

A Weekly Journal of the Mining and Mineral Industries

ENGINEERING AND MINING JOURNAL

McGraw-Hill Company, Inc. Largest Circulation of Any Mining and Metal Journal in the World Price 25 Cents Per Copy

September 17, 1921

Recent Applications of the Cottrell Process

By R. B. Hesson, P. E. Landolt and A. A. Heimrod

The Economic Situation of Iron Ore Mining in Latin America

By D. E. A. Charlton

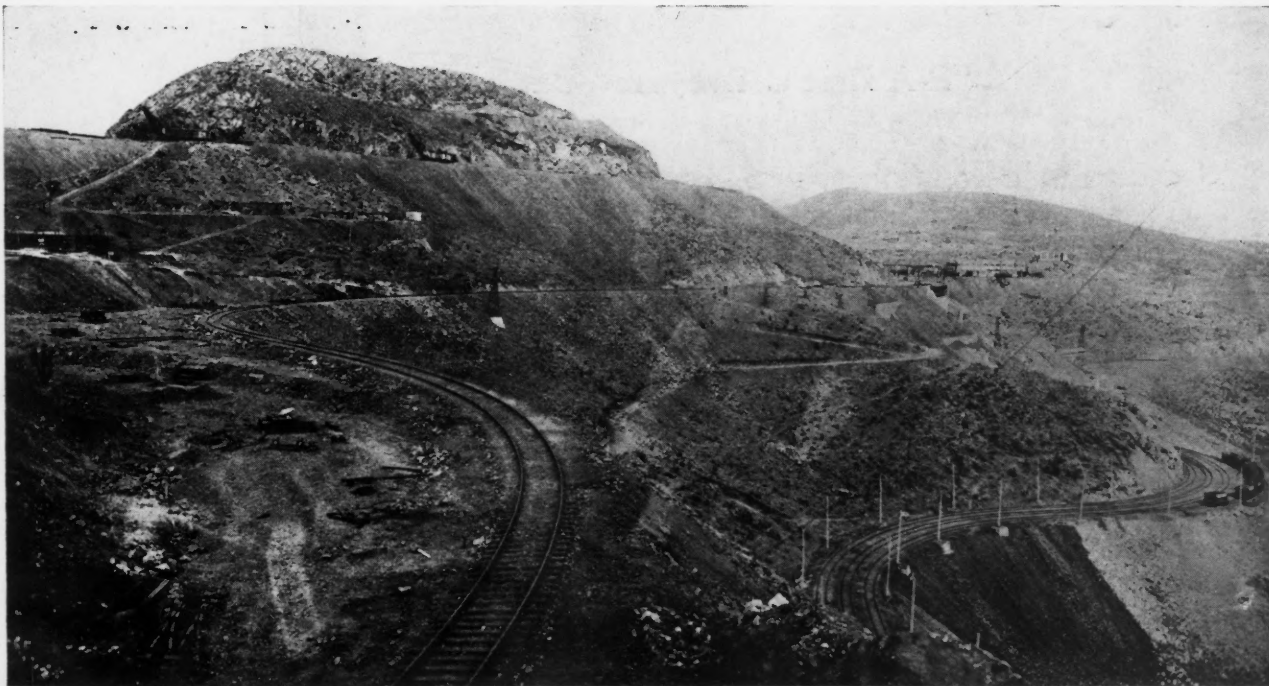
The Bureau of Mines and Private Investigations

By H. Foster Bain

THE views of a contributor on questions involved in profit sharing in mining appear on page 443. Mr. Crocker states that four interests require consideration: The employer, the employee, the buying public, and the general welfare. "Possibilities of Tungsten-Bearing Deposits" also appears this week in "What Others Think."



UNDER "Consultation" appear interesting data on the subject of magnesium. The occurrences, uses, methods of treatment, producing companies, future importance of the metal, and other data are given. Readers are urged to refer questions on the several branches of the mining industries to this department.



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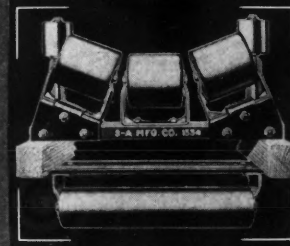
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A Weekly Journal of the Mining and Mineral Industries
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Volume 112

New York, September 17, 1921

Number 12

Why the Mining Engineer?

A RECENT VISITOR, the president of a school of mines in the Old World, has noted that students are going in more reluctantly for mining engineering, since they feel that in the pursuits of commerce, or even in the established professions, they can obtain as substantial financial rewards, without the hardships which attend upon mining.

There is little doubt that such students are right. Unfortunately, it appears to be true that there are more opportunities in commerce and in the professions than in mining. The pay is as good, and the chances of promotion are more numerous. More important, the young man will have fixed abode, may put forth social roots, become identified with and honored by various groups representing various angles of life, and may buy a home and marry without the perplexity and anguish of dragging his wife and little ones from one mining camp to another—from the high mountain altitudes to the tropical heats.

If all this is true—and there is no doubt that it is—it seems wonderful that we have at present any army of young mining engineers at all. But we have, and we fear, at present, more than one to each job. The supply rather exceeds the demand. What is the economic answer—since, it is currently understood, all modern problems have an economic solution?

The answer, we believe, is that it is not a problem in economics. That modern problems are all economic problems is, in our opinion, bunk; and he that so views it will not understand human nature nor current or past history. And we will propound another question: Why is it that among mining engineers, Americans and British have led the world, and are doing most of the world's mining, with the French well represented as a third party? The answer to this problem will perhaps give us a clue to the first.

The love of ease, stability, security and of the accumulation of goods does not mark the noblest of the youth of that racial group which we vaguely term Anglo-Saxon. Let those who will choose the shop and the law—so long as the Anglo-Saxon group and the kindred dominating groups of northern Europe cannot help but penetrate the wildernesses, and “Fell the dark forests, and let in the sun,” and for so long will the charm of travel, the stern joy of hardship, the sweetness of rude adventure, draw the swift-footed young descendant of pioneers who has brains, character, and the racial unrest, to the remote places of the earth, to the problems of discovering primeval earth secrets, conquering the unconquered rocks, in preference to the trifling game of outwitting other human beings.

So we shall never be without mining engineers, and the supply will at least equal the demand, even though the rewards be no greater than for softer living, showing the premium which our young men are willing to pay for the privileges of manly adventuring.

The Cards on the Table

IN THIS PERIOD of business slackness, methods which promise to increase efficiency are being sought after more earnestly and appreciatively than during the busy times of financial joy-riding. Work, brains, good-will, co-operation, now come to be valued at what they are: the elements whose quality decides whether a business shall or shall not go on. In the automobile world, for example, Henry Ford is a household word and a subject almost as universal as the weather. Henry Ford may not know the difference between Arnold Bennett and Benedict Arnold, but his enormous business scarcely bumped when the hardest of situations in the automobile industry overtook it. What is the answer? Work, brains, good-will, co-operation—he gets them all. He pays high wages, and the men work for him and for themselves. Recently he bought a railroad which was not paying. He eliminated some of the employees, raised the wages of the rest; they began to turn out more work: and the railroad began to show a profit.

There is one truth that every employer must remember—a man will work for himself harder than he will work for any one else. Therefore, if the employer is wise he will so arrange and organize that each man will feel and know that he is serving his own interest—that is to say, the common interest. In the old days, and sometimes in these days, the employee looks on the boss or on the company as hypocritical, grinding, and mendacious; and the bosses suspect the men of shirking and conspiracy to obstruct the business.

Thinking that a situation is so, often goes far toward making it so. But in these days, the employer is apt to be a “regular fellow” himself and no upstart, and he goes after a partnership with his men. There are all sorts of ways to get this. First you must be careful that you select the right kind of employers, just as it is said that children should be careful in the selection of their parents. Such an employer may bring about the right kind of good-will and genuine welfare partnership, without any set form or plan; or he may work out some system of conferences and frank interchange of ideas. In such an organization the terms capital and labor, used as if designating rival football teams, will soon become almost obsolete from disuse, and the rivalry will be for the efficiency (and hence the earnings) of “our company” with other companies in the same line of business.

The various devices to induce and expedite co-operation go by different names. An article in the *Outlook* for Aug. 31 by Sherman Rogers discusses “Employee Representation—Success or Failure?” interestingly and strongly. His verdict is altogether in its favor. An employee of the Mergenthaler Linotype Company, in which the system is in vogue, told him, “It is the greatest possible success because it is an *honest method* applied to dealings between *honest men*.” Regarding

quarrels between employer and employee, this employee said, "There has never been serious ill feeling, no trouble about getting a square deal on wages. We have no strikes, because both men and management are looking at the same set of figures. Each realizes what must be done to keep the accounts on the ledger out of the red-ink column. Every man in the works realizes that the prosperity of one means the prosperity of both."

Mr. Rogers makes a strong statement regarding those who have supported employee representation. "They have found that practically all men are both honest and reasonable when wild statements and abstract theories are shattered with broadsides of cold chilled facts."

This may or may not be too strong a statement—exceptions will be found among both employers and employees; but as a generality there is little doubt as to its being a practical working hypothesis.

To some these experiments in co-operation and adventures in common sense may seem wild and "radical." We remember, reverting again to Henry Ford, that when he established an unusually high wage scale for his men, the average wise and experienced employer pronounced him crazy. When we consider the money that through his methods has been put into the pockets of his employees, and especially of Henry, and when we view his methods of economy and finance which surprised the bankers whose panacea for industrial depression is simply to borrow, we could well wish that other employers could be inoculated with the same variety of insanity.

A Slump in the Humanitarian Market?

IT IS NATURAL to expect, with the general retrenchment now evident in the activities of the mining industries, that there will be a consequent slowing up in certain work that, due to its general adoption by mining and other industrial concerns and its direct relation to employer and employee, has come to be regarded as a necessary supplement to producing operations. We refer to that work coming under the head of welfare—a Mother-Hubbard term, perhaps, as it covers a great deal—but variously classified as educational and recreational work, publicity, and the like.

Naturally, the skillful manager cuts his cloth to suit his needs, and, finding that the demands for his product have fallen off, or that the price offered is below the cost of production, accordingly makes his program to fit those circumstances. He curtails and if need be discontinues proposed expansions, or effects economies of operation and makes such adjustments as will best conform with the general situation. Those plans relative to actual production detail can be carefully weighed and figured on a cost basis; the earning capacity of each item is apparent on the cost sheet, so that it is possible to visualize just where and what changes must take place. The adjustments are made not only with a view to present conditions, but the possibilities of the future are also considered.

The cost of so-called welfare work is known. We read in the various bulletins, company reports, and other statements that certain sums have been spent for this, that, and the other thing—all of which are productive of no tangible income when compared with, say, stopping operations and ore tonnage. But an actual earning ratio does exist, though it cannot be calculated and must

simply be put down as psychology. The returns for this sort of work can be found in the loyalty of the employees and in their satisfaction with their employment and surroundings.

Mining engineers are, as a rule, very capable psychologists; only they do not know it, and it is very difficult to tell them. Those intangible qualities that make a man a leader of men—and there are more of the engineering profession making practical use of leadership than of any other profession—are nothing but the application of practical psychology. On the other hand, our mining engineer deals with facts, and when mathematical calculations, such as are involved in costs vs. tangible income, are placed before him, together with a consideration of expenditures for a return that is based on psychology, he is quite likely to favor the former.

With the mining business at the top of the wave it was comparatively easy to put through appropriations for welfare expenditures. It was then the consensus of opinion that money spent in that way was well spent. But we have noted a tendency among some companies toward a slump in this particular line of activity, and we question if it is not a mistaken policy. Some curtailment is, of course, to be expected, but if, after all, welfare work is as essential as we have been led to believe, should it not receive the recognition due its relative importance, and accordingly be subjected to a proportionate curtailment instead of complete extinction? Not only have we especial need for the continuation of welfare activities at the present time, but to a large degree the success of future operations depends on them.

News Service

THESE ARE DULL TIMES in the mining-publication industry, as well as for the mining industries. They are times which lead us to rigorous inspection as to quality, economy, efficiency, and giving the reader and advertiser the worth of his honest dollar. Many of our changes result in increased expenditure, but if they improve the quality of the *Journal* we shall try to put them into effect, and by good management reduce along other lines which will mean no loss of quality. Our news service, for example, is a thorough and expensive one. It is entirely original, from special correspondents, and is, therefore, expensive; but we believe our subscribers read it gladly, as we do ourselves, as forming by itself the predominating newspaper of the mining industries.

One of our recent experiments has been to arrange for cable news through a well-known international news organization. We trust that these cabled dispatches will prove accurate and readable, as the reputation of the organization leads us to believe; and that thus our readers will be early apprised of certain happenings in the remote parts of the mining world which would otherwise be presented to them more tardily, through the mails, if at all.

E. & M. J. Index

THE INDEX for Vol. 111 of the *Engineering and Mining Journal* is now ready for distribution and will be mailed only to those who request it. Those who wish a copy of the Index are requested to send for it promptly. A postcard will do.

WHAT OTHERS THINK

Competition Offers Solution of Industrial Problems

In *Engineering and Mining Journal* of July 23, L. O. Kellogg, in a letter, "Profit Sharing in Mining," asks for the testimony of mine managers on their success or failure with profit sharing. I am not a mine manager, but a mine employee, and as such would like to say something about some of the questions involved in profit sharing.

In a discussion of this sort, it is first necessary to determine from what point of view the question is to be considered; otherwise we may not only disagree but misunderstand one another. There are four interests that require consideration: viz: that of the employer, that of the employee, that of the buying public, and that of the general welfare. The viewpoints of the employer, the employee and the buying public are personal and are likely to be more or less antagonistic. For this reason the viewpoint of either one of these can not be taken unqualifiedly as a measure of what is good. The only viewpoint that is equally fair to all, and the only one on which all can agree, is the welfare of the whole. It is useless to discuss the questions from any other angle when in actual practice the viewpoints of all the others have to be taken into consideration. The time is rapidly passing when industrial questions can be discussed and settled without the working man "sitting in."

All the different schemes for profit sharing that have been advanced are nothing but castrated forms of true profit-sharing or honest-to-God co-operation. They are counterfeits of the genuine. They are a cross between pure and simple wage slavery and genuine industrial democracy. They may raise the wage of the worker, but they do not touch the real thing at issue; the thing, above all others, that is of more consequence to the working man than anything else. Nothing short of a thoroughgoing profit-sharing system, in which the present obnoxious relation of employer and employee, which is essentially no different than that of master and slave, is entirely done away with, will do. Nothing short of a relationship in which all men are put on an equal footing will for long satisfy the worker. It is the only relation that is equally fair to all; it is the only one that makes for lasting peace, and the only one in which the self-interest of all concerned is not in conflict with the welfare of the whole.

There are just two working relations—one is where a man works for another or for others, and the other is where a man works for himself or where men work together for themselves. The working relation that should be established is the one where men work with, instead of for, another or others.

In discussing the question of ownership and industrial relations in general, a great mistake is made in assuming that there are only two forms of ownership—government ownership and private ownership—and that no other form is possible. There is another, a third form, and to my way of thinking the right form, viz: that an industry be owned and controlled by those working in it; no man to have more than a working interest,

and no man working for another or others, but all men collectively working for themselves. That is to say, the railroads to be owned and run by the railroaders, the telegraphs to be owned and run by the telegraphers, and so on. This is the principle of self-determination self-rule government by consent of the governed—applied to industry. This is true industrial democracy, and that is what the worker wants, and that is what is best for the welfare of the whole.

Mr. Kellogg asks, "Is in general any formula deducible on which to base the distribution of profits among the management, the heads of departments, the bosses in the departments, and the body of workmen? . . . Finally, can any rational basis be established for determining the percentage of profits to be segregated for distribution to the employee?" This is the wages question, which is one with all problems of distribution. The wages question may be divided into two parts: (1) the question of how to determine the wages of men doing the same kind of work, but who are of different efficiency; (2) the question of how to determine the wages of men who do different kinds of work. As to determining the wages of men who do different kinds of work, so difficult is it to determine the number and quantities of the factors entering into the production of a thing that it is practically impossible to base wages on the measurement of any factor or group of factors. No comparison can be made. In addition to this, even if comparisons could be made, who could be trusted to decide impartially what wages should be paid? Certainly, the decision couldn't, with any certainty of justice being done, be left to any party or combination concerned.

