranium and Vanadium in 1917" (pp. 60).

**Drill Bits**—Walter E. Carr in the September issue of *The Compressed Air Magazine* (11 Broadway, N. Y., 25c.), has a one and one-half page article entitled "Getting Best Results from Rock Drill Bits." Drilling speed can be vastly increased, and the number of bits to be resharpened considerably reduced, by the use of modern drill bits and sharpening equipment.

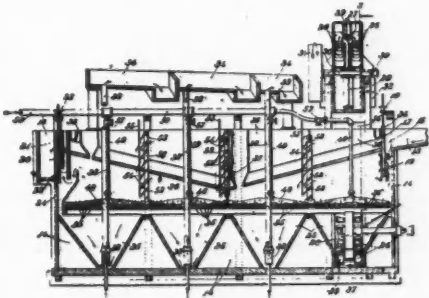
**North Dakota Oil**—A nine-page pamphlet, Bulletin No. 1, has been issued by the North Dakota Geol. Survey, Grand Forks, N. D. (free) describing the petroleum possibilities of that state. Small amounts of gas have been developed, but few wells have been drilled and no oil in commercial quantity has been found.

**Gas in Kansas**—The State Geological Survey of Kansas (Lawrence, Kans.) has issued Bulletin No. 5 (32 pages) on the Elk City gas field (free). The first well was drilled July 12, 1918. So far, 52 producing wells have been drilled averaging 27,000,000 cu.ft. daily.

## Recent Patents

**1,351,096. Apparatus for Separating or Concentrating Ores.** David Cole, El Paso, Tex., assignor to Minerals Separation North American Corporation, New York, N. Y. Filed Dec. 4, 1915.

A hydraulic sizer comprising a tank having an inlet at one end, an outlet at the opposite end, and a plurality of sizing compartments at the bottom, said tank being constructed and arranged to permit a free flow of material therethrough in a substantially horizontal direction from said inlet to

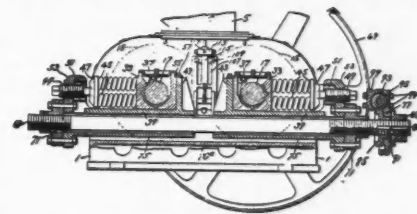


said outlet and above said compartments, and a series of vertically disposed spaced sets of shutters within said tank, said shutters having slats downwardly inclined in the direction of flow.

**1,350,748. Crushing-Roll Machine.** Thomas J. Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co., Boston, Mass. Filed Feb. 13, 1917.

A machine comprising, in combination, a bed, carriages slidably mounted on said bed, a pair of opposed crushing rolls carried by said carriages, a pair of adjusting shafts threaded to both of said carriages, worm wheels on said shafts adjacent one end of said base, a

cross shaft having worms meshing with said worm wheels simultaneously to rotate said adjusting shafts to vary the space between said crushing rolls, heads connected to said shafts adjacent one



end of said bed, and means detachably to secure said heads to said bed to confine said adjusting shafts against axial movement.

**1,350,440. Apparatus for Agglomerating Ores.** Edward W. Davis, Duluth, Minn. Filed Nov. 19, 1918.

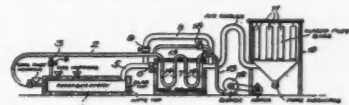
The combination in sintering apparatus of a track, a series of trucks mounted on said track to receive charges of material to be sintered, a vacuum chamber adjacent said track, means for forming an air-tight communication between each of said trucks and said vacuum chamber during the travel of said trucks adjacent thereto, and reciprocating feeding means mounted adjacent



said track and adapted to move said series of trucks by engagement with one of them, said feeding means having a part adapted to engage one of said trucks automatically upon its forward stroke and to pass by said truck upon its return stroke.

**1,350,286. Process of Treating Ores.** Lewis Bailey Skinner, Denver, Col. Filed Feb. 10, 1919.

The process of treating complex zinckiferous ores carrying precious metal values which comprises preparing a mixture of an oxidized ore of the character specified with an excess of carbonaceous reducing material, the mixture containing matte-forming constituents, charging said mixture on the hearth of a reverberatory furnace, firing the furnace with suitable fuel



and smelting the charge at a furnace temperature of at least about 1,200 deg. C. to produce molten matte and supernatant slag shielded by a non-oxidizing atmosphere, conducting from the furnace fume resulting from reduction and volatilization of zinc from the charge, and continuing the heat treatment of said molten mass until slag tapped from the furnace contains not substantially more than about 6 per cent zinc.

## MEN YOU SHOULD KNOW ABOUT

**Alfred H. Brooks** expected to arrive in Seattle Sept. 27.

**R. L. Agassiz**, president of Calumet & Hecla Mining Co., has gone to Houghton, Mich., on an inspection trip.

**L. M. Prindle** is doing geologic field work in the Hoosic-Bennington quadrangle in Vermont and Massachusetts.

**R. E. Davis** has resigned as director of the Wisconsin Mining School, Platteville, Wis., to engage in private practice.

**Ravenel Macbeth**, secretary of the Idaho Mining Association, is at the Arlington Hotel, Washington, D. C., for an indefinite stay.

**John R. Hall**, of Knauth, Nachod & Kuhne, has returned from an inspection of Alvarado Mining & Milling Co., Parí, Chihuahua, Mexico.

**J. S. Bradford**, mining engineer, formerly general manager at Chiksan Mines, Chosen (Korea) is now at Gensan, Korea, P. O. box No. 14.

**F. E. Downs**, mill superintendent with the Mexican Corporation, Ltd., Taziutlan unit, has resigned that position and is now in Mexico City.

**V. Durand**, mining engineer and graduate of Saint Etienne in 1906, has been appointed chief engineer of the Mines de la Chazotte, France.

**Warren R. Roberts**, chairman of the coal section of the standardization committee of American Mining Congress, is making a visit to western Canada.

**U. H. Berthier**, mining engineer, who was at Monterrey, is now assistant superintendent at the Mapimi smelter, Durango, Mex., of Cia. Minera de Penoles.

**H. N. Lawrie**, economist of the American Mining Congress, has completed his trip through the gold camps of the country, and is again at the Washington headquarters.

**Donald B. Gillies**, vice-president of the McKinney Steel Co., has returned to Cleveland, Ohio., following a visit to the company's mines in the Lake Superior district.

**W. S. Bayley**, of Urbana, Ill., is at Murphy, N. C., continuing the investigation of the iron ores of North Carolina, begun last summer by the North Carolina Geological Survey.

**W. K. McNeill** and **W. R. Rogers**, of the Ontario Department of Mines, were in charge of the Ontario exhibit at the National Exposition of Chemical Industries in New York last week.

**W. G. Mather**, of Cleveland, Ohio, president of the Cleveland-Cliffs Iron Co., and the directors of the company have been on a tour of inspection of the company's holdings in Michigan and Minnesota.

**John L. Agnew**, general superintendent of the mining and smelting division of the International Nickel Co., is

traveling by automobile from the works at Copper Cliff, Ont., to Kentucky.

**W. T. Lee**, of the U. S. Geological Survey, is completing field work on the coastal plain of Maryland and Virginia. He has made airplane observations of submerged topography.

**M. Pigeot**, director of mines of Montrambert, who was nominated Chevalier de la Légion d'Honneur recently, has been presented with a rich jewel of the order by the personnel of the Montrambert company.

**I. G. Wheaton**, during the past four years in charge of operations at Gowganda, for the Crews McFarlan Mining Co., Ltd., has been appointed superintendent of the Wachman Mining & Milling Co., Ltd., Dryden, Ont.



Harris & Ewing, Photo.  
EDSON S. BASTIN

**E. S. Bastin**, now a member of the geologic staff of the University of Chicago, has severed his connection with the U. S. Geological Survey, effective Oct. 31. Mr. Bastin has been teaching economic geology at the University of Chicago since the first of the year, but has maintained a part-time relationship with the Geological Survey.

**W. B. Plank**, mining engineer, who has been in charge of the Birmingham district for the U. S. Bureau of Mines, has resigned to accept a position as instructor of mining engineering at Lafayette College, Easton, Pa.

**L. A. Butler**, mining engineer, expected to sail Oct. 2 for West Africa, where he will be engaged in engineering work. His address will be Dun Du, via Pema, care of Caixa 347, Loanda, Angola, West Africa.

**William Guggenheim**, **J. Leonard Replogle**, of Vanadium Corporation of America, and **Eugene Meyer, Jr.**, of New York City, were among those receiving the decoration of Commander of the Italian Order of the Crown on Sept. 23, at a luncheon by F. Quattrone in honor of Mr. Guggenheim.

**John A. Burgess**, recently resigned as general manager for United Eastern Mining Co., Oatman, Ariz. He has opened private offices at 648 Mills Building, San Francisco, Cal.

Among the members and guests registering at the Petroleum Section meeting of A. I. M. E., at St. Louis, we noted **R. Van A. Mills**, Washington, D. C.; **F. W. DeWolf**, Urbana, Ill.; **Arthur Knapp**, Shreveport, La.; **John L. Henning**, Lake Charles, La.; **E. W. Ames**, Ft. Worth, Tex.; **S. O. Andros**, Galesburg, Ill.; **Winslow H. Herschel**, Washington, D. C.; **Walt M. Small**, Tampico, Fla.; **Wallace E. Pratt**, Houston, Tex.; **Ralph Arnold**, Los Angeles, Cal.; **Arthur Thacher**, St. Louis, Mo.; **John R. Roberts**, Eastland, Tex.; **David White**, Washington, D. C.; **L. A. Mylius**, Urbana, Ill.; **J. E. Wallis**, Los Angeles, Cal.; **Mowry Bates**, St. Louis, Mo.; **D. F. Sullivan**, Chicago; **W. J. Howard**, St. Paul, Minn.; **L. S. Wetzel**, Clayton, Mo.; **Ralph R. Matthews**, Wood River, Ill.; **Joseph L. Tweedy**, Dallas, Tex.; **Edgar Kraus**, Houston, Tex.; **R. D. Meyer**, Denver, Col.; **F. J. Fohs**, New York City; **Wilbur A. Nelson**, Nashville, Tenn. and **J. W. Gerhard**, St. Louis, Mo.

## SOCIETY MEETINGS ANNOUNCED

**Canadian Institute of Mining & Metallurgy** will hold its Western Meeting in Winnipeg, Man., Oct. 25, 26 and 27. Headquarters will be the Fort Garry Hotel, in that city. The program includes worth-while papers on the oil, coal, copper, gold and other mining industries of western Canada. Exhibits of all minerals known to occur in Manitoba and the west will be shown.

The Institute extends an invitation to all members and to all others interested in mining to come to Winnipeg for this convention. Those intending to be present should send their names and addresses promptly to the secretary, **W. W. Berridge**, P. O. box 3076, Winnipeg, Man., Canada.

**The New York Section of American Institute of Mining & Metallurgical Engineers** holds its regular monthly meeting on Oct. 6, at the Machinery Club, 50 Church St. After the informal dinner at 6:30 the members will hear an unusually interesting address. **Courtenay De Kalb** will give a talk on "A Visit to Some of King Solomon's Mines." He will refer in particular to the Rio Tinto and the Almaden mines, illustrating his comments with unusual stereopticon views. A general discussion will follow the talk, and many of those present will be expected to take part.

This is the first Fall monthly meeting and a large attendance is expected. Those coming to the dinner (\$2, payable at the dinner) are requested to advise at once the treasurer, **E. L. Gruver**, 25 Broad St. (phone Broad 6768).



# Petroleum Section of A. I. M. E. Meets in St. Louis

Two-Day Convention Draws Many Specialists — Paper on Russian Oil Fields Proves of Great Interest — Members Entertained by St. Louis Section of Institute — Anheuser-Busch's Bevo Well Gushes for Occasion

BY H. A. WHEELER

Special Correspondent *Engineering and Mining Journal*

The Petroleum Section of the A. I. M. E. held its first independent meeting at St. Louis, Mo., on Sept. 21 and 22, the St. Louis Section of the Institute acting as host to the visitors. By thus convening at a location midway between the financial centers of the East and the field workers of the West, it was anticipated that it would draw a larger and more representative attendance of geologists and oil specialists than do the usual general meetings of the Institute, where the oil section is a minor feature. It was also an effort to attract to the Institute some of the numerous workers in the Western fields, who thus far have not affiliated with the A. I. M. E., many of whom are members of the American Petroleum Association, an essentially Western organization. With this latter object in view Ralph Arnold, chairman of the Petroleum Section, issued invitations to all the members of the latter organization, some of whom took advantage of the opportunity to attend this special oil convention.

The meetings were held in the assembly room of the American Annex Hotel, which was the headquarters of the convention and where ample room was found in spite of a shortage of accommodations in the city caused by a very large convention of retail druggists that was held during the same week.

The petroleum convention was attended by over one hundred members and guests. The first day was devoted to a morning and an afternoon session for reading and discussing papers, with a smoker in the evening that afforded an opportunity for social "section" meetings. The morning of the second day was devoted to papers and discussions, but proved far too short to permit justice to be done to all the papers, and some of the discussions had to be omitted for lack of time. On Wednesday afternoon most of the members relaxed by making a sight-seeing trip about St. Louis, in the course of which they stopped at the very interesting Bevo plant of the Anheuser-Busch brewery and sampled some of the latest product. A hasty visit was also made to the Shaw Botanical Gardens, one of the largest and most noteworthy in this country. Some of the members visited the large new refinery of the Roxanna Oil Co. at Wood River, Ill., and a few inspected the experimental shale oil plant of the Industrial Process Co. of St. Louis.

Twenty papers were presented, some of which evoked very active discussions. The origin of the coastal salt domes came up several times and produced such prolonged discussions as to sug-

gest a special meeting and section on salt domes. The advocates of the volcanic origin of the salt plugs decidedly predominated, their views being in harmony with those accepted regarding similar Mexican coastal pools, in which the dome structure is unquestionably due to vulcanism.

An innovation of the meeting was the presentation of papers by foreign members, these including a paper on Brazilian oil shales and a very interesting review of the rich Russian oil fields, a brief extract of which is hereafter given. The meetings were presided over by Ralph Arnold, chairman, and by E. L. DeGolyer, vice chairman, of the Petroleum Committee of the Institute.

## RUSSIAN OIL FIELDS DISCUSSED

The most interesting paper of the meeting was an excellent, comprehensive review of the "Oil Fields of Russia" by A. Beeby Thompson, of London, the eminent oil geologist. These fields are but little known in this country, although according to Mr. Thompson's figures they are the richest that have ever been opened. They have been of very great importance to Europe in the past and are destined to regain this leading position in the future when Russian conditions become sufficiently settled to permit of their being reopened and extended. According to geologic evidence, the future output is likely to exceed the past brilliant record, especially since the recent introduction of American methods that have greatly decreased the cost of drilling and operating.

