

September 10, 1921

ENGINEERING AND MINING JOURNAL

A Weekly Journal of the Mining and Mineral Industries



This structure, which is the property of the Glen Alden Coal Co. (formerly the Delaware, Lackawanna & Western R. R. Coal Department) at Edwarsville, Pa., will be visited by Institute members and guests at Wilkes-Barre meeting.

A Million Dollar Coal Breaker

A steel, glass, and concrete building 213 ft. long, from 65 ft. to 107 ft. wide and from 100 ft. to 145 ft. high. It contains 3,000 tons of structural steel and 26,000 panes of double-thickness, ribbed glass. Construction is modern throughout.

Reclamation of Mexican Mining Titles

By Paul W. Meyers

Concentration by Roughing—III

By E. S. Wiard

Biography of Frederick F. Sharpless

Dividends are scarce these days, no matter whether industrial, railroad, or mining stocks are considered. Distributions by mining companies during August, published in this issue, are scanty compared with wartime standards, though some companies are not only paying but earning their regular dividends.

Points of interest in the anthracite coal district that will be visited by members of the A. I. M. E. during their 124th meeting are mentioned in a preliminary account which appears in this issue in "Echoes From the Fraternity." Three tours, covering the northern and Lehigh regions, have been arranged.

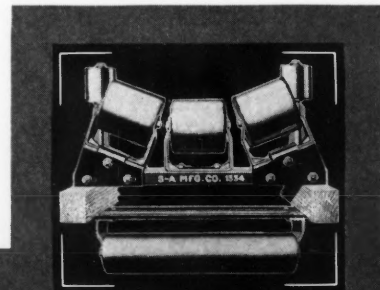


Belt Conveyors—Unit Carrier Equipped Are Dependable

Belt conveyors are rapidly taking the place of older and less efficient modes of handling bulk materials quickly and in large quantities. The mechanical simplicity of the belt conveyor is one of the outstanding features of merit. Like any other mechanical device, the machinery units must be correctly designed and well built.

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
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Support the Institute

A CORRESPONDENT raises the question whether it is worth the price to belong to the American Institute of Mining and Metallurgical Engineers. If our opinion is of value to him, it is to the effect that this society is the one organization to which he cannot afford not to belong. We believe that every engineer who is eligible should become a member. The society has been wonderfully active and virile, and that character still continues. What it has done in the way of developing knowledge of mining technology and in the advancement of it cannot be overestimated.

We are weighing our words. No small part of the prominence of the American Mining Engineer has been due to the exchange of knowledge, the instructions of the technical papers, and the general feeling of solidarity and good-fellowship which has been brought about by the Institute. We urge most sincerely every engineer who can qualify to join; and to all who are in it we represent that it is a benefit, and not only that but a duty, to remain.

You owe something—probably a great deal—to your profession, and you can express this debt most simply by being a member of the Institute and supporting it.

The Rôle of Criticism

WE WRITE this explicitly because it is our creed, and also lest our friendly criticism or friendly joking concerning *Mining and Metallurgy*, or any other detail of the Institute's activities, should be misunderstood for lack of belief in the necessity of loyalty and support for the society.

A sure sign of a good citizen is when he takes enough interest in the affairs of government to applaud and censure; and the same principle applies to the members of a great society. A great, virile organization like the Institute can never escape adverse criticism: it will never desire to, for the only man, and the only society, that never makes mistakes is a dead one. And besides mistakes, there is a difference of opinion, and both sides should express their opposing views; and out of this discussion we shall get enlightenment, and finally a course of action shaped by the feeling of the majority.

The Institute is an organization, not an individual; and if we make suggestions and criticisms we are only one of thousands of members who do so. Such differing points of view will be heard in its meetings, on its committees, in its directors' meetings, in conversation among its officers. It is organized like any well-ordered society, toward that end. No Lenine-Trotsky regime dictates; there is no head to attack; no prince to assassinate; no one but members, directors, and officers, who all have their ears to the ground to find out what the great body of the Institute wants and how its interests (which means the interests of the profession of mining engineering), can be advanced.

The Necessity of Taking Part

WE HAVE A LOT of suggestions and further criticisms to make to the Institute, but we do not want to spoil what we have, in a genuinely appreciative spirit, written above. We know the Institute will be thankful for them, as its members and officers have been in the past, and have so generously and courteously expressed themselves to that effect. Wherefore, brother members, go thou and do likewise. It is your society, and the temporary management of the society is keen to know what you are thinking about it, and chiefly solicitous that you should do some kind of careful thinking about it.

The solidarity of mining engineers is a mental economic and spiritual safeguard for the profession; and the Institute is the only society which symbolizes and makes coherent that solidarity.

The Sensitiveness of the Modern Economic System

THE MODERN ECONOMIC SYSTEM is a highly organized and exceedingly complex arrangement. It is a gradual development from the primitive custom in which each family group produced enough for its own particular requirements, to the complicated modern order in which we are all more or less highly specialized cogs in the great machine that keeps the world moving and improving. Under this scheme the rancher, to take a homely example, raises cattle, the hides of which are used by the shoe manufacturer to make shoes for the rancher or any one else demanding them. The miner in his turn produces copper for use in electrical machinery necessary to the economical production of shoes and other commodities. And so on. Through an exchange of commodities or services we are able to satisfy our wants to a certain degree. In normal times this arrangement brings about a fairly stable relation between the various producing groups, and prices are evolved that represent an adequate return for any particular branch of production or service. Every unit is closely knit together, nationally and internationally, and mutually dependent.

When some economic upheaval such as war or a financial panic and period of depression affects one or more of these commodities the others are also disturbed, the economic system is disorganized, and the complaint is made that conditions are highly unsatisfactory. The fact that the modern economic system is so sensitive to sudden change and slow in readjusting itself largely accounts for the predicament in which many branches of commerce now find themselves, as price relations are still abnormal, raw material prices being far below those of manufactured products. This situation must ultimately correct itself.

In the meantime the mining industry, as one of the great raw-material producing industries, finds itself in the short space of two years plunged from the heights of prosperity—fat dividends, jobs for all, and the other

symptoms of the times—to the most depressed period in many a year. The feeling is not enjoyable, but it has already deeply affected other units of trade. The shutdown of the copper and zinc mines of the country first shook labor, both skilled and unskilled, which was forced to seek employment in other activities, but under the unfortunate circumstance that other industries were also feeling the depression. Railroads lose heavily in revenue. In a period noted for its exceptionally high rates made to help them out of financial difficulties, the roads are unable to take the fullest advantage of this increase, because of a serious loss of traffic. Mine supply companies are hit, dynamite sales fall off, and machinery manufacturers push sales on a basis of replacement and the introduction of more efficient methods rather than greater production. Incidentally, the metal-producing states find their revenue cut severely, and are hardpressed to meet some political program decided upon at a more opportune time.

The fact that mining industries are depressed and that this is bound to have an effect upon others will ultimately result in some general readjustment of prices bringing them to a more normal relation, and though the process is tedious and nerveracking in its suspense, the mining industries can rest assured that sooner or later their period of inactivity will help to bring a correction among other commodities and services which will start the wheels of the mines turning again.

A German Example of a Technical Society Publication

GERMANY BECAME FAMOUS, among other things, for that efficiency which brushes aside morality and decency. Just as the Germans, however, are not wasting time on singing their hymns of hate these days, but are busy picking up the fragments, and with very good result and very efficiently, as reports go, so in this country we have since the armistice given over the exposal of the moral destruction back of such efficiency as Germany's. Therefore, we survey with renewed interest some account of an engineering journal published in Germany, as communicated to us from trustworthy private sources. This journal is published in German under the name of *Industrie und Technik*, in English under the name of *Engineering Progress*, also in Russian and Spanish. Our informant states:

"As far as *Engineering Progress* is concerned, it is a pure propaganda paper. In the heading of this paper, the publishers are stated to be the Society of German Engineers, the Association of German Steel Manufacturers, and the Society of German Electrical Engineers. The editor is one of the directors of the Society of German Engineers. These societies, however, have no financial interest in the matter, the real publisher being the *Auslandsverlag C. m. b. H.*, which is an organization formed for industrial propaganda in foreign countries, and which is strongly backed by what is called here the 'heavy industry,' by which is chiefly understood the Rhenish iron and steel industry. The *Auslandsverlag* is a part of a large organization, initiated during the war for the purpose of export propaganda for the German industry.

"The first enterprise started was a company formed for the purpose of centralizing the placing of advertisements in foreign journals, with the aim to secure in that way an influence in foreign publications, and by that an amount of favorable publicity. This company

has representatives and agencies in most foreign countries. It is conducted not so much as a commercial enterprise as a propaganda institution. Large funds are at the disposal of the company. The activity of this company has caused rather unfavorable comments not only abroad, but also in Germany; in the latter country for the reason that it plays an important part in the movement of bringing the German press under the influence of the iron and steel industry. Already a section of the press has been bought up by this industry, and a large number of papers are financially dependent on it, on account of the large influence the company has gained in the financial field."

Reverting to *Engineering Progress* in its different language-editions, our correspondent informs us, "The methods by which these publications have been financed is peculiar. Industrial firms have been solicited, with some pressure used, by the industrial organizations to subscribe to a number of copies, and to pay the subscription fee for several years in advance. A large amount of money was in that way received. Krupps, for instance, are said to have subscribed to several hundred copies for four years."

We have quoted liberally from this fascinating description, as we are much interested in the various types of technical journals, including those published as independent enterprises and those published by the technical societies, but as commercial ventures. In a recent address before the Philosophical Society in Washington, Dr. Robert B. Sosman analyzed the field, classifying the journals published by societies as altruistic, as opposed to the independent journals, or those published for profit. In a letter to him, however, we pointed out that the technical journals published by the societies were frankly, and according to their own statements, published for profit, and that the whole matter required closer analysis. We may thank heaven pharasaically that "they do these things more efficiently in Germany" when we learn of the frank union of the German engineering societies with a venal and prostituted technical press. May we be saved from this kind of efficiency! Individualism and the simple life were the original basis of Americanism; and we should cling as tenaciously as may be to whatever shreds of those ideals the times allow us to retain.

Labor's Stake in Industry

THE LARGEST TWO mining properties in the Grass Valley district in California, the North Star and the Empire, have been again beset by labor difficulties, which had their immediate origin in an attempt to equalize wages in relation to living costs. The prevailing wages had been increased during the last few years until neither of the mines mentioned was making a profit. According to Charles G. Yale, the cost of producing an ounce of gold has reached \$19.35 per oz. in the Grass Valley district. It was definitely stated that neither mine could operate under the prevailing wage. Thus the continuous employment of 600 or more miners is threatened.

Recently the Alaska Gastineau Mining Co. closed its Juneau property after a gallant fight to continue. During 1920, 478 men were continuously employed at an average wage of \$5.12 per day. The Mother Lode mines of California several months ago succeeded in reducing the prevailing wage scale without a strike. The difficulties of the copper miners are too well known

to render recounting them necessary. It is apparent to even the casual observer that the mining industry is facing a hard struggle to maintain itself and bridge the wide gap intervening between the present stagnation and prosperous times.

Labor is most benefited by continuity of employment and stability in both wages and living costs. Necessarily there must be hope of advancement or promotion. Interest of the employer and the industry generally in the hopes, aspirations, and welfare of its workers is just as essential as the interest of the worker in his particular job. Although it is true that in individual instances labor has been exploited, it is also equally true that labor has had its share in the exploitation of the public and individual employers as well. Exploitation of one kind or another by various groups is inevitable in our civilization. The great proportion of leaders in an industry are essentially fair-minded and solicitous for the continuation of that industry along sound economic lines and with the least possible exploitation of any interest involved, whether labor or the purchaser of its product. Were labor equally solicitous for the economic soundness of the industry from which it derives its living, there would be a whole-souled joining of interests and team work that would be of great benefit to the individual worker and therefore to all.

Efficient management and sound financing are as important to the worker as to the industry. Wages are important, but more important is the return made for the wages. Continuity of industry cannot be maintained without a substantial return in production, whether in tons broken per drill shift or saucupans made per labor shift. Collective bargaining carries with it collective responsibility and individual responsibility as well. If labor makes collective bargaining its tenet, then it must secure a thorough understanding of the economics of an industry, the peculiar difficulties that beset it and its relation to the common weal. Its responsibility is such that an industry cannot be allowed to wither and die, for this means a profound disturbance to the workers in that industry. In assuming the burden of collective bargaining, labor has taken a huge task upon its hands. To carry it out successfully it must secure the best executives and most comprehensive knowledge. Without this, collective bargaining may be disastrous both to the industry and the worker.

The present state of the mining industry is due to the limited demand for the metals despite the low prices prevailing. Were it possible for the mines to market a considerable proportion of the metals produced, operation for a limited time might be practicable, but with low prices and inability to market a considerable proportion of production at such prices, operation would speedily absorb available capital. In gold mining, many operations have been sustained largely out of a desire to retain working organizations and to prevent unemployment as much as possible. In other kinds of mining employment has been given to as many as possible in mine development and plant improvements.

Labor has a stake in industry. It is as important a one as the other fellow's. There has been too much discussion of individual rights, too much bickering among workers' organizations, and not enough of labor's interest in continuous productive industry. There has been too much suspicion of exploitation and not enough

appreciation of the persistent effort to keep the wheels going. There is not enough faith in disinterested efforts. We feel, however, that a majority of the skilled and semi-skilled workers in the mining industry are sound and have at heart pride in their industry. We bespeak a larger participation in the control of labor policies by them. We believe that a change is taking place that will cause a more decided pulling together than has hitherto been evident. In the specific instance given in the beginning of this editorial we have been informed that the Grass Valley miners are getting together with the operators. Their common interests would indicate a speedy and satisfactory adjustment of existing difficulties. The prevalence of this spirit now and in the future is indicative of the continuance of mining operations in such a way as to be remunerative to both employer and worker, without which industry cannot prosper.

From Beans to Bonus

THERE ARE WILDCATS and wildcats when drilling for oil is considered, as every one knows. There are wildcats that ought to be encouraged in their efforts to be good, and there are other wildcats that ought to be spanked. Spanking a wildcat is something like belling a tame cat. First you have to catch him and make sure that you have him.

Out in Fallon, Nev., a district renowned for its production of siliceous oil beans, the wildcats have been busy many, many moons. For over two years there have been frequent attempts at well drilling in this locality, some of which died a-borning and others of which died before they were born. Not one has resulted in anything except a slender hole in the ground. But the ground out at Fallon looks as if oil ought to be there, the wildcatters say. On the other hand, knockers say that geological conditions there are unfavorable. But are not oil beans produced locally, and is this not a doubt-removing argument-clinching fact? How could you have oil beans, if there was no oil? Tell us that, ye doubters and knockers.

Anyhow, the government of the State of Nevada has offered \$25,000 as a bonus for the first producing oil well, and the wildcatters are about to go at it harder than ever.

Words, Words

"LEASER," meaning "lessee," is frequently heard in mining camps from East to West and from Canada to Mexico. Fay, in his "Glossary," defines it when thus used, as a colloquialism in vogue in the West. Webster calls such use of the word rare, obsolete or dialectic, but defines it as "one who leases." "Leaser," thus used, is not rare and certainly not obsolete. Possibly it is dialectic, though a word familiar to several million widely scattered inhabitants of this country can scarcely be termed dialect or slang.

Apparently the dictionary here is lagging behind the development of our tongue. One who quarrels with a dictionary, however, may not expect to have the last word. Another definition given by Webster for "leaser" is "liar." This is really obsolete, but many having Mark Twain's famous definition of a mine owner in mind will be apt to confuse it with "lessor" rather than "lessee."

WHAT OTHERS THINK

"Science, Journalism, and Hypocrisy" Recast, In Accord With the Mark Diagram

The editorial in *Engineering and Mining Journal* of July 9 on the above test strikes such a sympathetic chord in my breast that I am tempted to try you out along the strike, but at greater depth. I wonder if your thoughts were limited by the National Geographic Society. Was it not possible that the same formula could be applied to societies a little nearer home? To be more concrete, does not much that you say apply to the old A. I. M. E.?

In the issue of the *Journal* of Nov. 16, 1912, you published a diagram got up by our friend Mark Lamb, aiming to aid the beginner in locating his standing as a mining engineer. In this diagram, if you will take a straight-edge and draw a line from "Member A. I. M. E.," through "Envied," you will find "Hand to Mouth." If you instead draw the line through "Mining Geologist," it strikes "Visiting Wife's Folks." To this point I can vouch for the truth of the diagram.

One more trial. Draw the line from "Contributes to the *Journal*" through "Mining Geologist," and it hits "Check Book." My dear Mr. Editor, you might tell us if that part is true—I can't; but if you will look over on the next line you will note that the last line runs through "Common Sense"; so I am still a believer in the diagram.

Now let's mud out and put in a longer steel. Do you think that the average member of the A. I. M. E. gets his money's worth? If you think he does, please tell us why and how. Of course he can tack the "Member A. I. M. E." to his "Member N. G. S.," which may look nice in his obituary, but will it increase extraction any? You agree that the National Geographic gives you your \$3.50 worth in magazine, but how do you come out with the A. I. M. E.? I confess to belonging to the two societies, and I think that I get the most for my time and money in the N. G. Society. Did the membership committee of the A. I. M. E. ever send back the initiation fee because the applicant was not far enough advanced in the requirements for membership?

Judging by a perusal of the year book, I should judge that in many cases they gave the candidate the benefit of the doubt. Maybe they did so in my case too, but I am in now, and my wife has gone to the expense to buy me one of the nice little badges of the two crossed hammers. I fear every moment that she will find out that they are not official badges, and that she will have another reason why no young lady should ever marry a mining engineer.

I proposed some of the foregoing notions to an old member of the society, and his answer was, "But think how much the A. I. M. E. does for the general good of the mining engineer"; and I have thought and still am thinking. The average mining engineer can stand quite a bit more of this "good" without having his coffers overflowing.

As Zach Sweeney used to say, "Don't just be good; be good for something."

How much does the A. I. M. E. assay in "good for something"? "The question ain't who, but why."
New York City. "TOMMY KNOCKER."

The Theory of Special Pleading

Principles terminate in precipices. If it is your principle, as expressed in a recent editorial, to support the mining industry "finely and honestly," do not flinch at the precipice. To trace the original finely etched chiaroscuro on some palimpsest were simple compared to determining just how you support the mining industry in displaying the anti-tariff pen of Marc Pawl on minerals and supporting this policy editorially.

Nascent mining industries need the protection of tariff if we expect them to thrive in this country. The readers of the *Engineering & Mining Journal* who make their livelihood by mining expect to read a brief FOR a tariff on minerals, and not to find in your columns print which would make them think you have become some puisne advocate of the manufacturer, who is anxious to have foreign minerals imported duty free, which will permit him to make large profits on account of tariff protection he enjoys on his finished product.

Let the mining papers support the miners, and not enshroud their principles with a caliginous vapor, which might conceal the principles they print they are anxious to support.

Those whose finances will be adversely effected by a minerals tariff will quickly enough find objections to protection on minerals, and it will then be time enough to see what is "the greatest good for the greatest number."

We have read how the Almond Growers' Association work for a duty on almonds—the dye manufacturers asked protection on dyes—surely mining publications can support a tariff on minerals.

The United States is perhaps the richest country in the world in minerals. The virgin resources of Alaska are immense. Congress will do well to stimulate prospecting by favoring a tariff on minerals. A mining journal should be proud to support such a measure. Chromite, magnesite, asbestos, tungsten and many other important minerals need the tariff to allow operations of the mines in this country. To help such operations should be your endeavor. C. S. MALTBY.

San Francisco.

Should Copper Blast Furnaces Be Bricked Up to the Tuyères?

I am much interested in the results published by Julius H. Gillis in *Engineering and Mining Journal* of Aug. 13. I have noticed, in my work, that a furnace will speed up in a damp climate and handle a greater tonnage than when the air is clear and dry. However, I do not think that Mr. Gillis or any of the other metallurgists have mentioned what to my mind is the greatest factor in obtaining a maximum tonnage per square foot of hearth area.

Several years ago I was in charge of a blast-furnace plant consisting of one 20-ft. and two 30-ft. furnaces, and in this plant we treated a magnetite ore which produced sows. When one of these furnaces was rebuilt and newly bottomed, with the tuyères 20 in. from the bottom, it ran much slower than the other furnace that was filled with the sow. As the sow built up in the new furnace the tonnage gradually increased, until it reached its maximum, when the sow was on a level with the tuyères and the connection was almost closed. This plant had to suspend operations at the outbreak of the World War, and I did not have a chance to experiment further with the different conditions, although I made a record of 8.7 tons per square foot of hearth area.

Several years later I took charge of a plant in the Southwest, where the blast-furnace work had been very unsatisfactory, and, remembering about the sow in the other plant, I bricked the furnace up to the tuyères when I overhauled it. This furnace gave an average of 10.2 tons per square foot of hearth area when put in operation, which leads me to believe that a crucible is a detriment to a copper blast furnace producing matte.

I would be glad to hear from any other metallurgists who have been experimenting along this line. Below are a few tables showing tonnages handled under various conditions:

TWO BLAST FURNACES—51 x 360 IN.

Month	Average Daily Tonnage	
May.....	921	New bottoms
June.....	1,200	As
July.....	1,262	the
August.....	1,490	sow
September.....	1,641	builds
October.....	1,683	up.
November.....	1,950	
December.....	2,240	

OPERATION OF SMALLER FURNACE IN SOUTHWEST, WITH AND WITHOUT A HEARTH
Furnace 52 x 168 In.

	Tons
December, with a hearth.....	5,724
January, with a hearth.....	5,828
February, without a hearth.....	8,806
March, without a hearth.....	8,915
April, without a hearth.....	8,900
May, without a hearth.....	8,961

The improvement, as the crucible is eliminated, is evident.
F. K. BRUNTON.
Venice, Cal.

Radium Ore Supply Not Limited

The editorial in *Engineering and Mining Journal* of June 25, quoting a Baltimore physician, a "radiologist," suggesting the exhaustion of the available radium ores in the world in possibly fifteen years, was lately brought to my attention as a quasi-radiologist. Having visited most of the carnotite mining fields of Colorado-Utah and the more recently known fields of the Carrizo Mountains, in New Mexico and Arizona, and having observed the rate of production of carnotite and its associated minerals, I venture to predict the availability of radio-active ores from these fields alone for a much longer period than the fifteen years referred to by the "radiologist."

At present there is little production of these ores; the industry is passing through a period of depression. Sacked ore is stored in many places, awaiting shipment. Production of ore, of concentrates, of radium sulphates, of the refined product, as well as the byproducts of vanadium, are awaiting better days. Some unsold

radium menaces the market for those who are not sufficiently large and influential to control the situation. At the same time the miner is again being "shaken out." The history of mining and milling of radio-active ores in Colorado and Utah is marked by a series of shut-downs and revivals that appear arbitrary and designed to keep the small producer in his place. At the present rate of production the Colorado ores will last several centuries.

Figures giving ore reserves of irregular orebodies lying unexposed or partly exposed in sedimentary beds in an area containing nearly 100,000 square miles, part of which is not yet explored save by the manufacturer of "white mule," are likely to be uncertain.

An addition to the known area that is mineralized is that region lying on all but the north side of the Carrizo Mountains in Arizona, where rich vanadium ores, associated with medium grade radio-active ores, have lately been discovered. From several trips into that region it appears probable there are many years' supply of both vanadium and radium for the United States in these new and almost unexplored fields.

Farther to the west and also to the southwest are still other fields. There will be plenty of material for vanadium steel automobile axles and radium applicators for an increased use for an uncertain and unguessable number of years. There is work for an army of diamond drillers, and it will be easy work, as the overburden is rarely 50 ft. and often only 20 ft. thick.

To the north, in Utah, are unworked deposits in the Henry Mountains. Big field parties have explored some, in an incomplete way. Tales come from there of workable deposits awaiting the railroad and the caprice of the makers of markets.

I trust the shortage of radium-bearing ores will not worry you, nor your readers, nor any "radiologist" of our acquaintance.

Idaho Springs, Col.

W. H. STAVER.

An Advertiser's Opinion

Permit me to congratulate you for having included, and Harry J. Wolf for having written, the article "Judged From an Advertising Viewpoint," which appeared in *Engineering and Mining Journal* of July 16.

I am glad to be on record as saying that there isn't anything for which I will "go to the mat" quicker than a chance to battle against "Proceedings" of engineering societies and other societies or their official organs, soliciting advertising in those fields which are already represented by the legitimate trade and technical press. I have been in numerous skirmishes on this point and I have some very hard and fast opinions on the subject. These are best brought out in an article printed in the Dec. 30, 1920, and Jan. 6, 1921, issues of *Printer's Ink*. I admit having some interest in the preparation of this material, as I had talked this over with friend Murphy some months previous and had told him that this article would be of more real benefit to this phase of advertising than anything he could do, and I am glad to be able to refer Mr. Wolf to these articles, which contain the viewpoint of not only the writer and Mr. Murphy but of a good many other advertising men.

Whenever you see the need for defending the legitimate trade and technical papers against the encroachments of these so-called official organs and "Proceedings," let me know, and I am here to serve you.

New York City.

S. W. L.

The Reclamation of Mexican Mining Titles

Legal Process Outlined for Regaining Possession of Valuable Properties Forfeited During Revolution for Non-Payment of Taxes—General Conditions Leading to Forfeiture Described

BY PAUL W. MEYERS

Written for *Engineering and Mining Journal*

TEN YEARS of Mexican turmoil discouraged most American mine owners. It was but natural that many should have ceased the struggle to keep up payments on their taxes when the revolutions continued year after year. While the State Department at Washington served notice that receipts for payments made locally under protest to *de facto* authorities having military control would be held as legal and valid, the practical difficulties and dangers attending such payments at local offices caused many owners, forced from the districts by the perilous conditions, to arrange for payment of taxes to the Central Office in Mexico City.

This alternative was not always easy. The Mexican government accepts nothing but actual cash in payment of taxes, and trustworthy agents are not always available in revolutionary times. At a period when doubt existed as to the legality of any faction in temporary control of the capital, when banks had closed their doors, when Americans had been ordered to leave Mexico by their Government, many American owners were obliged to suspend tax payments.

CARRANZA FORFEITED MANY CHARTERS

The Mexican government officially takes the position that order has existed in the capital since August, 1915, or soon after Carranza forces under General Pablo González occupied the city and General Carranza returned from Vera Cruz. But the reputed anti-American attitude of Carranza and his limited control of the country caused American owners of mining properties to hesitate. The result was that many properties before long were declared *caduca* (forfeited) by the Carranza government. The provisions of the mining law of pre-revolutionary times had imposed a fine of 50 per cent for default of payment during the first month following, then 100 per cent for the second month, and then *ipso facto* forfeiture. This practice was now suspended and the policy adopted of letting the taxes accumulate except where the forfeiture of a title was specially applied for (naturally by parties interested in acquiring such properties by relocation), when special orders of forfeiture were issued.

This policy enabled speculators and parties in position to take advantage of the general situation to look up the records at the Central Office in the capital, learn of valuable properties in arrears in their tax payments, obtain their forfeiture, and, in the disturbed conditions prevailing in many districts, relocate without serious opposition or competition, thus acquiring such properties at a certain amount of personal risk but at nominal cost.

THE LAW PERTAINING TO FORFEITED PROPERTIES

Realizing this situation, on March 31, 1917, Carranza, as Chief Executive, promulgated a decree, the preamble of which set forth the fact that it was neither equitable nor just that it should continue. The following is a translation of the three articles of the decree itself:

Art. 1. The right to exploit minerals in virgin ground or in properties which may not have been exploited, is granted in the terms established by the Mining Law in force and its Regulations.

Art. 2. Such mining properties whose concessions may have been declared forfeited, whether by omission of the payment of the mining tax, or because of idleness in the terms of the Decree of Sept. 14, 1916, and which, in the judgment of the Department of Fomento, Colonization and Industry, represent a value of consideration through the actual state of their development, will be granted to exploitation by means of a special contract whose clauses will be established by the said department, and without being subject to the legal process established by the Mining Law and its Regulations in force.