How, then, it will be asked, are we to determine wages? The answer is, competition. Adam Smith says, "By free and equal competition all problems of production and distribution will work themselves out to the very best advantage." That is to say, wages and prices will work themselves out to the very best advantage. In a system of free and equal competition, in which there are jobs enough for all, and where men have free access to all jobs, and all stand on an equal footing, every man, practically speaking, determines for himself the justice of the wage he receives. If he thinks he is not getting a square deal, he is always at liberty to go where he thinks he can do better.

What does it indicate when men flock from one industry to another in such numbers that they cannot be profitably employed? Doesn't it indicate that conditions are, as a whole, in that industry, better than they are in other industries? What is the remedy? Isn't it to change the wages or other conditions in the various industries until all are equally desirable to work in? No one can kick at that. For when a man goes from one industry into another he just as much as admits that, to him, the workmen in the industry he goes into are getting the best of the bargain. He has no just claim to advantages over his fellow workmen in other industries.

Many, particularly the socialists, claim that competition does more harm than good. The reason for this is,

the conditions to make a competitive system a success have never been fully complied with. To make it a success all must be put on the same footing; all must be given the same opportunity.

Under present conditions, in order to give all an equal opportunity, all should be allowed to seek employment and obtain it wherever they will, under the same conditions as anyone else, without anyone having the power to deny them such employment. And all, without exception, should be made to compete for their jobs. The idea in competition is not to throw anyone out of a job; all must work; but to find the man who is best suited for the job.

The only formula on which to base the distribution of profits in an equitable manner among the management, the heads of departments, the bosses of departments, and the body of workmen is to throw all of them into the same competitive system on the same footing, and exclude none from the full effect of economic law. It is the only system which is fair to all, and the only one not against the welfare of the whole.

In passing, it might be remarked that a thoroughgoing competitive system, one that excludes none from the full effect of economic law, solves the perplexing problem of the unearned increment.

As to determining the wage of men doing the same kind of work, but who are not equally efficient: It has been said that "it is an axiomatic proposition if one man produces twice as many chairs as another, he is entitled to twice the salary, and if one man displays twice the capacity or skill, energy and industry as another man he is entitled to twice the salary even if they be engaged in different occupations." I disagree with this proposition; it is not as just and axiomatic as it appears. To determine how just it is we will have to go away back into the past, and inquire as to just how it happens that one man hasn't the ability to do as much as another. It might be found, if it were possible to trace the thing out, that this inequality was due to some accident over which no one had any control, and least of all the men most concerned. Also, it might be found that others were responsible for the inequality. Who can say? All the factors that might enter into producing such an inequality are so numerous and varied that it is absolutely impossible for anyone to say positively how just a certain wage is. It is foolish to try.

How, then, should the wage be determined? The answer is, pay all the same wage that are doing the same work. And then proceed to make every man worthy of his hire, by making all equally efficient or as efficient as possible. This is the most sensible way out of the difficulty. With the present methods of wage payment we are always living in the dead past. What we are concerned with is the future. What we want is a system of wage payment that will bring out our potentialities. How do this?

The first principle of good management is to treat all men equally. They may not, at present, be equal, perhaps, but as a matter of policy, as a principle of action, they should be treated as if they were. As a matter of principle, men are assumed to be potentially equal, and for that reason should be treated as equal. The effect of such treatment will be to really make them equal. In the case of wages, giving the same wage for the same work would cause the competent, in a system where all men received according to what was produced, as a matter of self-interest, to train or cause to be

trained the less competent up to their own standard of efficiency. And, also, to cause the competent, if the incompetent were not naturally suited for the occupation, to find that occupation most suited to their abilities. In this way, by making all men doing the same kind of work equally competent, we can with justice give all men doing the same kind of work equal pay. Also, in this way we force some one—the employer and the workmen in an industry, who are naturally the best fit to give instruction—to assume the responsibility for the industrial education of the uneducated worker. In this way all that is in men will be brought out to the very best advantage, in the quickest possible manner.

Mr. Kellogg asks, "How, then, can profits be shared and at the same time protection be secured against gutting, neglect of development, neglect of maintenance, and shortsighted policies in general?" While inquiring into this it would be well to inquire into why there is a gutting of our natural resources, why we have a conservation problem, and that without any profit-sharing system. It is quite likely the reason will be found to be the same in both cases.

The reason why workingmen, in a profit-sharing system such as Mr. Kellogg speaks of, are liable to find it to their interest to gut a mine and encourage all sorts of short-sighted policies, is the uncertainty of the future. It is this uncertainty of what the future will bring forth that causes most of the unsocial acts of men; it is the cause of short-sighted policies in general, whether of an individual, or a mining corporation, or of a government. Men are put in a position where they have to choose between a present certainty and an uncertain future. And they choose the present certainty, of course, to the detriment of the future of the average man. If men were certain of the future, if they were sure that in the future they would have the same opportunity as others, they wouldn't gut the mines nor would we have a conservation problem similar to that which we have today.

From what has been said, the remedy is obvious; establish a system in which all men are given free and equal access to all our resources, by giving all men free and equal access to all jobs. This is the only way all can be given a free and equal opportunity at all times. The legal right to own without limit the natural resources on which all depend and can't possibly do without, is the principal cause of the trouble. Such a right gives a right to deny any and all access to these resources. The man who controls the job controls the man who depends on it.

A thoroughgoing competitive system—free and equal competition (it has never been equal)—is the formula by which all our industrial problems will find their solution.

A pretty good line can be had on what to expect from profit sharing, by what happens in leasing, which is a species of profit sharing. On page 158, in the same issue in which Mr. Kellogg's letter appears, there is something showing the ill effects leasing has had on zinc mining.

The profit-sharing scheme of the copper companies is not without its serious faults. It puts the worker where his self-interest — his immediate self-interest — is against that of the whole. It puts him in a position where it is to his interest to curtail the production of copper, by loafing and other means, in order to raise the price.

WILLIAM CROCKER.

Prescott, Ariz.

Possibilities of Tungsten-Bearing Deposits

The opponents of a duty on tungsten base their opposition largely upon the supposition that our known resources in that metal are too limited to justify a duty, and contend that such as we have should be preserved for war-time emergency. This idea is reflected in the editorials of the *Engineering and Mining Journal* and *Mining and Scientific Press*, and in the expressions of some of their contributors.

Mr. Hess, of the U. S. Geological Survey, has been a prolific disseminator of the belief that the United States is incapable of producing a significant part of our requirements, and is one of the early expositors of the conservation idea as applied to tungsten. It appears that the attitude of the leading mining magazines has been absorbed from the impressions conveyed by the Hess reports.

I am certain that the majority of the engineers and geologists who are genuinely interested in the tungsten problem, and possessed of more accurate knowledge of existing conditions, will agree with me that Mr. Hess' conclusions are considerably at fault. In taking this view, I do not wish to depreciate Mr. Hess' ability, nor imply to him any other than the highest motives in expressing his conclusions, but I feel that the opportunity in the field to observe closely and thoroughly was denied him. He had a large territory to cover in a limited time; he was investigating the occurrence and production of a mineral to which but little thought had previously been given. His conclusions may be justified in the light of the knowledge and facts he was able to gather at that time, but they should not govern when the conditions existing today are under consideration.

In 1915 the tungsten-bearing, contact-metamorphic deposits of the Great Basin and Inter-Mountain regions were practically unknown to either prospector, miner, or geologist. During the following three years of intensive exploration and development of some of them much was learned—particularly by those intimately associated with such exploration and development. Little of the valuable information thus gained has been made available to the public, and the impressions of Mr. Hess and others, gathered in their necessarily hurried war-time investigations, have been spread far and wide.

The stand taken by the opponents of a duty on the metal, upon the grounds of its limited known resources, becomes untenable when it appears that these "known resources" are but a small fraction of the potential resources of the country. To dispose of such opposition, and invite co-operation in obtaining reasonably just conditions for the industry, it only remains to prove the actual existence of our large potential resources. This is practically impossible for an individual to do, but my experience during the last five years, directed largely to studying contact-metamorphic deposits containing scheelite, leads me to believe that there is no doubt that a large number of deposits exists which are capable of economic exploitation. In Nevada today it is easier to find tungsten-bearing prospects than those containing gold, silver, lead or any other mineral, and Arizona and New Mexico, with their abundance of granitic intrusions in limestone, should offer still better opportunities.

Representative Longworth, in defending the potash

schedule, admitted his personal doubts as to the ability of the country to develop the industry, but was willing to try for five years in the hope that it could be attained. Why cannot the mining press assume the same charitable view toward tungsten, with its brighter prospects, and give it their active support?

Little has been published upon the occurrence of scheelite in contact-metamorphic deposits. It differs from other metals commonly mined from such deposits in its distribution, its relative quantity with respect to the gangue materials, and its place in the sequence of mineral deposition (or formation) from the parent magma. I find that when scheelite is present with garnet as the principal gangue mineral it is distributed throughout the mass; that its introduction into the mass was most likely contemporaneous with the formation of the garnet. (This does not hold true with epidote, which it follows.) In such deposits, then, the measure of the garnet becomes the measure of the ore.

That there are innumerable deposits of garnet in western America is well known; that many of them are tungsten-bearing is less known, but is certainly an assured fact. There is no real foundation in fact for the belief that the United States cannot produce all the tungsten it needs in time of peace, and at the same time create adequate reserves which would be available for use in case of war.

As long as the strict policy of conservation, recommended by Mr. Hess and tacitly concurred in by the mining press, is followed, the status of the tungsten industry in this country will remain just where it is today. Picture a sudden declaration of war two generations hence—a mining population ignorant of tungsten ores or the location of available deposits, which the policy of the nation had decreed should be of no value in time of peace. A frantic, incoherent effort to hunt up old prospects or search for new ones; a mad scramble to finance and equip such as may be found; imports cut off, prices soaring, with a tremendous demand. After the lapse of a year or two the "known resources of 1918" are rediscovered and brought to the point of high production—3,500 to 4,000 tons per year. It took this country nearly four years to attain that production prior to November, 1918. Would we expect our grandsons to do better?

On the other hand, suppose the price of tungsten had been stabilized at about \$15 per unit during the two preceding generations. The industry is on a going-concern basis; the search for and development of pay ore at \$15 has been carried on incessantly. But now the demand is suddenly doubled or trebled—and the price with it. Then there become immediately available immense tonnages that did not pay to mine with the price at \$15. That is what happened with copper, lead, zinc, and silver during the late war.

Some of the silver mines at Tonopah are today running solely upon ore, with silver at \$1 per ounce, that could not be mined with the price of that metal at 50c. or 60c. per ounce. Hundreds of properties that were considered exhausted were reopened and produced copper, lead, zinc, and other metals under the stimulus of high prices—when the country needed them.

The dread fear of exhausting our resources is comparable to the prospector who was afraid to sink a few feet deeper because he dreaded the possibility of spoiling his prospect.

CARL STODDARD.

Reno, Nev.

Recent Applications of the Cottrell Processes

Electrical Fume and Dust Precipitators Installed Within the Last Year At the Plants of the National Lead Co. and the Williams-Harvey Corporation Will Save 20 to 50 Per Cent on the Cost of Equipment

BY R. B. HESSON, P. E. LANDOLT, AND A. A. HEIMROD

Written for *Engineering and Mining Journal*

THE DESIGN and construction of Cottrell electrical precipitation equipment for the recovery of the valuable metallic particles carried away as fume from metallurgical furnaces has now been standardized and thoroughly tested in continuous commercial operation. The installations described in this paper are at the plants of the National Lead Co. and the Williams-Harvey Corporation, both in Brooklyn, N. Y., and illustrate the kind of electrical precipitation equipment used for the type of metallurgical problems there encountered. Both of these installations

steel balloon flue approximately 175 ft. long, placed as shown in Fig. 1, the primary purpose of this flue being to cool the gases to the proper temperature for treatment. The gases are then admitted, through individual openings at the end of this steel flue, into the bottom headers of the double precipitator unit to be described later, and from there pass up through the precipitator pipes in which the finely divided suspended particles of fume are removed. The cleaned gases then leave the top headers of the precipitator unit and pass through a common downcomer into a brick flue, and

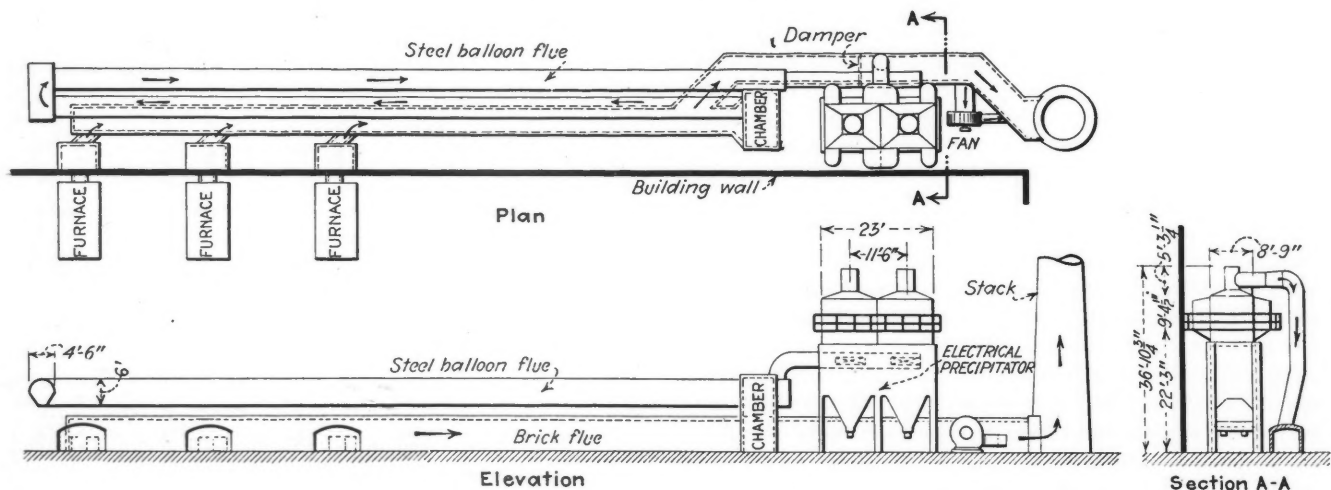


FIG. 1. PLAN AND ELEVATION OF NATIONAL LEAD CO.'S FLUE SYSTEM

were constructed by the Research Corporation during the last year.

It is assumed that those who will read this paper are familiar with the fundamental principles underlying the Cottrell processes. For those who may not be acquainted with previous developments, a selected bibliography is appended for reference.

RELATED PLANT OPERATIONS AND ORIGIN OF FUME LOSSES

The Cottrell equipment at the plant of the National Lead Co. replaced an original installation of these processes which proved inadequate and unsatisfactory. This installation recovers the metallic losses, consisting of tin, lead and zinc in the gases from metallurgical furnaces, including a ten- and a five-ton reverberatory furnace for the treatment of various white-metal drosses. The path of the gases from the furnaces to the stack is as shown in Fig. 1. The gases from the individual furnaces are led into a common brick flue. From a point in this brick flue just beyond the point at which the gases from the last furnace enter, the mixed gases are led into a brick chamber where they can be humidified, when necessary, properly to condition them for treatment in the precipitator. From this brick chamber the gases pass through a

from there to a brick stack. A fan and bypass flue are provided, beyond the point at which the downcomer from the precipitator enters the brick flue, for use at such times as the stack may not give sufficient draft to operate the furnaces.

At the plant of the Williams-Harvey Corporation, the Cottrell equipment recovers the dust and fume from the following furnaces used in the smelting of tin ores: three reverberatory smelting furnaces, one inclined rotary roaster, and one blast furnace. This installation supersedes and supplements a wet filter originally used to recover fume from the reverberatory furnaces only. This wet filter, although fairly effective, proved expensive to operate and maintain. A building, approximately 60 x 120 x 25 ft. high, originally housed these filters and is now used to house the complete Cottrell installation.