Two districts have thus far produced most of the oil, of which Baku, on the shores of the Caspian Sea, pre-eminently leads as a producing, refining and shipping center, while the Grozny field exceeds the combined output of the minor oil fields thus far developed. The oil is of a heavy, asphaltic grade that yields small amounts of gasoline, considerable kerosene and a large amount of fuel oil or residuum. It is this large fuel oil yield that is destined to become very important in the future as a dangerous competitor to the American and Mexican exporters in supplying the European markets when normal conditions again prevail in Russia.

The oil occurs on well defined structures and is produced from eight or more sands of Tertiary age that occur in unconsolidated sediments. The surface seepage of oil, asphalt, gas springs, and mud volcanoes are very noteworthy, and abundant, and some oil has been produced from shallow pits. Submarine gas issues are an interesting

feature of the Caspian Sea and have caused such violent ebullitions as to capsize boats.

The wells are mainly shallow and the deepest do not exceed 2,000 ft. They are drilled with rods operated by a walking beam and are cased with "stove-pipe" or riveted casing, the initial sizes being 36 to 42 in. The system is very crude, slow (taking one to three years) and very expensive, the costs per foot ranging from \$12 to \$25 before the war, in spite of very cheap labor, of which about 50 per cent is for casing. The Russian engineers were unable to use the American cable or rotary systems successfully and have been highly antagonistic to recent attempts to introduce American practice. The system of operating after the wells cease flowing is by bailing with large, high speed bailers, as the excessive amounts of sand produced with the oil, 50 per cent in some cases, renders pumps prohibitory. The cost of bailing a 120-bbl. well was 20c. per barrel in pre-war times. The air lift system has also been successfully used.

## ROTARY SYSTEM OF DRILLING PROVED BETTER

Recent results under American control, after months of obstacles and delays through the excessive jealousy of the Russians, have proved that the rotary system is not only very successful but in offset wells has shown a very great saving in time, costs and freedom from accidents, while the 10-in. screw-joint casing proved vastly more efficient than the huge, costly riveted Russian casing. In the discussion that followed Arthur Knapp stated that where 50 to 75 per cent of the wells put down by Russian methods failed to bottom successfully, the use of American methods resulted in only half as many failures, besides affording a very large saving in time and cost; that he had successfully employed American pumping methods for extracting the oil after the well ceased flowing with a marked saving and much less risk than with the Russian bailing, with its heavy wear and tear of ropes and casing, excessive power and greater risk from accidents. By employing screens below the pump, an innovation in Russian practice, he had greatly reduced sanding troubles.

## OUTPUT PER ACRE LARGE IN RUSSIAN FIELD

The most interesting feature of the Russian wells is the phenomenally large output per acre, as the yields vastly exceed anything known in American practice. The Grozny field has produced 300,000 bbl. per acre and the Baku

field 500,000 to 2,500,000 bbl per acre. A tract of 250 acres produced over 1,500,000 bbl. per acre where twelve sands were struck that aggregated several hundred feet in thickness. The Balakhany-Saboontchy field of Baku, comprising about 2,600 acres, has out-putted 500,000 bbl. per acre and is still capable of enormous collective production, although the output of the individual wells is now small.

Individual gushers or "fountains" have come in at 25,000 to 100,000 bbl. per diem, but the flow lasts only a few days and the gusher period is a thing of the past in the developed fields. The ultimate yield per well declined from 675,000 bbl. in 1892-1896 to 225,000 bbl. in 1912.

A typical well in the Grozny field yielding an ultimate output of 80,000 bbl. is cited as producing 50 per cent of its total production in the first year, 22 per cent in the second, 15 per cent in the third and 7½ per cent in the fourth year.

Russian production started in 1863 with 37,400 bbl. and increased to 203,000 bbl. by 1869 and became very active in 1877. From 1898 to 1901 the Baku fields produced about half of the world's oil output. The approximate output to 1918 is as follows:

	Barrels
Baku district, from 3,600 acres.....	1,652,610,000
Grozny district, from 8,000 acres.....	139,858,000
From 7 minor districts.....	61,526,000
Total.....	1,853,994,000

The Russian statistics are usually given in the local term *poods* and a barrel is equivalent to 8.3 *poods*.

#### DEEP DRILLING OF SALT DOMES ON GULF COAST URGED

In a paper on the "Urgency for Deeper Drilling on the Gulf Coast," A. F. Lucas urges the testing with very deep wells, under careful geologic guidance, of the salt domes of the coastal region to depths of at least 7,000 ft. He argued that the present high price and assured greater demand for oil warrant such deep exploration, especially as there is considerable promise of it being successful and that improved rotary drilling methods now render such great depths feasible. Capt. Lucas is inclined to regard the salt, sulphur and oil as contemporaneous, and referred to crystals of salt that contain oil, gas and sulphur, in which view Arthur Knapp concurred. Whereas Capt. Lucas formerly regarded the origin of the salt cores as due to crystallization from solution, he is now favorably disposed to the more prevalently accepted theory that they are due to volcanic plugs.

H. E. Williams' paper on "Oil Shales and Petroleum in Brazil" stated that Brazil has encouraging prospects for developing into an oil producer and has extensive amounts of oil shale of good grade that is now being studied and tested by government experts.

#### WATER PROBLEMS CONSIDERED

The paper on "Oil-field Water Problems" by A. W. Ambrose brought out

the great importance of careful observation by production engineers of the source and volume of oil field waters through chemical analyses. Casing records should be kept, he said. Subsequent variations are apt to occur in the analyses of the waters from a given well through changes that occur during the different phases as the gas volume decreases, with a consequent decline in vapor carrying capacity. The paper caused much discussion that brought out the very great importance of not drilling too deep into or too close to the underlying water table that occurs in most Mid-Continent oil fields.

It was shown by Mr. DeGolyer that in Mexico the life of some of the large gushers had been greatly prolonged by throttling down or reducing the output of the flowing wells when water or sediment began to show and to continue throttling or pinching the output as the wells increase in age. It was also thought that a sharp distinction must be made in studying water encroachment in the character of the oil, as the greater the viscosity the greater the danger of condemning and abandoning a well before the available oil was completely recovered through the tendency of the water to advance faster as the oil was recovered by pumping. That with thin, light oils, like the Pennsylvania, with a very low viscosity, the oil and water advanced at about an equal rate to the well, whereas Mid-Continent oils would drag and lag behind the advancing water, which would be still more marked in the very viscous California oils. Mr. DeGolyer cited Mexican wells where a close watch of the temperature has enabled them to forestall water trouble by prematurely throttling before the water appeared, when the oil temperature rose above normal. The underlying water is 14 deg. to 18 deg. warmer than the pure oil and hence warned of its threatened appearance in advance by the increase in temperature. R. A. Conkling, of the Roxanna Company, referred to a well-drilled lease in Oklahoma that had been kept free from water trouble through stopping drilling some distance above the water table, whereas the adjoining leases were making heavy water from the same sand by having drilled too deep and into the water table.

#### INEFFICIENT USE OF OIL AS FUEL POINTED OUT

The paper by W. N. Best on "Efficiency in Use of Oil as Fuel" brought out an interesting discussion that showed that although many burners now on the market are more or less unsatisfactory and wasteful, this is usually owing to lack of knowledge in using burners under the great range of conditions existing; that if thorough atomization of the oil is attained, whether by steam or air pressure, and if the oil is reliably fed by eliminating sediment and foreign clogging matter, successful results are readily attainable. This requires the oil to be heated to secure a thin, easily fed liquid, if residuum is used, supplied by tanks or pumps.

The short paper by J. E. Hackford, of London, on the "Nature of Coal" was a suggestive and thoughtful study from a purely chemical viewpoint of the marked similarity in the constituents of some coals with some of the oxidized products of petroleum, like albertite, grahamite, gilsonite and others, and he cited the prolonged litigation that has occurred in attempting to distinguish legally between such similarly appearing products as a connecting link.

The paper on "Oil-field Brines," by C. W. Washburne, elicited a keen discussion by R. A. Mills and E. DeGolyer on the coastal salt domes. A corollary of Mr. Washburne's paper shows that the salt cores could not have been formed by precipitation from salt solutions, as they cut across many open sands that outcrop at a higher elevation farther inland, in which artesian circulation would result from an upward movement at the site of the salt core and consequently the salt cores must be intrusive plugs. This was disputed by Mr. Mills, who maintained that the strong salt solutions would seal up and close the pores of the porous horizons adjacent to the salt core by precipitation.

F. J. Fohs presented an incomplete but comprehensive paper on the "Gulf Cretaceous Oil Fields" that was liberally illustrated by maps of the main structural features of the northern Louisiana oil fields and several local maps of individual structures. This paper will be subsequently enlarged before it is submitted for publication. Lack of time prevented a discussion.

#### CONDITIONS IN ILLINOIS FIELDS CONSIDERED

L. A. Mylius, of the Illinois Survey, presented a brief review of "Present Conditions in the Illinois Oil Fields," which are now producing about 12,000,000 bbl. annually and have shown an annual shrinkage of about 15 per cent since 1908, the zenith year, when 33,686,238 bbl. was produced. He cited the recent deep developments in the old shallow Casey field, where good wells are now being obtained from the Trenton limestone at about 2,400 ft., as compared with the 300 to 600 ft. horizons in the Coal Measure that opened up the eastern Illinois fields.

H. A. Wheeler gave a brief review on "Faulting in the Illinois Oil Fields" that showed that faults had thus far proved destructive on otherwise promising structures through leakage in favorable districts and that faults were much more numerous in the western part of the state, where it was within the zone of the influence of the Ozark uplift of Missouri. He cited an example where oil is migrating today through a heavy fault in the Centralia district, as shown by its marked accumulation in the old, worked-out rooms of a coal mine through which the fault passes.

The local committee on arrangements consisted of H. A. Wheeler, chairman; Prof. W. E. McCourt, secretary; J. E. Caselton, F. V. Desloge, J. D. Robertson and Arthur Thacher.



# THE MINING NEWS

## LEADING EVENTS

### Special London Letter

**The Threatened Strike of Coal Miners—  
New Minerals in Derbyshire—  
Mineral Resources Bureau  
Busy—Katanga To Is-  
sue New Capital**

BY W. A. DOMAN

London, Sept. 14—The threatened strike of coal miners and the attitude of labor generally are dominating not only the mining world but industrial and political spheres as well. Through the Coal Association the colliery owners are setting out very important facts concerning the earnings, output and slacking of the miners, which certainly do not confirm the altruistic claims of the latter. By their leaders they have refused every avenue of inquiry which would have ensured to them an impartial hearing, and consequently other branches of labor and the public generally are being antagonized. It is the more unfortunate because there is big business in contemplation which capitalists are deferring for the present. For instance, in a mining direction the Chemical & Metallurgical Co. has a plant to erect for one of its processes, and the François Cementation Process is debarred from proceeding with its contracts. Colliery owners are scarcely likely to sink additional shafts and open up new pits with the general position so uncertain.

It is announced that half a dozen new minerals have been discovered in the Peak district of Derbyshire by Mr. Garnett, the most important being cobalt. The others are diabantite, nephrite, cimolite, utahite, sulphur and allophane. The Peak district is one of those wild places that would fit in anywhere; one could even find gulches to satisfy the American promoter. Its geological appearance is such that no one would ever be surprised at the discovery of any mineral there. Lead is being principally worked by small syndicates. The veins, however, are narrow, and their extraction would not support a big company. This is one reason why English capital seeks an outlet at the other end of the world.

The Imperial Mineral Resources Bureau is getting to work. It is issuing pamphlets treating of certain base metals, and is also dealing with the mining laws of the British Empire and of foreign countries. It has a big program, but if carried out it will prove invaluable to the government and traders alike. The war showed us our backwardness in respect of mineral knowledge.

Tin interests are still at work endeavoring to fix a minimum price for the metal. It is argued that as there

### WEEKLY RÉSUMÉ

*The strike of miners on the Comstock Lode, in Nevada, remains unsettled, except at the Northend mines, in spite of concessions offered by the operators. Likewise in the Slocan, in British Columbia, the men who struck last May are still out and the shortage of labor is hampering operations. Canada Copper's concentrator at Allenby, B. C., is expected to be running soon when shipments will be made to Trail. The recent advance in freight rates in the United States has been discussed at conferences of operators held in Salt Lake City and Phoenix, Ariz. In the iron country a project to explore the western end of the Marquette Range is under way. The Northwestern is planning to increase the capacity of its Ashland ore docks and improvement of the Great Northern's docks at Alouez Bay has been started. Nov. 15 has been set by the Federal Trade Commission for a re-hearing of the Pittsburgh steel basing point case. In South Dakota at Deadwood the Iron Hill tunnel has reached its objective. In Illinois, various companies in the fluor spar district are affected by a strike of their employees. Explosives experts of the U. S. Bureau of Mines at Washington have undertaken to study the recent Wall Street explosion.*

*From abroad comes word that Katanga is to increase its capital and that the Knight's Deep stamp mill on the Rand has been destroyed by fire.*

are only about 150 producing mines and some of them of only secondary importance the thing is quite feasible. There is certainly a "live wire" in it—Oliver Wethered. He is a born optimist.

The Union Minière, which controls the great Katanga copper belt, in which Tanganyika Concessions is interested, is reported to be about to issue new capital at 800 francs in the proportion of one new share for six old. There is ample scope for the employment of additional funds, though the production of copper is about 2,000 tons per month.

For last month the Rand gold output is rather disappointing, for while the value is satisfactory—£3,940,216 against £3,864,520 in July—owing to the high price at which the metal is taken, namely, £5 12s. 6d. per oz., labor is again short as usual at this season of the year. The Far Eastern portion of the Rand continues to contribute the greatest amount of gold, and this time the Brakpan and Spring Mines, which for some months have done rather badly, are well to the fore with increased profits. The Anglo-American Corporation of South Africa is largely interested in these mines, and as their quotations have fallen so has that of the Anglo-American Corporation in sympathy.

### Knight's Deep Mill Burned

Fire destroyed the engine room and a 400-stamp mill at Knight's Deep, Ltd., East Rand, Transvaal, on Sept. 20. The damage is estimated at £100,000.

### Comstock Mines, Except Northend Group, Remain Shut Down

**Men Refuse To Accept Operators' Terms Upon Instruction From Union To Stay Out**

The following notice was recently issued by the mine operators of the Comstock district of Nevada to the striking employees:

"In order to arrive at a solution of the labor troubles of the Comstock district, the superintendents have considered the following facts:

"First: That there is no operation on the Comstock lode that is at present in a paying condition and that an increase in wages would be disastrous to all.