Art. 3. In case of simultaneous applications, the right to the concession of a property will be put to public bids and the best bid will be accepted, after the Department of Fomento has studied the conditions presented by the applicants.

The decree of Sept. 14, 1916, alluded to, had required the operation of mining properties under penalty of forfeiture. It was afterward not enforced, its injustice and impracticability being recognized.

On March 15, 1918, the Department of Industry, Commerce and Labor (which had succeeded the Department of Fomento, Colonization and Industry) issued a circular to local mining agents prescribing the terms and conditions for the special contracts alluded to in the decree. These terms were onerous and impracticable. I have inquired and been informed that only two special contracts were ever applied for and executed, which were soon forfeited. It is safe to say that practically all those who relocated mining properties of developed value did so by simple location in violation of the decree.

IMPRACTICABILITY OF DECREE OF MAY 29, 1918, DEMONSTRATED

Therefore, on May 29, 1918, the Department of Industry, Commerce and Labor issued another circular to local mining agents beginning: "This department having observed certain irregularities on the part of the mining agents in applying the proceedings which should be followed in conformity with the decree of March 31, 1917. . . ." The instructions which followed described how virgin ground or properties having comparatively slight development could be relocated under the old Mining Law, but decreed that properties containing important developments which could be considered of industrial value could be acquired only by special contract, and in doubtful cases the agent might accept an application for simple relocation but should forward it with reports and information, based on which the department would either approve or reject the application.

However, the impracticability of this decree and its two regulations, so far as the result desired by the government was concerned, has been fully demonstrated. Local mining agents are usually not informed upon the state of development of the various mines of their respective districts or are not qualified to pass upon the

question of "industrial value." Quite naturally they have continued to accept without question simple relocations and ignore the decree of March 31, 1917, and its regulations.

Therefore, the Mexican government, realizing that agents have forwarded to the capital many illegal applications for titles to valuable mining properties, has been unusually slow in issuing new titles. It is now a common thing for an application to be over two years in process without title having been granted. I have been reliably informed that the present administration, fully recognizing the unworkable character of the law, has been contemplating its cancellation, but has hesitated to act until the whole question of relocations made during revolution can be decided upon at one time.

CARRANZA CONSTITUTION STILL OPERATIVE

The authority of the law cited appears to be unquestioned. On Oct. 19, 1915, the United States officially recognized Carranza as the Chief Executive of the *de facto* government of Mexico, and in February, 1917, full recognition was accorded. In the following month Carranza was elected President of Mexico, and he was inaugurated May 1, 1917. In the ensuing three years, while probably the greater portion of the country for the major part of the time was under control of opposing factions, the capital was securely held by the Carranza Administration. Then came the sudden overturn of May of last year, and by the time General Obregón was inaugurated on Dec. 1, 1920, organized opposition had ceased throughout the republic. The so-called Carranza Constitution of 1917 has been adhered to by the Obregón Administration, and the various decrees, laws, and regulations of the Carranza Administration are given full force and effect.

The Carranza decree of June 19, 1915, admitting the legality of the payment of mining taxes on properties in regions controlled by opposing factions, is well known and has served for the reclamation of numbers of properties. The recognition of the Carranza government by the United States and Carranza's continued control of the capital encouraged numbers of Americans to seek connections in Mexico City and pay up their taxes, even though in the districts in which their mines were situated there were conditions of insecurity to life and property. Moreover, prospects and properties of unknown value with taxes in arrears remained largely undisturbed, and many owners were able to take advantage of a period opened by the Carranza government and later extended by President de la Huerta in the latter part of last year for resuming payments and covering the payment of accrued taxes in installments without penalties.

OPPORTUNITIES THAT STILL REMAIN

Even now it is possible to resume payment of taxes by paying to the Treasury Department the accumulation in a lump sum with certain penalties added, provided the properties in question may not have been declared forfeited, as many still have not. Even if forfeiture has been declared, if it so happens that the forfeiture was *ipso facto* and not obtained by relocators, it is still possible to petition the Department of Industry, Commerce and Labor and secure the revocation of the forfeiture upon payment of the accumulated taxes with penalties to the Treasury Department, thus restoring the validity of the title.

This privilege, of course, cannot remain open indefi-

nately, and I understand that the Mexican government is contemplating fixing another period expiring Nov. 1 for the payment of accumulated taxes, after which a general order for forfeiture will be made covering all titles which may remain unredeemed.

There remains, therefore, the case of owners of valuable properties who became completely discouraged by the general conditions in Mexico, but who perhaps clung to the hope that eventually they would be permitted to reclaim under conditions of entire peace and security, and so, after dropping the struggle to meet taxes every four months, did nothing further in the matter. Such owners, probably reading of disturbed conditions and conflicts between Federals and rebels in the general region of their properties, cherished the hope that the Carranza government would take such general conditions into consideration and not insist upon collecting taxes where operations would be dangerous, or, at least, unattractive from a business viewpoint. But the Carranza government re-established its mining agencies as fast as possible in regions of sporadic disturbances, adopted a stern attitude toward the mining industry, endeavored to force the operation of properties, and freely imposed the penalty of forfeiture for non-payment of taxes, so that speculators and relocators, risking the trips to the district agencies in periods of calm, effected the formal publications of forfeiture and relocated valuable properties at nominal expense.

Having studied the subject carefully, I am convinced that there is only one road still open to the recovery of such valuable, developed mining properties, and that is the application of the law of March 31, 1917, in cases in which title may not yet have been formally issued to new claimants.

ONLY ONE PRECEDENT EXISTS

There is only one really complete precedent of such application of the said law to my knowledge. In 1916 the old San Rafael mine of Zacatecas was declared forfeited for non-payment of taxes, and the central portion, embracing the main shaft, was relocated by former employees. Upon the promulgation of the decree in 1917, the American company which had owned the mine sought to have the law applied retroactively, and secured this result by executive order; that is to say, after the industrial value of the mine had been proved, the application of the relocators was rejected. These latter promptly brought suit in the State Court of Zacatecas, and won, but lost when the case was appealed to the Supreme Court of Mexico in Mexico City, the latter deciding that ownership is born with the issuance of title, up to which point the government can accept or reject any application for reasons which, in its judgment, are proper.

The question then arose of the requirements of the law for opening the property to public bids for a special contract. But, as it happened, the San Rafael had suffered damage through Villistas, and its owners submitted a proposition to the Treasury Department taking the position that the property could not be put to public bids unless security was deposited for this damage, and offering to renounce any claim for such damages in lieu of a special contract, provided they were permitted to pay the accumulated taxes in consideration of the revocation of the forfeiture of the title. This proposition was duly accepted by the Treasury Department, but not concurred in by the Department of Industry, Commerce and Labor until recently. However,

this case has now been closed and the title fully restored to the American owners.

The value of this precedent is lessened by the retroactive application of the law and the renunciation of the damage claim. Probably a number of valuable properties may be in similar position of having suffered damage to equipment and would cheerfully renounce any claim in consideration of getting their properties returned to them, but others may have no such proposition to offer.

THE DIPLOMATIC SITUATION

The news regarding Mexico, American interests and terms for recognition is dominated by the difficulties of the oil companies. American mining interests, once dominating a great industry in Mexico, are now singularly quiescent. But, while Article 27 of the Constitution of 1917 appears to confiscate legitimate subsoil rights, if interpreted retroactively, is there not some ground for the contention that the application of the mining law regarding forfeiture, whose stringency may not have worked undue hardship upon mine owners in the peaceful times before 1910, has been confiscatory in effect when applied in the troublous period which, it is to be hoped, is now closed?

Broadly speaking, it seems to me peculiarly unfair that mine operators—driven from the peaceful operation and physical possession of their properties by revolutionary conditions, and leaving the country because of the impracticability of resuming their businesses under recurring danger to life and property; then subjected to uncertainties and difficulties in the payment of their taxes, when one faction threatened to repudiate all payments to another, and no one could foretell who would emerge a winner or when the revolution would end—should have been subjected to the extreme penalty of forfeiture of their titles as a climax to their misfortunes; especially in the discriminatory manner practiced during the Carranza administration, when speculators were able to secure special forfeiture and pick the hearts out of valuable properties representing large investments of capital. It may be alleged in defense that ample time was usually allowed before declaring forfeiture, but it is an open question whether this time elapsed during actual conditions of security, using the word in a broad sense.

STATUS OF MEXICAN MINING TITLES

This question of security and protection of American interests is one which, in my opinion, can only be properly and effectively debated between the two governments. It is well known that Mexican mining titles are simply mineral rights which are granted by the Mexican government only for the period in which taxes are met, and are revocable upon the failure to pay such taxes. And so long as a mining property is in the prospective stage, one may perhaps look upon its loss through revolution as the fortune of war. But when a considerable sum has been invested, either through purchase or development, and the property has come to represent a real value in ore developed, equipment, and the collateral expenses which form so large a portion of the cost of bringing a mining property to the point of production, then its ownership becomes a vested right which should, in equity, be protected by a responsible government in time of revolution and civil strife, instead of being subjected to the extreme penalty of forfeiture as a climax to whatever injuries may already have been inflicted upon its business and equipment.

In other words, the Carranza government, finding itself unable to control the country or to give the mining business anything like the condition of peace and security in which it had been developed, in justice should have protected titles from speculators, as this was within its power. Itself in arrears in its financial obligations, it might fairly have given greater consideration to others in misfortune, especially as declarations of forfeiture yielded it little profit.

The Mexican government is, no doubt properly, sensitive of the use of the word "confiscation." It insists upon the legal interpretation that confiscation is the forcible appropriation of property without due process of law. But where law can be made overnight by executive decree, and revolutionary conditions may make observance either difficult or impracticable, the question of whether or not mining titles should be irrevocably lost becomes essentially a matter of justice and fairness on the part of the Mexican government.

What is known technically as "equity" in the courts of the United States does not exist in Mexico jurisprudence, where all is written law, and in order to make any reclamation of mining titles, in my opinion, it will be necessary to take the law as it is to begin with, and also to attempt to persuade the Mexican government to make such further regulations as may seem practical and just. I have submitted a plan for diplomatic negotiations on this point between the United States and Mexico which I believe to be not only just to Americans but of positive practical advantage to Mexico, as it would perhaps bring back numerous American mining men to reclaim and resume operations, and thereby stimulate the mining industry of Mexico, which is suffering such great depression.

METHOD OF RECLAIMING FORFEITED TITLES PROPOSED

It must first be stated that, in my opinion, retroactive action will be difficult, and, in the case of properties which have been duly forfeited, relocated and the *titles to which have been issued*, the Mexican government can only refer any reclamation to the courts. It is true that mining titles are issued "without prejudice to the rights of third parties," and Art. 116, Chap. VIII, of the Mining Law extends a term of three years from the issuance of a title in which an action might be brought in the courts with the object of securing annulment of the title by the government. But the way of the courts is tedious. I recommend that, as a first step, original owners should learn if their properties have been formally forfeited, and if so, second, whether they have been relocated, and then, third, whether title has been issued to the relocater.

If it proves that a relocation has been made but title not yet issued, an opposition should be filed at once at the Department of Industry, Commerce and Labor, in which the circumstances relating to the forfeiture of the title are clearly set forth, ending with a request that the department grant a reasonable term for proving the industrial value of the property under the law of March 31, 1917.

When this is granted, a Mexican "titled" or graduate mining engineer must be employed to examine the mine, take check samples, and verify as fully as possible the data of ore developed which have been submitted by the owner.

Should the report of this engineer confirm the industrial value claimed for the property, the Department of Industry, Commerce and Labor may require other more

specific information of the circumstances surrounding the forfeiture and relocation, and will doubtless also require the owner or his representative to prove legal authority to act by submission of deeds or powers-of-attorney.

The second regulation of the law of March 31, 1917, states that even though the mine workings may be under water or in ruins, if industrial value can be shown, the property is not subject to simple relocation, so it may be possible to convince an engineer by full data and collateral evidence, and so prove industrial value, despite the probable condition of a mine after years of idleness. Of course, the relocater may in turn contend the property to be without industrial value and ask for a period for proving same, but in the case of a property actually developed and with ore in sight, the relocater will obviously be at a disadvantage in attempting to prove a negative contention.

The case should eventually proceed to a decision upon the score of industrial value, and, if proved satisfactorily, the application of the relocater will be rejected.

At present, the Department of Industry, Commerce and Labor, despite the precedent of the San Rafael case, holds the opinion that the property should thereupon be put to public bidding for a special contract for its operation; but, as it is the custom to revoke forfeiture in favor of former owners who apply for the privilege of paying accumulated taxes, when no rights of a third party exist, and as such rights will have been removed by the rejection of the illegal relocation, it would obviously be unfair to insist on putting the property up at auction in disregard of the just rights of the original owner whose labor or investment gave the industrial value he has proved.

I have strong hopes that diplomatic conversations on this point may result in an interpretative regulation being issued by the Department of Industry, Commerce and Labor defining this question in favor of the reinstatement of the titles of the original owners upon their payment to the Treasury Department of their accumulated taxes.

This is the only legal recourse which is now open for those in the position outlined who would like to attempt the reclamation of their properties. I think it may be of interest to many of the former mine owners and operators in Mexico.

Accidents in Utah Ore-Dressing Plants

During 1920 there operated in Utah eighteen mills and ore-dressing plants, employing 1,534 men and milling 6,132,386 tons of ore (not including ore put through sampling mills), which represents about half the capacity of the mills in question. There were produced 421,864 tons of concentrates. These figures are taken from reports made to the Utah Industrial Commission by the plants themselves. Labor and accident data from the plants, as compiled by the Federal mine inspector in connection with the commission, are as follows:

MEN EMPLOYED AND ACCIDENT PERCENTAGE IN UTAH ORE-DRESSING PLANTS, 1917-1920

	1917	1918	1919	1920
Men employed.....	4,103	1,942	1,382	1,534
Total shifts of labor.....	1,459,383	691,255	483,852	516,487
Average days worked.....	356	356	350	337
Number killed.....	5	2	1	1
Seriously injured.....	170	66	56	56
Slightly injured.....	362	139	220	220
Total injured.....	496	532	205	276
All accidents per 100,000 shifts.....	34.0	77.1	42.3	53.5
Serious injuries per 100,000 shifts.....	24.8	13.8	11.0	11.0

A Blast Furnace for Zinc?

Experiments in Smelting of Ores Under Pressure Suggested Which Might Result in Economies Over Present Methods

BY EVANS W. BUSKETT

Written for *Engineering and Mining Journal*

MANY ATTEMPTS have been made to smelt zinc ores in a blast furnace, and some of these have been successful so far as the smelting operations were concerned. The zinc was extracted from the ore, but on account of the large admixture of air and gases it was found impossible to condense the zinc to metal. It came off as a blue powder, or zinc dust, mixed with zinc oxide.

The advantages of smelting zinc ores in a blast furnace are many. First there is the cost of installation. The cost of erection of a blast-furnace plant would not be more than 25 per cent of the cost of a retort plant of the same capacity. The cost of operation is less, especially the labor cost, which would be less than one-half that of a retort plant. Again, in a blast furnace the process is not so much at the mercy of the laborers as in the retort plant, nor is blast-furnace work as hard on men as the work around a retort furnace. A man does not have to face a fiery furnace all the time, as in a retort furnace. But the most important point of all is still in doubt—the recovery of the metal from the ore.

Schnabel says, in his "Handbook of Metallurgy," "In the present condition of science and technology, all attempts at the production of zinc in shaft furnaces must therefore be looked upon as presenting no probability of success." But science and technology are constantly changing. What was impossible yesterday is in common use today.

PRESENT METHODS OF ZINC RECOVERY FOLLOW BELGIAN PRACTICE

A close inspection of processes now employed in the metallurgy of zinc does not reveal anything revolutionary but rather only an improvement in the Belgian method. There are the large gas-fired furnaces with tiers of retorts four and five high; there are the larger regenerative furnaces fired by producer gas; and now metal shields protect the men. These details and a close attention to the furnace operations have reduced the losses from 25 to 15 per cent and in many operations to 10 per cent. But these savings are still accompanied by high costs—the cost of smelting in some plants being \$28 per ton.

I propose a set of experiments that in my opinion will lead to a commercially successful process of smelting zinc in a blast furnace or at least in a modified form of blast furnace.

In the retort furnace, the charge of coal and roasted ore is about 50—50. The excess of coal produces CO and CO₂ gases, thus keeping up a reducing atmosphere without which the zinc would be reoxidized and lost. It also plays the mechanical part of holding up the charge, allowing the CO gas to circulate freely and preventing the slag-forming constituents of the ore and coal from uniting with each other.

A series of experiments should be made using coal in slight excess of what is needed for the actual reduction of the zinc from the ore. These experiments can be made by filling a short piece of iron pipe with

the mixture and sealing the ends with caps or plugs. These pipes should be placed in a furnace and heated for several hours. In my opinion the pressure produced by the gases in the pipe will not be sufficiently strong to break it. The pipe should be removed from the furnace, set on end, and allowed to cool, after which it should be opened and examined. If the experiment is successful the zinc will be found in a metallic button at the bottom of the pipe with a layer of slag above it. The zinc and slag should be weighed and the slag assayed for zinc, iron, lime, and silica.

Should this first experiment prove successful, a second one should be made in which the pipe should be cooled below red heat, then opened and its contents poured into a mold. This will demonstrate the fluidity of the slag.

POSSIBILITIES OF UPRIGHT IRON RETORTS

Analyses should then be made of the ore and coal to determine the slag-forming constituents—iron, lime, and silica, and the necessary additions of fluxes made to produce a fluid slag. The success of these experiments will indicate that a process is feasible wherein upright iron retorts can be used. These retorts could be 12 to 18 in. in diameter and 10 ft. high. A 12 in. retort would have three and one-half times the capacity of an ordinary retort.

The fact that 75 per cent of the coal has been eliminated would make one of the iron retorts about five times the smelting capacity of a clay retort of the Belgian process. These retorts should be set in two rows, twenty retorts to the block. On the outer side a tap hole would be provided, opened and closed by a stop cock. The opening from the stop cock would be closed by a piece of charcoal before charging, to avoid difficulty in opening after the charge is melted. Charging would be done from above, and the charge rammed in tightly, either by hand or by machinery, and the top sealed by a clamp and wedge. After the charge is smelted, it will be necessary to allow it to cool before tapping, so as to prevent the volatilization and oxidation of the zinc. The tap hole will then be opened and the whole charge tapped into a large forehearth for the separation of the metal and slag. One forehearth will serve ten retorts.

EMPLOYING BLAST-FURNACE UNDER PRESSURE

From this sealed retort process it is but one step further to my proposed blast-furnace process. I propose to smelt roasted zinc ores in a blast furnace under pressure. Later it may develop that zinc sulphide can be smelted raw, as I believe it will be. To smelt zinc ore in this furnace it will be necessary to determine the slag-forming constituents contained in the ore and fuel and add such fluxes as will produce an easily fusible slag. It will probably be necessary to briquet the ore and fuel.

The furnace will consist of a shaft furnace, either brick or water jacketed. A brick furnace would be inclosed in boiler plate to enable it to withstand the pressure. A tap provided with a stop cock will serve to run the charge from the furnace. A swinging valve balanced by weight in the flue of the furnace will regulate the pressure.

In operation, the pressure will be removed for charging. Fuel will be charged first, and when the furnace is sufficiently heated the briquetted ore will be charged until the furnace is filled, after which it will be sealed.

The high-pressure air will then be turned on and the pressure regulated by means of a valve in the discharge flue. When the smelting is complete (this will have to be determined by experience), the blast is shut down and the furnace allowed to cool. When sufficiently cooled, the charge will be tapped into a forehearth for the separation of the metal and slag.

ASSURING CONTINUOUS OPERATION

It will be seen that this is an intermittent process. Owing to the volatile nature of zinc, it is not feasible to tap the furnace at a high temperature, although it may develop in practice that this can be done. If it does, it will only be necessary to shut off the blast for a few minutes, to introduce a new charge, thus making the process practically continuous.

The pressure necessary for this process is undetermined. It will be well, however, to provide a compressor capable of furnishing air at 100 pounds' pressure. The theory is that the zinc will not volatilize under pressure,¹ but will behave the same as lead does under atmospheric pressure. There will be some danger in trying out this process, as explosive gases may develop in such a furnace under heavy pressure. I am, however, convinced that if anything is ever done in the smelting of zinc ores in a blast furnace it will have to be by some such method as that here suggested.

Large Production of Fuller's Earth in 1920

The production of fuller's earth in 1920, according to the U. S. Geological Survey, was 128,487 short tons, valued at \$2,506,189, or \$19.51 per ton. These amounts represent the largest output, the largest value, and the largest average price ever recorded. The output was 21 per cent greater than in 1919; it was more than three times as great as in 1913 and nearly nineteen times as great as in 1895, the first year of production. The value in 1920 was 25 per cent greater than that in 1919.

Fuller's earth was produced in eight states in 1920; named in the order of their rank in output they were Florida, Georgia, Texas, Alabama, Nevada, Arkansas, California, and Massachusetts. Promising deposits of fuller's earth have been discovered also in Pennsylvania and Virginia. The Southern States reported 99 per cent of the output, Florida alone reporting about 85 per cent of the total.

The imports of fuller's earth, which for many years constituted the entire source of supply, also increased in quantity and value in 1920. During the war these imports naturally decreased in quantity, and with the cessation of hostilities they just as naturally increased. The imports in 1918 were about 50 per cent of the maximum (24,977 short tons in 1914); in 1920 they were 77 per cent of the maximum. During the war some refiners of edible oils and fats—by whom the imported fuller's earth is probably used exclusively—were unable to obtain a sufficient supply of foreign earth and were compelled to adapt domestic earth to their needs, and it may be that imports of this material will never again be so essential to the American industry.

The imports of fuller's earth in 1920 were 19,235 short tons, valued at \$221,893, or \$11.54 a ton. These amounts represent an increase of 39 per cent in quantity and of 17 per cent in value over the figures for the previous year.

¹This is not a new idea; zinc smelting under pressure in a blast furnace was proposed many years ago.—EDITOR.

Preliminary Roughing Concentration by Sorting, Jigging and Tabling—Part III*

Experiments With a Test Jig and With a Specially Designed Close-Sizing Device—The Wilfley Table as a Rougher, and The Results Secured by the Use of Deflectors and Baffles

BY EDWARD S. WIARD
Written for Engineering and Mining Journal

SOME OF THE EXPERIMENTS to be described in the following pages were failures, in that the procedure described was never adopted on a commercial scale. Other tests are given which should have been carried further if practical conclusions were to be drawn from them. The aim is, however, to present those tests which are suggestive or illuminative, as well as those of immediate practical value. Some of the former kind I consider of more real value than the practical kind.

flow down the inclined spout between the boards of the false partition and through a slot cut through the posts into a suitable catching receptacle. This arrangement also made the placing of the top discharges at the end of the compartments very easy. This is the position for them generally favored by millmen.

When the jig was used on the roughing principle, making tailings and middlings, the inclined partition boards between compartments were removed and fine-

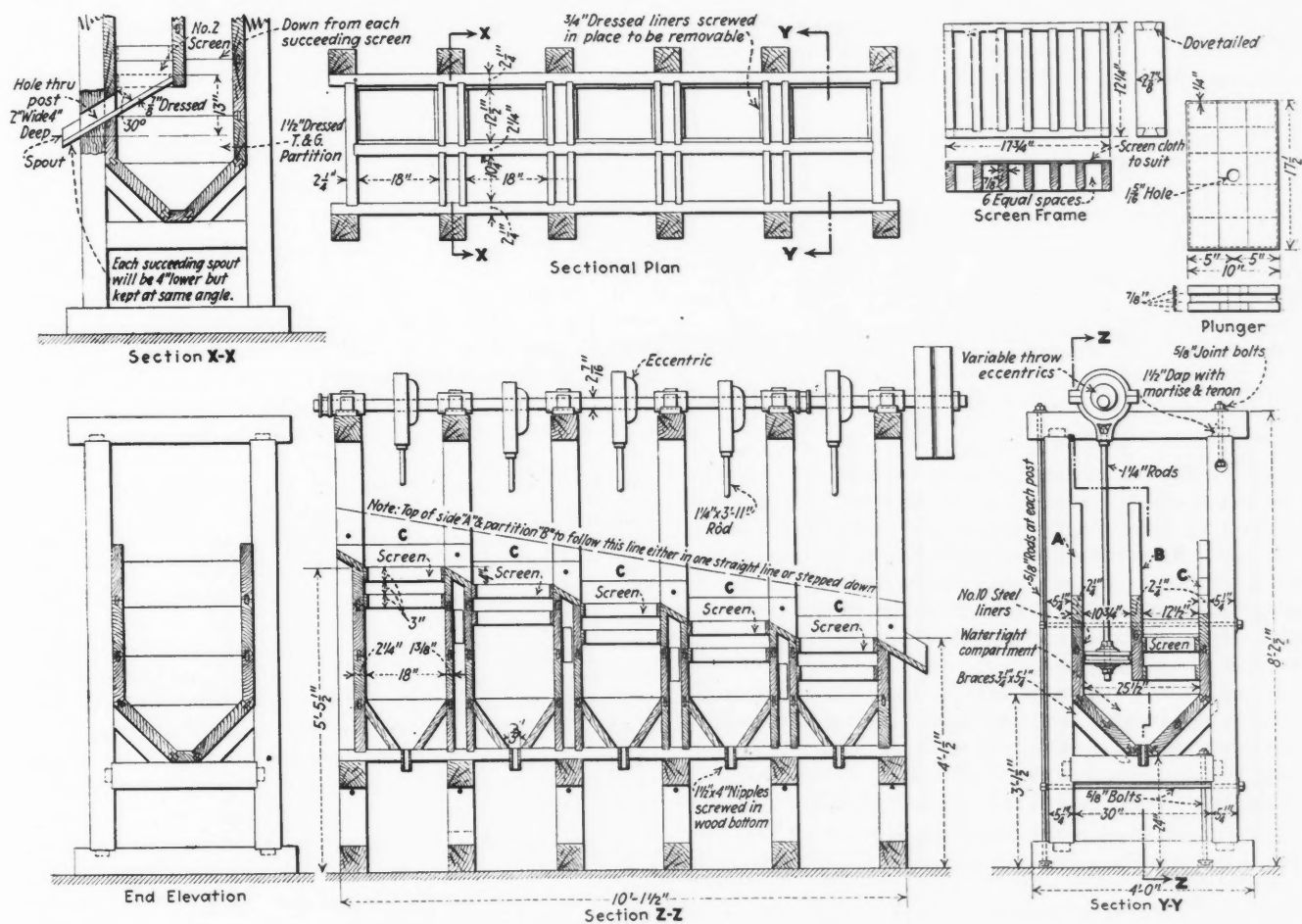


FIG. 1. DETAILS OF EXPERIMENTAL JIG

In the test jig, shown in Fig. 1, arrangements were made to convert the jig into one of any number of compartments up to five, by having false partitions between the compartments. By removing any one of the inclined boards between compartments, the material flowing from the upper of the pair could be caused to

mesh screens were substituted. By this means the water coming from one compartment could be largely removed, only a small part of it passing to the next. Water was introduced under each plunger by pipes from a header which ran along the top of the frame caps. Any desired amount could be introduced into a compartment without affecting the settling and sep-

*Continued from Sept. 3 issue.

arative work of the respective compartments below.

The material which was fed assayed: silver, 2.24 to 3.12 oz.; lead, 0.04 to 0.31 per cent; and zinc, 0.22 to 0.54 per cent. This material was jigged for the silver content. The low content in lead and zinc will be noted. It averaged less than 0.50 per cent of metal. The silver makes no appreciable increase in the total metallic content of the ore. As there are 29,166 troy ounces in a ton avoirdupois, an assay of 291.66 oz. equals 1 per cent of metallic silver, and other amounts in proportion.