The path of the gases from the furnaces to the stack is as shown in Fig. 2. Precipitator unit No. 1 treats the gas from the calciner or roaster. In a similar manner units 2, 3, 4 and 5 take care of the gas from the reverberatory furnaces, and units 6 and 7 handle the gas from the blast furnace. Each metallurgical operation has a separate flue system, so that the fume is collected separately, furnishing a flexibility in re-treatment, if necessary.

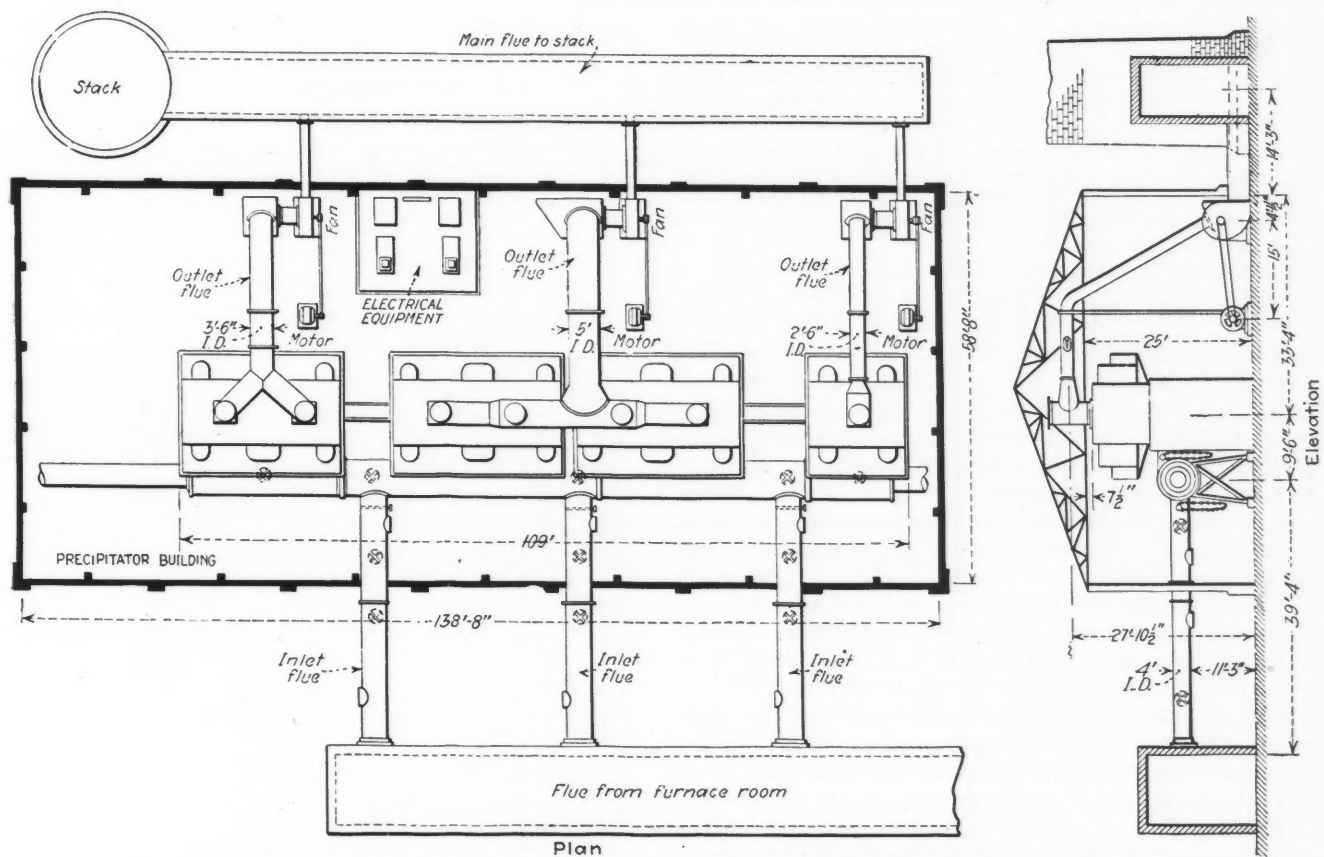


FIG. 2. PLAN AND ELEVATION OF WILLIAMS-HARVEY INSTALLATION

A Cottrell installation is usually made up of a number of individual units with separate gas connections and electrical control to permit of flexibility in operation and proper control, dependent upon plant operating conditions. Each of the units at both the National Lead Co. and the Williams-Harvey Corporation installations has forty-eight pipes, forty-four of which are 8 in. in diameter and 12 ft. long, and four of which are 12 in. in diameter and 13½ ft. long. Such a precipitator unit, when used to recover finely divided suspended fume particles, can treat effectively approximately 6,000 cu.ft. of gas per minute, measured at any treatment temperature between 150 and 600 deg. F. The general construction of this forty-eight-pipe unit at both of these installations is essentially the same, although certain details may differ, such as the design of the bottom header and the method of removing the collected material. Each of these forty-eight pipe units consists of a concrete bottom header or dust chamber, steel superstructure and top header, precipitator pipes or collecting electrodes, discharge electrodes with supporting framework, cleaning and rapping devices, high-tension connection and switches, and dampers and flue connections. The general location of the installation at the National Lead Co. is shown in Fig. 1, the appearance of the double precipitator unit by Fig. 3 and a cross-section in Fig. 5. The arrangement of the Williams-Harvey Corporation equipment is shown in Fig. 2, an exterior view in Fig. 4, and a view of some of the electrical equipment, including the switchboard for the installation, in Fig. 6.

The electrical power, both at the plant of the National Lead Co. and at that of the Williams-Harvey Corporation, is supplied by the Brooklyn Edison Co. and is 250 volts, 2 phase, and 60 cycles. To obtain the high voltage uni-directional current for operating the pre-

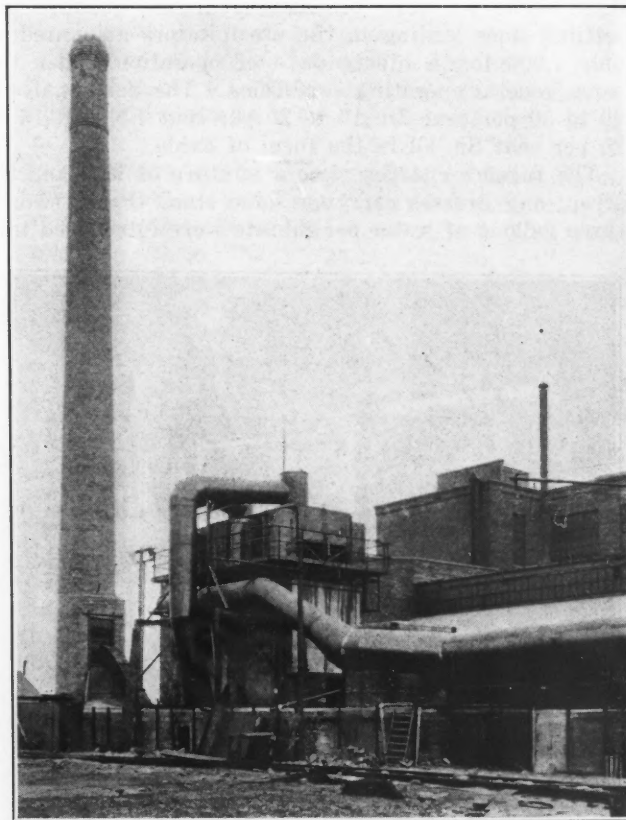


FIG. 3. COTTRELL INSTALLATION AT THE NATIONAL LEAD CO.'S PLANT

cipitator, the following is required per unit of electrical equipment:
 One 2-hp. synchronous induction motor for driving the mechanical rectifier.

- One special high-voltage transformer; 200 volts / 55,000 to 75,000 volts, with necessary taps.
 - One mechanical rectifier for converting the high-tension alternating current to a uni-directional high-tension current.
 - One control switchboard panel, with switches, meters, resistances, and other equipment. In order to obtain regulation between the voltages supplied by the various ratio taps of the transformer, a non-inductive series resistance is provided in the primary circuit. This resistance is divided into eight steps and so arranged that it can be controlled from the switchboard.
- Necessary high voltage switches and insulators.

The National Lead Co. installation has one unit of electrical equipment, and the Williams-Harvey two units. A General Electric Co. synchronous induction motor and a 20-kva. American Transformer Co. transformer were used on the National Lead Co. unit; and two synchronous induction motors and two 25-kva. transformers supplied by the Westinghouse Electric & Manufacturing Co. were used for the Williams-Harvey Corporation units.

Three high-tension conductors, properly screened, led from the two electrical units of the Williams-Harvey installation to three high-tension switches, which give great flexibility of operation of the treater units.

Performance tests conducted to determine the operating efficiency of the completed installation at the National Lead Co. plant indicated the following:

Up to 12,000 cu.ft. of gas per minute at an average of 650 deg. F. were treated in the two units, recovering an average of 97 per cent of the suspended matter in the gases, with a daily saving of 1,500 to 2,000 lb. of dust. The recovery of dust from the cooling and settling flues leading to the precipitators amounted to only 7,000 lb. in ninety days of operation under the same general operating conditions. The dust analyzed 40 to 50 per cent Zn, 15 to 20 per cent Pb, and 15 to 20 per cent Sn, all in the form of oxide.

The furnace charges were a mixture of lead and tin scrap, and drosses carrying some zinc. From two to three gallons of water per minute were introduced into

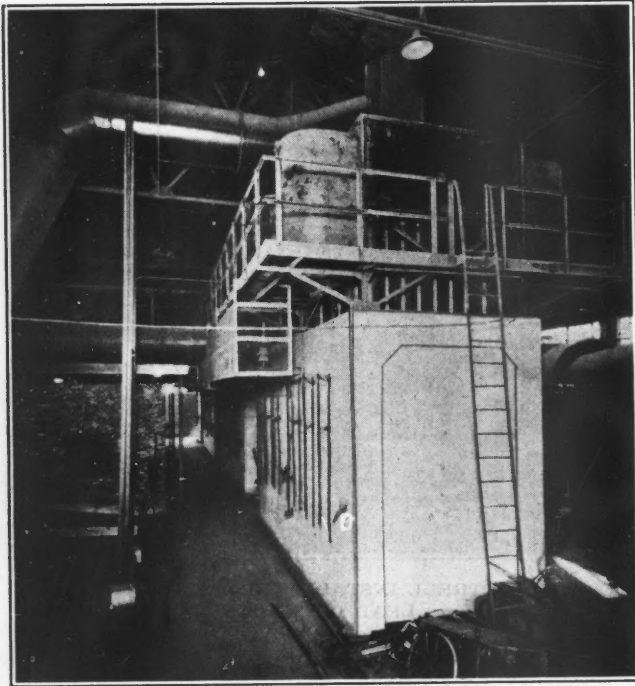


FIG. 4. EXTERIOR VIEW, WILLIAMS-HARVEY EQUIPMENT

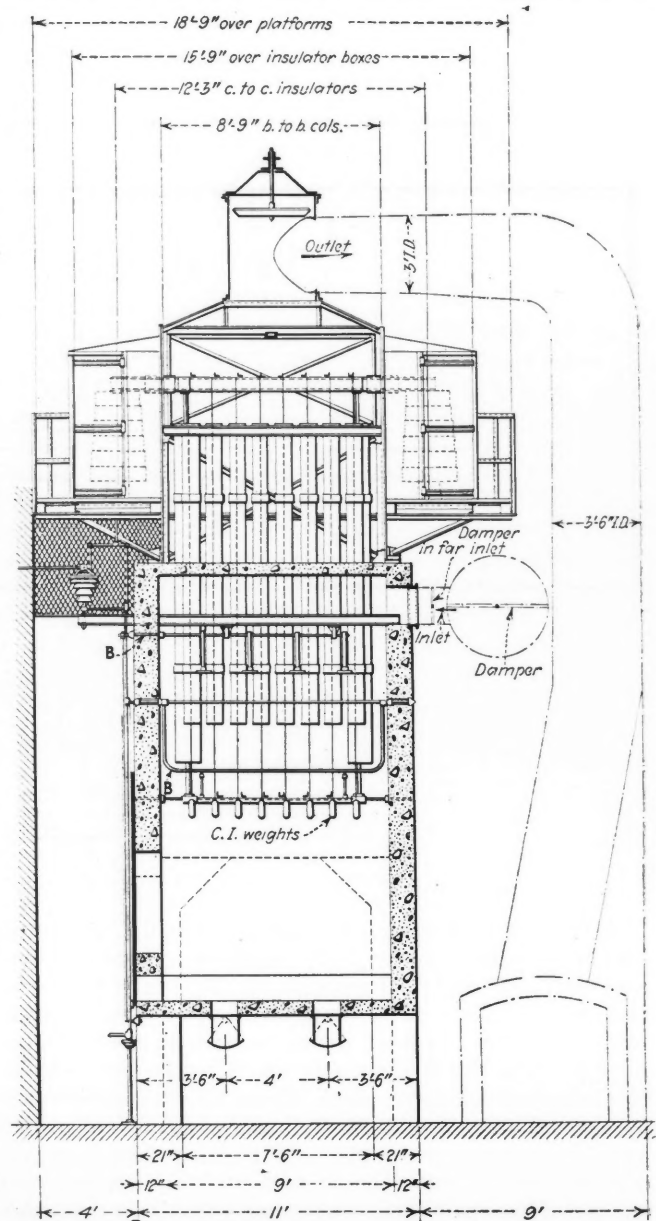


FIG. 5. A CROSS-SECTION OF THE NATIONAL LEAD CO.'S PRECIPITATOR

the gases by means of Schutte & Koerting sprays to condition the gases properly for electrical treatment. Electrical power supplied to the installation varied between 300 and 350 kw.-hr. per twenty-four hours. The fan indicated in Fig. 1 was not used, as sufficient draft was available for maximum furnace operation. In the way that the installation will be operated, only periodic attention is necessary to clean the electrodes and adjust the electrical operation and water sprays, requiring about one-third of one man's time per shift.

The cost of the installation, including the precipitators, electrical equipment, flues, and other equipment, was approximately \$30,000.

Therefore, with fixed charges at 20 per cent (inc. repairs)	\$6,000
Power at 3c. per kw.-hr.	3,000
Labor, pro-rated at \$5 per day	1,500

The total annual operating charges will be approximately

..... \$10,500
and the expected recoveries will be 450,000 lb. dust per year, containing 40 per cent Zn, 15 per cent Sn, and 15 per cent Pb, with a gross value of metals recovered,

neglecting the zinc in the dust, of \$16,000 to \$20,000, leaving a net return of \$6,000 to \$10,000, or 20 to 30 per cent net on the investment.

At the Williams-Harvey Corporation, each of the smelting-furnace precipitator units recovers approximately 1,000 lb. of dust per twenty-four hours, and usually two of the three furnaces are operating, assuring a total of 500,000 to 750,000 lb. of dust per year. The blast furnace is only operated periodically, and the precipitators connected to it collect about 500 lb. of dust per twenty-four hours, or a total of 50,000 to

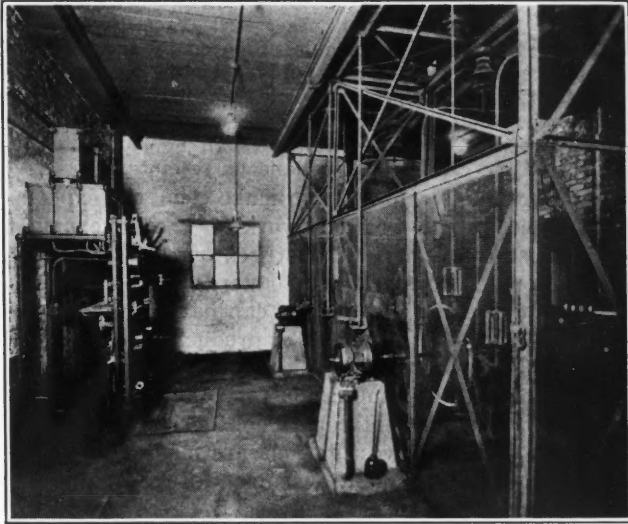


FIG. 6. PART OF THE ELECTRICAL EQUIPMENT AT THE WILLIAMS-HARVEY INSTALLATION

100,000 lb. of dust per year. The precipitator on the roaster flue collects about 1,000 lb. per twenty-four hours, or about 250,000 to 300,000 lb. per year. This dust contains appreciable bismuth as well as tin, and is difficult to re-treat. The smelting-furnace dust contains about 50 per cent Sn, and about 98 to 99 per cent recovery is made of the dust passing through the precipitators. The gross recoveries in the precipitators approximate, at present market conditions, about \$100,000 to \$125,000 per year. The investment in the Cottrell installation, including precipitators, flues, fans, and electrical equipment, but not including buildings or waste-heat boilers, is approximately \$125,000.