"Second: That the prevailing high cost of living is working a hardship on many of the families of the district. The operators have already issued a statement setting forth the fact that they are unable to meet the wage increase, and also their belief that the cost of living is now on the decline. It appears that there is some doubt in the minds of the miners as to the merits of this statement.

"The principal grievance or complaint of the miners seems to be that they cannot live on the present wage in face of the cost of living. With the above facts in mind the operators propose a plan which, it is believed, will in every way answer the demands of the miners for lower living costs and at the same time will provide an absolute guarantee on the part of the operators that the cost of living will materially decrease.

"The proposal is as follows: (1) The scale of wages will be the same as that which has prevailed during the past year. (2) Beginning with the day of the acceptance of this proposal miners or their families may go to the operators' general merchandise store and procure any of the commodities carried in stock at a price 20 per cent below present wholesale prices. This will bring commodities a shade below wholesale prices of 1917 and in reality will result in a saving that will average 35 per cent as compared with present retail prices. The operators, in establishing these reduced prices, desire the co-operation of the advisory committee of miners so there may be no dissatisfaction in this arrangement. Under this plan the operators assume the financial responsibility for any losses that aforesaid store may suffer, either through price changes, upkeep or overhead. (3) Room and board, including rooms with bedding and sheets, will be supplied to single men for \$39 per month, which is a reduction of over 20 per cent under present living costs.

The operators make this proposal as a guarantee of their belief that the cost of living will decrease and in a spirit of fair play.

"(Signed)

"H. L. SLOSSON, JR.  
"GEORGE H. DRYSDALE  
"ALEXANDER WISE  
"R. A. HARDY  
"H. B. BULMER"

After the appearance of this notice on the part of the operators the United Comstock Mines Co. offered to give the miners in its employ contracts instead of day's pay. Under this arrangement a number of the miners returned to work but the following notice from the Gold Hill Miners' Union stopped all further work:

"NOTICE FROM GOLD HILL  
MINERS' UNION

"That the minimum be a flat scale of \$6 for eight hours' work, and that there be no bonus and that men taking contracts receive a minimum of \$7 a day and recognition of the union.

"THOMAS ODGERS, president  
"W. J. STACK, secretary"

The situation at present is that work has ceased except in the Northend group of mines under Superintendent Alex Wise. At these properties the \$6 per day wage has been granted by the superintendent.

### Canada Copper's Mill Ready To Start

The Canada Copper Corporation expects that the new power line to its mill at Allenby, B. C., will be delivered to it complete by Oct. 4. It is stated that there will then be no reason why operation of the mill should not begin within a few days thereafter. The full capacity of the concentrator, namely 2,000 tons, will be worked up to as rapidly as possible. Shipments of concentrates to Trail will begin promptly. The plant has been standing idle since its completion about nine months ago. The railroad is completed and in operation and the heavy machinery has now been moved from Princeton up to the mine and is being rapidly installed on its foundations.

### Northwestern Ry. To Increase Capacity of Ashland Docks

The Chicago & Northwestern Ry. is to make an addition and improvements to its No. 3 ore dock at Ashland, Wis., on Lake Superior, during the coming winter. The dock will be lengthened 1,000 ft., extending it clear to the harbor improvement line. This will give 340 pockets instead of 200, and the total storage capacity of the company's three docks at that point will be increased to 213,000 tons. All pockets will be operated electrically. The Soo line has one dock at Ashland which has a capacity of 53,000 tons. All of the ore from the Gogebic Range passes through Ashland during the period of navigation and it is expected that this year's shipments from the range will total about 8,000,000 tons. A large increase is looked for next year.

### Slocan's Season Output Crippled by Strike Situation

Operators, Except Silversmith Mines, Standing Pat in Refusing to Employ O. B. U. Members

Since the One Big Union called a general strike in the Slocan, in British Columbia, on May 1 last, the operators, excepting the Silversmith Mines, have refused to employ any man who is an O.B.U. They will, however, employ all men who may belong to other unions or are non-union. Under these conditions they have been and still are working very short-handed. In fact, it is said, this strike has crippled the Slocan output for the season, which promised well in the spring. The general feeling, according to the manager of one company, is that now is the time to take a determined stand and once and for all time to break up the O.B.U. by a concerted effort. The strikers had demanded a \$1 per day increase, also that the British Columbia Health Regulation Act be strictly adhered to and that all employees be provided with blankets, sheets, pillows and pillow slips.

Winter is approaching and many men will be released from various outside employments and naturally will look to the mines. Many of the mine workers who went out on May 1 went into the woods and harvest fields. These will probably return to the mines when bad weather sets in and the harvest is over. The prospects are not good, however, for securing a fair-sized crew soon, owing to the demand for building materials and lumber, which is likely to continue.

The 100-ton mill of the Noble Five mine at Sandon, erection of which was begun in May, 1919, was started Aug. 23 last and is operating but one 8-hour shift at present.

### Effort To Close Cascade Mill at Neihart, Mont., Fails

The effort of Attorney General Ford, of Montana, to close down the Cascade Mines & Milling Co.'s mill at Neihart, Mont., has failed. Some time ago, acting for local interests, the attorney general brought suit for an injunction requiring the company to desist from dumping its tailings into Belt Creek on the ground that the water was becoming polluted. Testimony was brought forward in favor of granting the order, but the company showed that if such an order was granted it would be absolutely necessary to close the mill down and consequently the mining properties of the company, thus throwing out of work a large number of men and injuring the only industry in the district. The judge, after having had the whole question under consideration for some time, has decided to refuse the injunction. The mill, which has only been running at half force since the proceedings were started, is now operating full capacity and more men are being put to work underground.

### Mine Managers Testify at Rate Hearing at Phoenix

Gila Copper Sulphide Paying 7½c. Per Ton More for Nine-Mile Haul

"Sick babies" was the designation applied to small producing Arizona mines by Grant H. Dowell, of the Phelps Dodge Corporation, at a State Corporation Commission hearing at Phoenix, Ariz., to pass upon a petition of the railroads to add 25 per cent to their freight tariffs. It was generally agreed that the increase suggested would stop production in a majority of the smaller properties of the state. Mr. Dowell said that smelting costs at Douglas had about doubled already through added transportation charges. Because of this his company in 1919 paid for customs ores \$225,000 less than in the previous year.

G. M. Colvocoresses, the general manager of the Consolidated Arizona smelter at Humboldt, told that increase in freight rates would put about 60 of his customs ores shippers out of business. Especially would there be harm to production at the Swansea mine, now under lease to his company.

Percy Williams, manager of the El Tiro lease at Silver Bell, gave figures showing that his company now is making a profit of 80c. a ton on ores that average 130 lb. of copper to the ton. The proposed freight increase would leave the company 45c. "in the hole" for every ton shipped. George Morris, manager of the Gila Copper Sulphide Co. at Christmas, Ariz., included his mine as one of the "sick babies" and aroused interest by showing that the Arizona Eastern had interpreted the 25 per cent raise as increasing his rate for the haul to Hayden from 22½c. to 30c. a ton. The distance is nine miles for about 250 tons a day. He insisted also that the proposed raise would affect the living costs of his workmen, now furnished supplies at cost, and thus wages would have to be raised in the same old unending round. The railroads claim the increase under the Interstate Commerce Commission's recent interstate order.

### Inspiration Sues State and County for Tax Refund

About \$1,430,000 is demanded from Gila County, Ariz., and the State of Arizona in a suit filed in the Superior Court by the Inspiration Consolidated Copper Co. and the International Smelter Co., of Miami, Ariz., on account of taxes alleged to have been erroneously collected of the plaintiff corporations during the years 1917, 1918 and 1919. The gross sum due the Inspiration is alleged to be \$1,264,000, while the smelter corporation demands repayment of \$41,824 for 1917, \$76,152 for 1918 and \$47,511 for 1919. It is alleged that the State Tax Commission, sitting as a board of equalization, raised the valuations unconstitutionally after the tax rate for Gila County had been fixed by the county assessor and county board of equalization.



### Utah Operators and Freight Officials Discuss Rates

#### Smelters Hit by Increase Effective on Outside Ores—Tonnage Decrease Caused

Mine operators of Utah, Nevada and California have been meeting in informal conference in Salt Lake City with freight officials of railroads carrying ores to the Utah smelters in regard to the matter of the increased rates on low-grade ores as ruled by the Interstate Commerce Commission. As has already been stated in these columns, the state public utilities commission of Utah has refused to allow the increase within the state, so that operators here are not materially affected. But the smelters are affected in the matter of ores coming from outside. It is felt that the 25 per cent increase granted will cause many properties to close down and others to curtail their output of low-grade ores. In Nevada there has been a revival of old producers, which are now adding to the tonnage of low-grade ores. Operators in Plumas County, Cal., according to representatives from that district, would have to close down almost entirely.

It was conceded that both smelters and railroads require tonnage to be able to maintain profitable operation. As none of the officials present were empowered to act, nothing was decided at the meeting, which was held in a friendly spirit. It is hoped, however, that the executives of the various railroads will consider the whole question in the near future.

#### Arizona Commercial Employees Take Short "Vacation"

A few days' "vacation" was recently taken by about 150 employees of the Arizona Commercial Mining Co. at Globe, Ariz., to enforce against Super-

intendent Plummer a demand that he cease to exercise authority in the employment of shift bosses, backing up the contention of a foreman that such authority was his own prerogative. When the foreman resigned, he was followed by the shift bosses and then by the miners, only the pump men remaining. The men went back to work after listening to a Federal mediator.

#### Pittsburgh Steel Basing Point Case To Be Re-heard

By a majority vote the Federal Trade Commission has granted motions filed with it for rehearing and re-argument in the matter of the application of the Western Association of Rolled Steel Consumers for the issuance of a complaint against U. S. Steel Corporation, et al., known as the "Pittsburgh Basing Point for Steel Prices" case. The commission has fixed Nov. 15, 1920, at 11 a.m. as the time for such rehearing and re-argument at the offices of the commission in Washington.

#### Inspiration Wins Long-Drawn-Out Damage Suit

Through a judgment of the U. S. Court of Appeals at San Francisco, reversing a verdict from the Federal court in Tucson, the New Cornelia Copper Co. finally is victor in one of the oddest cases ever known to mining litigation. On Nov. 27, 1918, a number of Mexican employees of the corporation built a fire to warm themselves while waiting for the time they should go to work. The fire was lighted against an old boiler, property of the company, but for some time unused. In the boiler was a quantity of dynamite stolen from the company hidden by thieves. There was resultant explosion of the powder, with consequent injury to the members of the group of men.

The widow of Jesus Maria Ochoa, killed, sued for damages, after refusing an offer of settlement by the company, which, however, at no time assumed any degree of responsibility. In the lower court she was given \$10,000. The appellate court fails to find where responsibility attached to the defendant for the explosion.

#### Quebec Asked To Found Radium Institute

The Faculty of Medicine of McGill University, Montreal, Que., has requested the provincial government of Quebec to found an Institute of Radium. The estimated cost is between four and five hundred thousand dollars, including the price of two grains of radium and the installation of a laboratory.

#### Recent Production Reports

Calumet & Hecla produced 7,520,107 lb. copper in August against 8,312,025 in July. Production by subsidiaries was as follows: Ahmeek, 1,608,200; Allouez, 49,200; C. & H., 4,259,566; Centennial, 0; Isle Royale, 791,551; La Salle, 0; Osceola, 647,629; Superior, 48,600, and White Pine, 115,361.

Burma Corporation produced 4,424,000 lb. refined lead and 243,340 oz. refined silver in August compared with 3,416,000 lb. refined lead and 190,070 oz. silver in July.

Chile Copper produced 10,640,000 lb. copper in August against 9,904,000 in July.

Kennecott Copper produced 11,268,000 lb. copper (including Braden's output) in August, compared with 10,656,000 in July.

Granby Con. M. S. & P. Co. produced 2,471,200 lb. copper in August compared with 2,400,000 in July.

Cie. du Boleo, Santa Rosalia, Baja California, produced 618,390 lb. of copper in August against 781,613 in July.

## NEWS FROM WASHINGTON

By PAUL WOOTON  
Special Correspondent

#### Wall Street Explosion To Be Studied by Bureau of Mines

##### Rice Confident TNT Was Not Used—Research Experiments Under Way

The Bureau of Mines has decided to make an exhaustive investigation of the explosion in front of the New York office of J. P. Morgan & Co. A preliminary investigation was made by George S. Rice, chief mining engineer of the Bureau, who happened to be in New York at the time of the explosion. C. E. Munroe, chief explosives chemist of the Bureau, and Spencer P. Howell, an explosives engineer, have been sent to New York to study the explosion. In this connection the Bureau is con-

ducting experiments to determine the exact effect when explosives are detonated on a platform such as was formed by the wagon carrying the charge which wrought such devastation in Wall Street.

Mr. Rice, who made the preliminary examination for the Bureau of Mines, is of the opinion that the damage done by the explosion was equivalent to the destruction which would be caused by 50 lb. of dynamite, but he does not mean that dynamite was necessarily the explosive used in Wall Street. He feels practically certain that TNT was not used. Mr. Rice made observations of the effects of explosives in the battle area in France and was able to use that

information in estimating the amount of explosive which had been used in Wall Street.

#### Iron Ores of North Carolina To Be Studied

Plans have been perfected for a cooperative agreement between the U. S. Bureau of Mines and the North Carolina Geological and Economic Survey to study problems pertaining to the marketing and treating of iron ores in North Carolina. The work will be confined to the magnetic iron ore fields, where it is believed improved methods will make possible a more extensive commercial exploitation of these ores.

### Salary Question Still Unsettled in Bureau of Mines

**Difficult To Hold Technical Employees  
at Present Pay—Resignations  
Continue**

The rapid turnover among the technical employees of the U. S. Bureau of Mines is continuing. Officials of the Bureau are convinced that the salary scale must be advanced to practically that which was recommended by the Re-classification Commission. It is a matter of fact that with the recent increases which it has been necessary to pay laborers at the Bureau of Mines some of the laborers were being paid at a higher rate than the technical men engaged in the work.

Alaska has been without a mining inspector for a number of months because no properly qualified engineer will accept the position for \$3,000, which is the statutory salary. After an investigation of the matter officials of the Bureau of Mines are of the opinion that the proper man cannot be secured for less than \$4,800.