The material to be tested consisted of a quartz, gneiss, and granite gangue, with small amounts of galena and zinc as very pure "resin jack" (sphalerite). Some of the silver occurred as a close associate of the galena, and the mineral form is either argentite or gray copper. Another portion of the silver occurred as isolated patches and grains of the several forms of silver which are commonly denominated gray copper. All of these sulphides are antimonial rather than arsenical. There was occasionally some dark-red ruby silver.

The material for the tests was drawn from a mine dump. Occasionally rich pieces of galena were found, but most of the metallic contents was thinly disseminated through a relatively small bulk of the dump material. The favorable factor for jigging was the large proportion of waste; the unfavorable one was the lightness of the average mineralized piece of dump material.

The material fed in the first series of tests had passed a 1-in. round-holed screen and was held on 1/4-in. screen.

The adjustments of the jig were as follows:

	Comp. 1	Comp. 2	Comp. 3	Comp. 4	Comp. 5
Depth of bed.....	6 in.	5 in.	4 1/2 in.	4 1/2 in.	4 1/2 in.
Stroke.....	1 1/2 in.	1 1/2 in.	1 1/2 in.	1 1/2 in.	1 in.
No. strokes per min.	175	175	175	175	175
Height of discharge above screen.....	1 in. throughout.				
Screen cloth.....	10 mesh throughout.				

The first series of tests were four in number, each of twenty minutes' duration. The rate of feeding varied from 0.975 ton per hour to 1.001 tons per hour. The compartments were skimmed at the end of each twenty-minute period; the portion of the bed one and one-half inches deep, resting on the screen, being removed in each case. Skimming began with the first or uppermost compartment, the upper layers of the bed of material in the compartment being thrown into the second compartment, from which the material was raked back after the skimming was completed.

A similar method was used in the next three compartments. In the last the upper layers were raked into the fourth and were raked back again after the lower layers were removed. Following each skimming period, the jig was again put in operation, and feeding

FIRST SERIES JIG TESTS

Material	Dry Lb.	Weight, Per Cent	Average Assays			Percentage Recovery		
			Ag. Oz.	Pb. Per Cent	Zn, Per Cent	Ag	Pb	Zn
Feed.....	2,395 1/2	100.00	2.52	0.181	0.32	100	100	100
All beds.....	320 1/2	13.37	6.21	0.819	0.761	32.92	60.51	31.81
Middlings.....	939 1/2	39.22	2.83	0.064	0.183	43.97	15.86	22.43
Bed tops.....	125	5.22	2.32	0.180	0.230	4.80	5.31	3.78
Hutches.....	118 1/2	4.94	2.52	1.55	1.66	4.93	42.26	25.55
Tailings.....	698	29.14	1.88	0.055	0.138	21.70	8.78	12.52
Unaccounted for	194 1/2	.....	.....	.....	.....	.....	.....	3.91
Total.....	2,395 1/2	.....	.....	.....	.....	108.32	130.72	100.00
Assay of feed computed from products.....	.....	.....	2.95	0.211	0.349	.....	.....	.....

was resumed. Automatic discharges were used in all the compartments in this first series of tests, and in the summary the figures connected with the caption "All

middlings" refer to the combined weights, average assays, and other like data of the four separate tests, as do the other figures.

Attention is called to the figures accompanying the caption "Unaccounted for"; also the totals for the percentages of each metal recovered at the bottom and to the right. Some slime is bound to be lost in jigging experimentation, and owing to the low grade of the material treated and of the products made, the percentage error in assaying is great. For comparison the assay of the feed computed from the weights and assays of the products made is given at the bottom of the tabulations.

In the second series of tests, five in number, the results of which, in tabulated form, are given below, all automatic discharges were removed except that of the last compartment. As before, the aim was to keep the feeding, which was done by hand, as close to the rate of one ton per hour as possible, and the other constants of the test were also the same as in the first series. The average rate of feeding for the five tests was 0.946 ton per hour.

SECOND SERIES JIG TESTS

Material	Dry Lb.	Weight, Per Cent	Average Assays			Percentage Recovery		
			Ag. Oz.	Pb. Per Cent	Zn, Per Cent	Ag	Pb	Zn
Feed.....	3,069	100.0	3.12	0.151	0.234	100.0	100.0	100.0
All beds.....	492 1/2	46.0	7.65	0.701	0.696	39.32	74.51	47.7
Middlings discharge No. 5.....	366 1/2	11.9	2.15	0.019	0.154	8.22	1.92	7.93
Bed tops.....	104	3.4	2.40	0.060	0.180	2.61	1.30	2.64
Hutches.....	87 1/2	2.8	2.88	0.630	1.000	2.62	11.88	12.10
Tailings.....	1,833	59.7	2.00	0.034	0.118	38.29	13.61	30.04
Unaccounted for	186	6.2	.....	.....	.....	8.94	.....	.....
Total.....	3,069	100.0	.....	.....	.....	100.00	103.24	100.28
Assay of feed computed from products.....	.....	.....	3.03	0.166	0.250	.....	.....	.....

In the first series of tests 60.51 per cent of the lead was recovered in the beds, which formed 13.37 per cent of the weight of material fed, and the feed was graded up from 0.181 to 0.819 per cent lead, the tailings assaying 0.055 per cent lead. The percentage recovery and the percentage weight given in the tabulation is based on the assay and weight of the ore fed. Based on the weights and assays of the products made, the recovery of lead in the bed was 46.29 per cent and the beds were 14.6 per cent, by weight, of the products made and recovered and weighed. Attention should be directed to the large lead recovery made in the first series tests in the form of hutches. Based on the feed, the recovery of lead in the hutches was 42.26 per cent. The recovery, on this basis, in the beds and hutches was over 100 per cent. The error was apparently in sampling the hutches. Based on the weights and assays of the products recovered, the percentage of lead recovered in the hutches was 32.34 per cent. The combined saving of the beds and hutches was 78.63 per cent.

In the second series of tests, which are freer from error, 74.51 per cent of the lead was recovered in the beds, based on the figures of the feed, and 72.17 per cent based on the products. The respective recovery figures for the hutches, computed by these two methods, were 11.88 and 11.51. The combined savings of the beds and hutches were 86.39 and 83.68 per cent respectively. Attention is directed to the middlings, which, in the first series tests, is the product which came out of the automatic discharges placed in all five compartments. In the second series, the only middlings made were from the automatic discharge of the last compartment. It will be noted that the metallic content of the middlings is less than the feed. The great dis-

crepancy between the lead in the middlings and the feed is particularly striking and bears out the statement made in discussing the theory of jigging that it is impossible to remove "final middlings" by automatic discharges and that these devices on this class of material draw from all the layers of the bed in the immediate vicinity of the discharge and fail to draw out the enriched product of the lower layers. Compare the assays of the middlings discharge No. 5 product of the second series tests with those of the tailings of the same test and it will be seen that there was practically no difference between the material leaving the last compartment through the automatic discharge and the overflow or tailings from this compartment and the jig.

An analysis of the assays of the beds and middlings of each test of the first series is furnished by the accompanying table. The figures under the last column, "Compartment 5," should particularly be compared with one another.

These tests form only a small portion of some exhaustive experimentation done about five years ago. The rate of feeding was fixed by testing. A higher rate of feeding gave a lower recovery. Increasing the time of the periods of jigging increased the richness of the beds but lowered the saving. The dump material was experimented with to determine the best practical silver

unlocking of the "inch to quarter-inch" material fed in the tests would fail to give any yield of concentrate or even of rich middling, as was demonstrated by test. Beyond the second compartment the material of the beds consisted entirely of grains which would require fine grinding to unlock the sulphides.

A hand-sorting test of tailings from a jig run gave the following results:

HAND SORTING OF JIG TAILINGS

	Weight, Grams	Per Cent Weight	Ag, Oz.	Pb, —Per Cent—	Zn, —Per Cent—
1 to 1/2-in. Tailings:					
Concentrates sorted out.....	423.3	6.03	6.08	0.09	1.10
Reject.....	1,515.2	21.60	0.68	0.01	0.30
1/2 to 1-in. Tailings:					
Concentrates sorted out.....	347.1	4.95	7.04	0.20	1.20
Reject.....	2,384.1	34.00	2.56	0.02	0.10
1-in. to 12-Mesh Tailings:					
Too fine to sort.....	1,389.4	19.80	1.28	0.01	0.50
12-Mesh material.....	960.1	13.65	1.08	0.01	0.50
Totals.....	7,019.2	100.00			
Computed feed.....			2.15	0.028	0.041

The field of middlings' saving that these tests illuminate is beyond that of the operations in the ordinary jigging mill. They show the possibilities of the Harz jig for extracting the last modicum of mineral. The argument against the use of jigs to effect this by hand skimming may or may not have weight, depending on the individual ore. With the material under consideration, as only 20 per cent of the original ore is between

FIRST SERIES TESTS. COMPARISON OF BEDS AND MIDDINGS (AUTOMATIC DISCHARGE)

TEST NO. 1	ASSAYS									
	Comp. 1— Bed Side Disch.		Comp. 2— Bed Side Disch.		Comp. 3— Bed Side Disch.		Comp. 4— Bed Side Disch.		Comp. 5— Bed Side Disch.	
Silver, oz.....	10.96	2.00	3.84	1.88	4.48	1.44	8.12	2.80	3.84	11.60
Lead, per cent.....	0.020	0.03	1.86	0.15	0.33	0.03	1.88	0.01	0.54	0.02
Zinc, per cent.....	0.38	0.22	1.56	0.28	0.52	0.26	1.03	0.32	0.48	0.35
TEST NO. 2										
Silver, oz.....	3.52	2.20	11.84	1.76	7.20	1.60	5.68	3.32	1.36	2.24
Lead, per cent.....	0.20	0.08	1.92	0.01	0.47	0.07	0.34	0.09	1.19	trace
Zinc, per cent.....	0.55	0.32	1.56	0.28	0.42	0.15	0.45	0.18	0.78	0.15
TEST NO. 3										
Silver, oz.....	2.52	1.20	7.04	2.40	9.00	2.08	3.68	2.56	6.96	3.00
Lead, per cent.....	0.40	0.17	0.59	0.10	1.80	0.20	0.17	0.01	0.27	0.06
Zinc, per cent.....	0.28	0.22	0.76	0.25	1.60	0.15	0.28	0.12	0.33	0.13
TEST NO. 4										
Silver, oz.....	4.88	2.52	9.20	2.40	8.00	1.84	1.80	1.72	3.92	2.56
Lead, per cent.....	1.69	0.08	1.24	0.06	0.76	0.06	0.09	0.02	0.32	0.06
Zinc, per cent.....	1.20	0.08	1.13	0.22	1.38	0.13	0.18	0.15	0.38	0.10

extraction. In a later series of tests than the ones given, and without changing the constants of the second series tests, much better silver recovery was obtained. The first and second series tests are what may be denominated "key tests." In these tests, in order to obtain all possible information on the jigging problem, every separate product was dried, weighed, sampled, and assayed. Each separate product was also subjected to a sizing test and each size made was weighed, the percentage of the weight calculated, sampled and assayed for silver, lead, and zinc. Other tests along similar lines were not so complete. The first and second series tests are consequently better adapted to a general discussion of jigs in the roughing field. The lead figures throughout the tabulations will be found best suited for making comparisons.

It may be thought that occasional particles of pure galena and blende may account for most of the recovery obtained. To be sure, the beds from the first compartment would occasionally show a piece of bedding to one end or side of which was attached some pure galena or blende, and also in the second compartment there would occasionally be a piece of gangue with comparatively coarse inclusions of galena or blende, but the number of such richly mineralized pieces was too small to affect appreciably the recovery or to warrant means for removing them separately from the jig. A light crushing and

one-inch and quarter-inch size, and as the ratio of concentration of the feed to the beds averages about 6, the rate of handling of bed material per hundred tons of original ore will be only 3 1/2 tons.

The net area of the jig screens is 10 1/2 x 16 in. To the ton rate of feed per hour there is consequently a total area of 940 sq.in. for the five compartments. As the jigs have to be skimmed at definite periods, two jigs, or twice this area, would be required if feeding is to be continuous, or a total area of 1,880 sq.in.

The argument that roughing methods will require too large a spread of jig surface can be partly met by stating what is known to close mill observers, that much unnecessary jig area is wasted in concentrate making in the average jig mill; witness the rounded marbles of the coarse concentrates. If the concentrate compartments, or jig area devoted to concentrate making, were smaller, the concentrate particles would travel to the discharges faster and there would be less opportunity for attrition losses, and ample area to obtain the proper settlement of the concentrates. I believe that if concentrates can be made in the coarse sizes, and that if it is desirable to remove as far as possible the mineral content of the tailings and middlings made in that process, the proper procedure in many cases would be to pass the jig feeds first over Richards jigs to take out the concentrates; then to pass the tailings or middlings,

whichever term the reader prefers, from these jigs over Harz jigs with automatic discharges, using automatic discharges down to the point where a bed cannot be formed, a point which can be determined by making comparisons of the assays of the beds and discharges; and finally to pass the overflow from the automatic discharge jigs over skimming jigs.

The number, kind and spread of the jigs required in the application of jigging on the roughing principle can only be determined accurately by experimentation.

Tailings such as those made in the two series given were, at a later time in the experimental work, again subjected to jigging. The rate of feeding was 0.25 to 0.30 tons per hour, the other constants of the tests being the same as in the second series already given. The richest single bed removed during the progress of four single tests made assayed: Ag, 4.16 oz.; Pb, 0.21 per cent, and Zn, 0.18 per cent.

REJIGGING JIG TAILINGS

Material	Dry Weight, Lb. per Cent	Average Assays			Percentage Recovery		
		Ag, Oz.	Pb, Per Cent	Zn, Per Cent	Ag	Pb	Zn
Feed.....	1,438 100.00	1.84	0.077	0.131	100.00	100.00	100.00
All beds.....	390 27.7	2.76	0.154	0.163	40.74	54.05	34.04
Middlings.....	243 16.90	1.63	0.113	0.118	15.00	24.32	15.43
Bed tops.....	110 7.65	2.40	0.010	0.130	9.98	0.90	7.45
Hutches.....	58 4.03	1.76	0.020	0.200	3.85	0.90	6.38
Tailings.....	559 38.93	1.56	0.091	0.113	32.92	45.95	33.51
Unaccounted for...	76 5.32						3.19
Totals.....	1,438 100.00				102.50	126.30	100.00

RESULT OBTAINED FROM A CLOSE-SIZING APPARATUS

While the jig experimentation was being done on the wide range of size from 1 in. to $\frac{1}{4}$ in., collateral experimental work was performed with the close-sizing device shown by Fig. 2. It was assumed that if satisfactory roughing could be done with a wide range of size, better results would be obtained in actual milling if a practical method of close sizing could be devised and employed.

Feed enters the device of Fig. 2 at the point marked "feed end." The compartment at that point is merely for receiving and disintegrating purposes. The screens or grids which dip down midway in the compartments are strips of hard wood in which are inserted stout wires which can be spaced to give any desired width of opening. The grids are adjustable as to the depth to which they dip in the compartments. They are supported on cleats at either end, pierced with rows of vertical holes through which are passed adjusting and supporting pins. This detail is shown in the main plan and section of the drawing at the middle compartment position. At the forward end of each compartment is an adjustable dam. The detail of these dams is shown at the forward end of the first or uppermost compartments, and the mode of adjustment will readily be understood by an inspection of the drawing.

The apparatus is mounted on 3-in. I-beams or slides, which rest in track angles, not shown, and is shaken in a direction at right angles to the travel of the material down through the machine. The apparatus is shaken by an eccentric, and the center of the shaft driving the eccentric is shown in the drawing.

The material entering the first, or disintegrating, compartment passes into the second. Here the material which could not pass the first grid would overflow into the inclined trough between the first and second compartments, where, as the water entering with the feed tends to flow down through the apparatus, leaving the portion of feed back of the grid dry, spray water would have to be used to transport the oversize in the trough

to any desired destination. Spray water must for a similar reason be used with the other oversizes.

This sizing device was planned for use with the test jig. It was to be mounted above the cap timbers of the jig, the five different sizes made by the sizing apparatus being separately fed to the upper ends of the five compartments of the test jig, the tailings from each separate compartment being taken away from the jig by way of the spouts between compartments.

In this sizing apparatus it was the intent to take advantage as much as possible of the way grains will arrange themselves when a loose mass of them is vigorously shaken. Such shaking tends to bring the largest grains to the top of the mass and to send the

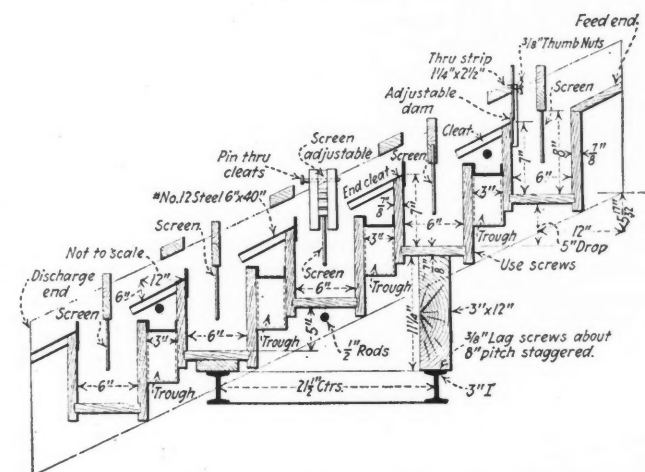


FIG. 2. CROSS-SECTION OF CLOSE-SIZING DEVICE

finest to the bottom, with a gradation of size between. It was believed that when material was fed into the machine in motion, the finer parts would work down through the interstices of the larger grains and pass down and through the first grid, and that the coarser particles, which would tend to come to the top of the bed, would discharge into the oversize spout, and that a similar mode of arrangement and disposal of grains would be effected in the other compartments.

When the device was given a trial it was found that the square ends of the compartments and the lack of a differential motion to the shaking caused the beds in the compartments to pack, and as the grains did not move freely across the grids they quickly became blinded. The press of other more important work prevented tests and changes on this device to overcome the defects revealed by operating. As it is presented it is merely suggestive. The device, and the suggestions which follow, are freely offered to anyone who wishes to work further with it.

By introducing sprays in the bottom of the compartments, greater mobility was secured and the device would work after a fashion. To obtain vigorous rapid stratification and a rapid movement of the grains back and forth over the grids, both forward and return movement of the stroke must be accelerated; and to secure the best effect from the differential movement the square ends of the compartment would have to be modified so as not to kill the movements of the grains in the corners of the compartments. Possibly each compartment would have to be built separately and be actuated by separate eccentrics with varying length of stroke. It was noticed during the course of the experimentation that with any given length of stroke and

rate of rotation of the eccentric shaft one compartment worked very much better than the others.

The question as to the proper dimensioning of the compartments for capacity and best effect received no attention, as the experimentation was too brief to enter into questions of this sort. For the same reason, no experiments were undertaken to determine the proper positions of the upper edges of the dams and whether or not the grids should be carried partly or all the way to the bottom of the compartments. If there were perfect interstitial stratification it would be unnecessary to carry the grid wires to the bottom of the compartments, but on practical grounds this course would probably be necessary.

During the duration of the tests the strokes of the machine ranged from 1 in. to 1½ in., and the number of strokes from 175 to 270.

EXPERIMENTS WITH THE WILFLEY TABLE AS A ROUGHER

One of the earliest uses of the Wilfley table as a rougher was in the Utah Copper Co.'s mills, the modified table being known as the Garfield table. This was not strictly a roughing device in the sense used in these articles, for the whole feed of the plant crushed to about 12 mesh was fed to a battery of tables, and two classes of *middlings* were made. At the time of the installation of the Garfield tables the material which discharged from the side of the deck was ground fine and passed to vanners for a finishing treatment. The rest of the material discharging from the deck, or the richer of the two classes of middlings made, was lightly ground and further concentrated on ordinary Wilfley tables with re-treatment of the "tailings" from these machines on vanners.

The capacity of the Garfield tables on Utah Copper ore was about 100 tons per day per deck. The deck was of the standard type, and the whole surface was riffled. The riffles were spaced 1½ in. apart, were ¾ in. deep at the head-motion end and tapered to ¼ in. at a diagonal line drawn from the water-box side of the deck to the lower corner. From this line to the end of the table the riffles were uniformly of ¼-in. depth. The transverse inclination of the deck was very great. To make the front sides of the riffles as nearly vertical as possible the lower surface of the riffles, or their contact surface with the deck, was cut with a bevel. The wear and tear on these decks even with so comparatively finely ground roughing feed as 12 mesh was great. To prolong the life of the riffles hard wood was substituted for soft wood.

RESUMÉ OF THEORY OF ACTION OF A WILFLEY TABLE

In treating coarse material on tables of the Wilfley type, riffles are a necessary "evil." The chief function of riffles is to stabilize the paths of the various layers stratified out by the shaking action. The riffles keep the bed of material on the deck spread out to a uniform depth. They protect the lower layers so that the course of these down the deck is nearly or very nearly in the line of the head motion. The upper layers, which are more nearly waste or tailing layers, not being so well protected by the riffles, are more under the influence of the transverse inclination of the deck and the wash water and tend to follow a diagonal path down the table, discharging at some point on the long or tailing side of the machine. If no riffles were on the deck, the material fed would take a diagonal course down the table, the richer layers, as before, being those nearest to the deck.

The sand or waste would tend to shift to some extent during this diagonal movement, reporting largely at the tailing side of the deck, and the concentrate would tend to report at the concentrate end, but variations in the rate of flow of the wash water and the speed of the table would make the paths of the grains more variable than they are when it is riffled. With all shaking tables, the head-motion component of the force acting on the particles has a much greater effect than the transverse component produced by the inclination of the deck and the wash water.

Let the reader lay a sheet of paper on a table to represent the deck of a Wilfley table. The upper right-hand corner of the sheet will be the feeding point; the lower edge, the concentrate discharge end, or, in roughing problems, the middling discharge portion, in part. The left-hand side of the sheet will be the tailing discharge side. Now, if the right hand be placed on the paper with the long axis of the hand corresponding with the diagonal line from the upper right-hand to the lower left, and the left hand be placed over the right, then there will be a representation, by the finger tips, of the stratification which ensues soon after the feed reaches the deck. Roughly speaking, the finger tips of the lower or right hand will represent the heavier portions of the feed and those of the left hand will represent waste or middling.

If, now, the two hands be slowly shifted past one another with the finger tips as a pivot, a representation will be obtained of the shifting or separation of the waste and concentrate bands from one another as the feed travels down the table deck. The shifting of the hands must not be carried to the point where there is an opening between the hands, because that would indicate a perfection of separation which it is impossible to obtain on a shaking table.

As is well known, the overlapping of the bands of material fed to a Wilfley or similar deck at the lower or discharge points, preventing sharp lines of demarcation and clean cutting of discharging products, constitutes the chief theoretical objection to the use of decks of this kind for concentration purposes. It would be expected that if the deck were increased in length over the present existing standard lengths, and in the direction of the diagonal resultant line of the motion of the particles fed, a much better separation of the various grades of material fed would result. The various bands tend to become wedge-shaped as they proceed down the table, but the spreading-out action of the individual band is less in amount than its shifting or divergence with respect to the others. This mode of overcoming the overlap of the bands has been tried with some degree of success.

It might also be expected that, by the use of deflectors and the rearrangement of the riffling, the bands might be made to pursue axes more nearly transverse than longitudinal, and that the same effect that can be secured theoretically by a deck very long on the diagonal line—viz., reduction of the overlap—could be obtained. It was with this thought in mind that I worked in attempting to get better separation and greater capacity from the Wilfley table. It may be stated at once that the experimentation which involved using deflectors and rearranging the riffling did not result in a practical increase in the saving. The reason seems to be that though the axes of the bands are more widely separated by the use of deflectors, the individual bands become more widely spread out and form more obtuse wedges,

and this action largely overcomes the good effect which is obtained by greater divergence of the axes of the bands.

By the use of deflectors much greater capacity was obtained than could be had with the Wilfley deck riffled in the ordinary way. The tendency of material fed to the ordinary shaking deck is to follow the diagonal line from the feed corner to the opposite or lower corner. As the rate of feeding increases, the tendency to build up and pack and dry out on this line becomes marked. If very coarse feed, say up to a maximum of $\frac{1}{4}$ in., is fed to a Wilfley riffled in ordinary ways, very shallow riffles will be found to give the greatest capacity and all-round best effect. The shallow riffles allow the feed to spread out, which deeper ones do not. The objection to shallow riffles is that they do not allow of good stratification, and, theoretically, the coarser the feed the deeper the riffles should be.

My present trend of thought regarding roughing decks is toward a highly inclined deck, with deep riffles arranged parallel to the head motion of the machine, and a long sharp stroke. Judging by experience with the McKesson-Rice screenless sizer, the wear and tear would be much less with highly inclined decks than with gently sloping ones.

SPREADING OF THE FEED ON A WILFLEY DECK BY DEFLECTORS

The material fed in the experimentation ranged down from $\frac{1}{4}$ in. The Wilfley roughing table as first received was completely riffled over its whole surface. At the beginning of the tests with this table, the concentrate end was raised $\frac{3}{8}$ in. higher than the head-motion end. Before the riffles with which the table was originally provided were removed, the difference in the two points was increased to $1\frac{3}{8}$ in. This increase in longitudinal slope did not have a favorable effect on the tailing bands, which failed to shift transversely to any marked degree, so the experiment was not continued.

The deck was then cleared of the original riffling and forty-four new riffles were nailed on. The longest riffle on the tailing side of the machine was $\frac{3}{4}$ in. at the upper end, tapering to $\frac{1}{4}$ in. at the lower end; the shortest riffle at the feed-box side of the deck was $72\frac{3}{4}$ in. long and was placed parallel to the line of the head motion, 3 in. from the inside edge of the deck. A baffle $23\frac{3}{4}$ in. long was secured to the deck in front of the feed box and parallel to it. A series of deflectors, radiating from the feed box, were secured to the top of the riffles. These deflectors were more nearly athwart the line of the head motion at that end of the deck than were those starting at points nearer the lower end of the feed box. The inclination of the line of deflectors to the line of the head motion decreased going down the deck. Naturally, the deflectors were closest together at the feed box and most widely spread at their ends on the tailing and concentrate side and end.

After the deflector blocks were put on they were sawed out between adjacent pairs of riffles, skipping every other pair. This left pieces of deflector blocks spanning two riffles, alternated by open spaces. A grain, passing through the open space between two riffles, would, in its passage down the deck between this pair of riffles, encounter the next deflector, where it would bridge the two riffles.

The first line of deflector blocks began 24 in. from the motion end of the deck and reached the tailing side 56 in. from the lower end of the deck. The next line began

3 in. lower down on the feed side, and at the tailing end the first and second lines of blocks were 16 in. apart.

Difficulties were encountered. The deflector system did not increase the divergence of the axes of the various bands, but it did increase the sharpness of the gradation from coarse material, discharging at the tailing side, to the finest material leaving the machine at the concentrate end of the deck. An additional baffle had been placed at the end of the feed box, attached to the deck at right angles to the line of the head motion, on the supposition that it would help throw the feed transversely out on the deck. The actual effect of this baffle was to crowd the feed up against the first line of deflector blocks. Eventually, owing to this action, all the space in front of the lower half of the feed box was filled up solidly with grains. In the deflector space immediately outside of the choked area there was also more or less chokage during the progress of the tests with these wooden block deflectors. Chokage would begin under one or more deflector blocks, and when a relatively large area had filled up the feed would ride over the blocks and proceed down the table in masses. There was also much choking and "drying out" in other parts of the deflector system. Large grains would lodge under deflector blocks and dam up other grains back of them.