Therefore, with fixed charges at 20 per cent. \$25,000
Power at 3c. per kw.-hr. 6,000
Labor and supervision. 4,500

The annual operating charges will be approximately \$35,500 and the expected saving will be at least \$60,000 to \$70,000, or over 50 per cent on the investment made.

Acknowledgment is hereby made to the officials of the companies herein mentioned for information furnished in connection with their respective plants and for their co-operation in making these installations successful. Especial appreciation is expressed to G. W. Thompson, chief chemist, National Lead Co., and vice-president Williams-Harvey Corporation; W. F. Kemble, general superintendent, Williams-Harvey Corporation; and C. W. Gesregan, superintendent, Crooke Works, National Lead Co.

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The Bureau of Mines and Private Investigations

Co-operative Studies of Great Technical Value to Mining Industries and To the Nation—Experiment Stations and Safety Demonstrations Keep Advance in Practice Before Engineer, Millman, and Miner—Conserving Public Interest in Patent Rights—Moving Pictures Effective Propaganda

BY H. FOSTER BAIN

Director U. S. Bureau of Mines

Written for *Engineering and Mining Journal*

NO MORE PUZZLING problems come up for decision in the administration of the U. S. Bureau of Mines than those relating to the division of investigative work between public and private agencies. In the various hearings before Congress at the time the Bureau was established, and in reports of Congressional committees since, it has been made abundantly clear that the plan of operations laid down by law contemplated widespread co-operation with the states and with industry. It was recognized that the National Government has a part to play, but only a part, in the work of increasing safety and decreasing waste in mines and works. It is not too much to say that such success as has been achieved—and it is definite and tangible already—has flowed from the widespread and generous co-operation that has been effected.

The states rather than the National Government have the police power necessary to enforcement of regulations. A Federal bureau can only recommend, and even sound recommendations accomplish but little without the interest and support of the industry. Fortunately, all these agencies have so far worked together in close harmony. It may be worth while to consider briefly the question whether the Bureau, in the effort to meet the industry half way, has at any point overstepped the boundary and got into the field of private work. I understand there are those who think it has, and in discussing the question I am less anxious to make a case for the Bureau than to get the advice of fellow members of the profession. The policy so far followed is one which has grown out of experience. If it is wrong, or can be modified to advantage, let us find it out promptly.

THE BUREAU'S FIELD DEFINED

In all of its work the Bureau is necessarily limited in its action by the organic law defining its scope and by the terms of the various appropriation acts. In the fundamental law there are two sections which bear especially on the relation of the Bureau to practicing engineers and to private work. These are as follows:

"In conducting inquiries and investigations authorized by this act neither the director nor any member of the Bureau of Mines shall have any personal or private interest in any mine or the products of any mine under investigation, or shall accept employment from any private party for services in the examination of any mine or private mineral property, or issue any report as to the valuation or the management of any mine or other private mineral property: Provided, That nothing herein shall be construed as preventing the temporary employment by the Bureau of Mines, at a compensation not to exceed \$10 per day, in a consulting capacity or in the investigation of special subjects, of any engineer or other expert whose principal professional practice is outside of such employment by said Bureau.

"That for tests or investigations authorized by the Secretary of the Interior under the provisions of this act, other than those performed for the Government of the United States or state governments within the United States, a

reasonable fee covering the necessary expenses shall be charged, according to a schedule prepared by the Director of the Bureau of Mines and approved by the Secretary of the Interior, who shall prescribe rules and regulations under which such tests and investigations may be made. All moneys received from such sources shall be paid into the Treasury to the credit of miscellaneous receipts."

These sections would seem to make clear the expectation that the Bureau would do work for the Government itself, the states, and for industry in general, but that as regards the latter certain safeguards were erected:

1. No member of the Bureau can have any personal or private interest in any mine or product examined.
2. No member of the Bureau may accept private employment in making examinations, nor may he issue any valuation or management report on a private property.
3. When tests or investigations are made other than for a state or the National Government, a reasonable fee covering costs is to be charged and the receipts are to be turned into the Treasury of the United States.

FEE WORK PROFITABLE TO GOVERNMENT

The first two restrictions are aimed clearly at preventing members of the Bureau making a personal profit out of a public office. No one questions the propriety of them, nor, so far as I am aware, has there ever been any question as to their having been strictly enforced. The provision covering the making of tests and investigations, when authorized by the Secretary, for fees is a necessary and reasonable one. It is under this that the system of examination for permissibility of apparatus and explosives used in mines is conducted. Each year a number of thousands of dollars are turned into the Treasury from this work, so that so far as it assumes a routine character the Government is reimbursed. There is no temptation for the members of the Bureau to push this to extreme, as the practical effect is to reduce by just so much the money available for new investigations, and it is in research that the main interest of the Bureau and its staff lies. Indeed, there are practical objections to any great extension of the fee work.

Appropriations to the Bureau are made by Congress upon specific requests for funds for definite researches. In practice estimates must be made in August for the money that is to be spent in the year beginning the following July first. That is one of the handicaps of a big organization such as the Government is. Always the departments ask support for more work than Congress can possibly finance, and no appropriation is made in the regular course without clear and definite showing of its need. It would in most cases be a mistake to stop the work after the money had been obtained. The time for considering its necessity lies long before.

In practice the demand for such work as is done under the fee system comes up suddenly. A state, a

city, or an industry finds itself facing an emergency and comes to the Bureau for help. If men be detailed for the new work they must be taken from other investigations, and studies long considered and previously approved by Congress be stopped. Before these could be resumed it would be necessary to get the money reappropriated by Congress, with all the resulting delay and uncertainty. No one familiar with the conduct of investigative work can have any doubt as to the effect on results.

In the effort to meet situations of this sort the Bureau has built up a system of co-operative studies under which it assumes cost of the supervision only, which would in any event be charged to general funds, and the co-operating agency pays directly the expense of the new work. This is simpler, and in the end the financial result is the same as though the Bureau stopped other work, detailed men, was reimbursed by the co-operating agency, turned the money into the Treasury and then waited for Congress to reappropriate it so that the interrupted regular investigations could be resumed. That is, the result is the same in every case except where a state is the co-operating agency. In such cases there would be no reimbursement, and the net effect would be to stop work for which after due consideration Congress had made a specific appropriation. It has seemed better logic to assume that when Congress allotted money to conduct an investigation the money should be used for that purpose, and if any other agency had work which it felt should be done that agency should pay for it unless content to await the time necessary for the Bureau to make the proper presentation to Congress and secure an appropriation. In many cases that would necessarily mean that the work would not be done.

OUTSIDE FUNDS EXPENDED FOR SPECIFIC TECHNICAL WORK

At present about one-fourth of the total expenditure controlled by the Bureau is from funds outside appropriations made to it by Congress. The amount of control exercised over these co-operative funds by the Bureau varies according to their source and purpose. The State of Oklahoma makes a direct appropriation toward the support of the Petroleum Experiment Station at Bartlesville, and the money is expended on order of the superintendent. In a few instances sums of money have been placed in bank subject to check of a Bureau official and for use in a specified way, such as when the Bartlesville Chamber of Commerce furnished the money with which to pay for building the station in that city. Usually each party to a co-operative agreement keeps control of its own funds, and the Bureau merely directs the work, hires the men, and, after auditing the bills, sends them to the co-operating agency for payment.

The larger number of the co-operative contracts are with the states, especially state schools, and relate to joint maintenance of experiment stations. Not all are in this class. In Wyoming at one time Bureau engineers examined the methods of production of petroleum, especially the care of the wells, of two large companies. They criticized these methods and insisted that certain changes would result in important savings of gas and petroleum. The companies thereupon asked the Bureau to do the necessary work and furnished \$30,000 per year for several years with which to meet the expense. The

bills were paid by the companies, but the men were organized and directed by the Bureau. A real saving of gas and oil was made and sands were protected from damage. The saving was national and the expense of supervision, met by the Bureau, was minor.

IMPROVED PRACTICE AND SAFETY ARE BUREAU'S CHIEF PURPOSE

The prime purpose of the Bureau is to improve practice, to the end that safety and efficiency be increased. Its main function is to undertake the fundamental researches which have wide applicability and which it would be unnecessary and uneconomical to have each state or producer carry out for himself. The information acquired is intended to be of general service, and the obligation to disseminate it is as clearly laid down in the law as to acquire it. The means of conducting research are primarily those of the laboratory, and the common method of dissemination of information is by use of print. It would, however, be indefensible to stick so closely to these means alone as to defeat the main purpose, which, after all, is to increase safety and decrease waste.

It has often happened that an excellent piece of research described in technical language and published in a Government report has produced no practical result. The Bureau has therefore adopted the policy of using demonstrations and of employing service men to spread the gospel. This has reached highest development in the safety work, where mine rescue and instruction cars are kept traveling through the mining districts. Literally thousands of men are yearly trained by the men on these cars, whereas no number of printed reports would ever accomplish this result. The car work is now being supplemented, especially through the co-operation of the National Safety Council, by a limited amount of special service work. Engineers are sent to observe safe and unsafe methods at the various mines, to discuss them with the responsible officials, and to pass on from one to another good ideas as they are found. It is believed that this is strictly in line with the purpose the Bureau was designed to serve.

EXPERIMENT STATIONS CLEARING HOUSES FOR IMPROVED PRACTICE

Similarly, Congress has provided for a number of experiment stations in the heart of the mining regions, with the expectation that they will become centers of research and by conducting investigations on problems at the point where they are of most interest will bring about more quickly the adoption of such new practices as may be developed and may stand the criticism of the technical men of the local community. It was desired and expected that informal relationships would be built up between the Bureau men and local engineers and metallurgists, to the purpose that any new and valuable idea would be promptly tested under service conditions, and, if found good, adopted.

In development of a new process or appliance there are three well-defined stages. The first is the laboratory study, next follows a semi-commercial small-scale test, and finally there is the reduction to engineering practice on a working scale. All are necessary if new ideas are to be set to work. The first step is clearly within the province of the Bureau whenever the problem is one of sufficient general interest to be of import to the nation as a whole. The second step is in debatable territory,

though usually outside the province of the Bureau, as the third is almost wholly. Nevertheless, the second two steps are equally necessary with the first if practical results are to flow from laboratory investigations.

DETAILS OF CO-OPERATIVE PLAN

The Bureau is attempting to meet this situation by co-operation. A company, or by preference a number of companies or a trade association, is interested if possible in the idea which it is desired to reduce to practice. The Bureau offers freely such information as it has and the services of its staff and equipment in assisting or supervising the further development. Usually a definite contract is entered into, and the co-operating agency agrees to allot a definite sum of money to the experiment. In all cases, and in the interest of the public, the Bureau reserves full right to publish details of the work, and heretofore such contracts have carried a clause to the effect that patents, if any, resulting from the joint work should be assigned to the Secretary of the Interior. Recent decisions have greatly disturbed the situation as regards patents flowing from Government work, and this particular plan probably cannot be exactly followed in the future, but in the past every effort has been made, and in the future will be made, to reserve in the interest of the public the maximum of rights, even though to these later and more expensive steps the monetary contribution of the Bureau is small. It may freely be admitted that this plan has drawbacks, but so far no better one has been found.

ASSURING RESULTS OF PRACTICAL VALUE

It is not thought advantageous that ideas developed in the Bureau laboratories should be put into books and left to accumulate dust. Nor has the Bureau been prepared to recommend, even if Congress could be brought to accept its recommendation, that the very considerable sums necessary for large-scale development of new ideas should be paid out of the National Treasury. That would be an easy way to waste, for everyone knows of the enthusiasm of the inventor, and Bureau investigators have as much human desire to see all their ideas tested in practice as have men in private life.

The plan now followed operates as a check on hasty or unwarranted expenditure on work beyond the relatively inexpensive laboratory-scale investigations, as no large-scale plant, and rarely even a semi-commercial plant, is built until some one actually in the business has enough faith in the idea to risk his own money on the test. This seems on the whole the best rough-and-ready method of making decision as to whether an idea is sound, and, if so, whether it can be fitted into current practice.

DESIRABILITY OF PROTECTING INVENTOR

Granted that it is desirable that ideas developed in the Bureau laboratories should be given a try-out in industry, it would seem hypercritical to insist that the men who developed them so far should have no part in their reduction to practice. If they do, they must either resign, in which case the Bureau loses what has been put into giving them experience, or they must be allowed to take part in the tests. The most feasible way of accomplishing this has seemed to be by arranging a carefully drawn contract for co-operation in the further development of the process or apparatus.

Another field in which there is extensive co-operation between the Bureau and those outside it, in this case mainly with individual companies, though occasionally with trade associations, is in the making of moving pictures. One of the functions of the Bureau is to disseminate sound ideas as to good technical practice, and a burden is also laid on it in regard to the economic development of the country. At first the Bureau employed a moving-picture photographer, and attempted to create a library of films showing best practice in mining as well as safe and unsafe methods. The technology of picture making soon got far beyond what it was reasonable for the Bureau to expend, and an educated public became at the same time intolerant of poorly made pictures. There was an era of faked pictures staged by people with little or no adequate knowledge of mining. These taught wrong practice. Incidentally, they were being used in places to promote the sale of fake stocks. It was felt that here was a responsibility that the Bureau should meet and that it should, if possible, get a reasonable number of fine pictures into circulation, if only to set up a standard.

FILMING THE MINING INDUSTRY

Having no funds for the work, the Bureau asked the co-operation of the industry, and this has been so generously given that within a year films costing more than \$100,000 have been made available. The arrangement is as follows: The Bureau detailed one man for part time to supervise the work. He hunted up a competent film maker and educated him to the needs and character of the work. The film maker invented and built necessary apparatus for the special work and then named a price for film based on the expected (and resultant) scale of operations as a whole rather than on each job.

Mining, smelting, and manufacturing companies interested in the mineral industry were invited to have films made which would picture good work and be truly educational. They have responded most generously to this invitation. The Bureau advises with them as to subject matter, scope, and technical problems and reserves the right to edit the film so that it will be worthy a place in the series. The contract for manufacture is made direct between the film maker and the company concerned in each case. The Bureau does not receive, nor does it handle, one cent of the money involved. It does ask, and does receive, a limited number of copies of the film, which it lends freely for showing to non-paying audiences. The borrower pays the transportation charges both ways. This circulation is not exclusive, and the co-operating firm is free to arrange for circulating any additional sets in any way it sees fit. In practice the firm usually has a long film made for inter-company use, and from this a shorter public film is compiled under the Bureau's direction.

PICTURES CARRY AMERICAN METHODS ABROAD

In the circulation of films the only expense met by the Government is in conduct of the necessary correspondence and in the minor repair of damaged films. Through the Pan-American Union and other agencies the films circulate abroad as well as at home, and I am persuaded they do a valuable work in spreading correct ideas as to American industries. Incidentally, the Bureau has several times been under the necessity of refusing to accept and circulate otherwise desirable

films because they were designed for advertising purposes. Any good film is an advertisement, it is true, but there is a difference between films in which the educational character is its main purpose and those in which this is merely brought in to carry advertising. The Bureau does not consider that circulating the latter is its function, and, admitting that differences of opinion are inevitable here as elsewhere, can merely plead that an honest attempt is made to live up to the ideals stated.

There are other points at which the work of the Bureau and private workers impinge, but enough has perhaps been said to illustrate the nature of the contacts. I would be glad to have suggestions as to any manner of arranging to cover the border field so as to make the Bureau most useful and to make the least possible incursion into any field properly occupied by private engineers, metallurgists, and chemists.