### Vocational Board Training Men in Mining Engineering

The Federal Board for Vocational Education is training more than a hundred disabled ex-service men in mining engineering. These men have been enrolled at the following institutions: Harvard University, Huntington School (Boston), Columbia University, Carnegie Institute of Technology, Lafayette College, Lehigh University, Pennsylvania State College, University of Pittsburgh, University of West Virginia, Georgia School of Technology, Michigan School of Mines, Rolla School of Mines, Montana School of Mines, South Dakota School of Mines, Colorado School of Mines, New Mexico School of Mines, University of Utah, Stanford University, University of Arizona, University of California, University of Nevada, University of Washington, and El Paso School of Mines.

### Geologic Work in Tropics Attended by Hardships

**Government Engineers in Some Cases  
Loath To Undertake Such Trips for  
Private Interests**

Formerly it was not difficult for private interests to make arrangements with Government geologists and engineers to make trips into Central and South America. Government agencies interested in mining and oil development rather encouraged the practice and extended leave freely for such trips because their technical employee would return with much information of value to his bureau. There has been no change of bureau policy in that connection, but so many of the men have met with physical misfortunes of one kind or another on these trips that it is becoming difficult to persuade the more experienced engineers to undertake such expeditions.

Geologic work in many tropical areas carries with it the greatest of hardships. Not only are the many animal and insect pests to be contended with but there is often the greatest difficulty in securing food which is at all palatable to those accustomed to an American diet. The worst feature of this type of work, however, is the probability of contracting disease. Among the engineers who have gone out from Washington, several on their return have had to fight stubborn cases of malaria and dysentery. There has been one serious case of blood poisoning, while another engineer has had his hearing affected by his stay in the very high altitudes of the Andes. Others have acquired hookworm to say nothing of those who have ringworm on their feet and legs and have had experience with the tropical type of chigger.

### Industry Seeking Government Aid More Than Before

Government agencies in general are being called upon by the industries to a much greater extent than was the

case before the war. The result of having maintained clearing houses for many industries in Washington during the war period has acquainted these industries with the advantages coming from such an exchange of information and has familiarized them, as never before, with the service the Government bureaus are prepared to render.

### War Mineral Awards

Two claims carrying awards aggregating \$5,909.53 were made by the War Minerals Relief Commission during the week ended Sept. 18. In the tungsten claim of Frank W. Griffin \$5,837.03, which was 41 per cent of the amount claimed, was recommended. In the chrome claim of William S. Moulton \$72.50 was recommended. The claim asks for reimbursement to the extent of \$311.50.

Awards during the week ended Sept. 11 have been announced by the War Minerals Relief Commission as follows (The claimant, the mineral, the amount recommended, and its percentage relationship to the amount claimed are shown): Edward De Kruso, chrome, \$838.60, 49 per cent; D. R. Ridge, chrome, \$163.32, 69 per cent; J. J. Skeahan, chrome, \$199, 39 per cent. In the claim of Hymer & Rufener an award of \$752.19 had been allowed previously but on the presentation of additional evidence a further award of \$2,987.61 has been allowed. In the claim of A. J. Schmidt an award of \$2,085.19 had been made previously. An additional award of \$90.23 has been allowed.

The case of David Taylor vs. Nevada Humboldt Tungsten Mines Co. was on trial before Judge Farrington of the Federal Court at Carson City, Nev., recently. The case involved two points, that of equity to the property and of money judgment. The property involved is the tungsten mines near Mill City which were sold some time ago to W. J. Loring and associates by L. A. Friedman and associates.

## NEWS BY MINING DISTRICTS

### MEXICO

#### Coahuila

The Mexican Coal & Coke Co., having its principal mines at Esperanzas, Coahuila, has asked a concession for the free importation of electrical material for the purpose of establishing a transmission line from Esperanzas to the fields at Palau, Coah., where extensive operations are to be started soon. The permission will be granted undoubtedly, with the usual restrictions. The northern coal fields have been pretty well freed recently of professional labor agitators and an increased output of both coal and coke is anticipated.

### CANADA

#### British Columbia

**Acute Labor Shortage Hampering Operations in West Kootenays—Claim Staking Activities Along Lardeau River**

**Sandon**—With the exception of Silversmith, at Sandon, no Slocan property is today operating on a scale of magnitude. The Silversmith company, in the face of protests from other operators, made a peace with the "One Big Union" in the spring, and is now manned in large measure by members of that organization, which claims to be purely Canadian labor organization, in contradistinction to the International Union

of Mine Mill Smelter Workers, successor to the A. F. of M. The Slocan strike situation has therefore resolved itself into a three-cornered contest between the One Big Union on the one hand and the old International and majority of Slocan mine operators on the other. Summer conditions have favored the former, but it remains to be seen whether the strike can be maintained during the winter months. Signs are not lacking that the One Big Union is losing ground. But even if the strike was to be abandoned tomorrow it is unlikely that Slocan operations would be resumed on anything like the old time scale until next season. With the Silversmith maintaining a crew of about fifty or sixty



men, and an equal number divided between Noble Five, Bosun, Cunningham properties and a number of leasing syndicates, it can be readily appreciated how hard the blow is that has fallen on British Columbia's silver-lead producing area, when it is stated the average number engaged in metal mining operations in the Slocan district during the past four years has been approximately 800.

**Rossland**—Rossland camp, at one time British Columbia's leader in metal production, has between 300 and 400 men working in the various gold-copper properties of the Consolidated Mining & Smelting Co. of Canada. There does not appear to be a possibility of an immediate increase in operating forces, as Rossland, in common with other points, must face the labor shortage and all costs must be materially reduced before production of the bulk of Rossland ores could be maintained at a profit. Future developments must in a large measure depend upon the outcome of the Consolidated's plans with regard to construction of a large capacity concentrator, designed especially to treat the lower grade Rossland ores. Immediate construction of this plant, which is to be located not far from the big smelter works at Trail, will likely be held back by high construction costs, but should these break in the near future the carrying out of plans in this connection may be brought under way sooner than now appears possible.

**Nelson**—Nelson, the business metropolis of the Kootenays, and whose existence was initiated by the proximity of the old Silver King mine, can report mining activity in only one instance, this in connection with the California group, owned and operated by the California Mining Co., Ltd., and which early in the season began remodeling the Athabasca mill, with a view to treatment there of California ores. A few men are employed, with the mill running on a one-shift basis. Some 200 tons have been treated and results are reported as being encouraging. Some development is anticipated at the Perrier group, also close to Nelson, during the coming winter.

The Blue Bell, on Kootenay Lake, almost opposite Ainsworth camp, and the scene of the earliest operations in British Columbia lode mining, is working a crew of about twenty-five men in mine and mill, and treating a small tonnage of oxide lead ore found close to the surface. Up to three years ago this property maintained a crew of about 100 men, but an inrush of water flooded the lower workings, and until this spring, with exception of maintenance of shipment of crude oxides, the property was practically non-operative.

The Florence, on the opposite side of Kootenay Lake from the Blue Bell, maintains regular operations at both mine and mill. Aside from the Florence no operations of any magnitude are being maintained in Ainsworth camp, although lessees are working at the Krao and the Skyline. Some very high-grade silver shipments were made by the former during the summer.

Development on South Kork of Kaslo Creek continues to be maintained at Silver Bell, Silver Bear, Index, Revenue and Martin groups. These are all silver-lead properties. The Gibson, one of the most promising groups in that locality, continues inactive, due to litigation, and it is likely a receiver will be appointed to get things in shape so that creditors can be paid off. Cork-Province remains inactive, with no immediate possibility of resumption of operations. There is no doubt as to the possibilities of the property, but considerable expenditure must be made in underground development before it can rank as the really large producer expectations warrant.

Some measure of success has attended leasing operations, more particularly in the Slocan and Kaslo districts. A case in point is at the White-water, 17 miles from Kaslo, where about twenty-two men have been leasing for several years past.

Renewed activity in the staking of placer claims is reported from along the Lardeau River. The area is thought to have possibilities from a dredging standpoint. Operations of this sort have been already attempted, but failed because of lack of proper apparatus for handling of large boulders that line the river bed.

**Ymir**—Good progress is being made in opening the Yankee-Girl mine. Operations underground are proceeding satisfactorily. Considerable new development has been done and a substantial body of ore blocked out. John W. Shaw, superintendent, has left for Toronto, Ont., to submit a report to the Mining Corporation of Canada, which is behind the enterprise, and in the meantime A. W. Newberry, of New York, is in charge.

#### Ontario

##### Temiskaming Shareholders To Consider Proposed Purchase of Coal Lands

**Cobalt**—A special meeting of the shareholders of the Temiskaming has been called for Oct. 7 to consider the proposal to purchase from the McIntyre, of Porcupine, a half interest in the Blue Diamond Coal Mines, of Brule, Alta., and the Canadian Coalfields, Ltd., on the Hay River, Alta, recently taken over by the McIntyre.

The Cobalt-53 in the Gillies Limit has encountered high-grade ore in drifting at a depth of 60 ft.

**Gowganda**—The Reeves-Dobie has gone into the hands of a receiver and 213 bags of concentrates valued at about \$100 a bag have been seized in course of shipment on a judgment against the company for wages.

A mining plant has been installed on the Silver Bullion property at Leroy Lake where a shaft is down about 50 ft.

**Skead Township**—A shaft is being put down by hand drilling on the Crawford Skead, which will be carried to the 100-ft. level on a vein varying from 2 to 6 ft. in width. Several other veins have been opened up on the surface. A three-drill compressor will be installed.

#### Special Australian Letter

##### Queensland Lead-Silver Strike Made in 1918 Near Brisbane Proves Interesting

**Brisbane**—An occurrence of silver-lead ore accidentally discovered towards the end of 1918 in the outskirts of Brisbane is developing interesting features and proving very profitable at least to the holders of the property on which the find was made. The locale is a residential site on a hill in one of the most picturesque suburbs of Brisbane known by the aboriginal name of Indooroopilly, four miles from the centre of the city of Brisbane. The owner of an allotment of land on which he had built a cottage was digging a hole in which to plant a fruit tree when he came upon some material which a mining friend told him was silver-lead ore, some of which he had previously been using in the making of a rockery. Exploration, involving the removal of the cottage, was for a time carried out on a small scale, and up to the end of last year there had been sent to southern smelters more than 100 tons of selected ore averaging 100 oz. of silver per ton, the total recovery up to that time being over 10,000 oz. of silver besides 61 tons of lead. Ore of about the same quality has been taken out during the present year, but a strike at the smelting works has delayed treatment.

The government geologist, who has examined the locality, describes the ore, comprising earthy cerussite near the surface passing below into galena, as occurring in a brecciated schist. Many mining leases have been taken up in the vicinity; from the adjoining allotment five or six tons of high-grade ore have been bagged, and during the present year promising developments are taking place. Work on this adjoining property has shown the direction in which the ore-bearing breccia dips; and in another holding the silver-lead-bearing formation has been met and followed back on to the felsite dike—a discovery which is considered of great interest and probable importance.

A novel feature connected with this new mining center is that a company now holding several of the leases has called in the aid of a southern concern called the Electrical Mines Surveys Proprietary, Ltd., which has made a survey with improved apparatus and methods based on the Williams and Daft system; and a map has been published showing the lodes indicated by the electrical survey.

Queensland mineral country certainly extends over a wide area. Silver and lead are being mined a little way from the southern (New South Wales) border near Stanthorpe, about 200 miles south of Indooroopilly, and also in the Cairns hinterland, over a thousand miles to the north.

In the Stanthorpe district is situated the Jiblenibar arsenic mine, one of a number of state enterprises upon which the present government has entered. There are many occurrences of arsenic in this state, but at pre-war prices it

did not pay to work them. The prickly-pear pest, which is overrunning the pastoral and agricultural areas of Queensland, can be held in check alone by the use of arsenic, and only profitably when this poison can be obtained at a low price. War-time rates made it quite prohibitive, and to meet the difficulty the government are now mining and treating arsenic ore at their own mine, and selling it to settlers for pear destruction at £10 per ton, when the market price is about £60. The mine is developing well, and is already turning out over 50 tons per month, the product of 11 per cent ore. It is now proposed to increase the capacity of the works, and consequently the output. A privately owned mine in the same district has produced, besides tin and copper, about 10 tons of arsenic, valued at £400, per month.

#### MICHIGAN

##### Showing Good in Arcadian's New Baltic Shaft—White Pine Not Closed Down

**Houghton**—The management of Arcadian Consolidated is very enthusiastic over the showing in the New Baltic shaft. On the 600-ft. level of this shaft the New Arcadian lode has been opened for about 24 ft. in the crosscut and the mineralization is even better than in the upper levels.

The New Baltic shaft will be sunk about 300 ft. further and the vein explored every 100 ft. The 900-ft. level drift will be driven to meet the same level in the New Arcadian shaft. These shafts are about 4,000 ft. apart and this long drift will explore the vein in good shape.

The management proposes to make good progress in this development during the coming winter.

The ore being removed from Ahmeek No. 2 shaft continues very rich. The crosscut at the 16th level on the famous Ahmeek fissure vein continues to open up rich mass copper. In the No. 3 shaft the grade of ore shows no change from the average maintained by this part of the mine. No. 4 shaft continues to open up richer ore with depth.

The White Pine, a subsidiary of the Calumet & Hecla, was reported as closed down some time ago. This is not so, as it is still producing a small amount of copper and silver with a working force of about 700 men, which is but a nucleus of their former organization. The decreased labor supply has been particularly hard on these smaller properties, situated so far from the centers of population in this district.

#### Menominee Range

##### Cleveland-Cliffs Takes Over Wickwire Lease on Virgil

**Iron River**—The Cleveland-Cliffs Iron Co. has taken over the lease of the Virgil mine from the Wickwire Mining Co. The mine has been idle for several years but is to be reopened and developed extensively. The shaft is down 300 ft. It is likely that the mine will be worked in conjunction with the Spies, which adjoins on the east. The latter is also a Cleveland-Cliffs prop-

erty and is getting out ore at present. There is a strong demand for the non-bessemer ores of the Iron River district this season and it is believed that the demand will continue next year.

#### Marquette Range

##### Captain Fay To Prospect Western End of the Range

**Ishpeming**—Captain M. F. Fay, a well-known Duluth mining man, has secured a lease on iron lands in the vicinity of Humboldt, on the western Marquette Range, and is to explore for ore. He expects to start several drills at work at an early date. The only mine now operating in the western part of the range is the Republic, a producer of high-grade hard ores.

No announcement has been made as yet by Henry Ford as to whether or not he will reopen the Imperial mine at Michigamme, which contains a large tonnage of limonite ore. Mr. Ford came into possession of this property when he purchased the holdings of the Michigan Land & Iron Co. from an English syndicate. The Imperial has a steel headframe and other equipment in place and it would not be a great task to unwater the workings, which are quite shallow. There is one other known ore deposit on the Ford lands, in the village of Alpha, on the Menominee Range, but no development work has been done there. Considerable territory remains to be explored.