In later tests with these wooden deflector blocks the whole area occupied by the deflector system was sprayed from a battery of spray pipes suspended above the deck. The spraying system consisted of a header from which, at intervals, ran stub pipes which were carried parallel to one another across the table. Spray pipes with very small openings were screwed into the stub pipes at right angles to them and with regular spacing. A relatively small amount of water, evenly distributed in the form of rain or mist, was found more effective in overcoming "drying out" than a larger amount of water issuing in distinct streams. It is merely necessary to keep the grains moist with a thin coat of water running over them to prevent them from adhering. The spray water did not overcome the chokages. In later tests, when the problem of overcoming chokages around deflector systems was solved, the sprays were found to be unnecessary and were removed.

In the next series of tests the radiating deflector block system was replaced by continuous deflectors placed athwart the line of the head motion. These continuous deflectors were placed parallel to one another, and all ended at the tailing side of the table. The continuous deflectors were made of strips of wood $\frac{3}{8}$ in. deep and $\frac{1}{4}$ in. wide and the various deflectors were spaced $2\frac{1}{2}$ in., center to center. To overcome crowding and packing at points near the feed box, the riffles in that vicinity were reduced in depth. The reduction in depth was carried in the area immediately facing the feed box and for the same length. The riffle nearest the feed box was cut down to a uniform depth of $\frac{1}{8}$ in. Going toward the tailing side of the deck the succeeding riffles were also cut down in depth, but there was increasing reduction in the cut removed until riffle No. 17 was reached, which, for the length of the feed box, was $\frac{1}{2}$ in. through-out. The rest of the riffling system was allowed to remain unchanged.

The deflector system was carried over the deck at a uniform height from it. When crossing the riffles, little filling-in pieces of wood were used to support the deflectors and maintain their height above the deck.

In later tests which followed those employing the

arrangements recited, and in order to deflect the feed out on to the table as quickly as possible, a system of baffles was installed. These ranged in depth from $\frac{1}{8}$ in. at the head-motion end of the deck to $\frac{3}{8}$ in. at the feed-box end, and with lengths ranging from 9 in. at the head-motion end to 15 in. at the feed-box end, and with spacings of 3 in. from center to center of baffles. These baffles were secured to the deck under the feed box and were placed at right angles to the line of the head motion. Where they crossed the riffles the latter were cut out to receive them.

The first four baffles were $\frac{1}{8}$ in. wide, the next four $\frac{3}{8}$ in. wide, and the last nine were $\frac{1}{2}$ in. wide. The baffles

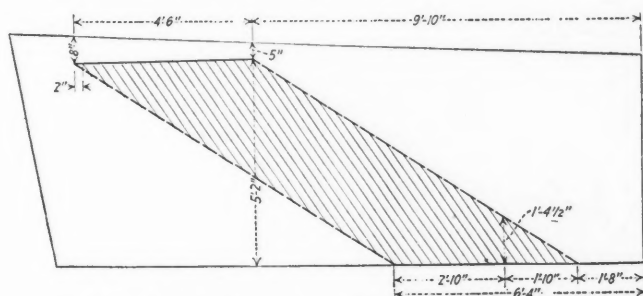


FIG. 3. ARRANGEMENT OF WIRES PLACED ON TOP OF RIFFLES

Wire List: 37 wires spaced $2\frac{3}{8}$ in. c. to c. starting at head-motion end; 3, No. 5; 4 each, Nos. 6 to 12 inc.; 3 each, Nos. 13 and 14; Washburn & Moen's English Gage

were found to have a beneficial effect in classifying the feed preparatory to entering the deflector system, but the cleats, as placed on the deck with the spacing given, were found to be too obstructive, and their depths and number were gradually reduced. In the final arrangement, the first cleat was placed under the feed box $14\frac{1}{2}$ in. from the motion end. The rest of the cleats comprising the baffle system, eight in number, were spaced 6 in. apart. The first cleat, which was 9 in. long, tapered from a depth of $\frac{1}{8}$ in. at the feed-box side to $\frac{3}{8}$ in. at the other end. At the lower end the baffle cleat was $13\frac{1}{2}$ in. long, and $\frac{1}{8}$ in. deep at the feed end, tapering to $\frac{3}{8}$ in. The intervening cleats varied as to depth and length between these two extremes.

In the final arrangement of baffles and deflectors the baffle arrangements remained as just described, but the wooden cleats were replaced by wires. The arrangement and size of the wires is shown in Fig. 3. The baffling arrangement is not shown.

The feed which was available at the time these roughing-table tests were made did not exceed 70 tons per day. At this rate of feeding the table was underloaded with $\frac{1}{8}$ -in. material. The table would have taken 100 to 125 tons per day or possibly more. On material of the grade of that used in the jig testing, and containing about 0.25 per cent lead, a 75 per cent recovery was obtainable, with a concentrate running about 1 per cent, and a ratio of concentration around 6. Recovery of the associated silver and zinc was somewhat less. Practically similar results were obtained with the Empire table, but with not as heavy a rate of feeding.

With the wire deflectors there was practically no stoppage. It had been planned as a safeguard on this point, if the experiments had been continued further, to mount the deflector wires in a hinged frame which could be raised up by the attendant from time to time to get rid of any damming action from an incipient stoppage. No observations were made on the wear and tear on the deflector wires; none developed, but the amount

put over the deck was too small to have given any information on this point. The possibility of wear and tear of the deflector wires, of stoppages caused by them, and the failure to obtain a better recovery than could be obtained on the Empire roughing table caused me to adopt an Empire machine in the plant for which the roughing experiments were made. Had the Empire table been available at the beginning, the deflector experiments would not have been made.

EMPIRE TABLE

A general view of this machine is shown in Fig. 4. This table has less capacity than the rougher which was developed by experimentation. The deck shown in the illustration is 4 ft. wide by 10 ft. long. In the experimental work strokes up to 6 in. were tried. When the inventor later began to manufacture the machine, he recommended a length of stroke from 2 to 4 in. The number of strokes per minute varies from 140 to 160. The general action of the machines, except the greater length of stroke, is similar to the ordinary shaking table, but this great length of stroke gives great mobility. Very slight changes in the transverse slope of the deck make great differences in the positions at which the bands discharge at the side and end of the deck.

On $\frac{1}{8}$ -in. material the capacity of the machine is about 60 tons per day. The serious objection to this and other shaking tables when coarse material is being fed is the tremendous wear and tear. Ordinary linoleum and wooden cleats will be completely worn away in a week or two of use. The linoleum stands up better than the riffles, the latter becoming shreds and scraps in half the time that the linoleum takes to wear out. This makes the cost of upkeep unduly high.

Suggested improvements in the riffles extend all the way from replacing softwood with hardwood riffles to brass, steel and special cast-steel riffles. It has been suggested that iron or steel decks be used, or cast-iron

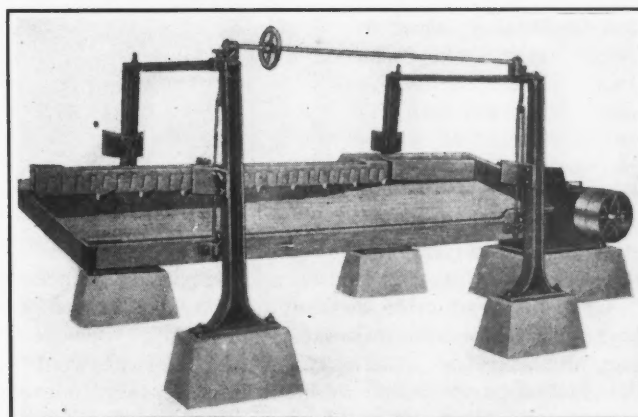


FIG. 4. THE EMPIRE ROUGHING TABLE

decks in which is embedded abrasive material as is found in patented stair treads. A deck made of material of this sort might resist wear well, but it might offer too great resistance to the passage of material over it. A pyroxylin-coated deck has recently been patented.

The Empire table of the rougher type mentioned is no longer manufactured. It has been improved mechanically, and is now being sold to do the work of and compete with standard concentrators. If the problem of wear and tear could be solved, a long-stroke machine could be successfully used in the solution of many ore-dressing problems.

Mining Engineers of Note

F. F. Sharpless

FREDERICK FRALEY SHARPLESS, the newly elected secretary of the American Institute of Mining and Metallurgical Engineers, enters upon his new duties after two years of experience in a similar position with the Mining and Metallurgical Society of America. Mr. Sharpless became a member of the Institute in 1889, soon after completing his college course, and since then he has been intimately connected in varying capacity with the mining industry, his work as an engineer taking him into many parts of the world. Born in Chester County, Pa., which is known for the great variety of its minerals, his father a mineralogist, Sharpless became a collector of minerals at the age of fourteen, and by the time he was ready for college had an interesting collection. At the Normal School in West Chester, his home town, he developed a taste for chemistry, and, following his inclination, went to Ann Arbor, where he took his bachelor's degree in 1888. In his senior year at Michigan he became interested in metallurgy, mining, and geology, which he attributes to his studying under Prescott, Cheever, Pettee, and Alexander Winchell.

Upon his graduation he went to Houghton as instructor, and later became professor of metallurgy, ore dressing, and assaying. Leaving there in 1894, he went to Minneapolis and opened a chemical laboratory in association with Horace Winchell. The work of the laboratory was entirely on ores, and Sharpless says he soon discovered that he lacked practical experience in mining and metallurgy. So, treating the defect in drastic fashion, he gave up the laboratory in 1897 and went to California, where he worked in various mines and mills on the Mother Lode under the management of R. A. Parker and W. L. Honnold. Finally he became manager of the California Copper Co., which had a mine at Daulton and a 150-ton smelter at Madera. Here he remained until the mine was worked out and the furnaces could secure no more ore on which to work.

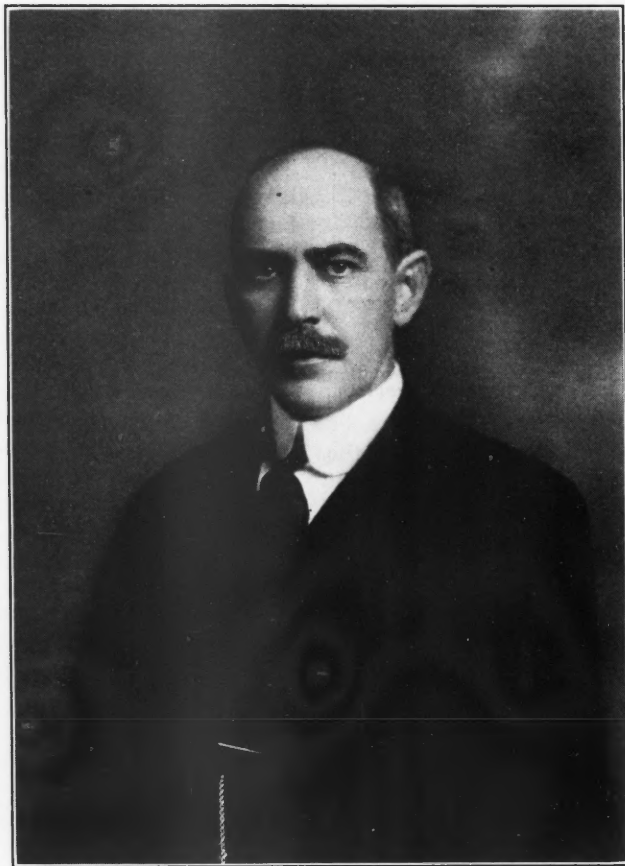
Following his California experience, Sharpless made several trips into Mexico on examination work. In 1900 he became connected with the Consolidated Mines

Selection Co., Ltd., of London, and for twelve years acted as that company's American representative. In this capacity he traveled not only throughout the West, but into British Columbia, the Yukon, Alaska, Mexico, and Central and South America. The work consisted in

making examinations and reports upon mining properties in all stages from prospect to abandonment, some of which were occasionally taken under development or operated by him. The fund of information gathered on these trips was often of exceeding interest and sometimes of much commercial value to his principals. In particular, a year in Colombia was especially valuable, and Sharpless was able to send back to England much data regarding the mineral resources of that country. Soon after this, English capital began to come into Colombia rather freely, and it is said that returns have been very satisfactory. Following his visit to Colombia, Sharpless went to Asia Minor to examine and report on mercury mines. Two of them, one at Koniah and one at Karabournou, were taken up and developed, and Scott furnaces were installed. The venture at Kara-

bournou was a success. Later, opportunity presented itself for Sharpless to spend a season on the Gold Coast of Africa, examining mines and prospects, in both of which his principals secured an interest with satisfactory results. During the last eight years Mr. Sharpless has been engaged in independent consultation, his work covering the United States, Canada, and Mexico.

Mr. Sharpless comes of Quaker stock, and is a member of the Quarterly Meeting at Westbury, Long Island, where he makes his home. He was married in 1892, and it is set down in the *Transactions* that he and his bride attended the Plattsburg meeting of the Institute that year, as a wedding trip, and were given a reception on Lake Champlain, at which Dr. Raymond officiated. He was also among the members that went abroad in 1889 as guests of European mining engineers. He became a charter member of the Mining and Metallurgical Society upon its organization, and in addition to serving twice as secretary, as already stated, has also been vice-president of that society.



F. F. SHARPLESS

HANDY KNOWLEDGE

Shaft Surveying at the North Star Mine, California

By G. S.

Written for *Engineering and Mining Journal*

A detail of the general method of carrying an azimuth into mine workings through a vertical shaft was used at the Central shaft of the North Star Mines Co. at Grass Valley, Cal., between 1900 and 1903, and I believe it to be of general application. The line was carried down by the two-wire method, using piano wires strained to about two-thirds of their safe strength. The shaft was 1,600 ft. deep. Any error in the method employed will arise principally from the difficulty of locating a line through the wires.

It is customary to set the transit up on a line through the wires and at the same time on line with permanent survey points underground so as to read the angle between them, or, by prolonging the line, set two underground points on the same azimuth as that on the surface. The former method is preferable and of more general application. The arrangement of points and position of the transit in the sketch was made to avoid the necessity of putting the transit on both lines at once and so, by avoiding this difficulty, increase the speed of reading the angles.

The wires are a and b . The permanent survey points are c and d . The transit is set up approximately at the point x , the intersection of the two. As the point x lies on the intersection of the two lines, it is for the time indeterminate. The line cd may be located and drawn on a stationary flat surface so that the line through the wires will fall on it. The transit is then set up on this line and nearly enough on line with the wires so that any movement necessary to bring it accurately in line with them is within the limits of the movable head. The base of the instrument should be as nearly level as may be to facilitate shifting and releveling between observations.

As in deep shafts the wires are never still, the limits of their swing are measured by reading on draftsman's scales set as close behind the wires as possible without touching them. Both wires and scales are illuminated by shaded lights set a little to one side but shining away from the observer. It is most convenient to have the transit so close to the wires that only one is in focus at once. It will avoid confusing the wires when watching the swing.

The necessity of putting the instrument on the line cd is avoided by fastening a scale behind the plumb line hung from the point d . If the instrument is set up at y instead of x , the angle ayz may be measured by the instrument and the angle zcd calculated by measuring the distances cd and zd . The distance cd should not be less than 50 ft. At that distance the arc subtended by one minute is approximately 0.0145 of a foot, and may be easily estimated by reading the scale.

The observer, by noting the limits of swing, determines their centers on the scales by averaging, and puts the instrument on line with points on the scales instead

of the moving wires. The angle ayz is then measured and the distance zd determined by observation. The scales at a and b are then moved slightly endwise, the instrument is shifted on the sliding head, again brought into line, and the operation repeated. The observer is, therefore, not influenced by his former readings. As the alignment of the instrument with the wires is the least accurate part of the process, as many shifts of the instrument and new determinations as possible should be made. It may be desirable to repeat the angle once. In the case cited, because of a peculiar defect in the transit, the angle was read once and repeated, and the instrument was then reversed and the angle read again and repeated.

The accuracy of measurement increases with the number of observations if they are independent and there is no constant error.

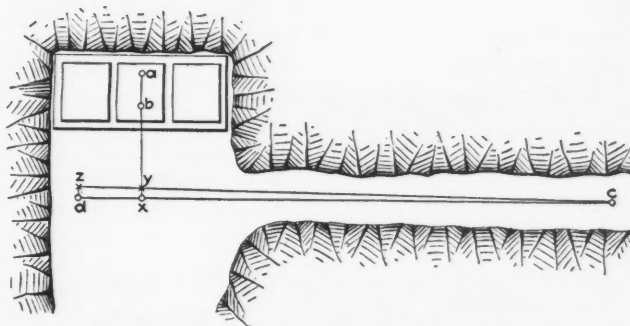


DIAGRAM SHOWING METHOD OF SHAFT SURVEYING

The wires must be set on the surface with great care and checked afterward, or, preferably, watched by an instrument man during the observations. A draft of air from a connection with the shaft on a level above may push the wires more or less constantly out of position, but in this event the azimuth need not be carried down from the surface but only from the lowest level on which there are connections with the surface. Compressed air pumps or drills may be shut down while the survey is being made.

The usual precautions to see that the wires hang free must be taken. It is naturally best to use wires hung in different compartments as far from each other as possible, as this increases the base and the probable accuracy of an individual measurement. The wires swing slowly and a series of measurements takes a considerable time.

It is well to make the observer as comfortable as possible, because doing so probably will be reflected in more rapid and accurate results. A stool or chair may be provided for him while he is watching the swing of the wires, as he may be staring continuously at them through the instrument for some hours.

After wires, lines, and instrument are set, the observer's assistant has nothing to do but watch the lights and occasionally move the scales behind the wires. He will save time for the observer by acting as recorder for scale and angle readings.

A Review of Drilling—Part III*

BY GEORGE J. YOUNG

Western Editor, *Engineering and Mining Journal*

DRILL SHANKS AND REMOVAL OF CUTTINGS

Properly shaped and accurately dimensioned drill shanks play their part in the drilling program. Under-sizes and oversizes cause trouble with chucks and result in unnecessary delays. Overlength shanks decrease the efficiency of the drill. Worn chucks are also a source of trouble.

The use of hollow steel with an internal jet of air and water has resulted in a marked improvement in drilling rates for horizontal and down holes. The cushioning effect produced by a thick mass of sludge in the drill hole has been reduced and the need for pumping or blowing out down holes avoided. The net result has been a gain in effective drilling rate. Water tubes cause some trouble, but if the blacksmithing work has been carefully done, both breakages of water tubes and stoppages due to clogged steel are minimized. Some trouble is encountered in soft rocks by the hole in the steel plugging up, due to the forcing of a core into the hole. Where trouble of this kind persists, the remedy appears to be to use a side hole instead of the usual arrangement.

With lower drilling rates, the removal of cuttings is not difficult, but with drilling rates of a foot or more per minute in down holes, holes have frequently to be blown out with an air tube. Piston drills using hollow steel have operated advantageously under these conditions.¹

BLACKSMITHING

Good drill sharpening and hardening are essential factors in securing efficient drilling. Accurate sizing of bits and shanks must be attained, or lost time results in drilling operations. The use of power sharpeners, oil furnaces in which pyrometric control is possible, and complete shop equipment has removed to a large extent the personal factor in drill sharpening, and it is entirely possible for an intelligent blacksmith to turn out drills which will meet the most exacting requirements of the mine. Gilman advocates inspection of drill steel before it is sent to the mine, and lists the following requirements:

"That the drill steel is straight and the bit and shank are formed in alignment with the steel body that the shank is of the proper length and shape; that the lugs or collar at the base of the shank are of the proper diameter and length; that the hole throughout the steel is of the proper size and free from obstruction; that the striking end of the shank is flat and square, with the inner and outer edges slightly rounded; that the bit is of the proper shape, with the cutting and reaming edges formed full and to the required size; that the gage of the bit is of the correct size for the length of the steel; that the reaming edges of the bit are concentric with the axis of the steel; that the angle of the reaming side corresponds to the standard that may be established for the existing conditions; that there are no sharp corners at the shoulder where the bit blends into the steel body; that the steel is free from cracks and other imperfections which might result in breakage when put into service; that the steels are of the proper length to correspond to the established length of steel change."

*Continued from the September 3 issue.

¹*Mine and Quarry*, "Choosing the Right Rod Drill," John F. Bertelling, July, 1918, p. 1071.

DRILLING RATE

Without specification of diameter of drill hole, air pressure and type of machine, as well as direction of drill hole and method of removing cuttings and nature of rock drilled, the drilling rate is not significant. Hard, tough rocks have been drilled at as high a rate as 12 in. per minute and rocks of intermediate class have been drilled at 18 in. per minute and upward. Up holes are drilled faster than down holes. As long as a drill bit retains its cutting edge it will maintain its initial drilling rate. In piston drills the drilling rate diminished as the depth of the drill hole increased, but with

Finished Diam. 1/4	Depth in Feet												Relative Drilling Rates (a)
	No. of Changes		3		6		8		10		12		
Bit Diameters													
Finished Diam. 1 1/8													1 1/8 - 3.55
1 3/16													1 3/16 - 2.55
1 1/2													2.11
1 7/16													1.77
1 9/16													1.48
1 10/16													1.30
1 11/16													1.14
1 12/16													1.00
1 13/16													0.64
1 14/16													
1 15/16													
2													
2 1/16													
2 2/16													
2 3/16													
2 4/16													
2 5/16													
2 6/16													
2 7/16													
2 8/16													
2 9/16													
2 10/16													
2 11/16													
2 12/16													

FIG. 1. RELATIVE DRILLING RATES

Dotted lines show range in drill diameters for holes of given depth for 3-in. change in diameter for follower drills; solid lines are for 1/2-in. change in diameter. (a) Relative drilling rates. The drilling rate for a 2-in. drill hole is assumed to be 1.00. Drilling rate is inversely proportional to the square of the diameter of drill hole, according to theoretical considerations, but is not practically so.

hammer drills the driller rate does not greatly diminish except when drill bits become dulled. Theoretically, as follower drills are of smaller diameter, the drilling rate should increase in inverse proportion to the square of the diameter of the drill hole. The last part of a drill hole should drill at a faster rate than the first. This is probably true to a limited degree, but other factors enter (the tightness of the smaller diameter holes and the sludging of the drill hole, for example) and the drilling rate approximately remains constant or does not greatly increase for the depth of the drill hole. In Fig. 1, relative drilling rates, calculated on a theoretical basis, are given for holes of different diameters. For a given mine, drilling rates for different rocks and types of drills should be determined for a drill hole of given diameter and the working air pressure. These results are valuable as a basis of comparison.

To be continued.

THE PETROLEUM INDUSTRY

The Fossil Oil Field*

The Fossil oil field is in Lincoln County, Wyo., about six miles west of Kemmerer and about four miles east of Fossil. Generally speaking it lies in the eastern part of T. 21N., R. 117 W., but future development may extend it north into the southeastern portion of T. 22N., R. 117 W. The field, as developed so far, occupies a portion of Sec. 11, 14 and 23, T. 21N., R. 117 W.

The geology of the southwestern portion of the state is somewhat different from that of the remainder of the state, especially in the matter of terminology. The particular difference lies in the fact that the oil-bearing sands are apparently found at much higher horizons in the Cretaceous system in southwestern Wyoming than in other parts of the state, notably central Wyoming or the Salt Creek district, and the Big Horn Basin.

In the Fossil field and also in the Dry Piney-La Barage districts, oil has been found in the Evanston, Adaville, and Hilliard formations, which correspond roughly to the Mesaverde and Pierre formations in other parts of the state. So far, no oil has been found in the Mesaverde formation in central or northern Wyoming, and only little oil has been found in the Shannon sand of the Pierre formation. On the other hand, the principal oil-producing sands of central, northern, and eastern Wyoming are found in the Frontier, and lower formations of Colorado age, and in the Cloverly or Dakota sands of lower Cretaceous age. This condition indicates a change in the character of the upper Cretaceous formations going west and southwest from central Wyoming. It has also been noted that the Frontier formation, which contains the famous Wall Creek sands of the Salt Creek oil field, tends to become likewise less productive as one goes west from central Wyoming, and the oil appears to have collected above the Frontier formation and below it.

In the Fossil field the Evanston formation, which is the upper member of the Cretaceous system, is exposed in a small area in Secs. 14 and 23. Underlying this will be found the Adaville and Hilliard formations, both of which are likely to carry oil in commercial quantities. In and surrounding the field are escarpments composed of Tertiary deposits, such as the Green River, Knight, and Almy formations. Structurally, there is an anticline running in almost a north and south direction through Secs. 2, 11, 14, and 23 of this township. The north and south extensions of the anticline are covered and concealed by the Tertiary formations, which are unconformable with the underlying Cretaceous.

Judging from the development that has taken place, it is believed that the axis of the anticline extends from about the northeast corner of Sec. 35, T. 21N., R. 117 W., to the southeast corner of Sec. 34, T. 22N., R. 117 W. There appear to be two oil horizons and one gas horizon so far developed. A number of shallow wells have been drilled in this field, and in these the first sand has been found at depths ranging from 100

to 250 ft. and the second sand at depths ranging from 250 to 450 ft. The first sand is a thin sand containing a heavy black oil, which is reported to be a high-grade lubricating oil of about 24 deg. Bé. The wells in this sand are pumped, and the production is only a few barrels per day per well. The second sand produces a high-grade oil of paraffine base, having a greenish-brown color and containing a high percentage of gasoline. The wells in this sand are pumped and will produce from 5 to 25 bbl. per day.

There are also a number of oil seeps in this small area, especially in Sec. 23. These seeps probably come mostly from the upper or black oil sand. In Sec. 35 of this township are several gas wells reported to be about 800 ft. deep. These wells are now flowing gas and sulphur water. Without knowledge of the logs, it is impossible to state from what sand the gas is derived. Little practical and systematic development has taken place in the field so far.

Rumanian Petroleum Production

SPECIAL CORRESPONDENCE

The following official figures, just published, show the petroleum production of the principal companies operating in Rumania during the months of May and June, 1921:

Name of Company	Production in Tons	
	1921	1921
	June	May
Steaua Romana.....	17,704	19,150
Astra Romana.....	22,358	29,340
Romana Americana.....	20,000	20,720
Internationala.....	4,535	4,784
Creditul Minier.....		5,408
Concordia.....	2,022	3,692
Orion.....	1,635	3,588
Nafta.....	2,381	1,330
Rumania Consolidated Oil Fields.....	1,036	1,730
Chiciura Oil Fields of Rumania.....	79	469
Colombia.....	1,553	1,742
Aqui la Franco Romana.....	755	994
Anglo Romana.....	305	362
Romana Belgiana.....	256	102

The production of the other companies operating in the country is so trivial that it is of no account. The total production during the month of June amounted to 78,000 tons, and during the month of July the production has even more decreased, amounting to not more than about 2,000 tons per day.

Pierce Junction Field Active

SPECIAL CORRESPONDENCE

Pierce Junction, eight miles southwest of Houston, is rapidly developing into an oil field of prominence. Recently the Brooks well, on the Howe lease, 1,400 ft. from the Snowden & McSweeney No. 1 Cain well, came in at 3,840 ft., flowing 6,000 bbl. It was later pinched down and is flowing 2,000 bbl. through a 3-in. choker. The Snowden & McSweeney well is also flowing this amount. The Gulf Production Co. will drill seven wells; Cullen & Co., two; Atlantic Oil & Refining Co., one, and the Humble Oil & Refining Co., one.

It is expected that before the end of the year Pierce Junction will be one of the largest producing oil fields on the Gulf Coast.

*Abstract of *Press Bulletin*, No. 11, G. B. Morgan, State geologist, Cheyenne, Wyo.

Technical Papers

Nickel Refining—In *The Mining Journal* for July 23 and 30 (15 George St., London, E.C.4, England; price, 8d. each) is an article describing the Haglund electrolytic nickel refining process. This process has been demonstrated at the Bamle smelting works, in Norway, but has not been operated on a commercial basis. In the Haglund process an almost neutral copper-free nickel sulphate solution is electrolyzed between sheet-iron cathodes and lead anodes, the latter, the insoluble anodes, being surrounded by diaphragms in which acid is liberated. The anolyte is neutralized by granulated copper-nickel matte in the presence of air, dissolving nickel and some copper, which latter is removed by cementation. Enriched in nickel, the solution returns to the catholyte, which is circulated independently at a speed several times as great as that of the anolyte. Many advantages over the Hybinette process are claimed.