Cost of Tin Mining in Straits Settlements

The principal items of cost of tin delivered to the smelter at Penang or Singapore are labor, equipment and supplies, fuel, transportation charges, and government taxes, according to John A. Fowler, trade commissioner, in *Commerce Reports* of Aug. 20, 1921. Before the war the Chinese tin-mining coolie was satisfied to make approximately 55 Straits cents (1 Straits cent = \$0.0057 at normal exchange) a day when working on a day basis. The increase of living costs (especially the cost of rice) and the high prices secured for tin were the chief factors contributing to the rise in wages of tin-mine coolies to 1.33 Straits dollars (1 Straits dollar = \$0.568 normally) per day at the peak of the inflation in March, 1920. Rice prices have dropped considerably since that time, although they have not yet reached pre-war levels, and the price of tin has gone a little below the pre-war level. This general slump is reflected in the wage scale, the present day rate in the State of Selangor, where extraordinary transportation problems are not involved, is 80 Straits cents per day.

The high prices for tin led to the operation of properties that cannot be profitably worked at the present prices, and most of these have now closed down. It is impossible to get accurate information on the movement of labor, but the ability of the country to absorb the large numbers of coolies released from the tin mines and rubber estates is one of the anomalies of the time and speaks well for the recuperating powers of the British Malayan possessions. From information at hand it appears that there has been a reduction in the number of coolies employed in tin mining of approximately 30 per cent in the State of Selangor, and this figure may be taken as representative of the situation in Perak also. For some time there has been an extraordinary movement of Chinese tin-mine coolies to China, but this has ceased. The present time is offering an excellent opportunity to the mine operators to force wages down to as near pre-war level as possible. The success in this endeavor will be gaged largely by living costs, and it may be said that when rice and transportation charges reach pre-war levels wages may do so.

Under cost of equipment, supplies and transportation is included capital charges, depreciation, replacements and machinery supplies, such as oils, packing, and other incidentals. It is claimed that the cost of machinery

has increased during the war period by 150 per cent and more, and there is no present indication of a prospective decrease. Tip cars that sold in pre-war years at 70 Straits dollars each are now selling at 230 Straits dollars. The prices of spares, pipe, fittings, packing and lubricating oils, and all the sundries that make up a large part of the running expenses of a tin mining plant have not responded to the general economic depression in reduced prices that has been evident in other branches of mining.

Railroad freight rates were increased by 25 per cent for long hauls and on an increasing sliding scale for shorter hauls. Some of the miners claim that the increase for some short hauls amounts to 200 per cent. On April 15, a reduction of 10 per cent for hauls over 100 miles and 20 per cent for over 200 miles went into effect. Transportation by bullock carts, which enters into the cost of every article shipped to or from the mines, has increased in cost in proportion to other increases. Before the war a pair of Benali bullocks could be bought for 350 Straits dollars, but today they are bringing 800 Straits dollars a pair. It is claimed by some of the miners that this form of transportation has not responded to the general decline, but the price of wood and some other staple products of local production seems to indicate that bullock-cart transportation charges have declined to a considerable extent. The tax on tin is on a sliding scale, based on the Singapore market price for refined tin, concentrates from the Federated Malay States being fixed at a ratio of 72 per cent refined tin.

Irish Deposits of Gypsum

Five bores sunk at Knocknacran, about two miles from Carrickmacross, in County Monaghan, Ireland, early in 1921, proved the existence of a large deposit of gypsum, according to Consul F. T. F. Dumont in *Commerce Reports*. Bores put down at Lisaboe, County Meath, in prospecting for coal or other minerals disclosed a body of gypsum estimated by an expert of the Department of Geology at 1,000,000 tons. The Farney Development Co., Ltd., is said to have secured the mineral rights over this property and to be building a factory capable of producing twenty-five tons per day of plaster of paris. About 1,000 tons of high-grade gypsum has been quarried and is ready for manufacturing. Some large blocks of beautifully colored Irish alabaster have also been secured, and it is reported that the entire output of this product will be taken by the Irish Marble Co., of Kilkenny, for disposal among its customers.

Mining in Syria Unpromising

Notwithstanding reports at various times of rich mineral resources in Syria, operations conducted thus far have not justified such optimistic conclusions, according to Vice-Consul Frederick O. Bird in *Commerce Reports*. None of the workings have, in fact, proved financially successful. Minerals have been discovered and worked to some extent, but reliable engineers report that the quantity of such minerals is so small and the quality so poor that the continuation of operations of the concessions would prove unprofitable. Certain concessions, for instance, were worked prior to 1914, but ceased after a short period.



APPROACH TO STEAM-SHOVEL WORKINGS AT TOFO, COQUIMBO, CHILE

The Economic Situation of Iron-Ore Mining In Latin America

Development of the Iron-Ore Resources Dependent Upon Four Principal Factors—Chief Drawback of Latin-American Iron Ores Is Inaccessibility of Deposits—Summary of Distribution, Characteristics, Possible Reserves and Development of Principal Deposits

BY D. E. A. CHARLTON*

Managing Editor, *Engineering and Mining Journal*

IN A CONSIDERATION of the commercial possibilities of any iron-ore deposit it is necessary to take cognizance of certain factors, all of which have a decided bearing on the successful or unsuccessful outcome of the enterprise. This, of course, is true of any ore deposit, but owing to an unusually large distribution of iron ores throughout the world and to the extensive utilization of iron and steel as compared with the other metals, operations are necessarily on a greater scale, and the total tonnage mined during, say, a year's time aggregates a figure not reached by any other metallic ore.

These governing factors are as follows: Iron content; the presence of beneficial or deleterious constituents; size of deposits and applicability to mining methods; and the proximity to transportation facilities or treatment plants.

Although it has been variously estimated that metallic iron forms approximately 5 per cent of the earth's crust, the distribution is such that large deposits of commercial value are few, and the available resources can be increased only by new discoveries, extensions of the fields already known, or the development of present treatment processes which will make the lower-grade ores available. With regard to the latter it may, at this time, be advisable to mention that considerable

advance has been made, particularly in the United States, in the work of beneficiation of iron ores. Washing plants have received considerable attention, and the development of iron-ore concentration has added largely to the reserves of marketable ore which were hitherto confined to deposits containing a high percentage of iron.

In any prepared estimate of an iron-ore field the figures should properly include respective tonnages for the various grades, for such an estimate will serve as the best index as to what may be expected when the enterprise is placed on an operating basis. Thus we may have several million tons of iron ore averaging 60 per cent iron, a greater quantity averaging 50 per cent, and so on. In the aggregate the entire deposit may be calculated on a ton-per-cent basis and so used for comparative purposes. Necessarily the amount of reserves in an iron-ore field can be indefinitely increased by lowering the grade of the material to be included in the estimate.

THE EFFECT OF CERTAIN ELEMENTS ON IRON MAKING

In consideration of the beneficial or deleterious constituents of an iron ore it is necessary to regard the availability of material from the viewpoint of the furnaceman who is governed in his choice of ores by their effect on his ultimate product. Also, there enters into such a consideration the question of mixing ores

*Written especially for and published in the October, 1921, issue of *Ingeniería Internacional*.

of different composition, to obtain a suitable mixture which will react properly to the fluxes used. Thus it is that in furnace practice a low-iron, low-phosphorus ore may be mixed with a high-iron, high-phosphorus ore and a satisfactory pig iron may be obtained. Other constituents are also considered in mixing, but as the treatment of furnace practice does not properly come under the head of this discussion no attempt will be made to elaborate. However, a few words may be said with regard to the effect of certain constituents of iron ore.

In the basic process of steel making, phosphorus, within certain limits, is not detrimental, but this is not true in the acid process, where it is decidedly injurious. The presence of titanium carries with it the detrimental effect in the furnace of raising the temperature of fusion, which leads to greater fuel consumption and a heavier blast. Manganese, on the other hand, is beneficial, as it helps to get rid of the sulphur. A high silica content is an objection because of the limestone that has to be added to the charge to neutralize the acid constituent, thereby reducing the output per furnace and increasing the cost per ton of pig iron; but a carbonate ore is sought after, as it is either self-fluxing or can, if the lime is present in excess, be mixed with siliceous ores in a proportion required for a fusible charge. A self-fluxing ore containing 25 per cent of iron may be as valuable as, or even more valuable than, a refractory ore containing 35 or 40 per cent iron.

As with any ore deposit, regardless of its geological occurrence, the size exerts considerable bearing on its commercial value. Obviously, the richness is of little account if sufficient extent is not assured. When it is proved that a reasonable tonnage of ore having the proper content is present, the next step, and one which is necessarily supplemental to the size of the deposit, is that of determining whether or not a suitable method of ore extraction may be profitably used. In many cases the formation may be such that several methods are applicable; in which event the operator naturally chooses that best suited to his needs. This perhaps may include a combination of methods, and in any case is subject to careful study and planning.

FACTORS INFLUENCING PROMINENCE OF IRON DISTRICTS

In any mining operation the operator must bear in mind the disposal of his product, and, regardless of whether or not he himself may act as the selling agent, the delivery of the ore to the furnace or smelter is dependent on adequate transportation facilities. These must be provided, and at a cost sufficiently proportionate to the value of the ore to assure a reasonable margin of profit to those engaged in any part of the enterprise. Up to this point an iron-ore property may offer every promise—extensive reserves, desirable grades, and cheap mining methods—but if the distance to available furnaces cannot be covered at reasonable freight rates the property ceases, for the time being, to be an economic factor. On the other hand, the deposit may be so situated that coal, limestone, and other requirements in blast-furnace practice may be within easy reach; in which case there is opportunity for the upbuilding of a local steel industry. But it is characteristic of the steel centers that they are situated at the conjunction of waterways, markets, and coal fields. The pre-eminence of certain iron-ore districts is due to the size and comparative ease of mining of the deposits,

to nearness to transportation facilities, to development of automatic machinery, and to low costs on account of large-scale operations.

It is not the intention of this discussion to attempt a complete treatise of the subject of iron-ore mining in Latin America, but merely to point out certain facts that have a bearing on the subsequent development of that industry in those countries. There is little need of emphasizing the important part that iron and steel have played in the upbuilding of civilization, and there is no doubt that they will continue to remain the most potent factor in the world's business. The tremendous impetus given to the demand for steel products during the Great War shows every indication of continuing, and this is manifested by an increasing need of those products for industrial uses. Such a demand must necessarily be met by increased production of the raw material (iron ore), and with the gradual exhaustion of the older producing districts will come the development of the new. Obviously, those districts which can first fulfill the necessary competitive conditions will be the earliest to realize their commercial value. But in the meantime even those that lack the requirements necessary to place them on a commercial producing basis will undoubtedly receive consideration.

In order to formulate a general idea of the distribution of the known iron-ore deposits of Latin America, their characteristics, possible reserves, and development, the following summaries are given:

CERRO DEL MERCADO IS LARGEST MEXICAN DEPOSIT

According to figures presented to the Minister of Industry and Commerce in Mexico in 1918, 242,978,000 tons of iron ore were among the available mineral reserves of that country. This figure includes important deposits in the states of Lower California, Coahuila, Durango, Guerrero, Michoacan, and Oaxaca. In a report of mining claims in Mexico, made in the same year, it was stated that 425 iron-ore claims were held, although this figure does not include claims held for minerals other than, and including, iron ore. The iron and steel industry already has reached a point of importance in Mexico, and there is a considerable activity in iron mining. The largest steel plant—that of the *Compañía de Acero y Fierro de Monterrey*, situated in Nuevo Leon and operated by Spanish capital—secures its iron ore from Coahuila. The largest and best known iron-ore property is the *Cerro del Mercado*, situated near Durango City, which was taken over in 1920 by a Boston syndicate. This deposit is stated to be 3,600 ft. in length and 1,100 ft. wide, and is estimated to contain 200,000,000 tons of magnetic iron ore, assaying 63 per cent iron. Small iron-mining operations are being conducted in Hidalgo, Puebla, Vera Cruz, and Oaxaca, and active work has recently been started on the mines of *Las Truchas*, in the State of Michoacan. In Lower California the iron-ore deposits near San Isidro are extensive and considerable ore has been uncovered, although little actual mining has been done.

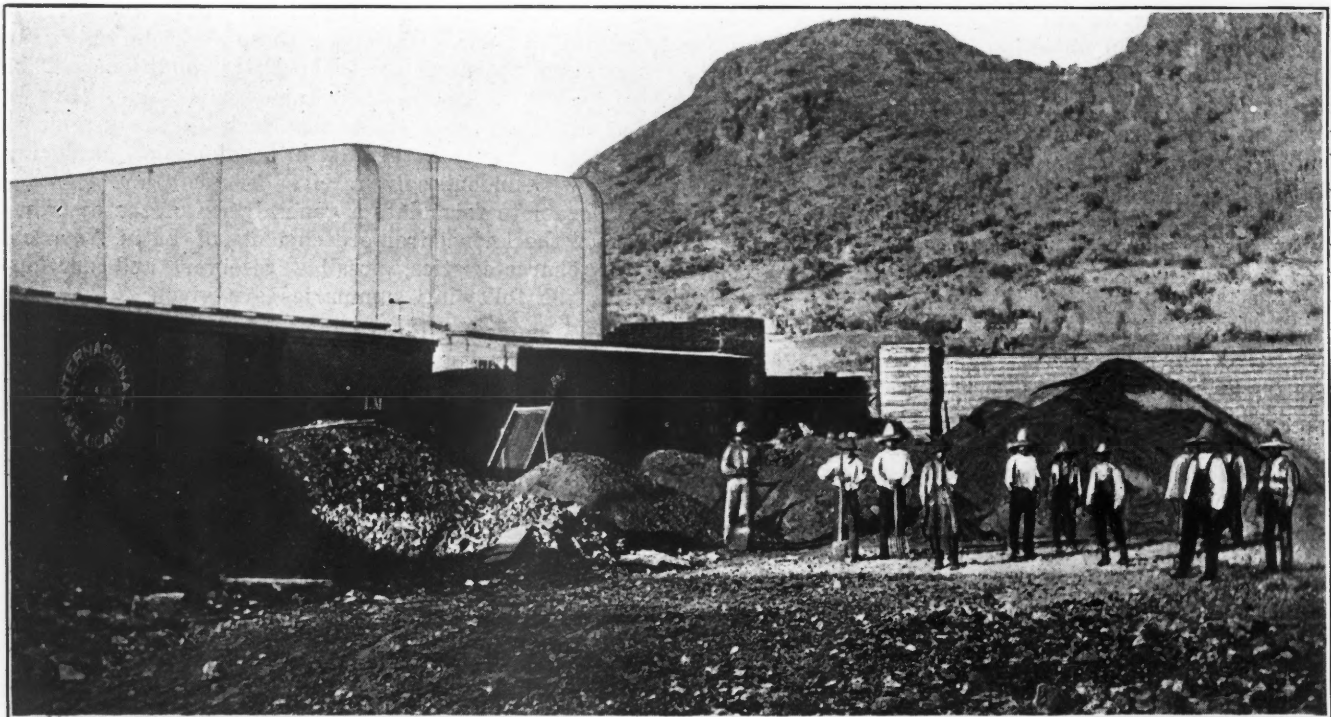
According to recent reports, American financial interests representing an important independent steel company are preparing to ship, by water, large tonnages of high-grade iron ore from a deposit adjacent to the Pacific Coast, in the State of Colima. Wharves are being built at the deep-water port which is being developed for ocean vessels. It is stated that a railroad will be constructed from the mines. Preparations are

being made by the Monterrey Iron & Steel Co., which has purchased a part of the great Iron Mountain at Durango, to make large shipments of the ore to its iron and steel plant in Monterrey.