#### MINNESOTA

##### Improving Great Northern Docks on Allouez Bay

**Duluth**—Total shipments of iron ore from the Lake Superior docks up to Sept. 1 were 35,349,874 gross tons, as compared with a total shipment of 29,598,048 on the same date last year, an increase of 19.43 per cent. It is estimated that upward of 60,000,000 tons have been contracted for shipment this season, but it is now doubtful if it will be possible to get this amount of ore down the Lakes before close of navigation. There has been great delay to boats at the lower end of the lakes, owing to car shortage at Lake Erie ports, and it is stated that many boats will not be able to fulfill their season's contracts.

Work has been begun on improvements and additions to the Great Northern ore docks on Allouez Bay, which it is estimated will cost \$800,000. Peppard & Fulton, of Superior, have been awarded a contract for wrecking and rebuilding the outer end of No. 3 dock and building approach to No. 1 dock. In the reconstruction of No. 3 dock there will be required 7,500,000 ft. of timber, 70,000 lin.ft. of piling, and 1,245 tons of structural steel; 166 spout hoists will be installed and operated by electricity throughout.

#### Cuyuna Range

##### Development of Maroco Property Started—Feigh Mine Stockpiling

**Trommald**—Active development work has been begun on the Maroco property,

leased last winter by the Marquette Ore Co. of the E. N. Breitung interests, from the North Range Iron Co. Stripping of overburden was recently started and is proceeding at an average rate of 3,000 cu.yd. per day. The overburden is shallow, ranging from 45 to 55 ft. in depth, and is being removed by hydraulic methods, using pressure giants and sand pumps. An inclined shaft has been completed to the 210-ft. level and will serve for hoisting ore from future pit. A half-unit washing plant is being completed at the property for treating a large portion of the orebody, which is a fair grade non-Bessemer iron ore. An Allis-Chalmers trommel screen, log washer, and turbo are to be installed. Provision made for later installation of tables if early results show advisability of so doing.

The Merritt Development Co. reports the production of 200 tons of high-grade manganiferous iron ore daily from the No. 4 shaft of Merritt mines. The operators have sold 22,000 tons for this season's shipment, manganese to average better than 20 per cent. Stockpile at No. 1 shaft will be shipped this year, and operations may be resumed underground at the No. 1. It has also been reported that Merritt Development Co. is considering taking over a lease on the Ferro mine property, adjoining the Merritt No. 4 orebody on the west.

**Ironton**—Held up by lack of boats and dock space the Feigh mine has been forced to stockpile its ore for the past two weeks, and the operators report that they do not expect relief for another week. Concrete foundations have been placed for new boiler and hoist house, 47 x 76 ft., and new change house, 33 x 56 ft. An engine generator set will be transferred from the Carpenter mine, Crystal Falls, for auxiliary power.

Coates & Tweed will start construction on a large combined engine-repair, blacksmith, and carpenter shops, at their Hillerst open pit mine.

The Mahnomen Mining Co. have started driving exploratory drift south from east end of Mahnomen mine pit to crosscut ore formation on the old Mangan No. 2 mine property, taken over last winter from the Mangan Co.

#### ILLINOIS

##### Strike Affects Many Properties in Fluorspar District

**Elizabethtown**—There is a strike on at the Rosiclare Fluorspar & Lead Co.'s mines, also at Fairview Fluorspar & Lead Co., and the Hill Side Mines. All of these mines are located near Rosiclare, Ill., and about three miles from Elizabethtown, Ill. There has been no trouble and no agreement has been reached. There was a strike at Rosiclare and Fairview about four years ago; guns and ammunition was shipped in and a fight followed, the operators then winning.

Fairview and Rosiclare are operating with a very small force of men and are keeping water out and mining a small amount of ore.



The Hill Side mines are a new concern, located on the Rosiclare vein and not yet doing actual mining. They are erecting one of the finest and largest plants ever placed in the fluorspar country. All work is at a standstill.

The Indiana Fluorspar Co., who are operating a diamond drill in their main shaft, recently lost the drill and are now sinking a small shaft to recover the tools. They have shipped very little ore this year.

The Superior Fluorspar Co. near Hicks and north of Elizabethtown, Ill., are running full blast, and are sinking another shaft. They have just purchased another hoisting engine for this purpose. Considerable high-grade ore has been shipped, and several hundred tons are on the dump and in bins, all being sold.

The Diamond Fluorspar Co., near Karbers Ridge, Ill., are operating with a small force of men. They have shipped three barges of high-grade fluorspar recently and are not effected by the strike.

The Spar Mountain Co., of Cave-in-Rock, Ill., have now about an 8-ft. blanket of ore. They are operating both at the mine and mill and are shipping considerable ore of both medium and low grades.

Several of the mines in and about here are closed on account of poor labor and bad conditions in general. Some have been closed for about a year. The mines are about the only means of employment in this section and men have nothing else to work at. This has not been a union section. The miners at Rosiclare and Fairview recently organized and at once made demands on the companies, which were turned down. The strike followed.

#### SOUTH DAKOTA

##### Iron Hill Tunnel Cuts Old Workings—Rescue Car No. 5 at Lead

**Deadwood**—The tunnel that has been driven for the last two years to tap the old workings of the Iron Hill mine in the Carbonate district has been completed. The old workings were cut at a depth of 300 ft. and the entire mine has been drained and exploration of the once famous silver property started. Active development work will be continued.

**Lead**—U. S. Bureau of Mines Rescue Car No. 5 in charge of B. W. Dyer, engineer, has arrived in the Black Hills and will spend two weeks giving instructions in first-aid and mine-rescue work.

**Galena**—Work has been resumed at the mine of the New Silver Queen company under the direction of Robert Seholt and regular shipments of lead-silver ores will be made to the smelter. Electric lines are being extended to the mine and the entire equipment will be electrified. Several shipments of high-grade lead silver ores were sent to the smelter early in the year. Production is expected to increase as the installation work is completed.

#### UTAH

##### Tintic Standard Explains Passing of Dividend

**Salt Lake City**—The Cardiff is shipping up to 65 tons of ore daily and expects to add to this tonnage as soon as some of the lower workings have been unwatered.

**Eureka**—Tintic shipments for the week ended Sept. 17 amounted to 147 cars.

The North Standard is continuing shaft sinking, working two shifts. The shaft is expected to reach the 800-level in six weeks.

A statement issued by Tintic Standard officials explains the passing of the quarterly dividend for the quarter just ended as having been due to making the final payment for the new railroad and to paying 60 per cent of the cost of the mill now being constructed, the total amount paid out amounting to about \$360,000. The working force is stated to have been for the last three

#### IDAHO

##### The Cœur d'Alene District Bryan Strike Continues Interesting—Federal Seeks Writ in Star Case

**Wallace**—The Imperial Mining Co. is starting to raise 700 ft. from the lower tunnel to connect with a winze sunk 50 ft. from the upper tunnel. This winze has been sunk on the vein that shows several feet of ore that assays as high as 6 per cent lead. The lower tunnel, which is 4,200 ft. long, was run with the expectation of cutting this orebody, but failed to do so after two crosscuts had been run aggregating 500 ft. The raise is expected to give a line on the course of the ore and permit its development on the lower level.

The strike on the Bryan, reported several weeks ago, continues to be the center of much interest. Since the discovery was made the ore has been crosscut 15 ft., showing continuous lead-silver ore of good milling grade, some of which will pay to ship crude.



PORTAL OF IRON HILL TUNNEL, DEADWOOD, S. D.

months 60 per cent of what was required. A dividend is promised at Christmas, after production has been speeded up by the addition of workmen available at the end of the harvest season. It is further stated that development has been hampered by lack of labor, and that some work, such as the sinking of the proposed new shaft, has been given up for the present. Development in general, however, is well ahead of production.

**American Fork**—The American Consolidated, a merger of the old Bog and Earl-Eagle properties, has taken a bond and lease on the Silver Dipper, lying above the Bog in American Fork Canyon.

**Bingham Canyon**—The Utah Consolidated is completing its new machine shop and the new change rooms for the men. Grading and concreting for the company's new concentrator in Pine Cañon near the International smelter is being done with a large working force.

Control of the Bryan is owned by E. R. Day, of Wallace. The minority interest is owned by Charles Burns, also of Wallace, who was preparing to work the property under lease. The Bryan is located in the East Cœur d'Alene district, about five miles from Salt Lake, Montana. Development will now proceed with every indication that the property will prove up well.

The Sunset mine is being unwatered as a means of entering the West Sunset, formerly known as the Portland group, which is now owned by the West Sunset Mining Company, of which the Days are the controlling factors. The Sunset and West Sunset have a common end line, from which the Sunset shaft is about 250 ft. This shaft has been sunk vertically 800 ft., from which levels have been run both east and west, showing up much low-grade lead-silver and zinc ore. The Sunset is owned by Senator W. A. Clark, of Butte, from whom the Days have secured permission to enter the West

Sunset through the Sunset shaft. The purpose of the Days is understood to be merely to take advantage of this means of investigating the orebodies of the West Sunset at a greater depth than has been obtained by tunnel, and if the showing justifies to drive a deep tunnel for a permanent outlet from some point on Beaver Creek, which will give a depth of 2,000 ft. or more. With the mine unwatered it is believed that the Days will give it a thorough inspection with the view to purchasing and consolidating it with the West Sunset.

The final step in the apex litigation between the Star Mining Company and the Federal Mining & Smelting Company has been taken by the Federal. Having had its application for a rehearing denied by the court of appeals at San Francisco, Federal has now appealed to the Supreme Court of the United States for a writ of certiorari.

#### MONTANA

##### Philipsburg District Actively Producing Manganese Ore

**Butte**—Successful extraction of lead values from residue from the electrolytic zinc plant at Great Falls is proceeding at an old copper stack remodeled to meet the necessities of lead reduction. Fifty tons of residue daily are being treated, but with the success attending the venture it is deemed likely that the tonnage will be increased.

**Philipsburg**—More than one thousand men are engaged in the production of manganese and silver ore here at the present time. A good sale is being had for all high-grade manganese. Of interest is the fact that Montana is leading the nation in the production of manganese, with the Philipsburg district in the van in the state.

**Scratch Gravel District**—Reorganization of the Scratch Gravel Gold is under way and it is expected to resume operations within several weeks. The property is located about three miles northwest of Helena.

**Comet District**—Operations will soon be resumed at the Comet mine, near Wickes, Mont., with a new treatment process for the complex silver-zinc ores.

**Libby District**—The Lukens-Hazel power plant will be in operation within a few days and it will be possible shortly to begin milling operations.

#### WASHINGTON

##### Power Shortage Hampers Work in Oroville-Nighthawk District

**Nighthawk**—Mining activity in the Oroville-Nighthawk district is being seriously hampered by power shortage. The Similkameen Power Co., which furnishes power to the mines of the district, is building a large power dam across the Similkameen River and planned to furnish additional power by May, 1921. Failure of delivery of the large water wheel for the plant has held up the work and it will be several months before the power will be ready for the mining companies. The new 75-ton mill for the Ruby mine is fully

completed and will be put in operation as soon as power can be secured.

At the Kaaba mine the southern extension of the vein is being explored from the 200-ft. level; this work is adding appreciably to reserves.

The Four Metals Co. have sunk a vertical shaft 100 ft. on the Shamrock vein which they encountered in a 30-ft. drift from the bottom of the shaft. On the Alice vein, owned by the same company, a 135-ft. incline shaft has been sunk on the vein and from the bottom of this shaft drifts are being extended to develop a tonnage of ore sufficient to warrant erection of a mill.

#### OREGON

##### War Eagle Company, at Gold Hill, To Erect Quicksilver Furnace—Gold Quartz Discovered Above Oakridge

**Gates**—The storeroom, cook and bunk houses at the North Queen gold property in the Quartzville mining district, southwest of Gates, was recently burned, the loss being about \$4,000. The property is owned and operated by A. M. Hammer and John McChesney, Albany, Oregon.

**Oakridge**—A vein of gold-bearing quartz was recently discovered in the upper Willamette River country, twenty-six miles above Oakridge, where gold has never been found before. The find has caused the usual excitement at Eugene, the nearest shipping point.

**Gold Hill**—The Chisholm quicksilver mine in the Gold Hill district, which has been closed for several months, has resumed with a small crew. It is equipped with a 12-pipe furnace. Negotiations are still under way for its sale. The prospective purchasers talk of erecting a Scott furnace of large capacity. The War Eagle Mining Co., owners of adjoining property, are assembling material and equipment on the ground to erect a furnace of this type. This will be completed within sixty days. Their present equipment consists of several 12-pipe furnaces.

#### CALIFORNIA

##### Reinmiller Claims at Engelmene Being Surveyed

**Engelmene**—George W. Lloyd and Charles J. Worden have a contract to survey the fifty-six claims owned by the Reinmiller Copper Mines Co. and are now engaged in the work. The claims extend for three miles and include sites for a reduction plant and sawmill. The road to the portal of the tunnel that is to be driven is now being graded and a boiler and compressor will soon be installed. John Reinmiller, president of the company, was in charge of the Engels from 1915 to 1919, when it was developed from a prospect to a dividend-paying mine.

M. H. McKelvey, superintendent, is planning to start driving a tunnel which will cut at about 1,000 ft. depth the big mineralized area on the Plumas Copper King mine, adjoining the Superior mine of the Engels Co. on the south.

#### NEVADA

##### Commissary in Tonopah and Divide Districts Cuts Living Cost

**Tonopah**—In the Tonopah district there is a shortage of skilled miners in the larger mines. Wages are high and living conditions excellent, and the healthy condition of the camp in general is indicated by the ever increasing number of houses that are being moved into town from Goldfield. The commissary established by the companies of the Tonopah and Divide districts is operating successfully and has cut living costs about 20 per cent. The volume of business handled is direct evidence of appreciation by the workmen of these districts.

The Tonopah Mining Co. shipped 1,500 tons last week, which is normal tonnage for the present time. In the Silver Top section of the mine ore is being broken in stopes near the surface, and development and stoping is being done on the Mizpah fault vein, the MacNamara vein and the Mizpah vein with good results.

The Tonopah Belmont mine is producing about 350 tons of ore per day, and in addition the mill is handling an irregular tonnage of custom ore from various parts of the district. No new developments of importance are reported with regular development work being performed from the 700, 800, 900, 1,000, 1,100, and 1,200 levels on several veins.

West End shipments for the last week were about 1,400 tons. Development work was accomplished on the 500, 600, and 800 levels on the West End, Footwall and Ohio veins with normal results.