Mineral Resources—Recent publications of the "Mineral Resources of the United States" series include: "Gold, Silver, Copper, Lead, and Zinc in the Eastern States in 1920," eight pages; "Gold, Silver, Copper, Lead, and Zinc in Idaho and Washington in 1919," forty-five pages; "Gold, Silver, Copper, Lead, and Zinc in Utah in 1919," thirty-two pages; "Salt, Bromine, and Calcium Chlorides in 1920," eight pages; "Mineral Resources of the United States in 1918," introduction and summary, 138 pages; "Gold, Silver, Copper, Lead and Zinc in Arizona in 1919," forty pages; "Gold, Silver, Copper, Lead, and Zinc in Montana in 1919," thirty-eight pages; "Chromite in 1920," seven pages; and "Gold, Silver, Copper, Lead, and Zinc in Nevada in 1919," forty-three pages. Any of these may be obtained on request to the U. S. Geological Survey, Washington, D. C.

Flotation Testing—Pamphlet No. 3 of the Bureau of Mines and Geology, Moscow, Idaho, twenty-two pages, obtainable on request, describes the various classes of testing machines on the market, with critical notes thereon, and outlines the principal things to be observed in test work.

Alaskan Mineral Resources—Bulletin 714, now complete, is obtainable on request from the U. S. Geological Survey, Washington, D. C. The various sections of this bulletin on the mineral resources of Alaska in 1920 have been previously reviewed in these columns as they appeared. The complete book contains 244 pages, and an excellent up-to-date map of Alaska, showing the mineral deposits of that territory, is included.

Iodide Method for Copper—The procedure for an iodide method for determining copper, for which great accuracy is claimed, is given in the *Alumni Magazine* of the Colorado School of Mines for July, 1921. (Golden, Col.; price, 25c.)

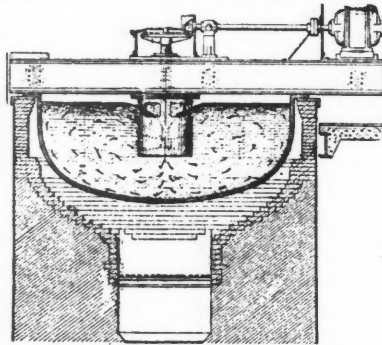
Mineral Resources of New York—The mineral resources of the State of New York form the subject of New York State Museum Bulletin, Nos. 223, 224, which may be obtained from the University of the State of New York, Albany, N. Y., on request. The bulletin contains 315 pages, paper bound. The principal products of the state are portland cement, pottery, salt, iron ore, natural gas, and limestone.

Air-Compressor Operation—In the *Iron Trade Review* for Aug. 25 (Cleveland; price, 25c.) is a four-page article entitled "Avoiding Compressor Troubles." Proper lubrication and occasional cleaning are the principal points to be observed.

Recent Patents

Patent specifications may be obtained from the Commissioner of Patents, Washington, D. C., for 10c. each. Postage stamps not accepted.

Lead Refining—No. 1,386,503. G. P. Hulst, Hammond, Ill., and M. W. Krejci, Chicago, Ill. A method of agitating a bath of molten lead while feeding thereto, without oxidation,



suitable reagents for removing impurities in the form of dross. The type of apparatus is shown in the illustration.

Chloridizing—No. 1,384,465. Harry Hey, Melbourne, Victoria, Australia. A process which embraces mixing lead-silver sulphide ores with hydrochloric acid and heating the mixture at a temperature substantially above 100 deg. C. to effect a preferential chloridizing of the lead and silver present.

Concentrating Table—No. 1,385,693. E. T. Lednum, Denver, Col., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del. An ore concentrating table with a surface of pyroxylin-coated fabric.

Jaw Crusher—No. 1,385,244. C. M. Conder and G. T. Vivian, Camborne, England. A new design of jaw crusher.

Shale-Distillation Furnace—No. 1,384,878. J. N. Wingett, Denver, Co., assignor to the American Shale Refining Co., Denver, Col. A design of furnace for distilling the volatile products from oil shale, which comprises superposed vaporizing and combustion chambers.

Book Reviews

Compressed Air. By Theodore Simons, Professor of Mining, University of Montana, School of Mines. Second edition; cloth; pp. 173; illustrated. McGraw-Hill Book Co., New York. Price, \$2.

This book has been prepared especially to provide the student with the groundwork that will enable him to solve the several problems connected with compressed air and its uses, and no attempt has been made to go into extensive descriptions of the different types of compressors or other pneumatic appliances. The greater part of the chapter on transmission has been rewritten, and modern formulæ are introduced, with examples of their application. The revision of the original text and the addition of new material brings this second edition abreast of modern theory and practice.

Oil Land Development and Valuation. By R. P. McLaughlin. Flexible cloth; 7½ x 5¼; pp. 196; illustrated. McGraw-Hill Book Co., New York. Price, \$3.

This handbook aims to outline only the steps necessary for the full and proper development of lands which have already been determined to be oil bearing. It will be found to be a valuable aid to all who are concerned in or responsible for oil-field operations. The chapters cover the following subjects: Development program; drilling of wells; assembling information relative to underground conditions; production of oil; repairing, deepening, and abandoning wells, and the value of oil land.

Iron and Steel in Sweden. Board cover; 7¼ x 9¼; pp. 183; illustrated. Edited and published under control of and in co-operation with Jernkontoret by Aktiebolaget Svenska Teknologföreningens Förlag, Stockholm, Sweden.

The printing and binding of this publication deserves special mention, and the general appearance of the book is a decided credit to the Iron Masters' Association (Jernkontoret) which has undertaken its publication and distribution. The book is intended to give necessary information to buyers of Swedish iron and steel, but its use will not be entirely limited to this purpose, for the work contains so much of general information that it serves as a fairly complete history of the iron and steel industry in Sweden.

The Engineering Index (1920 Edition). Cloth; 6¼ x 9¼; pp. 586. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York. Price, \$6.

This volume contains nearly 14,000 references to articles that have appeared in various domestic and foreign technical publications. The subjects are alphabetically arranged, and the book will be found invaluable for reference purposes.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

A. I. M. E. Meeting Will Include Three Tours

Automobile Trips Arranged by Committee Will Afford Excellent Opportunity for Visitors To View Northern and Lehigh Regions—Itinerary Covers Many Points of Interest to the Engineer and Miner

THE program of the Semi-Centennial Meeting of the A. I. M. E. has already appeared in *Engineering and Mining Journal* of Aug. 20, although, as announced at that time, it was subject to change. The changes, however, are so slight that it is not regarded as necessary to make any corrections in this issue.

Through the courtesy of *Coal Age* we are able to give the details concerning the three motor trips which will be made as a part of the program arranged by the committee of which R. V. Norris is general chairman.

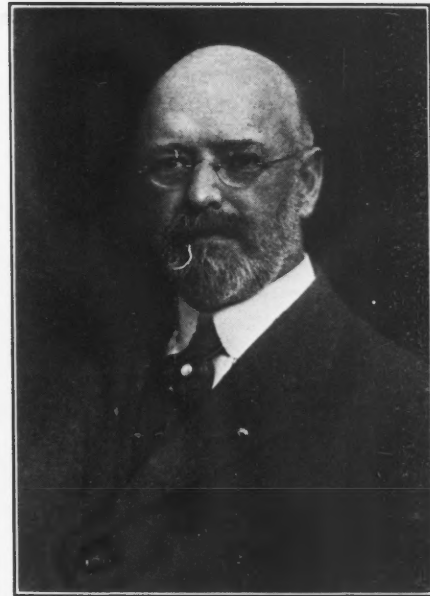
On Sept. 13 automobiles leaving headquarters at Irem Temple, Wilkes-Barre, will tour past the Dorrance, Prospect and Henry collieries, No. 14 colliery of the Pennsylvania Coal Co., the Hoyt shaft, and the Ewing breaker by Fort Griffiths to Pittston. The Pittston shaft of the Seneca colliery, where mining is being done under the Susquehanna River and its extensive flats, will then be visited. The Twin shaft of the same colliery, the breaker of the Barnum colliery, the washery of the Phoenix Mining Co. will be passed on the road to Duryea. The road then runs beyond the Hallstead breaker and the William A. colliery to Old Forge, where the No. 2 shaft of the Old Forge colliery, the breaker where the coal from that colliery is prepared, and the Jermyn colliery are located. Reaching Taylor, the party will pass the breaker of the Scranton Anthracite Co., the Greenwood colliery and a public school which was started but never finished because mine caves stopped the builders. The concrete breaker of the Taylor colliery is the first breaker that the visitors will pass that has been shut down to avoid the provisions of the Kohler law that makes the damaging of houses by mine caves a penal offense.

The Pine colliery follows, and then the Na-

tional and Dodge collieries, which have also closed down as a result of the Kohler law. The latter colliery is working by a semi-longwall method and using electric undercutting machines and belt conveyors along the working face.

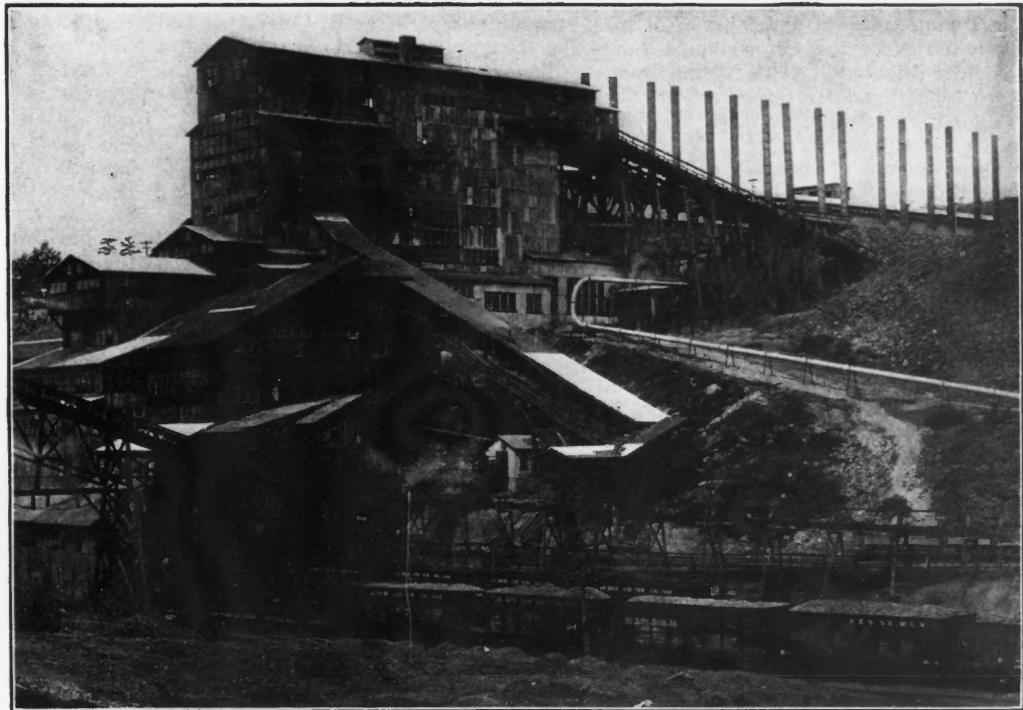
The automobiles will also pass the Hyde Park section of Scranton, where the caves have occurred of which so much has been printed in the newspapers. At the Oxford breaker of the People's Coal Co. the mine has been closed down and the company has passed out of existence. Some of the officials of the company have been tried and found guilty of a violation of an injunction of the court, but the case has been appealed.

Passing over the cave area, Mount Pleasant, the Diamond, and the Tripp collieries will be reached. Then the old breaker of the Bulls Head Coal Co., the West Ridge, Van Storch, Richmond and Legitts Creek collieries will be visited. Arriving at No. 1 shaft of the Marvine colliery, a Hudson Coal Co. plant, the party will leave the cars, inspect the plant, and reimbark at No. 2



R. V. NORRIS
General Chairman of the Wilkes-Barre Meeting

shaft. The Price-Pancoast shaft, at Throop, and the Richmond shaft on the outskirts of Scranton will be passed on the way to North Park, a section of Scranton, where the top bed—twenty to thirty feet below the surface—must lie unrecovered because the mining of



GREENWOOD BREAKER OF LEHIGH COAL & NAVIGATION CO., NEAR LANSFORD, PA.

this bed has been forbidden by permanent injunction.

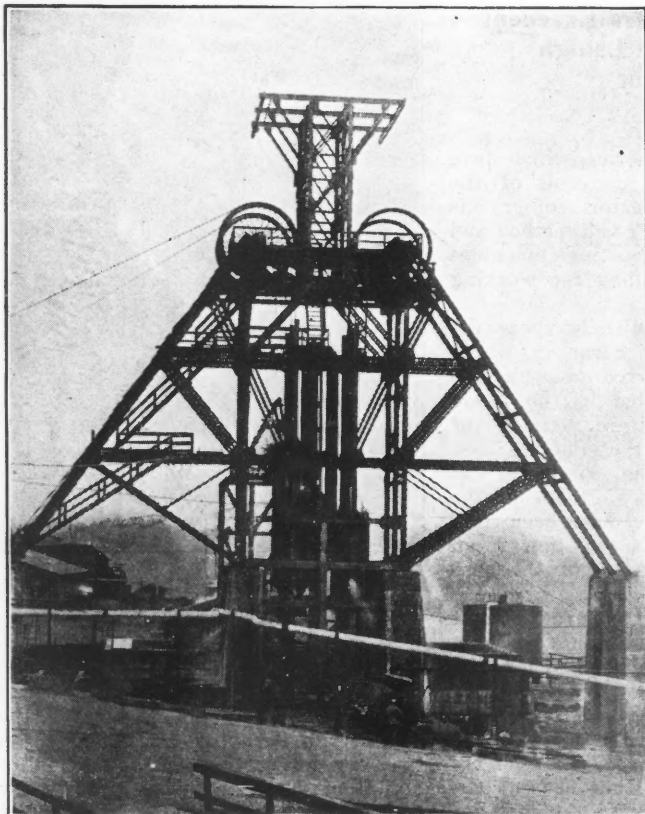
The party will then lunch at the International Correspondence Schools and hold a technical session in the same building, returning to Wilkes-Barre thereafter by the Pine Brook, Dodge, National, and other shafts visited in the morning. The road taken will be different, and No. 9 colliery of the Pennsylvania Coal Co., No. 4 shaft of

Starting at 9:30 a.m. on Sept. 15 the various parties will tour by way of Ashley and the Ashley Planes to White Haven, passing the Stanton, Buttonwood, Inman, and Maxwell collieries. Entering the Lehigh region at White Haven, the visitors will proceed to the Drifton breaker, passing the ruins of the old Pond Creek breaker, which was begun in 1879, the breaker of the East Point Coal Co., Highland No. 2 colliery,

and that of the Upper Lehigh Coal Co.; also Markle No. 5 and Highland Breaker No. 2. Skirting Freeland, the party will pass Highland No. 5 and the celebrated Eckley breaker and arrive at Jeddo and Japan Village, where coal is reclaimed from the piles by passing it through boreholes into the mines and loading it into mine cars which bring it to the surface. Passing Jeddo No. 4, some "Mammoth Vein" strippings, the Basin shaft, the Jeddo drainage canal, (built to protect the mines from the creek), and the G. B. Markle & Co. strippings will in turn be reached; also Harleigh No. 7 and the Hazleton shaft. Beaver Meadow and the

The visitors will reach Nesquehoning, passing the breaker named after that village and the Hauto washery and power plant. Luncheon will be served at Greenwood Park. Returning, the party will pass the Lansford colliery and the Coaldale breaker now being built to take the place of the one recently burned. They will then enter Coaldale and travel by way of the Greenwood, Rahn, and Tamaqua breakers, passing, on the way, an 800-ft. water shaft having one of the largest reduction-motor hoists in the world.

The motor is a 1,200-hp. machine. It hoists twenty-seven tons at each trip. Crossing the Schuylkill River, the automobiles take the road to Silver Brook washery, Audenreid, and the Beaver Brook breaker of Charles M. Dodson & Co. Other points of interest will be the Spring Brook washery, Cranberry colliery, Harwood colliery and electric plant. Hazleton will then be reached. Harleigh No. 7 and Lattimer collieries will next be passed. The Pardee headframe, which discharges the coal at right angles to the direction of hoisting, and the old Milnesville strippings, with their interesting rock folds, will next be noted, and then the party will make for home by Fairview and Ashley, a total run by the speedometer, from the start to the finish of the trip of 117 miles.



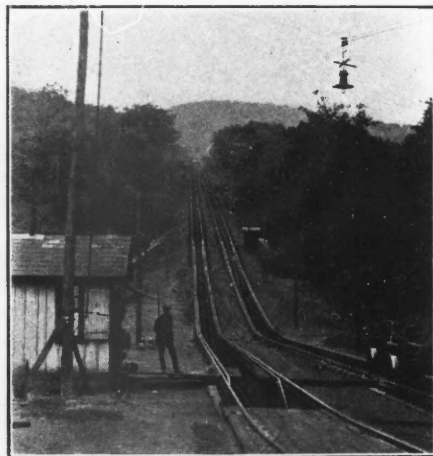
HEADFRAME OF WATER SHAFT AT TAMAQUA COLLIERY

the Ewing colliery, and Nos. 6, 5 and 11 collieries of the Pennsylvania Coal Co., also the Laffin colliery, the Delaware shaft, and a breaker of the Wilkes-Barre Anthracite Coal Co., will be on the itinerary.

Other points of interest will be the Pine Ridge colliery of the Hudson Coal Co., the beautiful Mineral Spring colliery of the Lehigh Valley Coal Co., the substantial buildings of the Peach Orchard colliery of the Glen Alden Coal Co., and the ill-fated Baltimore No. 5 colliery, where nearly 100 men were killed by an explosion of powder as the trip was being taken into the mine. No. 2 shaft of the Hudson Coal Co. is the last coal-operating point to be passed on the way to the starting point. The whole trip is short, covering only forty-six miles, but, as may be noted, it is well supplied with coal-producing equipment.

A shorter trip will be made on Sept. 14, when the plants on the road not already visited will be the Pettebone, Haddock, Harry E., Forty Fort, Mount Lookout, and Maltby collieries and the Cortright slope. The visitors will be entertained by the Wyoming Shovel Co. at luncheon.

breaker named after it, Coleraine, and the Evans Colliery Coal Co.'s plant will next be passed on the way to the Hudsondale storage plant of the Lehigh Valley Coal Co.



ONE VIEW OF THE ASHLEY PLANES OPERATED BY THE CENTRAL R.R. OF NEW JERSEY

Standard-gage equipment is used. This plane is 3,000 ft. long and 422 ft. high, and at this point the grade is 14.65 per cent.

Utah School of Mines Appointees Begin Work at Bureau of Mines Station

Research work has been started by fellowship appointees of the Utah School of Mines at the Salt Lake station of the Bureau of Mines, under the direction of Thomas R. Varley. Each year the University of Utah sets aside five fellowships for the research work related to mining. The following men have been appointed for the fiscal year 1921-1922, and have already taken up their work at the Bureau of Mines station: Charles G. Maier, a graduate of the Massachusetts Institute of Technology, has been assigned problems dealing directly with the hydrometallurgy of zinc and assisting in problems in physical chemistry directly concerning the application of chloride volatilization process.

Morris Badt, University of Nevada, assigned to work on problems directly connected with ore-dressing research.

C. G. Wurtzbaugh, South Dakota Schools of Mines, assigned to problems dealing with the chemistry of the volatilization process.

Douglas Gould, Tufts College, assigned to work on oil-shale investigations.

In addition, Dr. W. D. Bonner, professor of chemistry at the University of Utah, is doing important work with regard to the possibility of manufacturing hydrochloric acid on a commercial scale in Salt Lake.

George L. Oldright, a hydrometallurgist of many years' experience, has been appointed to work in volatilization prob-

lems in the place of E. P. Barrett, who was recently transferred to the Seattle Bureau of Mines station. Mr. Oldright was formerly research hydrometallurgist for the American Smelting & Refining Co., at Perth Amboy, N. J. Later, he directed the construction of the pilot mill of the Chile Copper Co. at Chuquicamata and afterward was general superintendent of the leaching plant.

It is the ambition of the staff of the local station to make the work of organization of the highest possible efficiency. In line with this ideal, many problems, the solution of which are of vital importance to the mining industry, are being studied. With the arrival of a new Leitz photomicroscope, the metallurgical laboratory becomes one of the best equipped in the United States.

Interest in the microscopic analysis of ore is growing rapidly, according to information received at the station. Operators have suddenly awakened to a realization of the need of knowing the physical structure of ores as well as their chemical composition, in order that the best methods of milling may be economically determined.

International Geological Congress Announced for 1922 in Belgium

The following is a translation of a letter recently received from the committee of organization of the International Geological Congress, of which Armand Renier, chief of the Geologic Service of Belgium, is secretary, and Jean Lebacqz, director general of mines and president of the Geologic Council of Belgium, is president:

"The honor of organizing the next International Geological Congress has been reserved to Belgium from 1913. The brutal invasion of our soil in spite of all agreements, the ruins which have accumulated in the course of the war, the distress of the entire country, have, as a necessary consequence, prolonged adjournment of this reunion. But sympathetic requests coming from all parts have incited us to wait no longer.

"In the name of the Committee of Organization, we have the honor to bring to your attention that an International Geological Congress will be held in Belgium the latter part of the month of August, 1922, and to invite you to take part.

"Excursions will be organized before, during, and after the session; they will cover our whole country, whose varied geology has already been studied in great detail. The study of questions of general character will be included. The later circulars will specify the details of arrangement.

"We are convinced that you will lend your valued assistance, and we thank you in advance.

"The addressed lists which are available to us being old, you would do us a great service in forwarding us lists of persons to whom we could profitably send the final circulars. Address all communications to the secretary's office, Geological Service of Belgium, Palais du Cinquantenaire, Brussels."

San Francisco Section, A. I. M. E., Approves Survey of Earth- quake Fault

The San Francisco Section of the A. I. M. E. held its regular meeting on the evening of Aug. 23. F. L. Sizer presided. Edward Higgins gave a short talk. The finances of the local section were discussed, the plan of voluntary subscription resulting successfully. Communications favoring Prof. A. C. Lawson's resolution, introduced in the May meeting, were read. The resolution advocated a survey of the changes in geographic position produced by the earthquake fault. Herbert Hoover, Secretary of Commerce; E. Lester Jones, Director U. S. Coast and Geodetic Survey, the San Francisco Chamber of Commerce, and Congressmen from California approved the project. Letters from F. F. Sharpless and President Ludlow to Chairman Sizer were discussed, and a membership committee consisting of H. M. Wolfen, C. A. Grabill, R. P. McLaughlin, H. R. Plate, and R. H. Bedford was appointed.

A request from A. F. Parsons for a historical sketch of the section for the San Francisco Chamber of Commerce was referred to the secretary, and the members were requested to collaborate with him in preparing a suitable résumé. Participation of the section in the affairs of the San Francisco Engineering Council were discussed, and a committee consisting of Wilbur H. Grant, A. A. Hanks, and C. G. Dennis was appointed to investigate and report at the next meeting.

Society of Chemical Industry of Great Britain Holds Montreal Meeting

The fortieth annual convention of the Society of Chemical Industry of Great Britain was held at McGill University, Montreal, Aug. 29-31. About 300 members were in attendance, including many prominent British and American chemists. Sir Charles Fitzpatrick, Lieutenant-Governor of Quebec, extended a welcome to the society on behalf of the province. Sir William Pope, F.R.S., president of the society, emphasized the imperial character of the organization, extending throughout the British dominions and having a large branch in the United States. He predicted that the present generation would see an immense development in the application of organic chemistry to industry, especially in the advanced use of petroleum along the same lines as had been applied to coal-tar products. The following officers were elected: President, Dr. R. F. Ruttan, of Montreal; vice-presidents, J. L. Baker, C. S. Garland, and Sir William Pope; councillors, F. Armstrong, J. W. Hinkley, D. J. Wilcock and E. V. Evans; foreign secretary, Prof. Henry Louis. The annual banquet was held the evening of Aug. 30, the principal speakers being T. H. Wardleworth;

W. H. Nicholls, who represented the American section; Henry Holgate; Harold J. Roast, secretary of the Canadian Institute of Chemistry, and Professor Pandya, of India.

British, French and American Engineers To Promote Unity

American engineers will meet representatives of the principal engineering societies of Great Britain and France at a dinner to be given at the Engineers Club, New York, on the evening of Oct. 10. The event, though formally celebrating the homecoming of the mission of distinguished American engineers who went abroad to confer the John Fritz Medal upon Sir Robert Hadfield, of London, and Eugene Schneider, of Paris, will mark the launching of a world movement of engineers to promote unity among the English-speaking peoples and among peoples who aided in the war against Germany.

Adjustment of Wage Scales To Be Studied

The U. S. Department of Labor, through the Bureau of Labor Statistics, is making an investigation to determine the manner in which cost of living figures are used in the adjustment of wages. The Commissioner of Labor Statistics has written the *Engineering and Mining Journal* as follows:

"The Department of Labor, through the Bureau of Labor Statistics, is making a study of the methods of adjusting wage scales and concluding collective wage agreements where cost of living figures enter into the wage adjustment. To that end, the Bureau of Labor Statistics wishes to communicate with the various companies, members of arbitration boards, labor managers, or others who are using cost of living figures in the determination of wage awards.

"If any reader of *Engineering and Mining Journal* who has not already communicated with the Bureau, is using cost of living figures in the adjustment of wages, it will be appreciated by the Bureau if he will write to the Commissioner of Labor Statistics, Washington, D. C., and inform him of that fact."

Geologists To Visit in Tennessee

The Association of American State Geologists is planning a field trip through Tennessee during the early part of October. Visits to the following points will be included: Oct. 7, smokeless-powder plant at Nashville, Pleistocene river gravel deposits, and Silurian fossil locality at Newsome Station; Oct. 8, Mount Pleasant phosphate field; Oct. 9, dam and power plant on Tennessee River near Chattanooga; Oct. 10, industrial plants at Chattanooga; Oct. 11, Ducktown copper district; Oct. 12, Knoxville marble quarries; Oct. 13, Mascot zinc field; Oct. 14, Embreeville zinc carbonate deposits, and Oct. 15, Cranberry magnetic iron-ore deposits.

MEN YOU SHOULD KNOW ABOUT

Henry C. Morris, of Washington, D. C., has been definitely chosen to head the new petroleum commodity division of the Department of Commerce. In addition to his public-school education, Mr. Morris attended a military academy and the Massachusetts



HENRY C. MORRIS

Institute of Technology. He was graduated from the latter institution in 1901 with the degree of B.S. in mining engineering. He was part owner and manager of the Blue Bull mining property, at Goldfield; the Nevada Hills lease, at Fairview, Nev., and the Reno Reduction Works. Most of his experience has been in the business department of mining, rather than in consulting engineering work. He has been in personal charge of oil-drilling operations and has made a specialized study of petroleum economics since May of 1918. Early in the war, Mr. Morris served with the Fuel Administration on a dollar a year basis. In May, 1918, he joined the staff of the U. S. Bureau of Mines and was made a member of the Capital Issues Advisory Committee. Later, he became the Bureau's representative on the Economic Liaison Committee. In that position, he made a special study of the international petroleum situation and has come to be regarded as authority on those matters.

C. W. Purrington sailed from England for Boston on Sept. 7.

Walter H. Aldridge announces the removal of his office to 41 East 42d St., New York City.

F. E. Calkins has recently completed an examination of the Lincoln gold mine near Crown King, Ariz.

C. M. Frantz, of Denver, is making examinations of the fluor spar resources of New Mexico and Arizona.

Horace V. Winchell is transferring his headquarters and residence from Minneapolis, Minn., to Los Angeles, Cal.