CUBAN IRON ORES PRINCIPALLY IN THREE DISTRICTS

According to J. E. Spurr,¹ there are two principal groups of iron-ore deposits in Cuba: the magnetite and hematite ore on the south coast, and the brown ore, or limonite, on the north coast. All are near the eastern end of the island. The ores of Firmeza and Daiquiri, on the south coast, are mixed magnetite and hematite, averaging about 58 per cent iron and 0.03 per cent phosphorus. They are associated with igneous rocks. A determination of tonnage is difficult because of the irregularity of the orebodies and estimates of reserves range from five million to nine million tons.

reserves in the world. The most important are those of the State of Minas Geraes, which lie in an area roughly 175 kilometers square, the center of which is about 350 kilometers north of Rio de Janeiro. The principal iron-ore deposits of Minas Geraes are found in an iron-bearing quartzite called itabirite, which shows considerable folding, and occur as lenses interlayered with the quartzite. Some of these lenses consist of a high-grade, hard hematite, some are soft and powdery hematite, and others are soft hematite intermixed with sand and clay. Magnetite of high purity is also abundant. The outcrops consist mainly of the hard hematite, the softer ores usually not showing on surface. Blanket deposits, known as "canga," have resulted from the cementation of eroded material and iron oxide, and these cover most of the ore-bearing areas. These ores are principally hematite and



LOADING IRON ORE FOR SHIPMENT AT CERRO DEL MERCADO, NEAR DURANGO CITY, MEXICO

The brown ore of the north shore is hydrated brown hematite, a laterization product of serpentine. The dried ore averages about 46 per cent iron, 0.01 per cent phosphorus, and 1.7 per cent chromium. The reserve tonnage, estimated as high as 3,000 million tons, is mainly contained in the three large deposits of Camaguey, Mayari, and Moa. The principal deposits of Cuba are owned and operated by the Bethlehem Steel Co. Important undeveloped deposits are owned by the Buena Vista Iron Co. (Midvale Steel & Ordnance Co.), the United States Steel Corporation, the Guantanamo Exploration Co., and the Eastern Steel Co.

BRAZILIAN ORES NOW CONSTITUTE GREATEST UNTOUCHED RESERVES

It is of interest that the first iron foundry in the Western Hemisphere was established in 1600 at Ipanema, in the State of São Paulo, Brazil, and the ore used was obtained from that district. Iron ore exists in practically every state in Brazil, and the deposits constitute the greatest and richest undeveloped

limonite and average from 55 to 65 per cent in iron and are moderately high in phosphorus. It has been estimated that the reserves in the Minas Geraes district total 3,500,000,000 tons, most of which is of bessemer grade, having a low phosphorus content. Other important deposits exist in Parana, Bahia, São Paulo, Santa Catharina, Espirito Santo, Matto Grosso, Goyaz, and Rio Grande do Sul.

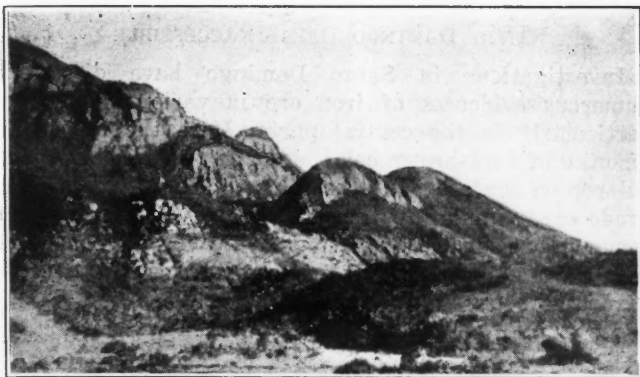
SEVERAL COMPANIES EXPLOITING BRAZIL DEPOSITS

Numerous companies have been formed for the purpose of exploiting the various deposits, and these include Brazilian, American, British, French, and German firms. Among those may be mentioned: the Itabira Iron Ore Co., the St. John del Rey Gold Mining Co., the Brazilian Iron & Steel Co., the Companhia Metallurgia Brasileira, the Minas Geraes Iron Syndicate, the Société Franco-Bressilienne, the Deutsch-Luxemburgisches Bergwerks und Hutton Aktiengesellschaft, and others.

Owing to the high cost of fuel and transportation the development has been slow in all of the districts, and

¹"Political and Commercial Geology."

only the higher grade ores have been mined to any extent. The Central Railroad of Brazil runs through the Minas Geraes district, but the heavy grades encountered have prevented extensive transportation of iron ores. Iron mining in Brazil has been favored by the passage of a decree in March, 1918, which provided government loans to further iron smelting and also agreed to arrange for minimum freight rates on machinery and supplies, as well as on the transportation of raw materials. Some progress is being made, in electric smelting of iron ore in Brazil. A recent report



IRON-ORE DEPOSITS AT MINAS GERAES, BRAZIL

states that two electric furnaces of a capacity of 3,000 kw. each are being installed, but the location of these is not stated.

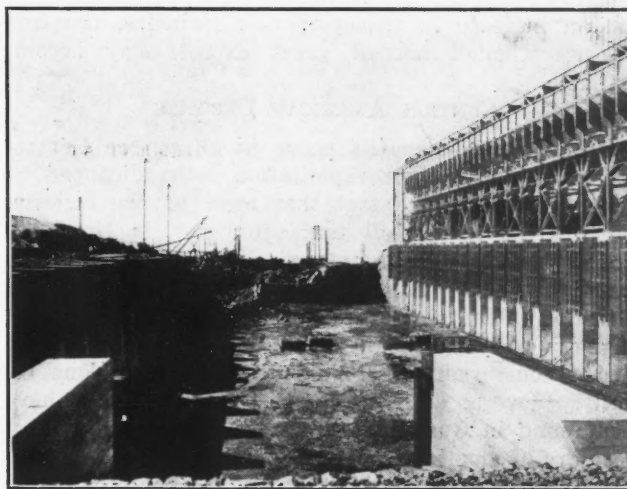
TOFO IRON DEPOSITS ACCESSIBLE FOR LARGE-SCALE OPERATION

The iron-ore deposits of Chile occur in the coastal mountain region, the principal deposits extending a distance of about 250 kilometers parallel to the coast. Most of the orebodies are inclosed as lenses in granitic rocks, and a few are in sedimentary rocks near the contact of igneous rocks. The largest deposit, Algarrobo, is owned by a Dutch-German syndicate controlled by William H. Muller and Gutehoffnungshutte, but the best known and most advanced, from the viewpoint of operation, is Tofo, which is under lease to the Bethlehem Steel Co.

The Tofo iron mines are situated at Tofo, in the Province of Coquimbo, and within about nine kilometers of the port of Cruz Grande. The mines, which comprise about 100 hectares, were previously owned by a French company, which made an unsuccessful attempt at smelting the ores, and finally suspended operation in 1911. In 1913 the property was taken over by the Bethlehem Chile Iron Mines Co. It is stated that explorations have shown a reserve of about 200,000,000 tons of ore, the average analysis being about 68 per cent iron and 0.05 per cent phosphorus. Mining at Tofo is open-cut work, as the ore is exposed and practically no stripping is necessary. The ore, after being mined and crushed, is hauled to storage bins at Cruz Grande and there discharged through chutes to the ore boats. An electric power plant which uses oil-fired boilers is situated at Cruz Grande and furnishes the mine with 22,000 volts over a transmission line nine kilometers long. This plant also serves the electric railway, forty kilometers in length, used for hauling ore from the mines, and provides the necessary power for the operation of the crushing plant, and other complementary machinery.

According to investigations² conducted by the government in Peru, that country may be favorably viewed by the iron miner. Not only are some of the deposits comparably of a high order, but the proximity of coal and limestone in certain districts offers good opportunity for the upbuilding of a steel industry. There are also deposits of vanadium, tungsten, and molybdenum in good quantity. At Tambo Grande, in the Department of Piura, there is a conglomeritic deposit made up of quartzite pebbles in a hematite cement, the latter assaying about 51 per cent iron. Although there is lime and coal in that region, the iron deposit is small, and little work has been done. The deposits at Aija, in the Department of Ancachs, consist of veins of magnetite containing a small quantity of pyrite, which is easily separated. The lack of fuel in the immediate neighborhood and the absence of a railroad naturally hamper development in this district. North of Aija are the iron deposits of Callycancha, also in the Department of Ancachs. These deposits consist of three parallel veins, the outcrops of which can be followed for 600 meters. Assays of the iron oxide forming the filling material of the veins show from 51 to 70 per cent iron, high silica, and 0.25 per cent phosphoric acid. The veins appear to continue the Callejon of Huaylas, the valley on the east of the Cordillera-Nebra, which is a short distance from coal and lime deposits and is also contiguous to the Santa River, which can supply considerable water power.

One of the most important iron deposits in Peru is at Huancavilica, in the Province of Huancayo. This deposit is situated within close proximity of the Mantaro River, and is also accessible from the Central Railway of Peru. The ore is principally red hematite with small amounts of pyrite. Lime of good quality is abundant, and the immediate coal fields of Jatunhuasi make the situation a particularly favorable one. Water



LOADING DOCKS FOR TOFO IRON MINES OF BETHLEHEM CHILE IRON MINES CO. AT CRUZ GRANDE, CHILE

power is also available from the Virgin and Mantaro rivers.

The deposits at Marcona, in the Province of Ica, have been estimated at 500,000,000 tons. The ore is a good grade hematite, having a low phosphorus and low sulphur content. From reports it would appear that

²From a report prepared by Dr. J. J. Bravo, Director of the Corps of Engineers of the Peruvian Government. See *Engineering and Mining Journal*, Feb. 5, 1921, pp. 263-266.

an excellent opportunity exists for open-pit mining, and, because of the short distance to the sea, the problem of transportation is not one of great difficulty. The exploitation of coal fields at Huayday will doubtless exert considerable influence on the active development of the Marcona iron field.

Among the favorable features which will affect iron mining in Peru is the liberal attitude held by the government with regard to taxes, mining laws, and concessions.

DEPOSITS IN NORTH COASTAL REGION OF SOUTH AMERICA

Deposits in Colombia, Venezuela, and the Guianas offer certain possibilities, principally on account of their proximity to the coast. In Colombia the ore-bodies appear to be of considerable extent. These occur in the Department of Cundinamarca, in which Bogota is situated. Other deposits have been located, but these are inaccessible, because of inadequate means of transportation. Small deposits of brown ore, similar to the Cuban ores, are reported as existing in the Guianas. The principal iron-ore deposits in the north coastal region are those in the eastern part of Venezuela, in the delta region of the Orinoco River. This district has attracted considerable attention from outside capital for the last twenty-five years, but, owing to political disturbances and difficulties of transportation, the deposits have not received the development warranted. The ore is mainly hematite averaging about 65 per cent iron and occurring in lenses.

URUGUAY AND PARAGUAY

North of the City of Minas, in Uruguay, micaceous iron schists are known to exist, and other types of iron ores are also found in various sections of that country. Large pockets of good-grade hematite are found in the Department of Cerro Largo. In Paraguay little mining is done at present, but with the continued development and an increase in transportation facilities, the iron deposits, though not of great extent, may become available.

CENTRAL AMERICA'S DEPOSITS

Although iron deposits occur in all of the Central American states, their exploitation is handicapped by lack of fuel and the fact that most of the deposits are, relatively, of small size. However, in Honduras the so-called "Iron Mountain" of Agalteca, situated about forty-eight miles northwest of Tegucigalpa, is estimated to contain several million tons of high-grade magnetic ore. A company was organized to exploit this deposit some years ago, but little has been done recently. Several deposits of merchantable grade have been found in Guatemala and also in Costa Rica, but these are of small extent.

In Hayti there are several small deposits that offer some promise, but these, according to Eckel,³ are relatively unknown commercially. Deposits in Jamaica and some of the other West Indian Islands are of little importance.

LACK OF TRANSPORTATION HANDICAPS PORTO RICAN DEPOSITS

In Porto Rico the iron deposits are scattering, and their development is mainly dependent on adequate transportation. The districts around Guayama and

Humacao are particularly rich, and the best indications of iron ore extend from the eastern end of the island toward Juncos for nearly ten miles. In this district considerable prospecting has been done, and it has been proved that ores are present in sufficient quantity to make working profitable if adequate transportation can be provided. The ores are chiefly hematite and magnetite, assaying about 60 per cent in iron and low in phosphorus and sulphur. There are also deposits on the south side of the island not far from Ponce, but here also there is need for transportation to assure marketing of the ore.

SANTO DOMINGO ORES INACCESSIBLE

Investigations in Santo Domingo have disclosed numerous evidences of iron ore in various districts, particularly in the central part. Here the ore is a limonite of dark-brown color, occurring in blocks which outcrop on surface. In other parts of the country low-grade ores, similar to those found in Cuba, are quite common, but as most of those areas are now inaccessible they have not attracted attention, and cannot be regarded as being of immediate promise.

GENERAL SUMMARY AND CONCLUSIONS

From this brief review it will be seen that already considerable headway has been made in iron mining in Mexico, Cuba, Brazil, and Chile, and although, judged from a production basis, the iron districts of these countries have not yet attained the prominence of the older established fields, they will undoubtedly play an important part in the future iron-ore history of the world. The development of iron-ore mining in the other countries of Latin America is dependent upon the several factors which were mentioned in the early part of this discussion, and also on the ability of the operators to compete with those who are already in the producing field. It may be expected that the tendency in those countries will be more toward local steel industries than toward the development of an export trade.

The several methods for the removal and concentration of iron ores now in use in established fields offer a variety that should make the production problem of the iron-ore operator an easy one. Underground, open-pit, and a combination of both methods of mining have been developed to a high degree. Wet and dry concentration of iron ores are established practices in most of the districts. There are drawbacks such as taxes, labor difficulties, and adverse market conditions, but these are to be expected and are encountered in most mining enterprises.

Iron mining is not a "poor man's game," for primarily it is one involving the production of large tonnages, and these cannot be obtained without the use of extensive equipment. Several of the deposits existing in the various countries of Latin America already show available ore in sufficient quantity to justify the expense of immediate development. Others await exploration, and in some cases much time and money must be spent before further capital can be justifiably applied for development.

In conclusion it may be said that the possibilities for the further development of an iron-mining industry in the countries under discussion are most favorable so far as natural resources are concerned. However, much will depend on fair and reasonable legislation and on the manner in which all branches of the various operations are conducted.

³"Iron Ores; Their Occurrence, Valuation and Control."

BY THE WAY

Hamlet and Hayden

Shakespeare, hell, and mining claims were linked by Representative Hayden, of Arizona, in the House recently, when he pointed out the advisability of ending the assessment work year at noon instead of midnight. "Rights to mineral claims henceforth will be initiated," said he, "when the sun is at meridian height, instead of at that time of night 'when churchyards yawn and hell itself breathes forth contagion to the world.'" This is a new thought. Anyone glancing at the interminable list of seemingly interminable lawsuits over mining property would be justified in thinking that the mineral rights involved had had their beginnings in iniquity with Satan looking on. But an excellent chance is afforded of studying the geology of local strata when churchyards yawn, if the churches happen to be in mining communities.

Mr. Bellows Roars

The w.-k. bard of Avon would probably exclaim "Well roared, lion!" again upon reading the latest statement of the California Commissioner of Corporations in regard to George Graham Rice, if it were at all possible for him to exclaim anything. Bingham-Galena is, of course, the commissioner's theme, and after stating wherein George, or Jake, to be exact, has erred, he says: "In offering this stock for sale here without a permit from E. C. Bellows, Commissioner of Corporations, both Rice and Child, Barclay & Co. violated the Corporate Securities Act of this state, and if they desire to test the virtue of this act, they have only to place themselves within the jurisdiction of the California courts, where warrants await them." Even at the risk of hurting Mr. Bellows' feelings, we can't help saying that though the act be virtuous, it is slow in acting. In fact, the whole procedure in California reminds one of nothing so much as locking the stable after the horse is loose. "Any stock proposition polluted by the touch of George Graham Rice and his associates will be regarded with grave suspicion in California," continues the commissioner, to which we add, "even as every Rice proposition has long been regarded in other parts of the country." Mr. Bellows concludes: "It has been stated that nothing was ever created in vain, but California investors incline to the opinion that the hand of Providence slipped a cog when George Graham Rice put in an appearance." The hand must have slipped a cog indeed. Providence should look after its gears at once.

Oddities of the Northwest

A wonderful deposit of something or other 2 to 20 ft. thick has been located in Idaho by residents of Buhl. It occupies 120 acres of what is thought to be an old sea bed. The mineral is said to work up like fine flour or talcum and has qualities which make it valuable for silver polish, window wash, tooth powder and soap. One expert is quoted as saying that it will make an egg food surpassing anything on the market today. From this we suspect that it is merely hennatite of the oolitic variety. And, by the way, the R. & R. Placer Association at Grant's Pass, Ore., informs us that it has

deposits of olympium, to say nothing of the platinum group of metals. We are still guessing about olympium, but suspect it is the stuff from which Mr. Heath, at Billings (or is it Helena?) reduces his element wilsonium.