The Tonopah Extension report shipment of 1,750 tons of ore for last week which is a little higher than usual for the past few months. Sinking of the Victor shaft is progressing satisfactorily and the water flow is being handled with little trouble. Development work was done in the Victor, McCane and No. 2 shaft sections of the mine on different levels, with no discoveries reported.

**Divide**—In the Tonopah-Divide mine stations on the 800 and 1,000 levels are complete and crosscutting is to be started in a few days. On the upper levels development faces are reported to be looking exceptionally well and a considerable portion of the regular ore shipments is coming from development. On the 165 level the vein is being crosscut at three points about fifty feet apart in ore. Other work on the 270, 375, 480 and 575 levels was done, the majority being reported as being in ore of milling grade.

**Pioche**—The Pioche Metals Mining Co. recently leased their Point property to Arthur Reall and associates of Pioche. Operations have been started.

The Victoria Nevada recommenced sinking their main working shaft Sept. 10. The shaft at present is 165 ft. deep and will be put down to the 200 ft. point before further drifting is done.

Everett Wade of Salt Lake City, Utah, has taken a lease from the Bristol



Silver Mines Company on the May-Day mine at Bristol.

William Willoughby and Cy Thomas are operating in the Zero territory and are taking out good silver-lead ore. Returns on their last car netted about \$500.

At the Deerfoot mine recent prospecting has shown up a promising new orebody which should yield considerable ore of shipping grade. Average assays across the body show 30 oz. in silver, which is the principal value. The Deerfoot is credited with a production of 385 tons during the last eight months.

Arthur Reall, of Pioche, has started operations with a small force of men at the Telephone mine. Recent examination of the underground workings has demonstrated the presence of a body of lead-silver ore which can be opened up with a small amount of development.

The Prince Consolidated is shipping at present over 5,000 tons per month and has produced from Jan. 1, 1920, to date the large total of 36,151 tons. The ore is of the usual fluxing grade, 75 per cent of the total tonnage being derived from the prolific Davidson bed and the remainder being mined from the big bed of the Prince. Arrangement will shortly be completed for resuming sinking of the main shaft to the lower beds. A pleasing improvement is being noticed in the greater efficiency of the underground labor employed. Production is being maintained with fewer men, who are showing a spirit of loyalty to the company which insures economy of operation.

The Virginia-Louise is doing a large amount of development work and the orebodies are proving to be of greater extent than anticipated and well up to average grade. A large tonnage is being shipped and with an improving lead market the product is bringing a satisfactory return.

The Pioche Silver Corporation, whose property adjoins the Virginia-Louise Mining Co. to the south, is planning a development campaign to pick up the extension of the Virginia-Louise ore beds. It is expected that operations will be started in the next sixty days. Charles Lee Horsey is president.

Uncertainty of the application of the new freight rate caused a slight decrease in the tonnage shipped.

Construction work is proceeding at the Southern Nevada mill, which is next to the Pioche R.R. depot. It is expected the plant will be in operation within the next two months. Delay in delivery of some of the essential equipment has entailed much hardship on the management. When completed this plant will treat the milling ores now available in the properties of the Pioche Mines Co., and such other ores as are suitable to the flow sheet.

Como—As a result of a recent boost in the cost of electric power, the high cost of labor and mining supplies, together with discovery of theft of bullion from the mill, Gurney Gordon, man-

ager of the Como Consolidated, has decided to shut that property down for the present at least. The pumps will be pulled.

Tybo—The furnace at the Tybo smelter has been shut down temporarily, as Fred W. Draper, manager found it impossible to get enough miners to produce on a scale that would keep the furnace going and to do development work. He is planning to cut down the size of the furnace, but before doing so wishes to see if the approach of cold weather will not improve the labor situation. The mill is running steadily three shifts and about eight tons of \$100 concentrates are shipped daily.

Piermont—A hydro-electric plant for power and lighting is being installed at the Piermont mine in Spring Valley, White Pine County.

Tule Canyon—W. J. Loring, manager of the Silver Hills company, has decided to let leases on the company's property in Tule Canyon, 40 miles southwest of Goldfield.

Jean—The directors of the Christmas Consolidated mine, which is located nine miles southwest of Jean, recently engaged Henry M. Adkinson, a geologist of Salt Lake City, to examine their property and outline a program of development. Mr. Adkinson suggested that the production might be increased by leasing the old workings where much high-grade ore is still to be mined. Special attention was paid to the vanadium deposits which have been uncovered at the Christmas mine and, following Mr. Adkinson's complete report, it is planned to enter upon an active development campaign.

Battle Mountain—Eight sets of lessees are at work on the property of the Maysville Consolidated, 15 miles south of Battle Mountain, and all are said to be in silver ore of shipping grade. Rollins & Williams shipped a carload from their lease in August which ran better than \$200 per ton.

Copper Basin—Frank B. Keever is operating the Bentley mine at Copper Basin, south of Battle Mountain, under bond and lease. He is reported to have developed considerable \$35 to \$40 ore and ships what is taken out in development.

Pyramid Lake—The Nevada Western Gold & Silver Mining Co. are preparing for active operations on their property near Pyramid Lake and have bought a hoist, a Chicago Pneumatic compressor and a Cochise drill from the Western Engineering Co., of Reno. H. W. Dawes is general manager.

Leadville—The mill at the Leadville mine, 40 miles north of Gerlach, which was developed by Johnny Harnan, is again being remodeled and a flotation system is being installed.

Contact—Ed Gray is developing a property at the copper camp of Contact. Contact will be on the line of the proposed railroad from Twin Falls, Idaho, to Wells, Nev., the actual building of which is expected to begin shortly.

## ARIZONA

### C. D. Ridgeway Takes Over Arabia Mine in Mohave County

Stockton Hill—The C. O. D. shaft has reached the 400-ft. level where station and skip pocket are being cut. The first carload of machinery for the new mill arrived in Kingman on Sept. 15. This shipment included crusher, rolls and ball mill. Hauling to the mine and installation is under way.

The I. X. L. has installed a larger compressor and a contract has been let for sinking the shaft another 100 ft. The new auto road to Berry on the main line is now in use.

Mineral Park—The Golden Star has made a 50-ton test shipment to the smelter of ore recently cut. The ore, while extremely high grade in spots, is variable. Results from this shipment will determine average values.

Chloride—The Pay Roll crew are making good progress in cleaning up and retimbering the shaft. It is hoped that conditions will permit resumption of sinking in the near future.

The Hidden Treasure has added a night shift. Drifting continues along the main vein and a good grade of milling ore is being opened up.

The Dardanelles shaft is now down 175 ft. Hard rock and pumping problems delayed progress during August. It is hoped that crosscutting for the vein on the 200 level will be under way soon after Oct. 1.

The Arabia mine in the Union Pass district has been taken over by C. D. Ridgeway and associates. The mine camp is being overhauled. Grading for new hoisting equipment at the old shaft is under way. The workings will be unwatered and an underground crew put to work as rapidly as possible.

Paradise—The Cochise Mineral Mines Co. have driven their main tunnel 700 ft. Several veins showing upon the surface have been cut so far showing good values in lead-silver. A good vein of manganese has also been cut. H. D. Buford is general manager in charge.

## NEW MEXICO

### Octo at Lordsburg Cuts Sulphide Vein at 300 Level

Lordsburg—The Octo has cut a strong vein in copper sulphides carrying some red oxides at 170 ft. east of the main shaft on the 300-ft. level, which so far shows a width of 5 ft. with the opposite wall not yet struck. This is the deepest ore showing on what may be termed the north side of the district and confirms favorable surface indications. Fred C. Semmek is manager.

Exploration work on the lead-silver veins on the Monte Rica property is showing excellent results. The veins are strong and the values well disseminated. Tentative arrangements have been made with Virginia parties that may lead to the erection of a mill, which would be well justified by the mineral showings. Lawrence Boyd is manager.

# THE MARKET REPORT

## Daily Prices of Metals in New York

Sept.	Copper		Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.	
23	17.90@18.35	41.50	43.50@43.75	7.25@8.00	7.65	7.60@7.70	
24	17.80@18.25	41.25	43.50@43.75	7.25@8.00	7.65	7.60@7.65	
25	17.75@18.20	41.25	43.25@43.50	7.25@8.00	7.65	7.60	
27	17.75@18.15	41.75	43.25@43.75	7.15@8.00	7.65	7.55@7.60	
28	17.75@18.10	41.75	43.00@43.50	7.15@8.00	7.65	7.50	
29	17.75@18.00	41.50	42.75@43.25	7.15@7.75	7.50	7.45@7.50	

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

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

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

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

sold for export, and the London price has advanced. Five thousand tons of December copper was offered at 18c., delivered, late last week, but found no takers. Many normal buyers of copper whose business is good are not in the market, because they are using scrap metal, large stocks of which continue to be available. Rumors of a pronounced cut in the price of copper sheets have been heard, the normal differential of 3 to 4c. from the price of unfinished forms having been considerably exceeded in recent months.

## Lead

Last Thursday the A. S. & R. reduced its contract price from 8½ to 8c., New York, and a further reduction to 7¾c. was made today. This should tend to cut off foreign importations, which continue unabated. Imported lead on the dock here was offered late last week at 7.75@7.50c., and early this week at 7.40c. Prompt shipment from Germany is offered at 7c., duty paid. The tone in the Middle West is also easier. Many cancellations and postponed deliveries are being requested, and producers who have been turning away inquirers for the last few months are now scurrying after business. Spot lead continues in fairly active demand for small lots, and quick deliveries obtain a slight premium over our quoted prices.

## London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
23	96¼	97¼	112	268¾	273¾	34¾	35	41	42¼
24	95¾	97¼	112	268¾	274	34¾	35	40¾	41¾
25									
27	95¼	96¾	113	271	276¾	34¾	35	41¼	42
28	93¾	94¾	113	271¾	276¾	35	34¾	41¾	42¾
29	94	95	113	268½	274½	34¾	34¾	40¾	41¾

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

## Zinc

A fair demand has existed, but only at decreased prices. With the freer movement of sheets, demand from galvanizers was expected, but it has not come. Apparently the only galvanizing business demanding zinc is that of wire. One large producer predicts 7c. zinc in the near future. This would of course mean that production would be curtailed, but this would be offset by the absence of export demand, which has been normally about 8,000 tons per month.

## Tin

Consumers are being advised to buy a supply of tin at current low prices, as dealers predict an upward tendency soon. Whether the wish is father to the thought remains to be seen. Anyway, the market continues very dull. Some small sales of electrolytic have been made at or fractionally under the price of spot Straits. Producers of high-grade 99 per cent are not willing to sell at present prices.

Straits tin for future delivery: Sept. 23d, 44.25@44.75c.; 24th, 44.50@44.75c.; 25th, 44.25@44.50c.; 27th, 44.25@44.50c.; 28th, 44@44.50c.; 29th, 44.00c.

Arrivals of tin in long tons: Sept. 22d, London, 25; 27th, London, 225; Singapore, 450.

## Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver			Sept.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
23	349¾	99¾	94	597	27	349	99¾	93	59¾
24	347¼	99¾	93	59¾	28	349¾	99¾	93	59¾
25	347	99¾	93	59¾	29	348¾	99¾	92¼	59¾

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

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

## Metal Markets

New York, Sept. 29, 1920

The industrial reaction which has been such a pronounced feature of the last week's news has not been without its influence on the metal market. Practically all buying except on a hand-to-mouth basis has ceased. Consumers are looking for lower prices on everything, and the fact that many metal prices are already at or below the cost of production is considered no argument why the market should not drop further. The tone of the producers and selling agencies is hopeful, but in al-

most all instances large tonnages would be sold at markedly cut prices if buyers could be found. The prompt market is quiet, but demand for forward delivery is absolutely dead.

## Copper

The larger producers have apparently decided that the time has come when it will no longer be advisable to continue production without selling, and are willing to meet the market half way. No one is now asking more than 18½c., delivered, and this price has to be shaded to attract even small business. Some electrolytic copper has been



**Silver**

The silver market remains quiet and dull, with small purchases for China account. India, however, continues to keep out as a buyer. The London quotation today is 59½d., with the market reported sentimentally weaker on the Indian government ceasing to sell sterling drafts on London. Purchases of silver to date by the U. S. Government under the Pittman Act amount to about 16,000,000 oz.

**Mexican Dollars**—Sept. 23d, 71½; 24th, 71; 25th, 71; 27th, 71; 28th, 71; 29th, 70½.

**Gold**

Gold in London on Sept. 23d, 117s. 6d; 24th, 117s. 9d.; 27th, 117s. 11d.; 28th, 117s. 11d.; 29th, 117s. 9d. Correction: Gold on Sept. 15th, 118s. 6d. instead of 117s. 4d.

**Foreign Exchange**

The market for European exchange has been very thin, and on that account fairly wide fluctuations during a day's trading are not particularly significant. No important changes have taken place in the last week. On Tuesday, Sept. 28, francs were 6.71c.; lire, 4.19c.; and marks, 1.63c. New York funds in Montreal, 10½ per cent premium.

**Other Metals**

**Aluminum**—For 50-ton lots: ingot, 99 per cent and purer, 35c.; 98@99 per cent, 34.8c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

**Antimony**—Spot metal, 7½@7¼c. per lb. Cookson's "C" grade, 12½c. Chinese and Japanese brands, 7¼@7¼c. W. C. C. brand, 9@9¼c. Chinese needle antimony, lump, firm at 7¼c. per lb. Standard powdered needle antimony (200 mesh), 11¼c. per lb. Market dull.

**Bismuth**—\$2.55 per lb., 500-lb. lots, and \$2.57 per lb., 100-lb. lots. Market quiet.

**Cadmium**—Nominal, \$1.40@1.50 per lb. Market steady. Probably no change before Jan. 1.

**Cobalt**—Metal, \$6 per lb.; black oxide, \$4.10 per lb.; sulphate, \$1.60. Market probably firm for some time.

**Iridium**—Nominal, \$350@400 per oz. Heavy demand, but small supplies.

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

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

**Nickel**—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

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

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

**Palladium**—\$100@110 per oz.

**Platinum**—Firm at \$115 per oz.

**Quicksilver**—Market quiet; \$75 per 75-lb. flask. San Francisco wires \$75. Unchanged.

**Ruthenium**—\$200@220 per troy oz.

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

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

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

**Metallic Ores**

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

**Chrome Ore**—Guaranteed 50 per cent Cr<sub>2</sub>O<sub>3</sub> foreign ore with a maximum of 6 per cent silica, 70@80c. per unit, New York. California concentrates, 50 per cent Cr<sub>2</sub>O<sub>3</sub> and upward, 70@75c.

**Manganese Ore**—65@75c. per unit, seaport; chemical ore (MnO<sub>2</sub>) \$70@90 per gross ton, lump; \$80@100 per net ton, powdered.