J. W. Bell, of the North Crown mine, in Porcupine, has joined the staff of the Gutta Percha Rubber Co., Toronto.

Albert G. Wolf, mining engineer to the Texas Gulf Sulphur Co., was in New York last week on a brief professional visit.

J. R. Mougín has been engaged as mill manager for the Ore Chimney Mining Co., Northbrook, Ont., and will take charge Oct. 1.

J. F. Callbreath, secretary of the American Mining Congress, addressed the members of the Engineers' Club of San Francisco on Aug. 24.

John F. Sleeper, author and chemist, will leave Tenafly, N. J., the middle of September and take up a permanent residence in Santa Barbara, Cal.

G. T. Hansen has resigned as district manager of Allis-Chalmers Manufacturing Co. in Salt Lake, and will give his attention to personal mining and oil enterprises.

Frederick Lyon, formerly a member of the engineering department of the United States Smelting Co., and later vice-president of the company, has been visiting in Salt Lake City.

H. E. Nyberg, formerly assistant general manager of the Cía. Minera "Las Dos Estrellas," S. A., of El Oro, Mexico, has recently been appointed general manager of the same company.

F. G. Cottrell, who has been in Europe during the summer investigating industrial conditions of interest to the mining and chemical industries, will sail from Cherbourg for New York on Oct. 11.

B. A. Middlemiss, former assistant general manager for the Chile Exploration Co., at Chuquicamata, Chile, has completed a three-year contract with this company and intends to enter business in this country.

George H. Kilburn, of the Consolidated Mining & Smelting Co., of Canada, Ltd., is making a mineral survey of the Esquimelt & Nanaimo railway belt lands on Vancouver Island for the Canadian Pacific Ry.

E. R. Rice, formerly manager of the Van Dyke Copper Co., Miami, Ariz., has entered into a partnership with L. H. Foster, of Kingman, Ariz. The firm will be known as Foster & Rice, mining and civil engineers.

E. A. Holbrook, acting director of the U. S. Bureau of Mines during the absence of Director Bain, will represent the Bureau of Mines at the Wilkes-Barre meeting of the American Institute of Mining and Metallurgical Engineers.

David White, chief geologist of the U. S. Geological Survey, left Washington on Sept. 4 for an extended field trip, during which he will examine reported oil-shale deposits in the northern Ap-

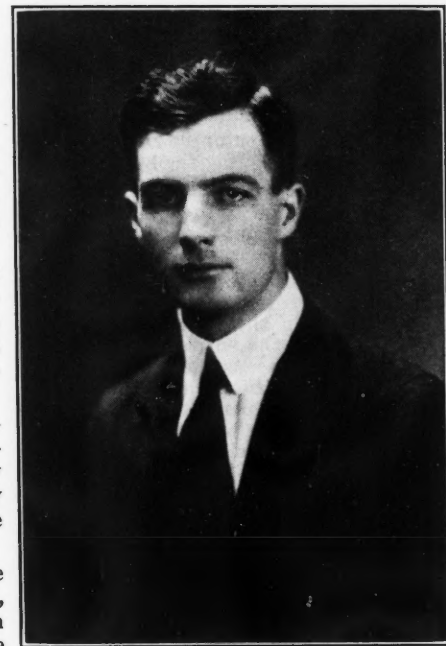
palachian region and will make several stratigraphic studies in the Pennsylvanian system.

F. W. Bradley, president of Olaska Treadwell and associated companies, and president of Bunker Hill Mining & Concentrating Co., after a visit to the Bunker Hill operations in August, is making an annual inspection of the Alaska mining enterprises.

Howard S. Gilman, for the last three years with the Ingersoll-Rand Co., at Los Angeles, has been transferred to Lima, Peru, as local manager. He is accompanied by E. P. Cleary, who has been the company's representative in Mexico City for several years.

Mining engineers recently in New York City included: L. S. Twomey, Cleveland, Ohio; S. D. Bridge, San Antonio, Tex., and W. B. Donoghue, Casapalca, Peru.

G. St. J. Perrott, associate physical chemist of the Bureau of Mines Experiment Station, Pittsburgh, Pa., has been sent to Birmingham, Ala., to study the physical properties of coke in relation to its production and use in the blast furnace. Blast-furnace operators declare that there is a decided lack of knowledge regarding the physical and chemical properties of coke in producing iron ore. In the stress of war time they found it necessary to use almost anything in the way of coke material that was offered,



G. ST. J. PERROTT

and, it is said, they found they could use materials that before had been regarded as impossible of utilization. It is believed, therefore, that the investigation proposed offers a fertile field for obtaining important information. Conditions are favorable for the conducting of these investigations at the Tuscaloosa Experiment Station of the Bureau of Mines, where there are a number of small blast-furnace plants and by-product plants.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Missouri Charcoal Iron Industry Passing

Sligo Furnace Co. Makes Last Cast—
One Furnace Left in Southeast Missouri

The Sligo charcoal furnace, in Dent County, in central Missouri, has just made its last cast and will permanently go out of business. This furnace has been in almost continuous operation for over forty years, and was built at a time when there were about ten charcoal furnaces in Missouri, all of which have gone out of business and most of them, especially in the Iron Mountain district, over thirty years ago. Though the Ozark hills are timbered mainly with oak, which makes an excellent, strong charcoal, the yield per acre is very moderate, or only about ten cords, so that the timber is rapidly exhausted, which is the cause of the practical extinction of this industry in Missouri. By building a railroad, the Sligo Furnace Co. was able to extend its life to this date by pushing farther and farther away from the furnace for its supply of charcoal, but it has now gone beyond the profitable stage and passes into history. The Sligo furnace relied mainly on local pocket deposits of hematite and limonite, and though these are very uncertain as to tonnage, the company was in a district that has been able to supply a good grade of iron ore to date, although a few shipments of special ore were drawn from mines of the Lake Superior district.

There still remains one charcoal furnace in southeast Missouri, that was built during the recent war mainly to secure the byproducts, as it is equipped with an expensive byproduct oven plant. As this furnace is in a district that has not been cut over, it may continue several years longer, although it is not favorably situated for a reliable supply of iron ore.

Czecho-Slovakia To Stimulate Production of Radium

(Cable by Reuters to "Engineering and Mining Journal")

Prague, Aug. 30—In order to increase the production of radium, the government of Czecho-Slovakia has granted 12,000,000 crowns for the technical improvement and development of the mines. The annual output is expected to reach four grams as a result of this aid.

WEEKLY RESUME

The last week has been barren of important events. At Washington protests continue to be made one way or the other against provisions of the metal schedule of the Tariff bill. The Bureau of Mines and the Bureau of Standards are preparing to study the reasons for breakage of drill steel.

In California the suit of Carson against the Afterthought Copper Co. resulted in a verdict of \$1 damages for the plaintiff. In Utah the Utah-Salduro company has been taken over by the Western Chemical & Dye Co. In Nevada conditions are rapidly becoming normal at Tonopah and Divide. In the Joplin-Miami district the High Five mine, near Waco, Mo., has been acquired by the American Zinc, Lead & Smelting Co. In Ontario the mineral output during the first half of 1921 is estimated at much less than in the same period last year.

Day-Smith Interests Seeking To Control Hecla?

Injunction Obtained Against Star Deal Looked Upon as Move in Fight To Gain Control of Mining Company

The order issued by Judge Blake, of the superior court of Spokane, temporarily restraining the officers and directors of the Hecla Mining Co. of Wallace, Idaho, from taking any steps toward the ratification of the agreement to join the Bunker Hill & Sullivan in the purchase and operation of the Star mine, is popularly regarded in the Coeur d'Alene district as a move by Eugene R. Day, manager of the Hercules mine and a Hecla stockholder, and Mrs. Sarah E. Smith, a director of the Hecla Mining Co., in their fight to gain control of the Hecla company. The order was issued upon their application and the hearing set for Sept. 9. The agreement between the Hecla and Bunker Hill to develop the Star is looked upon as the most important enterprise that has been undertaken in the district for several years, and this move on the part of the Day-Smith combination to block it is regarded by some as a scheme to harass the Hecla management, with the purpose of gaining control of the Hecla.

The Hecla mine has continued in full operation in spite of unfavorable metal conditions, and in joining the Bunker Hill the company will be instrumental in adding a new mine to the list of producers.

Carson Gets Nominal Damages In Afterthought Suit

Jury Awards Him \$1 for Infringement of Patent Covering Feeding of Reverberatories—Defendant Calls No Witnesses

The suit brought by George C. Carson against the Afterthought Mining Co. for the infringement of his patent covering the feeding of ore and fettle material through holes along the respective sides of the arch adjacent to the side walls of the reverberatory furnace was recently tried before a jury in the United States District Court, sitting in San Francisco. Plaintiff called a number of witnesses, but the defendant's attorney, W. K. White, did not put any on the stand. At the conclusion of the trial, which occupied about five days, the jury retired, and, after deliberating for eight hours, arrived at what might be deemed a compromise verdict, by awarding the plaintiff nominal damages in the sum of \$1. Although the plaintiff apparently achieved a victory, as a matter of fact the rulings made by the court during the trial were such that the Carson patent, in any future litigation, can probably be easily invalidated. Such rulings arose out of the following situation:

On Jan. 15, 1907, Carson filed an application for letters patent and disclosed therein a reverberatory furnace provided with side-feed ports located in the furnace arch but having combined with each of said feeding ports a receptacle or hopper into which the ore was first fed and from which the feeding of the ore through the hole in the arch was controlled by a sliding gate. After such application was pending for many years, the Patent Office held, in 1915, that the application disclosed three different, distinct, and separate inventions as follows:

The feeding mechanism for feeding the ore through the arch at the side of the furnace.

A particular construction of hearth embracing a dam; arranged crosswise of the hearth and making it possible to treat basic material at one end and acid material at the other end of the furnace.

A particular roof construction embracing a particular kind of bracket for supporting the arch.

On account of the rule that provides that separate inventions cannot be covered in one patent, the Patent Office in-

structed Carson to cancel his claims respectively covering the specific hearth structures and the specific roof structure. Mr. Carson did so, and reserved the right to file a separate application for letters patent on the hearth structure. Upon the cancellation of said claims, a patent issued on Aug. 10, 1915, on such original application, in which there was but one claim covering the Carson side-feed mechanism, but limited to a structure in which was a hopper into which the ore was first fed.

On June 26, 1915, Mr. Carson, of his own volition, filed a second application, in which he disclosed a furnace having two rows of holes arranged along the sides of the arch, but without any hoppers being provided. During the pendency of this application, the British Siemens patent was cited, but Carson was able to have the same found inoperative by reason of certain tests he said he made

in Berkeley, Cal. As a result of this second application, a patent was issued to Carson in 1919 and covering broadly his side-feed mechanism, and it was this second patent that was involved in the case cited. During the course of the trial Judge Van Fleet ruled that the application for said second patent was not a proper divisional application, and, therefore, that the date of such application could not be carried back to Jan. 15, 1907, but must be deemed to be June 26, 1915. The result of said ruling is that any prior use in this country of the Carson invention, or any any description of the Carson invention in any printed publication or patent more than two years prior to June 26, 1915, will operate to invalidate such patent. Notwithstanding the said ruling, the defendant in the case, by reason of insufficient funds to make a proper defense, was not able to prove any such prior use or publication or patent, although it is

understood that there are patents, publications, and prior uses antedating June 26, 1913, and which are sufficient to invalidate the patent.

Radium Reported Discovered in Belgian Congo

(Cable by Reuters to "Engineering and Mining Journal")

London—It is understood that radium has been discovered in the Belgian Congo. A special mission is about to leave Brussels to investigate the deposits.

Iron Ore Deposits Discovered in France

(Cable by Reuters to "Engineering and Mining Journal")

Paris—It is reported that ore deposits containing over 50 per cent of iron have been discovered in the Department of Lot.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Protests Continue Against Metal Schedule of Tariff Bill

Zinc Institute Representative Before Senate Committee—Foil Men Want Tin on Free List—Aluminum Discussed

E. H. Wolff recently appeared before the Senate Finance Committee as the representative of the American Zinc Institute to call particular attention to the fact that the industry, as a whole, believes it inequitable to give the products of zinc a two-year protection when the duty on raw material is for the life of the bill. He also urged that the committee adopt the rates of duty proposed by the Institute. These rates are somewhat higher than those contained in the Fordney bill, as it passed the House. To set forth clearly the situation as to zinc rates, Mr. Wolff submitted the table given below:

He also particularly called the at-

tention of the committee to these paragraphs in a brief which he submitted as a part of his remarks:

"Just before the passage of the bill in the House the Ways and Means Committee awakened to the fact that the zinc-mining industry of this country is threatened almost with extinction. They, therefore, voted to make the two-year rates on zinc ore only the rates for the life of the bill. But in the stress of their work the members of the Ways and Means Committee overlooked the fact that after two years, if the rates on the products of zinc ore are not similarly advanced, these higher ore rates will be practically valueless to the zinc miners of this country.

"In this connection the question naturally presents itself as to where, after two years of the higher ore rates, are the zinc miners of the United States to find a market for their ores. That market is wholly a domestic one. It must, therefore, be obvious to all that,

unless the rates on the products of zinc are advanced in keeping with the rates on zinc ore which were at the last minute decided upon the Ways and Means Committee as necessary to the salvation of our zinc miners, there will be no market for domestic zinc ore after two years."

In the course of his remarks to the Committee on Mines and Mining, Mr. Wolff said:

"Our operating costs are getting up higher than they were in pre-war years. One of the important facts to be considered is that the zinc industry as a whole operated on a twelve-hour basis. Today it is on the eight-hour basis, which is the American day, and no one expects that we will go back to the twelve-hour basis. That in itself is going to increase the labor costs permanently about 30 or 35 per cent.

"Then there is the further fact that freight rates have a very large bearing on our business. This is all heavy tonnage, and the amount of money involved in the payment of freight is very large indeed. While it is true that the rates are somewhat higher today than we care to see them, and we expect them to come back to a somewhat more normal basis, yet we do not expect them to go back to what they were in 1910, 1912, or 1913.

"Another matter to be taken into consideration is fuel. Fuel is high today compared with pre-war days, and we do not expect to see fuel come back to that point. I might say that the zinc industry has had protection for many years. It has been understood that zinc had protection. It has never been coming into this country in any large volume, and I do not think anyone expects it to come in from foreign countries. It is a domestic proposition. We should like to have it remain so."

	Act of 1909 Cents	Act of 1913 Per Cent	Proposed by Institute Cents	Reported by Ways and Means Com- mittee, 1921 (a) Two Years Cents	There- after. Cents
Ore up to:					
10 per cent.....	Free	10	Free	Free	Free
10 to 20 per cent.....	1/4	10	1 1/2	1/2	1/4
20 to 25 per cent.....	1/2	10	1 1/2	1	1/2
Over 25 per cent.....	1	10	2	1 1/2	1
Slab zinc.....	1 3/8	15	2 3/4	2	1 3/8
Zinc dust.....	1 3/8	15	3 3/4	2 1/4	1 3/8
Sheets.....	1 3/8	15	3 3/4	2 1/4	1 3/8
Sheets, coated.....	....	....	3 3/4	2 1/8	1 3/4
Old and wornout.....	1	15	2 3/4	2	1
Zinc oxide, dry (b).....	1	10	2 3/4	1 1/2	1 1/2
Zinc oxide, in oil.....	1 3/4	15	....	2	2

(a) Passed by the House July 21, as reported, except that two-year rates on ore were made permanent rates at last minute.

(b) 1909, zinc oxide not containing lead; 1913, zinc oxide not containing more than 5 per cent lead; reported zinc oxide not containing more than 25 per cent lead.

Otto Ruhl, representing the zinc ore producers of Missouri, Kansas and Oklahoma, submitted figures to show the situation in that district and to call particular attention to the need of adequate protection against Mexican ores.

Charles T. Orr, of Webb City, Mo., called attention to the fact that all the mines which produce zinc only are closed down. The properties which are operating, he said, are those that produce lead as well. Prices of zinc are less than they were twenty-two years ago, with labor costing twice as much as it did then.

A protest against the removal of tin from the free list has been made to the Senate Finance Committee by Egbert Moxham, representing the Conley Foil Co. He also filed a brief from the Tin Foil Manufacturers of the United States supporting his contentions. It was contended that the dependence of the United States on the outside world for tin is so absolute that it is self-evident that any import duty imposed by the United States on this material will be followed by retaliatory duties on the part of producing countries. The levying of any duty on tin, it was declared, will react most unfavorably upon the consuming public of the United States. It is the contention of the tin-foil manufacturers that 4½c. may be considered as a normal price for lead. On that basis, the 2½c. duty prescribed by the Fordney bill is equivalent to a 50 per cent ad valorem rate, it was pointed out. They argue that as the country is producing its full requirement of lead and is exporting large quantities of this material, it would indicate that the industry is in a position to compete successfully with foreign producers,

and therefore a rate of approximately 50 per cent ad valorem is unnecessarily high.

A vigorous protest against a duty on aluminum in crude form was made to the Senate Finance Committee by Lawrence M. Brile, of New York. He also stated that the proposed rate of 9c. per pound on aluminum sheets, bars, and other forms would be equivalent to an embargo. He asked that, regardless of the rate fixed on crude aluminum, the rate on aluminum sheets and rods should not exceed that rate by more than 1½c. A rate of 9c. on fabricated aluminum would be entirely inconsistent with a rate of 5c. on crude aluminum, Mr. Brile declared.

Engineers Asked To Serve on Committee To Study Steel

In the hope that they will serve as a consulting committee to study breakage and heat treatment of drill steel, a joint invitation has been extended by the Bureau of Mines and the Bureau of Standards to the following engineers: B. F. Tillson, New Jersey Zinc Co.; F. W. Denton, Copper Range Company; Dr. Van. H. Manning, American Petroleum Institute; Dr. J. A. Matthews, Crucible Steel Co., and W. L. Saunders, Ingersoll-Rand Co.

Would Exempt Gold Mines From Excess-Profits Tax

Senator Smoot, of Utah, has introduced an amendment to the existing revenue laws which, if enacted, would exempt gold-mining operations from the war excess-profits tax assessed in the Revenue Act of 1917.

Ingersoll-Rand Co. Wants Tariff Unchanged on Hollow Drill Steel

Testifying before the Finance Committee of the Senate, C. F. Schwep, of the Ingersoll-Rand Co., asked that the present tariff rate of 8 per cent on hollow drill steel be allowed to remain in effect, instead of the higher rates prescribed by the Fordney bill. He pointed out to the committee that the old type of percussion drilling differs widely in principle from hammer drilling. The hammer drill, he said, uses hollow steel, and instead of lifting the steel in the chuck up and down, the drill is tapped on the end. Owing to the fact that the tool receives blows at the rate of 2,000 per minute, it must possess qualities which enable it to withstand this shock and vibration. Mr. Schwep declared that his company has found that there is something inherent in the Swedish steel, which is not revealed by analysis, which makes that steel much better adapted for the modern drill than is American steel.

Government Engineers Want Western Field Man To Head A. I. M. E.

There is much interest in Washington in the action which the nominating committee of the American Institute of Mining and Metallurgical Engineers probably will take at the Wilkes-Barre meeting of that organization in the selection of a candidate for president of the organization. There is a general desire among the mining engineers of the Government service that the committee select a Western field man rather than a New York engineer for this post.

NEWS BY MINING DISTRICTS

London Letter

Rebuilt Port Pirie Plant Has Only Half of Former Capacity — Sub-Nigel Disappoints—Lonely Reef Results Erratic—Yarde Kerri's Tin Production Lags

By W. A. DOMAN

London, Aug. 22—It would appear that the grade of ore treated by the Waihi Grand Junction Gold Mining Co. last year was slightly higher than that mined during 1919. The bullion return averaged 33/8 per ton, as compared with 32/1 per ton, and the tailings values were 3/8, in contrast with 2/11. A lower tonnage was milled, 57,450 tons, against 66,530 tons, and expenses were high. Bullion recovered was £109,506, and, making various adjustments, the total revenue was £113,685. Costs, which include mine de-

velopment redemption at 5/— per ton, depreciation and administrative expenses, aggregated £130,463, so that there was a loss on working of £16,778, raised to £21,016 by taxation. For 1919 the debit was £10,550, leaving the company to start 1921 with an adverse balance of £31,566. Development work was very satisfactory. At the beginning of the year the tonnage in reserve was 90,450, 57,450 tons milled, and the reserves at Dec. 31 last had risen to 120,500 tons. As the company is now obtaining power by contract from the government installation at Hora Hora, a substantial economy has been effected. The directors assume that the maximum working cost per ton has now been reached.

The reconstructed Port Pirie smelting plant is now in operation. To some extent it will relieve the labor position, and provide a certain amount of income for the Broken Hill mining com-

panies, but unfortunately the capacity is only half that of the plant destroyed by fire six months ago, and metal prices are not in the least encouraging for the producers.

Although shareholders in Sub-Nigel have never been led to expect great things from the mine, it must be admitted that recent developments have proved disappointing. In the June quarter 2,850 ft. was advanced, and this work cost over £6 per ft. Of the total 1,635 ft. was sampled, and only 20 per cent showed payable values. This gives some idea of the heavy burden which each payable ton has to bear, and raises no great hopes in the matter of dividends. Specific figures of value are not stated. Where profitable rock exists, the gold content is usually high, and the 28,400 tons milled in the June quarter gave a revenue of £90,408, with a working profit of £19,368, and an estimated net profit of £14,290. On

tonnage milled an average of 10/— is fairly good, but the ratio to revenue, which of course includes gold premium, is poor.

Erratic results, with some excellent values included, continue to be shown in the Lonely Reef mine. The 23d level north drive for the last 40 ft. averages more than 15 dwt. over 45 in. Relatively this is poor, but it is quite profitable ore. In the No. 24 level (the lowest) north drive the last 60 ft. shows a gold content of 3 oz. 10 dwt. over an average width of 40 in. At such a depth the value is exceptionally good, though it remains to be seen what further footage will disclose.

When the Yarde Kerri tin mining company was floated, sensational stories concerning the quantity of tin that could be recovered were circulating in the City. In fact, it was stated in one quarter that the assays were so high it would be misleading to publish them. Presumably it is the depressed condition of the metal market that has interfered with production. In March and onwards to July inclusive the output of concentrates has been in tons 13, 13, 34, 9½ and 6. Except under certain conditions it is not worth while to work tin properties at all; it is noticeable, however, that the Malayan companies are producing pretty well up to standard, whereas about two-thirds of the Nigerian areas and the whole of the Cornish mines are idle.

AUSTRALIA

Queensland

Mining for Silver-Lead Ore Near Brisbane Slowing Down—Electrical Prospecting Reported To Fail

Brisbane, July 30—The slump in the metal markets is affecting the mining for silver-lead ore in the Brisbane suburban center of Indooroopilly, and except in one case, on the original lease, holders of mining tenements are marking time. At the mine referred to, now owned by a company called Finney's Hill United, eighteen men are at work, a depth of 155 ft. has been reached, and the shaft is still in the second body of felsite, which had been entered at 155 ft. Since February, returns have been received from two parcels of ore shipped from this mine. One of these consisted of 48 tons of ore yielding 22.5 tons lead and 3,760 oz. silver, and the other 31 tons yielding 13.6 tons lead and 2,557 oz. silver, giving an average of about 46 per cent lead and 80 oz. silver per ton.

At the adjoining mine, now down 120 ft., workings have been sampled at 5-ft. intervals, and an average content of 10 per cent of lead with 14 oz. silver per ton is expected. The most recent shipments from this mine, covering two months, were one of 9.46 tons of ore containing 3.3 tons of lead and 435 oz. silver, and another of 10.50 tons containing 3.6 tons lead and 486 oz. silver, bringing the total production of this holding up to 65½ tons of ore containing 33.7 tons lead and 4,460 oz. silver, which is equivalent to 51½ per cent of lead and 68 oz. silver per ton.

Indooroopilly is four miles west of Brisbane. At Yeeronga pocket, two and a half miles to the eastward on the opposite side of the Brisbane River, mining holdings have been taken up on sites selected by the electrical "diviners," who had previously tried their "system" at the first-named place, and later the diviner has been active at another suburb (Coorparoo), which is three miles east of Yeeronga and at which numerous mining tenements have been either granted or applied for on residential areas. Incidentally, it may be mentioned that it is reported that on one of these areas the owner is running a successful poultry farm, and is said to be strenuously objecting to the granting of a lease to mine thereon, on the ground that the concussion incidental to blasting will seriously interfere with the incubation of his eggs. At present the local mining warden is considering this little problem.

As pointed out by the government geologist who contributes periodical notes on this silver-lead mining to the *Government Mining Journal* (Mr. L. C. Ball), so far the diviner has signally failed at Indooroopilly to locate orebodies of which there are no surface indications, and Mr. Ball is sceptical as to his claims at Yeeronga and Coorparoo. The survey at Indooroopilly was undertaken by the Electrical Mines Surveys, Ltd., and was carried out by two diviners with their "improved apparatus and methods, based on the Williams and Daft system."

CANADA

British Columbia

W. A. Cameron and Associates Lease Rambler-Cariboo Mine—Survey of Windermere Division Begun

Three Forks—Following the announcement of the intention of the Rambler-Cariboo Mines, Ltd., to suspend development operations on company account, official information has been given out that W. A. Cameron, mine superintendent, and a number of local residents have secured a lease on the Rambler-Cariboo mine and mill for the rest of this year and until the end of 1922. Provisions of the lease provide for certain development work to be done by the lessees. It is understood that for the present they will confine their operations from No. 7 level upward, seeking to develop high-grade orebodies in the Jennie ground. This claim was acquired by purchase two years ago.

Rossland—The mill at Le Roi No. 2 mine has begun operations and is working on dump material.

Sandon—Twelve men are working on development on the McAllister group, a dry ore property up the north fork of Carpenter Creek.

Invermere—Dr. S. J. Schofield, of the Dominion Geological Survey, Ottawa, with a party of surveyors, is encamped near Windermere, and has made a good start on a geological survey of the Windermere Mining Division.

Such a survey has been hoped for by local mining interests for a number of years.

Trout Lake—The recent strike made by owners of the Noble Five group near this point is described as one of the most promising made in recent years, 7 ft. of galena ore having been uncovered on the property.

Grand Forks—Some shipments of reject fluorspar material from the Consolidated company's Rock Candy mill, on the North Fork of Kettle River, are to be made this fall to the smelter at Trail. Local fluorspar production has been at a standstill for some months following unfavorable marketing conditions.

The final chapter in the history of Granby's Grand Forks smelter operations is being written with the announcement that the company is to move the remnant of equipment from the smelter site and store it pending ultimate disposal. Decision to do this has been forced by the announcement of the Canadian Pacific Ry. to the effect that the steel bridge over the smelter dam is to be taken down at an early date.

Cranbrook — It is announced that the Federal Mining & Smelting Co. has again bonded the Stewwinder mine, in the Kimberley section, and plans diamond-drilling development on an extensive scale. The property has been held for a number of years by the MacKenzie & Mann railway interests and was under bond to the Federal before, but after some diamond-drilling exploratory work the bond was allowed to lapse. It is also believed the North Star mine, under lease for some time to Thompson & McKinney, has been taken under bond and lease by the Federal company.

Silverton—A number of men are now working at the Standard mine, operations being conducted by the new owners, who acquired the property from the old Standard Silver-Lead Co. W. H. North, general manager for the old company, continues in charge of operations.

Ontario

Mineral Output Declines Greatly in First Half of 1921—Patricia District Added to Kenora Mining Division

Cobalt—With the exception of gold, platinum, and lead, there has been a marked decline in the output of the Ontario mines for the first half of 1921 as compared with the corresponding period of 1920. The production of lead and platinum is small, so that it may be really said that the only metal to show an increase was gold. The mining industry is passing through the same crisis as the industrial world, and the base metals have all shown a very severe decline. Owing to the complete cessation of all operations by the International Nickel Co. in the Sudbury field, the report for the second half of 1921 is expected to show a still further decline.