An Explanation

What's the good of having kind intentions when some one with a chip on his shoulder is constantly mistaking them for bad? Some time back we inadvertently mentioned Cousin Jacks and mules in the same breath, not to be disparaging the former or praising the latter, but simply because we happened to be thinking about carrots, which naturally brought the two to mind at the same time. A mule would leave home for a carrot, and anyone who has ever tasted a Cornish pasty knows that one without a carrot is like a kiss without whiskers or an egg without salt, or like many another thing without something indispensable. That's all we meant; yet T. Bray, of Camborne, has written us very excitedly, wishing to know if it were our intention to cast insult at the entire fraternity of Cornishmen. No indeed, Mr. Bray. We have the highest admiration for the Cornish miner, individually and collectively. The backbone of the industry is Cornish, and without the Cousin Jack the mining world wouldn't be what it is today; that is, it would be a whole lot worse. As it is, the Cousin Jack has made it a decent place to be merry in. To prove this we close our explanation with another of D. E. A. C.'s reminiscences of Cap'n Dick:

THE PERSONAL PRONOUN

"Time an' again," said Cap'n Dick, "I do 'ear discussions baout 'ow words should be used an' w'ot a man should say w'en 'ee wants to be a-sayin' sumthin'. Tha 'ole bloody thing looks to me like as though the mos' h'important part wuz tha h'ununerstanin' o' w'ot a chap is meanin'. Moor o' this 'ere clarity o' h'expression is w'ot we wants, m'son. I remember one time in tha Copper Country w'en tha Trevarthans moved h'out to tha Mo'awk location, an' took tha 'ouse nex' to tha Joneses. Mrs. Jones wuz one o' these 'ere fussy body's, an' she wuz very much 'eated w'en tha young Trevarthans started playin' right below 'er window. One day, h'out she come an' h'ordered them h'over h'in their h'own yard. Mary Jane Trevarthan speaks right h'up to tha res' an' sez, 'Ear 'er a-h'orderin' we. Us don't belong to she.' Now, dam-me m'son, there might be some 'oo couldn't make that h'out, but any chap 'oo h'unnerstan's tha h'English language couldn't fail to naw wo't wuz meant."

A Step in Metallurgy

Dean Francis A. Thomson, of the School of Mines at Moscow, Idaho, submits the following from a would-be research fellow:

"In the issue of the ——— appears an artical of what your University is offering in Re Research Fellowships. you mention this only applies to students. This is disapointing as if it was open, I would want to get in and show you that I have Patents for a System that covers All you Mention.

"I own the Patent on a Dry ore Seperator and Concentrator That will give you 99.099. A perfect seperation. I have a ore Dryer and a wet ore seperator for Placier mining.

"I break, I Roll, I Screen and I seperate. I do all this for cents per ton that by any other system costs dollars.

"No more Rotten German oil Flotation no Poisonous Cynade or Cloronation. Myself and a helper do all the work of 1000 tons per day. Tell me how you can be Interested and I will give you all the attention in my power."

CONSULTATION

Magnesium, Its Production, Uses, And Prospects

"Is magnesium widely used in industry? What companies produce it, and how? I would greatly appreciate any information you may give me regarding the development of the industry in the United States and what its prospects are."

Magnesium is one of the commonest metals of the globe. Magnesium reserves are practically inexhaustible, but the metal has a limited application, and only in the last six years, under stimulus of war, has any attempt been made to produce it in this country, to expand its uses, and to learn more about its general characteristics. Formerly Germany, as with many other commodities, furnished the bulk of the American supply of magnesium.

Production of the metal in the United States is confined to two companies. They are the American Magnesium Corporation, affiliated with the Aluminum Company of America, at Niagara Falls, N. Y., and the Dow Chemical Co., Midland, Mich. The American Magnesium Corporation is the largest producer, and markets its product in both stick and powdered form. Only a small part has been sold as alloys and castings. The Dow Chemical Co. has produced the stick form of magnesium, for experimental purposes, for various automobile and aircraft manufacturers. There was no appreciable production in the United States prior to 1915. Since then the output has been as follows, according to the U. S. Geological Survey:

METALLIC MAGNESIUM PRODUCED IN THE UNITED STATES, 1915-1920

Year	Number of Producers	Quantity, Pounds	Value	Average Price per Pound	
				Stick	Powder
1915.....	3	87,500	\$440,000	\$5.00	.....
1916.....	4	75,400	311,462	4.13	.....
1917.....	5	115,813	233,626	2.02	.....
1918.....	4	284,118	615,217	1.81	\$2.67
1919.....	3	127,465	247,302	1.83	2.85
1920.....	2	(a)	(a)	1.60	2.75

(a) Permission to publish withheld; slightly less than 1919.

Magnesium is not found native, but is a common constituent of many minerals, the chief ones being brucite, magnesium hydroxide, containing 69 per cent MgO; magnesite, the carbonate, containing 47.6 per cent MgO; kieserite, the sulphate, containing 29 per cent MgO; and carnallite, the chloride, containing 16½ per cent MgO.

Two methods are used in the United States for producing magnesium. The Dow Chemical Co. uses the chloride, and the American Magnesium Corporation the oxide of magnesium. Hydrous magnesium chloride, which is obtained by the Dow Chemical Co. as a by-product from its salt and bromine industry, is mixed with common salt in the proportion of 4:1 and with a small quantity of ammonium chloride, and heated in shallow vats over a slow coal fire to remove about 50 per cent of its combined water. A second furnace is used completely to dehydrate the chloride, and the metal is produced by electrolysis of the fused magnesium

chloride in a bath of common salt and ammonium chloride. Graphitized carbon electrodes are used as anodes, and cylindrical sheet-iron cells containing the bath serve as cathodes. Formerly carnallite was imported for the purpose of producing magnesium.

The metallurgy of magnesium as well as its properties closely resembles that of aluminum, and cheap electric power is necessary for its economical production. The American Magnesium Corporation has worked out a process using magnesite, or the oxide, which it obtains from the Pacific Coast in a calcined form. The metal is produced electrolytically in a bath of fused fluorides, the oxide going into solution and being decomposed by the electric current. Power consumption is high, and the main advantage is in the low cost of raw materials. The metal may be refined by remelting the magnesium ingots produced, in small retorts.

The U. S. Tariff Commission estimates that existing plant equipment represents a capital investment of over \$2,000,000 and that large sums have been spent for experimental purposes and discarded equipment. The General Electric Co. and the Electric Reduction Co. of Washington, Pa., were prepared to produce magnesium when the Armistice was signed.

Magnesium is used mostly as a scavenger (due to its great affinity for oxygen) in the manufacture and use of the non-ferrous metals and alloys, particularly nickel and brass, but it finds notable employment in alloys designed for lightness and strength. Magnesium is only two-thirds as heavy as aluminum, and resembles it closely in appearance.

Alloys of magnesium are in demand in aircraft construction. The skeleton of the first dirigible to cross the ocean, the British R-34, and gaffs of the yacht "Resolute," which carried off the honors in last year's cup races, were made of a magnesium-aluminum alloy. In the form of powder, magnesium is used for flashlight photography, pyrotechnics, star shells, and projectiles.

As an alloy with aluminum, magnesium is said to make it stronger, giving it a fine grain. Alloys of aluminum and magnesium containing 5 to 30 per cent of Mg have approximately the same mechanical properties as brass. Hardness increases with magnesium content, and with 70 per cent magnesium the alloy is as hard as mild steel. It is reported that a very promising application of magnesium aluminum alloys is for hydraulic valve fittings usually made of brass and bronze. Besides being as serviceable as the brass, it is cheaper. Aluminum and its light alloys are described in *Chem. and Met. Eng.*, Vol. 19, No. 8, Oct. 15, 1918.

Producers maintain that magnesium is in the position that aluminum occupied a few years ago, and that as the demand for the metal continues to grow and its application becomes better understood the price will be cheapened. Competition from Germany in the future is expected to be particularly keen, as that country will no doubt make a strong bid to recover the trade which it controlled before the war. Germany is in an excellent competitive position.

HANDY KNOWLEDGE

A Review of Drilling—Part IV*

BY GEORGE J. YOUNG

Western Editor *Engineering and Mining Journal*

DRILL STEEL CHANGES

Sets of drill steel are arranged in length increments of 1 to 2 ft. and longer where a feed-screw length of 2½ ft. is used.

Tests should be made to determine the maximum and average distances drilled by standard bits in the different kinds of rocks in a mine. This data will enable standard drill steel sets to be made for holes of various depths. For hard, tough rocks the change increment is usually 1 ft. and for intermediate rocks, 2 ft. The fewer the steel changes, the greater the time saved in drilling a hole of given depth. In Fig. 1, *Engineering and Mining Journal*, Sept. 10, p. 420, the bit diameter for 6-, 8-, 10- and 12-ft. holes is shown for six and twelve changes of steel per hole. It is evident that for the shorter increment the number of drill steels

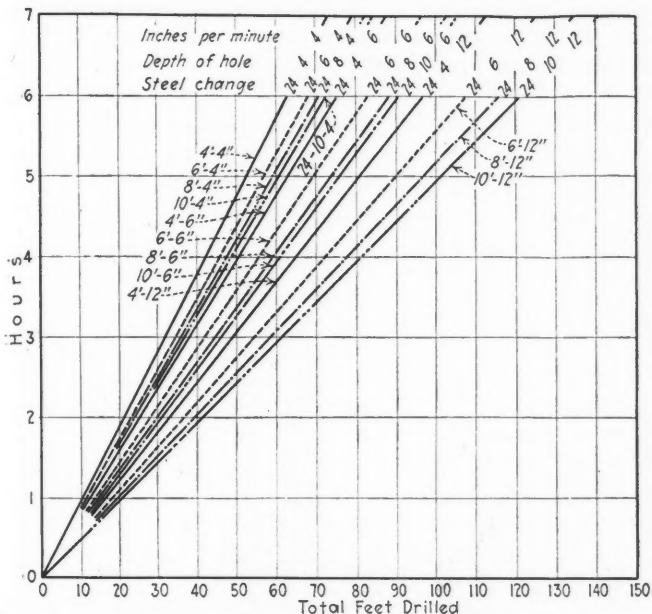


FIG. 2. FOOTAGE DRILLED BY DRIFTER, WITH 24-IN. STEEL CHANGE, HOLES OF 4, 6, 8 AND 10 FT. DEPTH AND DRILLING RATES OF 4, 6 AND 12 IN. PER MINUTE

per hole is doubled, this calling for a greater time in changing steel, more time in getting steel to and from the working and a greater amount of blacksmithing.

DIAMETER AND DEPTH OF DRILL HOLE

The starting diameter of the drill hole is determined by the reduction of drill diameter for successive drills, the drill-steel change length, the depth of the drill hole and the diameter of the powder used. The most commonly used powder sizes are 1¼ and 1½ in. diameter. Occasionally 1 in. is used. In any one mine the cartridge size is usually constant. The bottom diameter of the drill hole is thus from 1½ to 1¼ in. in diameter.

*Continued from Sept. 10 issue.

Drill bit sizes vary by ½ or ⅙ in. With hammer drills and well-designed bits a ⅙-in. decrease in size per drill is usually all that is necessary, providing the blacksmithing is all that it should be. With twelve drill steels, a 12-ft. hole would require a starting diameter of 2 in. for a ⅙-in. change in bit diameters. The smaller the starting diameter, the greater the drilling rate and the lower the cost per drill hole. There is economic waste in rock drilling due to using starting

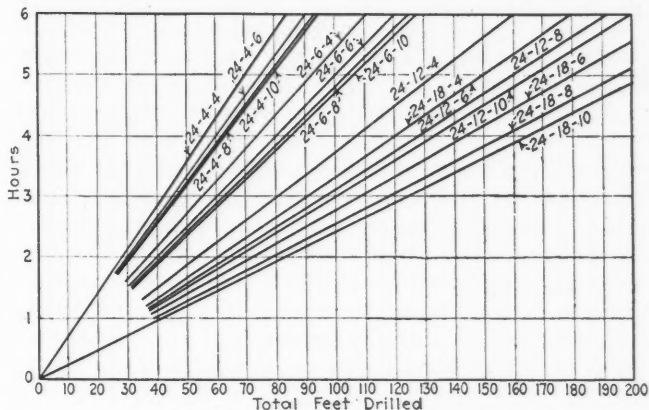


FIG. 2A. FOOTAGE DRILLED BY STOPER, WITH 24-IN. STEEL CHANGE, HOLES OF 4, 6, 8 AND 10 FT. DEPTH, AND DRILLING RATES OF 4, 6, 12 AND 18 IN. PER MINUTE

diameters unnecessarily large. Experimental work in standardizing drill diameters to suit the conditions of a given mine is essential, if drilling costs are to be reduced to a minimum.

The depth of the drill hole is determined by blasting conditions. In drifting, 6 to 7 ft., in raising, 6 ft., and

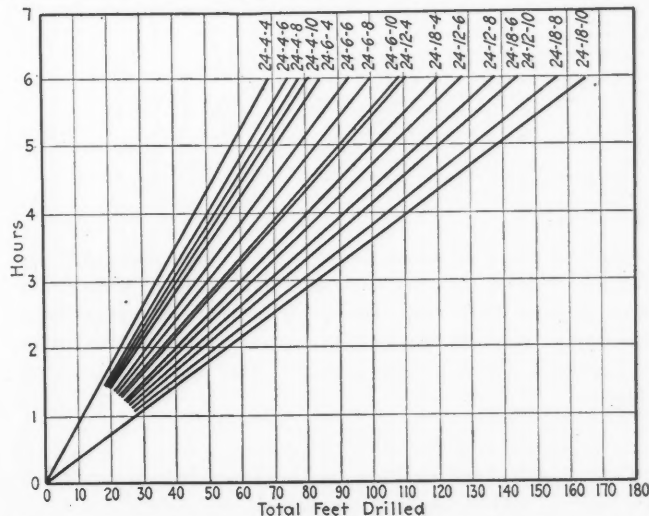


FIG. 2B. FOOTAGE DRILLED BY PLUGGER, WITH 24-IN. STEEL CHANGE, HOLES OF 4, 6, 8 AND 10 FT. DEPTH, AND DRILLING RATES OF 4, 6, 12 AND 18 IN. PER MINUTE

in shaft sinking and stoping, 6 to 10 ft. represent prevailing practice underground.

Actual drilling time in an eight-hour shift ranges from three to four hours. Setting up a drill upon a column requires from thirty to forty minutes; taking

down, somewhat less; loading holes, one hour, and barring down at the beginning of a shift, from thirty minutes to one hour. One man is required for operation of the drifter, stoper, or plugger. In some instances he is given assistance in setting up the column in drifting work and in stoping where the drifter is used. Where light drill mountings are used, assistance is usually unnecessary. Drill steel is distributed by tool carriers or "nippers." Efficient tool and powder distribution increases effective drilling time and co-operation on the part of the mucker facilitates setting up the drill. Fig. 2 indicates aggregate footage drilled by drifter, stoper, and plugger for holes of various depths and different drilling rates. These charts must not be interpreted too literally, as they have been computed with the object in view of permitting a visualization under certain assumed conditions of the quantitative side of drilling. Actual charts for operating conditions in a given mine would no doubt depart greatly from those given. For a given drilling time with all types of drills, the deeper the drill hole, the greater the aggregate footage. This is due to fewer changes of the position of the drill. Necessarily, faster drilling rates give greater aggregate footages. Stoppers and pluggers give greater footages than drifters, as less time is required for shifting and steel changing. With the drifter, eleven to fifteen holes, 4½ to 5 ft. in depth, or from 55 to 75 ft. of drilling; for the stoper, twelve to fifteen 6-ft. holes, or a total footage of 72 to 90 ft.; for the plugger, 60 ft. per man-shift are fair performances in medium hard rock.