**Molybdenum Ore**—85 per cent MoS<sub>2</sub>, 70@75c. per lb. of contained sulphide, New York.

**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots, against recent price of 65@70c.

**Titanium Ores**—Ilmenite, 52 per cent TiO<sub>2</sub>, 1¼@2c. per lb. for ore. Rutile, 95 per cent TiO<sub>2</sub>, 15c. per lb. for ore, with concessions on large lots or running contracts.

**Tungsten Ore**—Scheelite, 60 per cent WO<sub>3</sub> and over, per unit of WO<sub>3</sub>, \$6 f.o.b. mines; wolframite, 60 per cent WO<sub>3</sub> and over, per unit of WO<sub>3</sub>, \$5, in New York.

**Uranium Ore (Carnotite)**—\$2.75@3 per lb. for 96 per cent of the contained oxide (U<sub>3</sub>O<sub>8</sub>). Ores must contain a minimum of 2 per cent U<sub>3</sub>O<sub>8</sub>.

**Vanadium Ore**—\$1.25 per lb. of V<sub>2</sub>O<sub>5</sub>, (guaranteed minimum of 11 per cent V<sub>2</sub>O<sub>5</sub>), New York.

**Zircon**—Washed, iron free, 5c. per lb.

**Zirkite**—\$90@100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at \$1.15 per lb. in ton lots.

**Zinc and Lead Ore Markets**

**Joplin, Mo., Sept. 25**—Zinc blende, per ton, high, \$48.55; basis 60 per cent zinc, premium, \$45; Prime Western, \$45; fines and slimes, \$42.50@40; calamine, basis 40 per cent zinc, \$35. Average settling prices: Blende, \$46.15; calamine, \$38.27; all zinc ores, \$46.09.

Lead, high, \$101.15; basis 80 per cent lead, \$90@80. Average settling price, all grades of lead, \$94.09 per ton.

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

Shipments for the week: Blende, 11,560; calamine, 81; lead, 2,030 tons. Value all ores the week, \$727,590.

Shipments for nine months: Blende, 430,516; calamine, 7,312; lead, 67,598 tons. Value all ores nine months, \$28,164,660. The shipment is 72,223 tons blende and 13,676 tons lead excess over last year, with calamine 2,798 tons less.

Reports from the smelting area south and west indicate more labor trouble early in October.

Lead prices have dropped \$32.50 per ton in three weeks. A number of mines have made profit principally from lead sales, and this extraordinary decline will put some of them below the profit line.

**Platteville, Wis., Sept. 25**—Blende, basis 60 per cent zinc, \$49.50 base for high-grade. Lead ore, basis 80 per cent lead, \$90 per ton. Shipments for the week: Blende, 1,311; calamine, 30; lead, 40 tons. Shipments for the year: Blende, 51,326; calamine, 2,429; lead, 4,248; sulphur ore, 1,241 tons. Shipped during the week to separating plants, 2,871 tons blende.

**Non-Metallic Minerals**

**Asbestos**—Crude, No. 1, \$2,400@3,000; No. 2, \$1,400@1,700; spinning fibres, \$400@800; magnesia and compressed sheet fibres, \$325@400; shingle stock, \$110@150; paper stock, \$60@75; cement stock, \$17.50@30; floats, \$8.50@15. all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

**Barytes**—Crude, 88 to 94 per cent barium content, \$10@12 per net ton; ground (white) \$24@30 in bags, carload lots; (off-color) \$22@26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, \$12 per gross ton; ground (white) \$23@25; ground (off color) \$16@19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, \$23; ground (white) \$45; ground (off color) \$30@32 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, \$11@11.25 per ton, f.o.b. cars, Missouri; floated, \$28 per ton in bbls.; \$26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

**Chalk**—Domestic, extra light, 5@6c. per lb.; light, 4½@5¼c.; heavy, 4@5c.; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

**China Clay (Kaolin)**—Crude, \$9@12; washed, \$12@15; powdered, \$18@22; bags extra, per net ton, f.o.b. mines, Georgia; crude, \$8@12; ground, \$15@40, f.o.b. Virginia points. Domestic lump, \$10@20; powdered, \$25@30; imported lump, \$25@35; powdered, \$30@60, f.o.b. New York.

**Feldspar**—Crude, \$8@18 per gross ton, f.o.b. Maryland and North Carolina points; \$7.50@10, f.o.b. Maine; ground, \$80@35, car lots, f.o.b. Baltimore; ground, \$17@21, f.o.b. North Carolina points; \$17@21 per ton, No. 1 ground, f.o.b. New York State; \$21@

\$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

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

**Gypsum**—Plaster of Paris in carload lots sells for \$4.25 per 250-lb. bbl., alongside dock, New York.

**Kaolin**—See China Clay.

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

**Magnesite**, Calcined—High-grade caustic calcined, lump form, \$35@40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, \$75@85 per ton, f.o.b. Eastern points.

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

**Mica**—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, \$1.20@1.40; No. 4, \$2@3; No. 3, \$4.25@5; No. 2, \$5.50@7; No. 1, \$8. Clear block: No. 6, 55c.; No. 5, \$2; No. 4, \$4; No. 3, \$5.75; No. 2, \$7; No. 1, \$9; A1, \$14; extra large, \$25, all f.o.b. New York; ground, \$100@150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, \$45@50 per ton; punch, 4@5c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., \$1.15; 2 x 3 in., \$1.65; 3 x 3 in., \$2.10; 3 x 4 in., \$2.50; 3 x 5 in., \$2.75; 3 x 6 in., \$3.75; ground 165 mesh, \$240 per ton; ground roofing mica, \$60; mica washers, 75c.@2 per lb.; 1½-in. disks, No. 1, \$1.60 per lb.; No. 2, \$1.30.

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

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

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

**Pyrites**—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

**Quartz**—(Acid tower) fist to head, \$10; 1½ to 2 in., \$14; rice, \$17, all net ton, f.o.b. Baltimore; lump, carload lots, \$5@7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is \$16 per ton in car lots, and \$22 in less quantities, including bags.

**Sand (Glass)**—Dry glass sand, \$4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is \$3 per ton; \$2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in

Missouri, is \$2.50 on contract; some outside sales have been made at \$4.

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

**Talc**—Paper making, \$12@22 per ton; roofing grades, \$9.50@15; rubber grades, \$12@18, all f.o.b. Vermont. California talc, \$20@45, talcum powder grade. Southern talc, powdered, carload lots, \$12@15 per ton; less than carload, \$25, f.o.b. cars; freight to New York \$5.25 per ton, carload lots; less than carload lots, \$9.25. Imported, \$60@70; Canadian, \$20@40 per ton.

#### Mineral Products

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

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

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

#### Ferro Alloys

**Ferrocobaltitanium**—For 15 to 18 per cent material, \$200@250 per ton, f.o.b. Niagara Falls, N. Y.

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

**Ferrocromium**—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18½@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c., f.o.b. works.

**Ferromanganese**—For 76 to 80 per cent, prompt delivery, \$175@180, freight allowed; last half, \$170; English, \$170@175, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, \$80@85, f.o.b. furnace.

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

**Ferrosilicon**—For 10 to 15 per cent, per gross ton, f.o.b. works, \$60@65; 50 per cent, \$82.50@85; 75 per cent, \$150@160.

**Ferrotungsten**—70 to 80 per cent W, 90c.@1.05 per lb. of contained tungsten, f.o.b. works.

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

**Ferrovandium**—Basis 30 to 40 per cent, \$6.50@9.50 per lb. of V contained, f.o.b. works.

#### Metal Products

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

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

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

**Yellow Metal**—Dimension sheets, 26½c.; sheathing, 25½c.; rods, 8 to 3 in., 23½c.

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

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

#### Refractories

**Bauxite Brick**—56 per cent alumina, \$160 per 1,000, f.o.b. Pittsburgh.

**Chrome Brick**—\$100@110 per net ton, carload lots, eastern points; 9-in. straights, f.o.b. Baltimore, \$100@105.

**Clay Brick**—First-quality fire clay, f.o.b. New Jersey, \$75 per 1,000; second quality, 9-in. straights, f.o.b. Pennsylvania, Ohio and Kentucky works, \$50@55.

**Magnesite Brick**—9-in. straights, f.o.b. Baltimore, \$110@120 per net ton.

**Silica Brick**—9-in., per 1,000, \$65@70, Chicago district; \$65 Mount Union, Pa.

#### Iron Trade Review

Pittsburgh, Sept. 28, 1920

Though transportation conditions as affecting the steel industry have been improving as a whole, there are fluctuations from week to week and not a few bad spots. The accumulations of steel at mills have been reduced at least two-thirds, perhaps more, from the high point, and as this reduction has occurred almost wholly within the last four or six weeks, while production has at the same time increased, deliveries of steel have been much heavier. This by itself would account largely for the extreme stagnation in the steel market, but of course there are contributing influences, including the feeling that prices of many commodities are going to decline, while the rate of actual steel consumption is likely to decrease materially before it increases again.

The steel industry is not perturbed by the reduction in automobile prices that has occurred, and resents the conclusion reached in some uninformed quarters that reductions in steel prices will be necessitated thereby. Automobiles sell at 50c. to \$1 and more per pound, not all the weight being steel, and the Steel Corporation or Industrial Board prices range from 2.35c. a pound on bars to 5c. to 7c. on special grades, such as cold-rolled strip, special finished sheets, and like forms. Fancy prices 10c. or higher applied only on small tonnages, and, moreover, disappeared some time ago.

Buyers are still taking deliveries freely in most lines of steel, and the mills still see full operation ahead, though for an uncertain period of time. Prices show little change, except that delivery premiums continue to decrease.

**Pig Iron**—The market is absolutely stagnant, with practically no inquiry for either prompt or forward. Prices are nominal, based on last sales: Bessemer and basic, \$48.50; foundry and malleable, \$50, f.o.b. Valley furnaces, with \$1.96 freight to Pittsburgh.

**Steel**—Market inactive. Last sales of sheet bars, \$65, Pittsburgh. Nominal mill quotation on billets, \$60, with resale lots offered at \$58 or less.

#### Charcoal and Coke

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

**Connellsville**—Furnace, \$16@16.50; foundry, \$17@18.



## COMPANY REPORTS

### Broken Hill Proprietary Co. Shows Profit

Lead, Zinc, Iron; Australia

The report of the Broken Hill Proprietary Co. for the year ended May 31 states that the net profit amounts to £517,663. The sum of £377,614 has been expended on plant at the steel works, and £500,000 was transferred from profit and loss to reserve, which now stands at £1,065,000, leaving a credit balance of £528,943. Liquid assets total £971,560, exclusive of 200,000 shares in the Broken Hill Associated Smelters Proprietary and 720 shares in Zinc Producers' Association. Outstanding debentures total £748,100, and the credit balance of the sinking fund is £11,622. Owing to the shortage of coastal shipping, the steamship "Iron Prince" and steamship "Iron Baron" were purchased at a cost of £275,000. Owing to a strike at Broken Hill which occurred on May 5, 1919, and which still continues, no productive work was carried on. A conference has just begun at Sydney, and the directors are hopeful that a settlement will be reached.

Maritime troubles extending over eighteen weeks were responsible for much dislocation of the operations at the Newcastle works, resulting in diminished output and increased costs of production. The rod mill is giving excellent results. The works of John Lysaght, Ltd., for the manufacture of corrugated plain galvanized and black steel sheets, should be ready to start operations next month. Rylands, Ltd., are starting works for the manufacture of wire netting and similar products, and have entered into arrangements to take raw material from the company. Further iron-ore leases in close proximity to the Iron Knob tramway have been secured from the government of South Australia, comprising a total of 560 acres, and are now being opened. The two large blast furnaces produced jointly 169,409 tons of pig iron. The foundry furnace produced 1,730 tons of pig iron, 12 tons of spiegel, and 1,271 tons of ferromanganese. Pig iron sold totals 39,677 tons. The openhearth furnaces produced 166,772 tons of steel, the blooming mill 151,681 tons, the 28-in. mill 73,667 tons (including 54,200 tons rails), the 18-in. mill 60,760 tons, the 12-in. mill and 8-in. mill 21,816 tons, and the rod mill 23,011 tons. An additional blast furnace with a daily capacity of 500 tons is being erected with necessary coke ovens.

### Las Dos Estrellas Mining Co.

Gold-Silver; Michoacan, Mexico

The annual report of Las Dos Estrellas Mining Co. for the year 1919 states that the production of gold amounted to 3,451.52 kg. and that silver production amounted to 42,307.6 kg. The average price obtained for silver during the year was \$1.1216 per oz.

The average cost of all operations, including development work, was 11.55 pesos per dry metric ton. Total operating costs, including development work, amounted to 4,236,751.37 pesos. The net income from operations was 3,369,247 pesos. Dividends paid in 1919 amounted to 763,145.08 pesos, making a total of 34,682,411.89 pesos distributed to the end of 1919. The original capitalization of company was 300,000 pesos, which was refunded to shareholders in 1909. The 1919 production was 366,820 dry metric tons, of an average content of 10.2 grams gold and 168 grams silver per ton. Recovery of metals amounted to 20,783 pesos per ton. The various reserve funds of the company at the end of 1919 amounted to practically six and a half million pesos, whereas there was additionally voted the sum of 500,000 pesos for the purpose of investigating new mining properties.

### Tincroft Mines, Ltd., an Example of High Tin Production Costs

Tin; Cornwall, England

The report of the Tincroft Mines, Ltd., operating in the Cornwall tin area of Great Britain for the first half of the present year, shows a loss of £2,435 17s. 5d. The directors call attention to the serious situation of the industry in stating that "at the date of the last meeting in February the price of tin was £380, and a small profit was being made. A fall of more than £150 per ton caused the gravest anxiety to all engaged in the industry, and although prices have improved somewhat of late, it is unreasonable to expect any industry to succeed with its product fetching only 25 to 40 per cent above pre-war levels, while coal, power, and other operating charges average 200 per cent higher. . . ."

"Owing to existing prices, practically all development has had to be suspended, despite the fact that at the bottom of the mine a good section of ground is only waiting the necessary funds in order to be opened up."