The production of gold for the first half of the year shows an increase of

\$71,000 over the 1920 figures. Though this is not a very large increase for the six months, its significance will be noted when reference is directed to the output for the first quarter of the year, which showed a decrease of \$560,000 as compared with the corresponding period in 1920, so that the increase in production for the second quarter of 1921 is \$726,000. The decrease in the first quarter of the year was due to a shortage of hydro-electric power.

The production of silver shows a decrease of \$2,500,000, due largely to the severe decline in the price.

The greatest decreases are in the exports of copper and nickel matte. The value of the copper matte exported was only about 5 per cent of the corresponding 1920 production, and that of the nickel matte was only 8 per cent. The exports of metallic nickel for the 1921 period were only about 1 per cent of those in 1921. Metallic cobalt, cobalt oxide, and nickel oxide, which are produced almost exclusively from Cobalt ores, also showed severe declines. The total of the three products was only \$362,000, as compared with \$1,726,000 for 1920. The total value of the products of the province was \$11,000,000, as compared with \$22,000,000. In arriving at the copper and nickel in matte, the copper was valued at 8c. per lb. in 1921 as against 13c. in 1920; nickel was valued at 25c. per lb. for both years.

The mining area of the Province of Ontario has been increased by the inclusion of a large section of the district of Patricia, which has been added to the Kenora Mining Division. The new area is 300 miles long and about 100 miles wide, at the widest point. This action was taken by the government owing to the reported discoveries of valuable minerals in that section.

Signs are not wanting that the government's attitude with regard to increasing the mining taxes is undergoing a change, as recent information gives strength to the belief that there is little danger of new taxes being introduced at the next session of the House. This new attitude will, no doubt, be strengthened by the complete closing down of operations by the International Nickel Co. The provincial revenue from the mining industry will be very much smaller than last year, and the government officials are now beginning to realize that the mining industry is one that cannot be milked with impunity.

Irrespective of whether or not operations are resumed by the Dominion Reduction Co.'s mill, Crown Reserve will not attempt to get back on a producing basis this year. A small amount of high grade is being sorted out at one of the surface dumps.

Some high-grade ore has been found in the bottom of the 38-ft. shaft of the Oxford-Cobalt mine. The shaft is being deepened, and an attempt will be made to develop some profitable ore.

The fiscal year of the Kerr Lake ended Aug. 31, and it is understood that

developments for the year have been satisfactory. No production, except a small amount of high-grade obtained in development work, has been attempted, as the Dominion Reduction Co., which treated the low-grade ore of the Kerr Lake, is closed. At the present time Kerr Lake's chief revenue is obtained from the Tahoe silver mine, in Utah, which is producing 60,000 oz. a month. During the fiscal year the company has paid \$300,000 in dividends.

Work was recently resumed on the Violet property of the La Rose, and the company has cut its main vein on the 540 level, where it shows good silver values.

Porcupine—It is understood that during one day recently the Hollinger milled 3,490 tons of ore. It is probable that almost 1,000,000 tons of ore will be treated during the year.

It is understood that trouble has arisen with regard to the Allied Porcupine Mines, which is an amalgamation of the Three Nations, La Palme, and Cavana properties. The agreement calls for a certain expenditure per month, but the La Palme has maintained that this has not been fulfilled. It is understood that the merger will probably be dissolved.

Kirkland Lake—In recent decisions given at Osgoode Hall, Toronto, judgment was entered against Sir Charles Ross, finding him liable for debts incurred in the name of the Patricia Syndicate. The late C. A. O'Connell interested Sir Charles Ross in the Boston Hollinger Mines, on which Mr. O'Connell had an option, and Sir Charles put up \$100,000. When this money was exhausted loans were obtained from the Bank of Commerce upon notes signed by Mr. O'Connell, as trustee for the Patricia Syndicate. It is held that Sir Charles is liable for the notes given by the Patricia and also for accounts of sundry creditors in northern Ontario.

MEXICO

Chihuahua

Naica Company, Reorganized as Cia. Minera de Concho, To Employ Large Force

Chihuahua City—Henri Faivre, an individual operator, has a small force of men working his manganese properties at the Cerro Santa Rosa, near Chihuahua City. A shipment of 40-per cent ore amounting to forty tons was sent to the Monterrey smelter.

The Santa Eulalia camp is showing greater activity. All mines have resumed work on full time, giving daily work to all miners looking for it. This is in marked contrast to the past, when workmen were given work only three days a week, thus helping them over the critical period.

The Cia. Minera San Juan intends to increase operations soon so as to employ fifty to sixty men. Shipments of silver-lead ore will be resumed Sept. 1. José Bovio is general manager.

The Erupcion Mining Co., at Los Lamentos, is pushing the survey work on its railroad line, which will connect the mine with a point of the National railroad yet to be decided upon. The road will have an easy grade and will be without a single bridge on the entire 47 miles of the line. After preparing the maps for submission to Mexican government's approval, bids will be received for the grading work. It is expected that the actual grading work will be started by Nov. 1.

The Alcaparra camp is setting great hopes on the building of the Lamentos railroad, which will pass about five miles from the northern, and three and one-half miles from the southern extension of the Sierra de la Alcaparra. At present a wagon road 15 miles long connects the camp with the station Villa Gonzales of the National Railroad. The lime formation of this part of the country is cut by several dikes of granite and porphyry, and the mineralization consists of silver, gold, lead and zinc. Most of the valuable ground was taken up in form of denouncement, and some of the owners are developing their properties on a small scale. It is reported that the owners of the Corona mine have a carload of silver-lead ore ready for shipment. Besides the above-mentioned ores, commercial iron is also to be found. A large vein 25-30 meters wide and assaying 55 per cent iron outcrops on the property owned by Federico Saenz.

The Rio Plata mine is reported to have resumed operations. Lincoln Bonneau, treasurer of the company, accompanied by his son and Frederick Po-thast, left recently for the mines at Rio Plata, in the southwestern part of the state, to reopen the property for the owning company. The mine has been leased for some time to Mendoza and Nesbitt, and new arrangements will be made upon their return from the property.

An American company early this year entered into a bond and lease agreement with the British owners of the San Martin mine, in the western part of the state, in the El Rayo district. The operations were suspended in June for unknown reasons.

Parral—Charles C. Coulter, representing the Mexican Natural Resources Co., of San Antonio, Tex., is taking up properties in the Parral district. It is rumored that the company which he represents may build a mill at Parral.

San Francisco del Oro—José Bovio has taken a bond and lease on the Transvaal mine. The property is already partly developed, and the new company intends to start work immediately. The veins carry rich gold-silver-copper and lead ore. The company is planning to erect a mill. Electrical power will be furnished by the Cia. Agricola y de Fuerza Electrica del Rio Concho, S. A., which has its power plant at La Boquilla, near Camargo.

Naica—The Cia. Minera de Naica has been reorganized as the Compañia

Minera de Concho S. A. This is a Mexican concern and Lic. Jose Estrada Otamendi is president. The company owns a large group of properties and is a well-known producer of lead carbonate ore carrying an average of 500-600 g. of silver. The total production of ore has reached 276,129 tons. The reserves consist of 200,000 tons of high-grade and of 100,000 of low-grade ore. Between 500-600 men were employed at the mine, the monthly production having been 4,000 tons. The company owns a 30-km. narrow-gage railroad connecting the mine with the Concho station of the National railroad. Twenty-seven cars and five engines are operating on the line. A complete repair shop, in which even all castings are made, is on the spot.

The mine is equipped with a 250-hp. gas engine and a new compressor, both of which could not be installed on account of disorders incident to the revolution, as the mine was constantly visited and greatly handicapped by bands of revolutionists.

Electrical power is to be taken from the Cia. Agricola y de Fuerza Electrica del Rio Conchos S. A. for all mining purposes. A large force of men will be employed at once, and it is intended to increase greatly the previous extraction of ore. José Bovio, who was mine superintendent for nineteen years, will act in the future in the capacity of consulting engineer.

Adargas—The Adargas mine, situated at Adargas, in southern Chihuahua, and owned by Guadalupe Galvan, is being examined by engineers for a Philadelphia concern. It is said that silver-lead ore was shipped in previous years from the property.

Zacatecas

La Luz Mining Co.'s Stockholders' Meeting Called for Sept. 12

Zacatecas—The La Luz Mining Co., with mines in Zacatecas, failing to obtain a quorum at the general meeting of stockholders called for Aug. 2, has issued another official call for the meeting to take place in the city of San Luis Potosi on Sept. 12.

An assessment of one peso per share has been levied against the outstanding stock of the Manuela y Anexas Mining Company to procure funds for carrying on development work at the property.

ARIZONA

Property of Kingman Consolidated Copper Co. Sold—Mascot Copper Co. Buys Railroad

Tombstone—V. L. and J. L. Mellgren have purchased the remaining six shares in the Co-operative Milling Co. The new owners have taken charge, and will operate on a custom basis as soon as a new steam plant is installed to furnish power.

Three shifts are working on the new cyanide plant at the State of Maine, operated by the Old Pueblo Leasing Co.

Cochise—A carload of timber has arrived for the Red Bird mine, a gold property being worked by Griffen and Smith.

Pearce—The mill is running on lessees' ore, and a fair recovery is being made.

Jerome—Verde Central is installing a heavy compressor, purchased from the United Verde Extension Mining Co., and has on the road a hoist that is to be used in deepening the main shaft 300 or 400 ft. A large share of the Verde Central stock is now in the hands of Calumet & Arizona interests, which purchased a late offering of treasury stock. In consequence, the corporation is well provided with funds.

Kingman—Under execution, at Kingman, the property of the Kingman Consolidated Copper Co. has been sold to satisfy claims aggregating about \$30,000.

Bisbee—The Mascot Copper Co. has purchased from the Southern Pacific Co. the rails and material of the twelve-mile railroad that has been operated for ten years by the mining company between Willcox and the mines. The material heretofore has been used under lease. The price paid was \$88,091.11.

Nogales—What is known as the Mejia part of the famous Planches de Plata mines of northern Sonora has been purchased by a Nogales company headed by Augustine von Borstel. The mines are twenty miles southwest of Nogales, on the Altar road.

NEW MEXICO

Abundant Water This Season Stimulating Placer Mining at Pinos Altos

Lordsburg—Shaft sinking at the Eighty-five mine is progressing steadily. A station is being cut at 1,200 ft. depth. A pump station will be cut at 1,350 ft. and a triplex electric pump installed to pump to surface. Drifting continues on the 1,050 level, with a satisfactory showing of good ore.

Pinos Altos—On account of the unusual rainfall this season, placer mining has been carried on with successful results in the old diggings in this vicinity. Some good results are reported. This district has been producing placer gold for small operators with more or less regularity since 1868.

Silver City—Stauber, Wright, Armstrong, and Bell have shipped two carloads of low-grade silver ores from their lease on the Stevens property in Chloride Flat. Another car is ready to ship. These are test shipments, and if it is found that this grade of ore can be handled at a profit, considerable tonnage will be sent to the El Paso smelter from this section. The above named signed a lease recently on the old Bohemia mine, principally owned by Frank Vesely, of Silver City. Other lessees at Chloride Flat are Perrault and Morales, who have shipped one car of high-grade silver ore; also Jake Reidlinger & Co., and John Blackwell.

COLORADO

Radium Co. of Colorado Increasing Force—Matterhorn Company To Use Flotation

Idaho Springs—The Gem Mining Co. is driving a drift 300 ft. to connect with the Franklin property. Operations will be conducted through the Newhouse tunnel. Ore mined from the Gem property will be shipped to the Newton mill for treatment.

Paradox Valley—The Radium Co. of Colorado, Inc., is increasing its working force by about fifty men, to meet the recent increased demand for radium ore. The product will be shipped via Whitewater, instead of via Placerville, as heretofore. James S. James is manager.

Ophir Loop—Flotation equipment will be installed in the plant of the Matterhorn Mining & Milling Co., of which P. J. Dills is manager.

UTAH

Garfield Smelter Producing 10,000 oz. Silver Daily—Utah-Salduro Company in New Hands

Salt Lake City—It is reported that the American Smelting & Refining Co. will not—as some other smelting companies have done—make a flat reduction in its smelting rates in conformity with the lower freight rates on bullion which went into effect Aug. 11. The reason given is that this company receives most of its ore under contract, and that these rates in many instances were not increased at the time larger shipping charges were initiated by the railroads. However, it is said that, wherever smelting rates had been advanced, the recent reduction in freight rates on bullion would undoubtedly reduce to the shipper.

The Garfield smelter of the American Smelting & Refining Co., according to A. M. Richards, general superintendent, in an address before the Rotary Club of Salt Lake City, is producing in round numbers at the rate of about 10,000 ounces of silver daily from 1,200 tons of ore. Although some copper is being smelted in connection with the silver ores, the copper output of the plant is negligible. It will be remembered that to meet changed conditions, the copper smelters of the state made certain changes in their processes, which have made it possible for them to treat dry siliceous ores successfully, and at a profit. A good tonnage of ore of this character is now coming in, especially from the Tintic district, where mines were forced to curtail some time ago, when it was not possible for the smelters to take their ores, but are now working at capacity. Mr. Richards predicts that Utah in 1922 will produce more silver than any other state. During the first six months of 1921, the Garfield smelter handled an average of 1,210 tons of ore daily, recovering 100 ounces of gold daily and an average of 9,981 ounces of silver. The plant consumes 117 bbl. of oil daily and 223 tons of coal.

There are at present employed 550 workmen, and the monthly payroll is \$60,000. The smelter has a daily capacity of 5,000 tons, and in normal times turns out 500 tons of blister copper a day. From present conditions, according to Mr. Richards, a revival of the copper industry of Utah may be expected on a light producing basis early in 1922.

Lead furnaces at the Salt Lake Valley plants operating at the end of August were: A. S. & R. at Murray, three lead furnaces; United States at Midvale, four furnaces including one on matte concentration. At Garfield the A. S. & R. has added a fourth reverberator for the treatment of siliceous ores.

The hearing before Judge Johnson of the United States district court on the exceptions taken by the Utah Apex Mining Co., of Bingham Canyon, to the accounting of the Utah Consolidated for ore taken by it from ground owned by the Utah Apex, has been concluded. The Utah Consolidated places the amount of ore taken out by it at about \$500,000, and the Utah Apex claims in the neighborhood of \$1,000,000. The final arguments will be heard the latter part of September.

Eureka—The Victoria has opened an orebody on the 1,700 level which is a continuation of the deposit followed from the 1,350 to 1,550 level. The deposit in question is furnishing the larger part of the output from the mine at present, although some ore is coming from the 900. The Eagle & Blue Bell in the two weeks ended Aug. 24 shipped thirty cars of ore. This and the Victoria properties are controlled by the Bingham Mines Co., which owns also the Dalton & Lark and Yosemite mines at Bingham. The Tintic Milling Co. in the two weeks ended Aug. 24 shipped two consignments of bullion. This company is opening up the old Swansea mine, which it has under lease, and expects a good tonnage of sulphide ore, of which it is in need, from the property.

Park City—Shipments for the week ended Aug. 24 were 1,378 tons, as compared with 1,212 tons the week preceding. Shippers were: Judge allied companies, 593 tons; Silver King Coalition, 593; Ontario, 469.

The new mill of the Silver King Coalition is expected to be completed by the end of the year. Concrete work is now finished, and the steel work for the building will be started immediately. The large orebody in the O'Brien fissure opened on the 1,150 level has been followed downward for some distance, and continues strong on the lower levels. There is also a large amount of low-grade ore in the mine awaiting the completion of the new mill. When this is completed shipments will be considerably increased, and earnings proportionately. The Park-Utah is being opened up with a view to larger production. The present output is about two cars daily. This property is controlled by the Judge interests.

Salduro—The Utah-Salduro Company, owning large potash deposits in western Tooele County, has been taken over by the Allied Chemical & Dye Co. of New York. The Salduro company was a subsidiary of the Solvay Process Co., and is said to have spent in the neighborhood of \$2,000,000 on a plant for the production of potash from the brines underlying the large salt beds near Wendover, and has had about 200 men in its employ. Recently the company closed down for the time being. These deposits are the largest in Utah, and a large potash industry could be developed in the state, it is believed. At present, owing to the coming in of potash from Europe, there is not much market for the output. Utah men are anxious to see a tariff on potash, so that the new industry may be started.

Gold Hill—The Western Utah Copper Co. reports a promising strike on the 700 level. The ore is sulphide, and carries 4 to 15 per cent copper and 6 to 30 ounces silver.

IDAHO

Coeur d'Alene District

Cedar Creek Company Makes Important Strike—Chicago-Boston Stockholders To Vote on Acquiring Kill Buck Claims

Wallace—The Cedar Creek Mining & Development Co. has made what appears to be an important strike on the North Side, near Murray. In extending a drift from the main crosscut about 700 ft., a large body of low-grade lead and zinc ore had been developed. This has now been followed by striking 2 ft. of high-grade galena, practically free from zinc, two samples of which gave the following assay results: No. 1, silver, 25 oz.; lead, 66.4 per cent; No. 2, silver, 31.3 oz.; lead, 78.7 per cent.

The Chicago-Boston Mining Co. has called a meeting of stockholders for Sept. 27 for the purpose of taking action on three propositions, namely: Increasing the capital stock from 1,500,000 shares to 2,500,000 shares; exchanging the increase in the capitalization for the property of the Kill Buck Mining Co., share for share; and changing the name of the company to the Galena Mining Co. The Kill Buck company owns five patented claims joining the Chicago-Boston, which are probably on the same vein, making its development and operation more economical through the Chicago-Boston. Both companies are controlled by the Callahan Zinc-Lead Co. and it is expected that the three propositions will carry.

The great orebody of the Morning mine at Mullan, owned by the Federal Mining & Smelting Co., has been cut on the 2,200 level, showing about 20 ft. of excellent ore, probably better than in the levels above. The ore shoot on the 2,000 is about 1,300 ft. long and has an average width of 15 to 20 ft., and it is believed that these dimensions will be found on the new level.

MONTANA

Butte & Superior Cuts Copper Deposit on 2,200 Level

Butte—The Tuolumne Mining Co. recently cut a band of ore in its west workings on the 1,600 level of the Main Range mine which shows an increasing copper content in a heavy pyritic ore. The Spread Delight vein shows a width of about 30 ft. on the 1,600 level, narrower than on the next level above, the 1,200.

Butte & Superior has cut the copper vein on the 2,200 level. The crosscut is in 18 ft. showing ore apparently better than that on the 2,000 level. Assays are not yet available.

Neihart—Decision to reconstruct the mill of the Cascade Silver Mines & Mills Co. was reached at the recent annual meeting of stockholders in Butte. It also was decided to install what is known as the Schwarz process for the separation of zinc from the Cascade's silver ores. George G. Brabrook, of Boston, was elected president and William L. Creden, of Butte, vice-president.

Hassel—The Iron Mask mine of the Bamar Copper Co., near here, will resume operations this fall, according to advices from Butte interests which control the corporation. A tunnel has been driven a distance of 2,500 ft. to reach a point under an old shaft, and it will be necessary to drive this working 200 ft. further to reach its objective.

Jefferson City—The Assets Mining Co. is said to be planning to resume operations at the Golconda mine.

Elkhorn—The Merrill Construction Co., of Boston, has been awarded a contract for the installation of a heating system at the Elkhorn mill of the Boston & Montana Development Co. The Hardinge company, of New York, is furnishing the equipment for the concentrator, which installation is rapidly nearing completion.

WASHINGTON

Eagle Group, Near Chewelah, Leased to A. J. Moore

Orient—Extensive and thorough sampling of the First Thought mine, near here, has been made this summer for the Spokane owners, who acquired the ground from the Burns interests two years ago. It is stated that if the results are satisfactory, installation of a cyanide plant will be considered.

Chewelah—The Bluestar Mining Co., owners of the Eagle group of claims, two miles north of this point, has given a lease and bond on the property to A. J. Moore, a mining engineer. The lessee has gone to New York, and upon his return in the fall intends to proceed with active development. The property has been idle for many years, but in the early stages of development is credited with a gross output of about \$40,000.

Springdale—An air compressor is to be installed on the Aichan Bee property this fall.

NEVADA

Tonopah Extension Sues Cash Boy for \$15,000—Tonopah Divide Resumes Shaft Sinking—New Capital May Enter Comstock District

Tonopah—The Tonopah Extension has brought suit against the Cash Boy for \$15,000, for alleged trespass on the Golden Anchor lode claim. The Tonopah Extension shipped bullion valued at \$42,000, which represents the clean-up for the first half of August. The Cash Boy has opened a 6-ft. face of ore assaying \$24 per ton in the winze below the 1,645 level.

The Belmont is operating at full capacity. The clean-up for the first half of August amounted to \$126,000, which is a record production.

Divide—The Tonopah Divide has resumed shaft sinking from the 1,000 level, and will continue sinking until the water level has been reached. Fifty tons of ore a day is being forwarded to the Belmont mill.

The Divide Extension has started regular shipments of high-grade ore to the McNamara mill from orebodies on the 100 and 200 levels. The Dividend has intersected the Extension orebodies on the 100 and 200 levels. The Giant Divide has resumed development work on the 400 level.

Virginia City—Sampling under the direction of Albert Burch and R. B. McGinness has been started in the Hale and Norcross tunnel. The sampling will be continued on the upper levels of the middle group of mines, which include the Best and Belcher, Gould and Curry, Savage, Norcross, Chollar and Potosi. Outside interests will start mining and milling operations on a large scale similar to the United Comstock Mines Co. at Gold Hill, should the sampling show sufficient tonnage.

Spanish Belt—The Consolidated Spanish Belt Mining Co. has recently started its new fifty-ton mill. The process used is a combination of concentration and flotation.

NORTH CAROLINA

Ten-Stamp Mill Bought for Spoon Mine—Development To Be Resumed at Coggins Property

Ashboro—At the Spoon mine, in Randolph County, twelve miles northeast of Ashboro, high-grade free-milling ore has been encountered at 70 ft. and at 110 ft. The level is now being opened. A pay streak of unusual richness is 18 in. wide, and there is other ore of lower grade available on the same level. A ten-stamp mill has been purchased, and will be erected immediately; only amalgamation will be attempted at the beginning. Robert G. Dickens is superintendent.

Eldorado—At the Coggins mine, at Eldorado, in Montgomery County, fifteen miles northwest of Troy, the county seat, surveys of the 450 and 550 levels were made recently. This was done to obtain data from which to plan work to connect the known orebodies of the 450 level with the openings

on the 550 level, and to carry on the proper development of the 550 level. Work on the raises is expected to begin soon. Some addition is also to be made to the mill. Work has been suspended for nearly a year, for the same reason that other mines have shut down, namely lack of labor and the high price of supplies. This mine has been more extensively developed than any other gold property in the state. It has according to an engineer's statement, over 100,000 tons of ore ready for mining.

MICHIGAN

Menominee Range

Oliver Company Again Shipping From Stock at Chapin and Aragon Mines—Underground Work Stopped at Berkshire

Iron Mountain—The Oliver Mining Co. has issued orders once more to ship from stockpile from its Chapin and Aragon mines. Both are now idle, but considerable ore is in stock. There is not a mine in operation in Iron Mountain.

Crystal Falls—All underground work has stopped at the Berkshire mine. The Bates, Davidson, Dober, Homer, and Delta, employing less than 500 men, are the only active mines in the iron River field, which has close to twenty properties.

Marquette Range

Work Stopped at Princeton Mine—Equipment of Ford's Imperial Mine Continued

Gwinn—Operations were suspended Aug. 27 at the Princeton mine, the oldest in the district. Most of the men were given employment at other mines of the Cleveland-Cliffs Iron Co. in the district.

Negaunee—The Marquette Ore Co. is again mining at its Mary Charlotte property. The mine was closed down for a few weeks, and it was believed that no more underground work would be carried on this season. Two hundred and fifty men are working on a full-time basis. There is no ore in stock, and all being hoisted is shipped.

Michigamme—Machinery continues to arrive at the Imperial mine, which is being reopened by Henry Ford. About sixty men are engaged in getting the property in condition for production. A large compressor, of German manufacture, is ready to be installed as soon as the new buildings are erected. Two pumps for underground use have been purchased from the Hancock Consolidated Copper Co. Some other equipment, including rock drills, was secured from the White Pine mine of the Calumet & Hecla Co. It is believed that about 200 men will be on the payroll when mining starts, but over 1,400 applications for work have been received at the mine office. Captain William Holman, who formerly was in charge of shaft-sinking work for the E. J. Longyear Co., has taken a position at the Imperial and will be in charge of underground work. A new

track is being constructed from the Duluth, South Shore & Atlantic road to the mine.

Ishpeming—The Marquette Range office of the Oliver Iron Mining Co. has been advised that the wages of all employees of the company were reduced on Sept. 1, but the amount of the cut was not given out. It is likely that it is one of 10 per cent, the same as announced for the steel employees. Altogether, the wages of Oliver employees have been lowered 40 per cent since Jan. 1, there having been two previous cuts, one of 20 per cent and one of 10. About 90 per cent of the men are working on a part-time basis.

JOPLIN-MIAMI DISTRICT

Missouri-Kansas-Oklahoma

American Zinc, Lead & Smelting Co. Takes Over High Five Mine

Waco—Decidedly increased production from the Waco, Mo., zinc field, when zinc ore prices improve, is confidently expected in the Tri-State district as a result of the recent taking over of the High Five mine, at Waco, by the American Zinc, Lead & Smelting Co. Development in this camp, which is about fifteen miles northwest of Joplin, has been comparatively slow during the period of dull prices, for the reason that heavy drainage is necessary in extracting a large part of the ore. With the assistance and co-operation of other companies, the High Five company has maintained a pumping station and has kept the water down to about 230 ft. Drilling and development by the Barnsdall and Butte-Kansas companies has proved the orebody to extend for at least 100 ft. deeper than this, however, and it is felt certain that the Barnsdall people will not be able to co-operate with the American company for this deeper drainage. Unofficial statements to this effect have been given out by officials of each company.

It is understood the purchase of the High Five mine by the American company involved no material cash consideration, but the ultimate purchase price is \$250,000, though a large part of this is to be paid out of the ground. The sale is more in the nature of a long-term option agreement. Temple Chapman, of Joplin, and George E. Starr, of Philadelphia, Pa., were the principal owners of the High Five.

Joplin—Though no zinc producer in the Tri-State field really wants to push production at present, many companies are maintaining fairly complete operations in order to maintain their working organizations. The price of lead, which is not so bad, enables many of these companies to operate at a close margin of profit, but the general effect is to increase the surplus of ore in the field and to hold down the price of zinc ore. The situation is simply one that cannot be avoided, producers declare. Among the mines that have been started up recently are the Premier, at Picher, and the King-Brand, in Kansas, northwest of Picher.

THE MARKET REPORT

Daily Prices of Metals

Sept.	Copper, N. Y., net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
1	11.75	26.25	26.75	4.40	4.125@4.20	4.175
2	11.75	26.50	26.875	4.45	4.25@4.30	4.20
3	11.75	26.50	26.875	4.45	4.25@4.30	4.20
5	.....	.....	.....	.....	.....	.....
6	11.75@11.875	26.75	27.25	4.425@4.50	4.30	4.20
7	11.75@11.875	26.75	27.25	4.45@4.50	4.30	4.20

*These prices correspond to the following quotations for copper, "delivered": Sept. 1st, 2d, 3d, 12c.; 6th and 7th, 12@12.125c.

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

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

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

lowest price which was quoted. Tuesday found most of the 12c. sellers off from the market, the generally quoted price being 12.125c., delivered, with sales in some cases at fractional concessions. Today September business has been booked at the same prices, but with producers generally quoting 12.25@12.375c. for October deliveries. There is a marked hesitation in quoting further forward than October. One 100-ton lot for October is offered today by a dealer at 12.125c., delivered, but it is doubtful if more could be obtained. Many of the small consumers and some of the larger are taking more interest in the market now that the price is advancing, but domestic business has not been large.

Export business continues excellent, considering conditions in Europe.

Total sales for August are estimated at 80,000,000 lb., well over production for the same month.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
1	67 3/4	68 3/4	71 1/2	154 1/2	156 3/4	23 1/2	22 3/4	24 3/4	25 1/2
2	68 3/4	69 1/2	71 1/2	156 3/4	159	23 3/4	22 3/4	24 3/4	25 1/2
3	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	68 1/2	69 3/4	73	159 1/2	161 3/4	23 1/2	22 3/4	24 3/4	25 1/2
6	68 1/2	69 3/4	73	161 1/4	163 3/4	23 1/2	22 3/4	25	25 1/2
7	68 3/4	69 3/4	73	162	164 3/4	23 3/4	22 7/8	25 1/2	25 3/4

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

Lead

The American Smelting & Refining Co. advanced its official contract price for lead from 4.40c. to 4.50c. on Sept. 2.

Lead has been active during the last week, particularly in the Chicago and New York markets. The demand in the St. Louis district does not seem to have been so marked, and on last Thursday the best one producer could obtain was 4.125c. The Smelting company's advance had a good effect in the outside market, however, and yesterday and today 4.30c., St. Louis, and 4.40c., Chicago, were the ruling prices by most sellers, though one large interest held consistently above these figures. Some large orders have been placed through New York agencies and more are expected soon, as stocks in the hands of prominent consumers are generally very low. Business for later than October is almost absent, and many producers will only quote on October deliveries when coupled with lead for September.

Zinc

Zinc has held the advance which started last week; in fact, the price today is a slight improvement over that quoted a week ago. Demand is still quiet, however, and galvanizers are taking only small lots. With the large stock of zinc on hand, and knowing that numerous small producers have been willing to meet low prices in the past, they do not feel that buying beyond current requirements is advisable. Brass special is quoted at 10 points premium over Prime Western, and high-grade remains at 6c. delivered at Eastern points.

Tin

Tin has advanced slightly with the improvement in London and steady sterling exchange, but consumers remain aloof. The tinplate business is

Silver and Sterling Exchange

Sept.	Sterling Exchange "Checks"	Silver			Sept.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
1	373 1/2	99 1/4	62 1/2	37 3/4	5	.....	.....	.....	38 7/8
2	372 3/4	99 1/4	63	38 1/4	6	369 1/4	99 1/4	63 3/8	39 1/8
3	372	99 1/4	62 3/4	38 1/4	7	371 1/2	99 1/4	63 7/8	38 7/8

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

Metal Markets

New York, Sept. 7, 1921

The prices of all four of the major non-ferrous metals have increased during the last week, despite the holiday on Monday, and which really included Saturday also. This stronger tendency, coupled with a belated recovery in the stock market, has caused producers and traders to feel more optimistic, though no runaway market is expected in any metal, and it is the general prediction that the price recovery, if it has now started in earnest, will be gradual.

Followers of copper should not disregard the aluminum market. Aluminum can now be imported for 18c. or slightly above, and at that price is a formidable competitor of copper at 12c.

In fact, there are reports that fairly large quantities of aluminum have been sold for the manufacture of cable and other apparatus in which copper can be displaced by the lighter metal. Germany, of course, being an important producer of aluminum, would spare no expense to carry this substitution as far as possible. It is reported, however, that aluminum has not proved altogether successful in the electrical uses to which it has been applied.

Copper

Even as late as last Thursday some copper was obtained as low as 11.75c., delivered, by consumers to whom low delivery charges applied. The bulk of the sales, however, were made at 12c., delivered, and on Friday this was the

reviving, but the spectre of large Eastern stocks still hangs over the market. No one knows when the governments of the Federated Malay States and the Dutch East Indies will find it necessary to throw some of their stocks on the market. United States deliveries of tin during August, as announced by the New York Metal Exchange, amounted to 3,320 long tons, compared with 1,525 long tons for July. This increase was unexpected and most encouraging, and no doubt was the cause to some extent of the advance in London. It is understood that most of this tin went to steel interests.

Arrivals of tin, in long tons: Aug. 30th, Straits, 60. Total for August, 2,560 tons. Sept. 2d, Straits, 10; 3d, Straits, 25; 6th, London, 40; Rotterdam, 100; Straits, 840.

Gold

Gold in London: Sept. 1st, 110s. 4d.; 2d, 109s. 8d.; 5th, 110s. 10d.; 6th, 110s. 9d.; 7th, 110s. 10d.

Foreign Exchange

Sterling prices have held steady, but other European exchanges, particularly German, have tended to become weaker. Sterling cables continue to be quoted one-half cent higher than checks as given on page 435. On Tuesday, Sept. 6th, francs were 7.63c.; lire, 4.33c.; and marks, 1.08c. New York funds in Montreal, 11½ per cent premium.

Silver

In spite of the holiday, there has been somewhat more activity in the market in the last week, and the greater part of the business continues for New York account rather than for San Francisco. The price today at 63¼c. is the highest since Jan. 28, 1921. The market closes steady.

Mexican Dollars—Sept. 1st, 48; 2d, 48½; 3d, 48½; 6th, 48½; 7th, 49.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

Aluminum—List prices of 24.5@25c. are nominal. Outside market, 18@20c. per lb.; 18½c. for imports, duty paid.

Antimony—Chinese and Japanese brands, 4.50c.; market dull. W.C.C. brand, 5.25c. per lb. Cookson's "C" grade, spot, 9c. Chinese needle antimony, lump, nominal at 4c. per lb. Standard powdered needle antimony (200 mesh), nominal at 5.25c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb₂O₃, wholesale lots, 6½@7c.

Bismuth—\$1.50@\$1.55 per lb.

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

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

Iridium—Nominal, \$160@\$170 per oz.

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

Nickel—Standard market, ingot, 41c.; shot, 41c.; electrolytic, 44c. Small tonnages, spot, 35@38c. Market dead.

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

Osmium—\$70 per troy oz. Nominal. \$70, Los Angeles, Cal.

Palladium—Nominally, \$52@\$55 per oz.

Platinum—Nominally, \$72@\$78 per oz.

Quicksilver—Nominal, \$45@\$46 per 75-lb. flask. San Francisco wires \$45.70. Little demand.

Rhodium—\$150 per troy oz.

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

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

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

Metallic Ores

Chrome Ore—Ore analyzing 40@45 per cent Cr₂O₃, crude, \$20@\$25 per net ton; ground, \$30; analyzing 45@50 per cent Cr₂O₃, \$30; ground, \$35; f.o.b. Atlantic ports. Quotations are nominal.

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

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

Manganese Ore—22c. per unit, seaport; chemical ore (MnO₂) \$50@\$55 per gross ton, lump; \$70@\$75 per net ton, powdered. Nominal.

Molybdenum Ore—85 per cent MoS₂, 55@60c. per lb. of contained sulphide, New York.

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

Titanium Ores—Ilmenite, 52 per cent TiO₂, 1¼@2c. per lb. for ore. Rutile, 95 per cent TiO₂, 12c. per lb. for ore, with concessions on large lots or contracts.

Tungsten Ore—Scheelite or wolframite, 60 per cent WO₃ and over, per unit of WO₃, \$3@\$3.25, f.o.b. Atlantic ports.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U₃O₈ and 5 per cent V₂O₅, sells for \$1.50 per lb. of U₃O₈, and 75c. per lb. of V₂O₅; ore containing 2 per cent U₃O₈ and 5 per cent V₂O₅, sells for \$2.25 and 75c. per lb., respectively; higher U₃O₈ and V₂O₅ content commands proportionately higher prices.

Vanadium Ore—\$1 per lb. of V₂O₅ (guaranteed minimum of 18 per cent V₂O₅), New York. Nominal.

Zircon—Washed, iron free, 3c. per lb.

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

*Furnished by Foote Mineral Co., Philadelphia, Pa.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 3—Zinc blende, per ton, high, \$23.25; basis 60 per cent zinc, premium, \$20; Prime Western, \$19@\$20; fines and slimes, \$19@\$17; average settling price, all grades of blende, \$21.48.

Lead, high, \$54.80; basis 80 per cent lead, \$54; average settling price, all grades of lead, \$51.80 per ton.

Shipments for the week: Blende, 4,930; lead, 964 tons. Value, all ores the week, \$155,850.

Considerable zinc ore sold late on Saturday of last week on \$19 basis, closing around 10 o'clock at night on \$20 basis. All ore purchased after noon was included with purchases this week. A little ore was purchased this week on \$19 basis. The Empire Zinc Company, out of the market since last December, purchased 2,100 tons, re-entering the market late last Saturday. Two companies purchasing regularly materially increased purchases, one on \$19 basis, the other on \$20 basis. This increased competition disposed of 8,200 tons of zinc blende this week, the largest single week's purchase since March 12, and exceeded but twice this year. The average purchases this year were 4,570 tons per week. Sellers are greatly encouraged by the stronger demand.

Platteville, Wis., Sept. 3—Lead ore, \$51 per ton. No sales. Zinc ore shipments, none. Lead ore, 123 tons. Shipments for the year: Blende, 8,461; lead ore, 1,131 tons. Shipped during the week to separating plants, 351 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, \$1,500@\$2,000; No. 2, \$850@\$1,250; spinning fibers, \$350@\$850; magnesia and compressed sheet fibers, \$225@\$350; shingle stock, \$95@\$150; paper stock, \$55@\$70; cement stock, \$16@\$27.50; floats, \$8.50@\$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada.

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

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

Borax—Granulated, crystals, or powdered in bags, carloads, 5¼c. per lb.; in bbls., 5¼c.

Chalk—English, extra light, 5c. Domestic light, 4¼c.; heavy, 4c. per lb. all f.o.b. New York.

China Clay (Kaolin)—Crude, \$6.50@ \$8.50; washed, \$9@\$10; powdered, \$13@ \$20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, \$13@ \$20, f.o.b. Virginia points. Imported lump, \$12@\$20, f.o.b. American ports; powdered, \$35@\$45, f.o.b. New York.

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

Feldspar—No. 1 soap grade, \$7@\$7.50 per ton, f.o.b. North Carolina points; No. 1 pottery, \$6@\$6.50; No. 2, \$5@ \$5.50. Market dull. Large stocks are available and quotations are nominal. Producers report cancellations of orders. No. 1, Canadian, ground, \$26 f.o.b. cars.

Fluorspar—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$20@\$22.50 per ton, f.o.b. Illinois and Kentucky mines; acid, glass, and enamel grades, \$40@\$55; ground, suitable for acid, chemical or enameling purposes, \$32@\$35; lump, \$13.50, f.o.b. Lordsburg, N. M. Ground, acid grade, 97 per cent CaF₂, \$30, New Mexico.

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

Graphite—Ceylon lump, first quality, 6@7c. per lb.; chip, 4½@5c.; dust, 3 @4c. No. 1 flake, 5@6c.; amorphous crude, ¾@2¼c.

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

Kaolin—See China Clay.

Limestone—Crushed, New York State shipping points, ¾ in. size, \$1.40@\$1.75 per net ton; 1½ in., \$1.35@\$1.70. Prices for other sizes practically the same. Agricultural limestone, \$2.50@\$4.50 per net ton, f.o.b. eastern shipping points, depending upon analysis.

Magnesite, Calcined—Crude, \$12@ \$15 per ton. High-grade caustic calcined, lump form, \$30@\$40 per ton. Plastic calcined, \$45@\$50 in barrels, carload lots, f.o.b. California points. Atlantic seaboard, \$60.

Dead-Burned—\$33 per net ton, Chewelah, Wash.; \$53@\$64, Chester, Pa. Austrian grade, \$53.80 per ton, f.o.b., Chester, Pa. (Magnesite brick—See Refractories.)

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

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

¹Foot Mineral Co., Philadelphia, Pa.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$11.65; 75 per cent, \$10.65; 75@ 74 per cent, \$10.15; 70 per cent, \$6.25; 68 per cent, \$5.75; 68@66 per cent, \$5.50.

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

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 12c.; Spanish lump, 12@14c.; domestic fines, f.o.b. mines, Georgia, 11@12c.

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

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

Talc—Paper making, \$11@\$20 per ton; roofing grades, \$8.50@\$13; rubber grades, \$11@\$18; all f.o.b. Vermont. California talc, \$16@\$35, talcum powder grade. Southern talc, powdered, carload lots, \$7.50@\$11 per ton; less than carload, \$25, f.o.b. cars. Imported, \$35@\$40; Canadian, \$20@\$40 per ton.

Mineral Products

Arsenic—6c. per lb.

Sodium Nitrate—\$2.10@\$2.30 per cwt. ex vessel, Atlantic ports.

Sodium Sulphate—For 95 per cent material, \$12.50 per ton, f.o.b. in bulk, Western mines, spot and six months' contract; \$22@\$25 per ton, New York.

Potassium Sulphate—Powder, domestic, \$1.25 per unit, basis 90 per cent, f.o.b. New York.

Ferro-Alloys

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

Ferrocerium—Per lb., \$12@\$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 12c. per lb. of chromium contained; 4 to 6 per cent carbon, 13c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, \$65@\$67, f.o.b. furnace; resale, \$90, delivered; English, \$65@\$70, c.i.f. Atlantic seaports. Spiegeleisen, 18 @20 per cent, \$26@\$25, f.o.b. furnace.

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

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

Ferrotungsten—Domestic, 70 to 80 per cent W, 40@45c. per lb. of contained tungsten, f.o.b. works. Foreign, 50c., duty paid, f.o.b. Atlantic ports.

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

Ferrovanadium—\$4.25@\$4.50 per lb. of V contained, according to analyses and quantity.

Metal Products

Copper Sheets—Current New York list price, 19.50c. per lb.; wire, 13.25@ 13.50.

Lead Sheets—Full lead sheets, 7½c.; cut lead sheets, 8c. in quantity, mill lots.

Nickel Silver—29.50c. per lb. for 18 per cent nickel. Grade "A" sheets.

Yellow Metal—Dimension sheets, 16.25c.; sheathing, 15.25c.; rods, ¾ to 3 in., 13.25c.

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

Refractories

Bauxite Brick—56 per cent alumina \$50 per ton; 76 per cent, \$90@\$95 f.o.b. works.

Chrome Cement—40@45 per cent Cr₂O₃, \$30@\$32 per net ton, and \$31 in sacks, carload lots, f.o.b. eastern shipping points.

Chrome Brick—\$52@\$55 per net ton.

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

Magnesite Brick—9-in. straights, \$65 @ \$70 per net ton; 9-in. arches, wedges and keys, \$77; soaps and splits, \$98 f.o.b. works.

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

The Iron Trade

New York, Sept. 6, 1921

Business in pig iron in the eastern district last week was less active than during the two preceding weeks, according to *The American Metal Market*. Several large consumers who have put out inquiries for fourth quarter of this year and first quarter of next failed to close, and there was less demand even for small lots for prompt shipment. Furnace interests in all districts made an effort to obtain higher prices, so that at least an old dollar might be swapped for a new one if possible, but the freer buying by consumers which was evident during the second half of August seems to have been checked by the advance. Fewer inquiries are now in the market. It is too early after three holidays to expect any increased activity; in fact, consumers seem less disposed to buy, although not a few of them are expected in the market during the course of the week.

Steel making iron has continued dull in the east, and prices have not changed essentially, but in the Central West and Lake districts higher prices are asked, and, in a few instances, obtained.

Coke

Connellsville—Furnace, \$3@\$3.25; foundry, \$4.25@\$4.50.

Lead Has Had Minimum Price Depression

Market the Most Active of the Non-Ferrous Metals—Heavy Importations of Spanish Lead During May and June—World Production Has Declined 36 Per Cent Below Figure of 1913

EDITORIAL MARKET STUDY

ALTHOUGH lead is cheap, and some producers, in selling it around 4.25c. per lb. St. Louis, are virtually presenting a check to the metal purchaser which represents the difference between cost and sales price, the lead-mining companies have had a comparatively fortunate time of it. Compared with zinc, the position of lead has indeed been far superior; the market has been the most active of all of the non-ferrous metals since the Armistice, and its statistical position much better than that of the other metals. The industry is not burdened with heavy surplus stocks, as in the case of copper, zinc and tin, over-production, or under-consumption, of lead being absent.

The production of lead, in company with that of all other metals, has declined, and for the month of July was estimated at about 28,000 tons, compared with about 39,700 tons monthly in 1920, and 34,300 monthly before the war. Consumption has been satisfactory, considering the general industrial depression, and the business done has enabled producers to avoid accumulating a surplus. Excess stocks have been a wet blanket on any spark of life in copper and zinc, so that the absence of any unusual accumulation at lead mines or smelters places lead in a good statistical position.

There is a distinct determination noticeable among lead miners to aid the lead market as far as possible by not pressing the sale of their product when the market goes below the cost of production. Two of the largest lead producers have repeatedly taken the attitude that if their lead cannot be sold at a small profit, the best plan is to cut or stop production, withholding the lead from the market. As lead-mining companies have had no extended period lately in which the price of lead permitted sales only at a loss, they are generally in a good financial position and can afford to play a waiting game in a depressed or declining market.

The world's production of lead for 1920 is far below that of pre-war years, as the following figures given by the American Bureau of Metal Statistics testify:

WORLD'S PRODUCTION OF LEAD
(In Short Tons)

1911.....	1,237,500	1916.....	1,241,600
1912.....	1,330,200	1917.....	1,284,300
1913.....	1,297,600	1918.....	1,257,400
1914.....	1,286,300	1919.....	951,800
1915.....	1,171,400	1920.....	827,500

World's lead production in pre-war years, according to these figures, was not exceeded by either war or post-war production. On the contrary, the 1920 output is about 36 per cent below the 1913 figure. At the same time, United States production has more than maintained its pre-war rate, so that relatively the United States has become more important as a producing country.

As has been stated in previous reports, the impression is prevalent among some lead producers that the world's lead reserves not only have been getting smaller, but that the failure of any new discoveries of large lead deposits points to a logical increase in the value of the present lead resources of the world. The only notable exception to the rule has been the recent development of Burmese lead fields in Asia. The most important lead-producing nations, such as the United States, Spain, Germany and Mexico, show a steady or declining output. In other words the world has been fairly well prospected and combed for lead, and from now on a situation different from that of pre-war times faces the lead industry. However, the lead resources of the world are still plentiful, and the strong position of lead need not be ascribed to a lack of ore reserves, but is to be attributed to the disturbed state of the world's lead industry and the consistent demand for the metal. The thought is merely advanced here that possibly there is something in the lead-producing position of each nation that will alter the future market for lead.

The record of exports and imports of lead for the first seven months of 1921 is featured by the unusually heavy importations of pig lead during the months of May and June, when 23,481,000 lb. and 17,443,000 lb., respectively, were imported. Department of Commerce statistics indicate that most of this imported lead came from Spain (16,800,000 lb.), France (11,200,000 lb.), and Mexico (13,300,000 lb.). The French lead was in all probability of Spanish origin. It will be recalled that Spanish lead has become a factor in the American market and that large quantities of it have been sold to American producers. The imports of lead in general for the first seven months of 1921 have been below the pre-war average. Exports of domestic lead have been negligible, and the exports of lead from foreign ores far below the rate of 1910 to 1913. Bonded Mexican lead has, however, recently been freely sold abroad.

Stocks of lead in London are larger than in the United States, and Spanish lead is being shipped to London in addition to that which has come to American ports. The dearth of production from Australian points, coupled with a possible further decline in Spanish production, would throw the burden of supplying most of the world's requirements upon the United States.

If, as some economists predict, the industrial corner has been turned, and better times are in store, lead will have been one of the few metals to pass through the depressed period with a minimum of price disturbance. The position of lead in the near future should not change materially, as fundamental conditions have not been altered. In fact, the prospect of a higher tariff and a maintenance of the present status of foreign producers would seem to indicate that lead's fortunate position will continue.

MOVEMENTS OF LEAD TO AND FROM THE UNITED STATES

			In Pounds						
			EXPORTS						
	Monthly Pre-war Average	Monthly Average 1920	Jan., 1921	Feb., 1921	March, 1921	April, 1921	May, 1921	June, 1921	July, 1921
Lead produced from domestic ore.....		455,700	151,000	198,150	77,500	136,600	119,700	63,059	171,202
Lead produced from foreign ore.....	13,453,000	2,805,200	3,304,707	2,131,138	3,138,800	448,100	505,400	2,800,204	574,595
			IMPORTS						
Lead in ore.....	3,540,000	2,457,300	1,627,400	440,200	341,200	988,500	1,209,500	688,585	1,346,980
Lead bullion.....	10,328,300	8,008,600	5,561,800	47,400	1,900	11,380,900	8,466,200	5,582,016	9,971,247
Lead pigs and other forms.....	268,600	5,953,000	905,400	2,000,900	,993,300	4,558,400	23,480,900	17,442,890	2,305,038

COMPANY REPORTS

Mount Morgan Gold Mining Co., Ltd.

Gold, Copper; Australia

A report of operations of the Mount Morgan Gold Mining Co., Ltd., for the year ended May 29, 1921, shows the following financial results:

Total revenue for the year from all sources amounted to	£1,038,682	18s.	2d.
Expenditure charged to profit and loss account, including development and depreciation, etc., has been	918,524	9	5
Showing surplus of	(a) £120,158	8s.	9d.
Add balance brought forward from last account	92,191	13	11
Balance forward to next account	£212,350	7s.	8d.

(a) This surplus is due to realizations of copper and gold produced prior to the present financial period and at prices greater than those at which they were taken into account for the previous financial period.

Included in the income from all sources referred to above is 2,528 tons of copper on hand at the close of the year, and, as usual, this has been valued at £55 per ton. If the present ruling prices for this copper are realized, plus the present premiums on gold, and allowance is made for the actual surplus realized on copper produced prior to May 30, 1920, and taken into the accounts at that date at £55 per ton, the result of the operations for the year under review would show a substantial loss instead of the profit of £120,158 8s. 9d. as above.

It should be noted that some of the copper realized during the latter part of the twelve months ended May 29, 1921, was produced in Mount Morgan as blister as far back as December, 1919.

The unfortunate series of strikes in 1919 and 1920 considerably delayed refining and realization, and the direct result due to these "hold-ups" meant a very serious loss through missing the high-price copper market.

The ore raised during the period amounted to 260,062 tons; 167,802 tons of ore was treated for a production of 60,033 tons of concentrates. These tonnages produced 5,149 tons of fine copper and 76,463 oz. of gold.

Nevada Consolidated Deficit for Second Quarter, \$278,858

A report of operations of the Nevada Consolidated Copper Co. for the quarter ended June 30, 1921, states that as operations were suspended March 31 production of copper during the quarter was only 298,243 lb., compared with 9,064,082 for the first quarter of 1921, this output coming from clean-up of bins and plant during early days of April. Income account compares for quarters ending:

	1921		1920	
	June 30	Mar. 31	Dec. 31	Sept. 3
Operating loss	\$22,605	\$112,424	\$423,849	\$434,043
Plant shut-down expense	247,090			
Other income	(a) 9,163	105,790	143,350	350,864
Total income	(a) 278,858	(a) 6,634	(a) 280,499	(a) 83,179
Dividends				499,864
Deficit	278,858	6,634	280,499	583,043

(a) Loss.

A small force of miners is still retained at the underground workings of the Ruth mine developing the direct smelting, high-grade orebody recently opened up on the 700 level. This work shows conditions believed to be favorable for the development of new and larger tonnages of high-grade smelting ore.

Organization at mine, mill, and smelter has been reduced to lowest reasonable limit consistent with maintenance and protection of plant and equipment. All expenses have been reduced to absolute minimum, and salaries of company officials have been cut 20 per cent.

Quarterly reports are suspended until operations are resumed.

Chino's Deficit for Second Quarter, \$304,609

A report of operations of Chino Copper Co. for the second quarter of 1921 states that the complete suspension of operations and closing down of the plants became effective as of March 31, 1921. There was no output of copper for the second quarter therefore, other than the nominal quantity produced during the time required to properly clean up and shut down the mill. The net production of copper after smelter deductions was 567,248 lb., as compared with 8,570,034 net lb. produced during the first quarter. At the mines all mining and stripping operations were suspended, and the equipment and apparatus cleaned up and prepared for an indefinite shutdown. Immediately after the treatment of the tonnage of ore at the head of the mill and a general clean-up of the plant, the concentrator was also closed down.

During the period of suspension there will be retained in service only sufficient employees properly to guard and take care of the property and to prevent undue depreciation of plants, machinery, and equipment. All expenses have been cut to the absolute minimum, including a reduction of 20 per cent in salaries of company officials. The details of the financial outcome for the quarter are shown in the following statement:

Operating loss	\$120,119.93
Plant shutdown expenses	200,478.26
	\$320,598.19
Miscellaneous income, including payment for precious metals	15,989.32
Total net deficit	\$304,608.87

The item of "plant shut-down expense," as stated above, includes, in addition to the actual and necessary cash outlay for the period, the regular monthly accruals for taxes, insurance, and the usual fixed and general overhead charges.

Though there has been no marked improvement in the market demand during the last few months, it is satisfactory to note that current sales and deliveries, since the cut in production of crude copper, have taken care of the output for the first quarter and are making inroads on the surplus stocks of refined metal on hand at the beginning of the year. As there will be no production to report during the period of temporary suspension, the issuing of further quarterly reports will be discontinued until such time as operations are resumed.

Mining Dividends for August, 1921

The following dividends were paid by North and South American mining companies during August, 1921:

Companies in the United States:	Situation	Per Share	Totals
Bunker Hill & Sullivan, l. s.	Idaho	\$0.25M	\$81,750
Chief Consolidated, s. l.	Utah	0.05Q	44,202
Colorado Fuel & Iron, pfd.	Col., N. M., Wyo.	2.00Q	40,000
Home-take Mining, g.	S. D.	0.25M	62,790
International Nickel, pfd.	N. J., Ont.	1.50Q	133,689
Miami Copper	Ariz.	0.50Q	373,557
New Jersey Zinc	N. J.	2.00Q	840,000
Companies in Canada and Mexico:			
Amparo Mining, g. s.	Mex.	\$0.025Q	\$50,000
Hollinger Consol. Gold	Ont.	0.05 4 wks.	246,000
Lake Shore, g.	Ont.	0.02K	40,000
Lucky Tiger-Combination, s.	Mex.	0.07M	50,074

K, irregularly; M, montly; Q, quarterly; g, gold; s, silver; l, lead.

One more copper company, the United Verde Extension, succumbed to the low price of copper and passed its dividend, which was 25c. in May, for the first time since August, 1916. The dividend of the New Jersey Zinc Co. is reported to be paid out of surplus. An increase of the Hollinger dividend is being speculated upon. The Rand Mines, Ltd., paid a dividend to holders of the so-called American shares, amounting to 80c., on Aug. 24.

MINING STOCKS

Week Ended September 3, 1921

Table listing mining stocks with columns: Stock, Exch., High, Low Last, Last Div. Includes sections for COPPER, NICKEL-COPPER, LEAD, QUICKSILVER, and ZINC.

Table listing mining stocks with columns: Stock, Exch., High, Low Last, Last Div. Includes sections for GOLD, SILVER, GOLD AND SILVER, SILVER-LEAD, and VANADIUM.

*Cents per share. †Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. Toronto quotations courtesy Hamilton B. Wills; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Commerce and Oil; Colorado Springs, The Financial Press, N. Y.

ASBESTOS section with columns: Stock, Exch., High, Low Last, Last Div. Includes entries for Asbestos Corp. and Asbestos Corp., pfd.

MINING, SMELTING AND REFINING section with columns: Stock, Exch., High, Low Last, Last Div. Includes entries for Amer. Sm. & Ref., Amer. Sm. & Ref. pf, Am. Sm. pf. A., U. S. Sm. R. & M., and U. S. Sm. R. & M. pf..