### September Mining Dividends

The following is a partial list of dividends paid by mining companies during September, 1920:

U. S. Mining and Metallurgical Companies	Situation	Per Share	Totals
Ahmek Mining, c. . . . .	Mich.	\$0.50Q	\$100,000.00
American Smelting & Refining. . . . .	U. S. & Mex.	1.00Q	609,980.00
American Smelting & Refining, pfd. . . . .	U. S. & Mex.	1.75Q	875,000.00
Calumet & Arizona Mining, c. . . . .	Ariz. & Mex.	1.00Q	642,520.00
Chino Copper. . . . .	N. Mex.	.37½Q	326,242.50
Consolidated Interstate Callahan, z.l. Idaho		.50Q	161,651.50
Copper Range Co. . . . .	Mich.	.50Q	200,000.00
Daly-West Mining. . . . .	Utah	.25Q	62,500.00
Federal Mining & Smelting, pfd. . . . .	Idaho	1.75Q	209,757.00
Golden Cycle, g. . . . .	Col.	.02K	30,000.00
Hecla Mining, ls. . . . .	Idaho	.15Q	150,000.00
Iron Cap Copper Co. . . . .	Ariz.	.25K	35,526.50
Judge Mining and Smelting. . . . .	Utah	.12½Q	60,000.00
Kennecott Copper. . . . .	Alaska	.50QX	1,393,530.00
Nevada Consolidated Copper. . . . .	Nev.	.25Q	499,864.25
Oroville Dredging, g. . . . .	Cal. & Mex.	9d.Q	£25,745.175
Ray Consolidated Copper. . . . .	Ariz.	\$0.25Q	\$394,294.50
St. Joseph Lead. . . . .	Mo.	.50Q(a)	704,734.00
Utah Copper. . . . .	Utah	1.50Q	2,436,735.00

(a) Further stock dividend of one share to each ten shares held, ex Sept. 27.

Canadian, Mexican, Central and South American Companies	Situation	Per Share	Totals
Cerro de Pasco Copper. . . . .	Peru	\$1.00Q	\$898,229.00
Hollinger Consol. Gold. . . . .	Ont.	.05X	246,000.00
McIntyre Porcupine, s. . . . .	Ont.	.05Q	182,014.15
Mexico Mines of El Oro, g.s. . . . .	Mex.	4 sh.Q	£36,000.000
Mining Corporation of Canada, s. . . . .	Ont.	\$0.12½Q	\$207,506.25
Pato Mines, Ltd., g. . . . .	Colombia	3½sh. Q	£17,500.00
Holding Companies			
Yukon-Alaska Trust. . . . .		1.00Q	203,433.00

Q, quarterly; K, occasional; X, includes an extra dividend.

Isle Royale, of Michigan, voted to pay no dividend at this time owing to production costs and the relatively low market price of copper. The company's last dividend was 50c., paid in September, 1919. Cresson Consolidated also passed its dividend, owing to low grade of ore being mined. Iron Cap Copper Co., however, was feeling easier and declared its first common stock dividend since February, 1919, when it stopped paying 25c. monthly; and Golden Cycle Mining & Refining Co. also resumed, after omitting three monthly payments.

National Lead Co. paid its regular quarterly dividends of 1½ per cent on the common and 1¼ per cent on the preferred shares.

# MINING STOCKS

Week Ended September 25, 1920

Stock	Exch.	High	Low	Last	Last Div.	Stock	Exch.	High	Low	Last	Last Div.	
<b>COPPER</b>						<b>GOLD</b>						
Adventure.....	Boston.....	58	57	58	Sept. '20, Q	.50	Alaska Gold.....	N. Y.....	1 1/2	1 1/2	1 1/2	
Ahmeek.....	Boston.....	1	1	1			Alaska Juneau.....	N. Y.....	1 1/2	1 1/2	1 1/2	
Alaska-B.C.....	N. Y. Curb.....	23	23	23	Mar. '19,	1.00	Carson Hill.....	N. Y. Curb.....	25	24 1/2	24 1/2	
Allouez.....	Boston.....	55 1/2	51 1/2	52 1/2	Aug. '20, Q	1.00	Cresson Consol. G.....	N. Y. Curb.....	11	11	11	June '20, Q
Anaconda.....	N. Y.....	10 1/2	10	10	Oct. '18,	.50	Dome Ex.....	Toronto.....	*40 1/2	*37	*40	
Ariz. Com'l.....	Boston.....	9	9	9			Domr Mines.....	N. Y.....	11 1/2	11	11 1/2	July '20, Q
Big Ledge.....	N. Y. Curb.....	57 1/2	56	56 1/2	Sept. '19, Q	.25	Golden Cycle.....	Colo. Sprgs.....	11	11	11	Sept. '20, Q
Bingham Mines.....	Boston.....	285	285	285	June '20, Q	5.00	Goldfield Con.....	N. Y. Curb.....	*10	*9	*9 1/2	Sept. '19,
Calumet & Ariz.....	Boston.....	10 1/2	10	10	Dec. '18, SA	1.00	Hedley.....	Boston.....	47 1/2	46	46	June '19,
Calumet & Hecla.....	Boston.....	45 1/2	41	41 1/2	Sept. '20, Q	1.00	Hollinger Con.....	Toronto.....	5.98	5.77	5.77	Sept. '20, X
Canada Copper.....	N. Y. Curb.....	15 1/2	14 1/2	14 1/2	Feb. '20, Q	.10	Homestake.....	N. Y.....	47 1/2	46	46	Sept. '19,
Centennial.....	Boston.....	29 1/2	26 1/2	26 1/2	Sept. '20, Q	.37 1/2	Kirkland Lake.....	Toronto.....	*49	*48 1/2	*49	
Cerro de Pasco.....	N. Y.....	35 1/2	33 1/2	33 1/2	Sept. '20, Q	.50	Lake Shore.....	Toronto.....	1.13	1.10	1.11	Oct. '19,
Chief Consol.....	Boston Curb.....	*38	*36	*37 1/2	Dec. '18, Q	.05	McIntyre-Porcupine	Toronto.....	2.07	2.04	2.05	Sept. '20, K
Chile Copper.....	N. Y.....	8 1/2	8 1/2	8 1/2	Mar. '20, Q	.25	Porcupine Crown.....	Toronto.....	*25	*22 1/2	*25	July '17,
Chino.....	N. Y.....	11 1/2	10 1/2	10 1/2	Dec. '19, A	.50	Portland.....	Colo. Sprgs.....	6	4	6	July '20, Q
Columbus Rexall.....	Salt Lake.....	*85	*70	*80	Feb. '19, SA	.15	Reorgan. Booth.....	N. Y. Curb.....	6	4	6	May '19,
Con. Ariz.....	N. Y. Curb.....	2 1/2	2 1/2	2 1/2			Silver Pick.....	N. Y. Curb.....	*6	*5	*5 1/2	
Con. Copper M.....	N. Y. Curb.....	35 1/2	33 1/2	33 1/2	Sept. '20, Q	.50	Teck Hughes.....	Toronto.....	*8	*7	*8	
Copper Range.....	Boston.....	11 1/2	10 1/2	10 1/2	Dec. '19, A	.50	Tom Reed.....	Los Angeles.....	1.02	*97	*98	Dec. '19,
Crystal Copper.....	Boston Curb.....	*41	*38	*40			United Eastern.....	N. Y. Curb.....	3 1/2	2 1/2	3	Apr. '20, Q
Davis-Daly.....	Boston.....	2 1/2	2 1/2	2 1/2			Vindicator Consol.....	Colo. Sprgs.....	18	18	18	Jan. '20, Q
East Butte.....	Boston.....	2 1/2	2 1/2	2 1/2			West Dome Consol.....	Toronto.....	*6 1/2	*6	*6 1/2	
First Nat'l.....	Boston Curb.....	*70	*58	*70			White Caps Min.....	N. Y. Curb.....	*9 1/2	*8	*8	
Frankl'n.....	Boston.....	35 1/2	35 1/2	35 1/2	May '19, Q	1.25	Yukon Gold.....	Boston Curb.....	1 1/2	1 1/2	1 1/2	June '18,
Gadsden Copper.....	N. Y. Curb.....	28 1/2	27 1/2	28 1/2	Aug. '20, Q	.50						
Granby Consol.....	N. Y.....	4 1/2	4 1/2	4 1/2								
Greene-Cananea.....	N. Y.....	40	40	40	July '20, Q	.05						
Hancock.....	Boston.....	49 1/2	44 1/2	45 1/2	July '20, Q	1.00						
Houghton.....	Boston Curb.....	28	27	27 1/2	Sept. '19, SA	.50						
Howe Sound.....	N. Y. Curb.....	26	24 1/2	24 1/2	Sept. '20, Q	.50						
Inspiration Con.....	N. Y.....	1 1/2	1 1/2	1 1/2								
Iron Cap.....	Boston Curb.....	2 1/2	2 1/2	2 1/2								
Isle Royale.....	Boston.....	17	13	15	Oct. '18, Q	.25						
Kennecott.....	N. Y.....	1 1/2	1 1/2	1 1/2								
Keweenaw.....	Boston.....	17	13	15	Oct. '18, Q	.25						
Lake Copper.....	Boston.....	2 1/2	2 1/2	2 1/2								
La Salle.....	Boston.....	2 1/2	2 1/2	2 1/2								
Magma Chief.....	N. Y. Curb.....	17	17	17	Jan. '19, Q	.50						
Magma Copper.....	N. Y. Curb.....	*18	*12	*18								
Majestic.....	Boston Curb.....	1 1/2	1 1/2	1 1/2								
Mason Valley.....	Boston.....	3 1/2	3 1/2	3 1/2	Nov. '17, Q	1.00						
Mass. Con.....	Boston.....	6 1/2	5 1/2	5 1/2								
Mayflower-O.C.....	N. Y.....	20 1/2	19 1/2	19 1/2	Aug. '20, Q	.50						
Miami.....	N. Y.....	60	58	58	Aug. '20, Q	1.50						
Michigan.....	Boston.....	5 1/2	5 1/2	5 1/2								
Mohawk.....	Boston.....	13 1/2	12	12	Sept. '20, Q	.25						
Mother Lode (new)	N. Y. Curb.....	3	3	3								
Nevada Con.....	N. Y.....	18 1/2	18 1/2	18 1/2	Aug. '20,	.25						
New Arcadian.....	Boston Curb.....	17	13	15	Oct. '18, Q	.25						
New Baltic.....	Boston.....	1 1/2	1 1/2	1 1/2								
New Cornelia.....	N. Y. Curb.....	1 1/2	1 1/2	1 1/2								
Nixon Nev.....	N. Y. Curb.....	1 1/2	1 1/2	1 1/2								
North Butte.....	Boston.....	1 1/2	1 1/2	1 1/2								
North Lake.....	Boston.....	1 1/2	1 1/2	1 1/2								
Ohio Copper.....	N. Y. Curb.....	25	24 1/2	25	Dec. '18, Q	1.00						
Ojibway.....	Boston.....	39 1/2	39 1/2	39 1/2	June '20, Q	.50						
Old Dominion.....	Boston.....	48 1/2	46	47 1/2	Sept. '20, Q	1.00						
Oseola.....	Boston.....	16 1/2	15	15	June '20, Q	.25						
Phelps Dodge.....	Open Mar.....	†210	†180									
Quincy.....	Boston.....	40	38	38	June '20, K	2.00						
Ray Con.....	N. Y.....	15 1/2	15	15								
Ray Hercules.....	Boston Curb.....	1 1/2	1 1/2	1 1/2	Nov. '17, Q	.25						
St. Mary's M. L.....	Boston.....	9	8 1/2	8 1/2	Jan. '20, Q	.25						
Seneca.....	Boston.....	2	2	2								
Shannon.....	N. Y.....	*26	*20	*20								
Shattuck Ariz.....	N. Y. Curb.....	4	3 1/2	3 1/2	Apr. '17,	1.00						
South Lake.....	Boston.....	10 1/2	9 1/2	10	May '18, I	1.00						
South Utah.....	Boston.....	*60	*55	*55	May '13,	.10						
Superior.....	Boston.....	32	30 1/2	30 1/2	Aug. '20, Q	.50						
Superior & Boston	Boston.....	7 1/2	7 1/2	7 1/2	Sept. '18,	.25						
Tenn. C. & C.....	N. Y.....	66 1/2	61 1/2	62	Sept. '20, Q	1.50						
Tuolumne.....	Boston.....	1 1/2	1 1/2	1 1/2	Dec. '17,	.30						
United Verde Ex.....	Boston Curb.....	2	2	2								
Utah Con.....	Boston.....	*35	*35	*35								
Utah Copper.....	N. Y.....	13 1/2	13 1/2	13 1/2	Jan. '20, Q	.50						
Utah M. & T.....	Boston.....	13 1/2	13 1/2	13 1/2								
Victoria.....	Boston.....	4 1/2	4 1/2	4 1/2	Sept '20, QX	.15						
Winona.....	Boston.....	16 1/2	16 1/2	16 1/2	Sept '20, QX	.50						
Wolverine.....	Boston.....	*13	*13	*13	Dec. '15,	.05						
		1 1/2	1 1/2	1 1/2	Nov. '18,	.25						
<b>LEAD</b>						<b>SILVER-LEAD</b>						
Hecla.....	N. Y. Curb.....	4 1/2	4 1/2	4 1/2	Sept '20, QX	.15	Caledonia.....	N. Y. Curb.....	*21	*17	*19	July, '20, M
St. Joseph Lead.....	N. Y.....	16 1/2	16 1/2	16 1/2	Sept '20, QX	.50	Consol. M. & S.....	Montreal.....	25 1/2	24 1/2	24 1/2	July '20, Q
Stewart.....	Boston Curb.....	*13	*13	*13	Dec. '15,	.05	Daly Miming.....	Salt Lake.....			2.40	July '20, Q
Utah Apex.....	Boston.....	1 1/2	1 1/2	1 1/2	Nov. '18,	.25	Daly-West.....	Boston.....	4 1/2	4 1/2	4 1/2	Sept. '20, Q
<b>ZINC</b>						<b>NICKEL-COPPER</b>						
Am. Z. L. & S.....	N. Y.....	13 1/2	12 1/2	12 1/2	May '17,	1.00	Internat'l Nickel.....	N. Y.....	20 1/2	18 1/2	18 1/2	Mar. '19,
Am. Z. L. & S. pf.....	N. Y.....	46 1/2	46 1/2	46 1/2	Aug. '20, Q	1.50	Internat'l Nick. pf.....	N. Y.....			80 1/2	Aug. '20, Q
Butte C. & Z.....	N. Y.....	7 1/2	7 1/2	7 1/2	June 18, I	.50						
Butte & Superior.....	N. Y.....	20 1/2	18 1/2	18 1/2	Sept. '17,	1.25						
Con. Interst. Cal.....	N. Y.....	10	9	9	June '20, Q	.50						
New Jersey Z.....	N. Y. Curb.....	179	177	178 1/2	Aug. '20, Q	4.00						
Success.....	N. Y. Curb.....	*4 1/2	*3 1/2	*4 1/2	July '16,	.03						
Yellow Pine.....	Los Angeles.....	*95	*95	*95	June '20, Q	.03						

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