B. F. Tillson gives the drilling rates in feet per shift for the Franklin and Sterling Hill mines of the New Jersey Zinc Co. His tables have been condensed to the following:

	Ft. per Drill Shift	Cu. Ft. per Ft. Drilled	Cu. Ft. per Lb. Drill Steel
Franklin Mine:			
Drifts (1½ in. hollow round).....	121.2	1.51	23.9
Raises (¼ Q. O. solid).....	118.1	0.93	....
Stopes (¼ Q. O. hollow).....	117.9	7.16	....
Top slices (¼ Q. O. s. and h.).....	96.2	2.86	....
Average.....	106.6	4.44	60
Quarrying (1½ hollow round).....	101.1	11.18	71.9
Average—all.....	106.4	4.67	49.7
Sterling Hill Mine:			
Drifts (1½-in. hollow round).....	151	1.71	....
Stripping.....	122.9	3.96	....
Total average.....	145	2.1	47.10
(¼ in. Q. O.)			
Stopes.....	78.1	9.85	....
Stripping.....	86.7	3.5	....
Raising.....	129.1	0.91	....
Total average.....	96.5	5.24	34.25

The results as compared with those obtained in Western mines are high, and consideration should be given to the fact that the rock broken is crystalline limestone, a rock which is softer than most rocks encountered in Western mines. The stopes are also wide.

ROUNDS

The objective of drilling is the breaking of rock by explosives. Mere drilling footage is secondary as compared with the proper placing of drill holes. It costs just as much to drill a poorly placed as an effectively placed hole. The close observation of the physical features of the rock and the determination of the number, distribution and depth of holes constituting a round are essential factors in attaining low drilling costs.

Standard rounds and the so-called blueprint round are all efforts in the right direction. Foremen, shift bosses, and engineers can effectively co-operate in

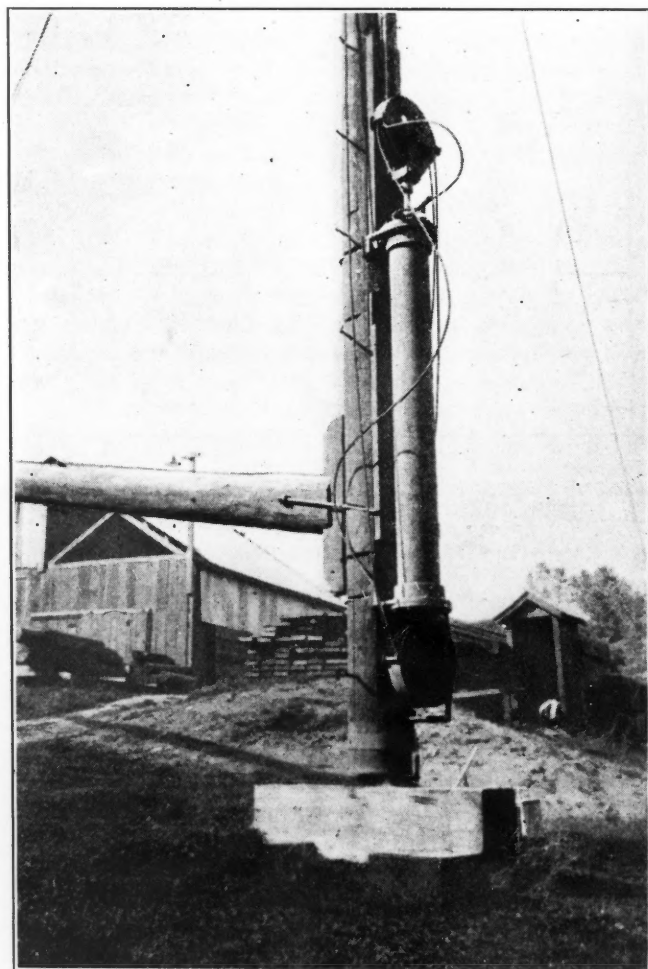
systematizing drifting, raising, shaft sinking, and stoping in a given mine. Every foot of drill hole should contribute its proper share in ground breaking. The ratio of cubic feet of ground broken per foot of drill hole is indicated for the New Jersey zinc mines in the preceding table. Greater footage per unit broken is required in restricted workings such as raises, drifts, and winzes and shafts. At the North Star mine, in California, Bedford and Hague give a ratio of 3.6 ft. per ton (1 ft. drill hole to 3.6 cu.ft. broken) for narrow stopes in hard granodiorite and quartz, or twice the amount of drilling footage for the same volume broken.

To be continued

Air Cylinder Operation of Boom Derrick

Written for Engineering and Mining Journal

At the Old Eureka mine, near Sutter Creek, Cal., a boom derrick is used in the timber yard for handling 16-ft. mine timbers. The timbers are lifted from the truck by the derrick and stacked in a pile, which is formed concentrically with the mast of the derrick. The timbers are removed in the same way as needed. To operate the hoisting cable quickly, an air cylinder is attached to the mast of the derrick, as shown in the illustration. On the bottom head of the air cylinder, two sheave pulleys are carried by bearings and an axle. On the end of the piston rod a pair of sheaves and bearings are also mounted, together with a crosshead, which operates in a pair of guides. The cylinder is approximately 10 in. in diameter and of 6-ft. stroke. This gives a cable lift of 24 ft. In place of an air cylinder, a Tugger hoist would be an excellent substitute.



BOOM DERRICK OPERATED BY AIR

THE PETROLEUM INDUSTRY

Decrease in Petroleum Production and Prevention of Lower Prices Considered Encouraging

WASHINGTON CORRESPONDENCE

The Federal Reserve Board has recently issued an analysis of the business situation and has the following to say in regard to petroleum:

"Although production of crude petroleum during the month of July continued in excess of consumption, a slight but gradual decline was noticeable. This decrease in production, together with the halt in the tendency toward lower prices in the petroleum industry, is considered encouraging by the producers. The fall in prices during July averaged 12 per cent for crude petroleum and 5 per cent for leading refined petroleum products. Since the peak was reached last October, the average price of crude petroleum in the United States has receded 64 per cent.

"A favorable feature in the oil situation has been the good demand for gasoline, which has been running about 10 per cent in excess of the requirements during the corresponding period last year. However, it must be remembered that this is the season for the greatest consumption of gasoline. Production figures compiled by the U. S. Geological Survey show that production of crude petroleum in the United States for the month of July was 111 per cent of that for July a year ago, or 40,228,000 bbl., as compared to 36,203,000 bbl. The number of oil wells completed in July, however, showed a drop of 748 wells, as compared with July, 1920.

"District No. 12 (California) reports that 76 new wells, with an initial daily production of 19,675 bbl., were completed during the month of July, but five wells were abandoned. California reports an average daily output of 331,252 bbl. of crude petroleum for July, as compared with 337,625 bbl. in June and 279,169 bbl. in July, 1920. District No. 10 (Kansas City) states that production of crude oil in the Kansas-Oklahoma and Wyoming region showed a daily average production of 419,250 bbl. in July, in comparison to 394,000 bbl. daily production in July a year ago, and production in Wyoming alone has been reduced to less than 50,000 bbl. per day. The number of new wells completed in the district was only about 56 per cent of those that were completed during July, 1920.

"The Midcontinent field exceeded all previous records, with a total production of 25,594,982 bbl., although a decrease in monthly yield and daily average was registered by all Texas fields with exception of the North Texas group. In this district only 251 new wells were completed during the month, in comparison with 868 wells in July, 1920. With the price of oil at the present low point, the cost of drilling deep wells, particularly those of low productivity, is almost prohibitive. In nearly all the oil fields the outstanding feature is the continued increase in stored stocks of petroleum."

Russian Petroleum Production

SPECIAL CORRESPONDENCE

Recent reports of Russian petroleum production leave much to be desired. The output in 1921 in the three principal districts of Baku, Grosnyi, and Emba was stated to be as follows:

PETROLEUM PRODUCTION IN THE BAKU FIELD

1921		Estimate	Production
January.....	13,730	12,861	
February.....	14,095	12,296	
March.....	14,115	13,448	
April.....	13,960	13,347	
	55,900	51,952	

Reported production, 95 per cent of estimate

The total annual production of the Baku district will probably amount to from 150 to 160 million poods.

PETROLEUM PRODUCTION IN THE GROSNYI FIELD

1921		Estimate	Production
January.....	11,900	4,018	
February.....	14,095	5,278	
March.....	10,314	6,908	
	36,309	16,204	

Reported production, 45 per cent of estimate

The total annual production of the Grosnyi district will scarcely reach about 40 billion poods.

PETROLEUM PRODUCTION IN THE EMBA DISTRICT

1921		Estimate	Production
January.....	0.050	0.028	
February.....	0.150	0.088	
March.....	0.300	0.072	

These figures, which are given by the Soviet government, show how the production has decreased in Russia. Almost complete lack of means of transportation is adding to the difficulties.

Oil Operations in Western Canada

SPECIAL CORRESPONDENCE

Captain E. J. Edwards, Senior British Trade Commissioner at Montreal, has received from the Winnipeg branch a detailed report on oil operations in western Canada, dealing mainly with the work of the Imperial Oil Co. The fields in which this company is interested are given as follows: In Saskatchewan at Consul; in Alberta at Pouce Coupé, Brazeau, Coal Spur, Irma, Monitor, Nanton, Okotoks and Pincher Creek; on the Great Slave Lake at Windy Point and Pine Point; in the Mackenzie Basin at Fort Norman. A total of about 300,000 acres is reported to have been staked at Fort Norman, 100,000 by the Imperial and 200,000 by other companies and individuals.

In the Peace River fields several wells are being drilled, most of which have struck small quantities of oil. Only three are working at present, the San Joachim, the Victory and the Peace River Petroleum Co. wells; but the Imperial Oil is believed to be negotiating to take over three unfinished holes fifteen or twenty miles north of Peace River Crossing. Drilling operations by the British Columbia government were started this summer near Hudson's Hope, close to the Alberta border.

Book Reviews

Mine Accounting and Cost Principles.
By T. O. McGrath. Cloth; pp. 260; illustrated; 6 x 9. McGraw-Hill Book Co., Inc., 1921. Price, \$4.

Mr. McGrath has already contributed considerable information on the subject of mine accounting through the technical press, and this latest accomplishment will be regarded as a valuable addition to the literature on the subject. By reason of his familiarity with the subject and a careful study of the operative and administrative functions of mine management, Mr. McGrath has had an excellent opportunity to realize the importance of proper accounting procedure, and the arrangement of the book shows careful planning and a logical order that can be easily followed. The edition presents the principles of accounting and costs of mining operations, with sufficient forms, charts, records, and procedure to illustrate how the principles are applied in actual practice. Mr. McGrath has stated in his preface that "the only explanation of the present status of mine accounting is that the great diversity in methods of mining, treatment, and disposal of mine products, as well as the character of the mines themselves, limits the treatment of the subject to a description of individual systems and accounts, unless the fundamental principles underlying all mining operations are recognized." It is in the excellent portrayal of the "fundamental principles" that the strength of Mr. McGrath's book is found.

D. E. A. C.

Technical Papers

Transvaal Tin Deposits—The Geological Survey of the Union of South Africa has issued Memoir No. 16, 192 pages, entitled "The Mutue Fides-Stavoren Tin Fields." (Obtainable from the Geological Survey, Pretoria, South Africa; price, 7s. 6d.) This tin field has never lived up to the extravagant promises made some years ago. The reasons have been small, erratic and in some cases complex deposits; the inaccessibility of the region; lack of water; low prices for tin and tungsten and high cost of supplies; and the fact that the district is unhealthful.

Mining in Quebec—The annual report on mining operations in the Province of Quebec for the year 1920 is now obtainable from the Bureau of Mines, Quebec, P. Q. The book contains 140 pages and includes the names of the operators and owners of the principal mines and quarries of the province. Asbestos continues to be the principal product, \$15,000,000 worth having been produced last year.

Shaft Lining—R. H. Gillespie has written a comprehensive article, "Lining a Shaft With Concrete and Gunite

Without Interfering With Operation," which appears in the Aug. 25 issue of *Coal Age*. (New York, N. Y.; price, 20c.) The article details the methods that were used recently in the construction of a permanent self-supporting lining in the hoisting shaft of No. 1 mine of the Lake Superior Coal Co., at Superior, W. Va. The concrete was machine-mixed on surface and lowered on the cage in wheelbarrows. During part of the "guniting" operation the "Cement Gun" was located on the surface, and during the rest of the work operated in the upper coal bed. Although the work was done in a coal mine, several of the problems and the manner in which they were solved are identical with conditions met in shaft lining at metal mines.

Fluorspar—The Imperial Mineral Resources Bureau has published an eighteen-page pamphlet giving statistics and general data regarding the world's production of fluorspar. It may be obtained from H. M. Stationery Office, Imperial House, Kingsway, London, W. C. 2, for 9d.

Mineral Resources—Recent publications of the U. S. Geological Survey in the "Mineral Resources" series include: "Asphalt and Related Bitumens in 1920," nine pages; "Sand-Lime Brick in 1920," two pages; "Fuller's Earth in 1920," two pages; "Silica in 1919," two pages; "Bauxite and Aluminum in 1920," eight pages; "Gypsum in 1920," ten pages, and "Magnesium in 1920," four pages. Copies may be obtained on application to the U. S. Geological Survey, Washington, D. C.

Manganese Ore Deposits—"Deposits of Manganese Ore in Montana, Utah, Oregon, and Washington" is the title of Bulletin 725-C, 102 pages, just issued by the U. S. Geological Survey, Washington, D. C., and obtainable on request. The bulleting covers the history, production, reserves, and general features of the various deposits in the states named.

Oklahoma Oil—The U. S. Geological Survey has published an eighty-five page bulletin, No. 726-B, entitled "Geology of the Cement Oil Field," obtainable on request. The area discussed in this report is in Caddo County, in the southwestern part of Oklahoma. The production of oil at Cement proves not only that the structure in that region is of the type favorable for oil accumulation, but that there are adequate reservoir beds and a source of petroleum. One of the reasons for this report was the fact that it appeared desirable that geologic reports should be made available covering certain areas because much of the land in Caddo and Kiowa counties is owned by the Kiowa, Wichita, Caddo, and Apache Indians, and it is important that the office of Indian Affairs form some conception of the true value of oil rights.

Differential Flotation—Pamphlet No. 4 of the Bureau of Mines and Geology, Moscow, Idaho, twenty-three pages, ob-

tainable on request, discusses the principles upon which the differential flotation of minerals is based, and outlines the methods to be pursued in experimenting on differential flotation in small test machines.

Chrome Ores—Bulletin 725-B of the U. S. Geological Survey, Washington, D. C., obtainable on request, is a fifty-four page bulletin entitled "Chrome Ores in Pennsylvania, Maryland, and North Carolina." Geological features are discussed, with brief histories of the various deposits which have been worked.

Metallurgy of Zinc—M. André Surny has republished a twenty-page article which recently appeared in *Revue de Métallurgie* entitled "L'introduction et le développement de l'emploi des gazogènes dans l'industrie du zinc aux Etats-Unis d'Amérique." Many illustrations of various types of gas producers are given. The author may be addressed in care of *Revue de Métallurgie*, 5 Cité Pigalle, Paris IX, France.

Talc—Talc is the subject of a recent publication of the Imperial Mineral Resources Bureau, twenty-four pages, obtainable at 9d. from H. M. Stationery Office, Imperial House, Kingsway, London, W. C. 2. The bulletin gives statistics to and including 1919, brief descriptions of the industry in various parts of the world, and a bibliography of important literature on the subject.

South African Coal—The second coal number of the *South African Mining and Engineering Journal* has been published under date of July 31, 1921. (Johannesburg, or 82-85 Fleet St., London, E. C. 4; price, 5s.) The history, present status, and future outlook of the coal industry in South Africa are reviewed, this issue supplementing the first special coal number published a year and a half ago.

Australian Data—The official year book of the Commonwealth of Australia, No. 13, containing statistics and general information for the period 1901-1919 inc., is now available. It is a book of 1,182 pages, with board covers, and may be obtained from the Commonwealth Bureau of Census and Statistics, Melbourne.

Flotation of Pyrite—"Flotation of Pyrite" is the title of a 17-page paper by W. S. Morley, recently published by the American Institute of Mining and Metallurgical Engineers. (29 W. 39th St., New York.) A record is given of tests made at the University of California to determine the action of oils and other reagents on the flotation of pyrites. Those reagents which showed the highest grade of concentrate and recovery were Pentarco Nos. 350 and 400, kerosene acid sludge (Standard Oil No. 1), and a mixture of 3 parts coal tar creosote (G. N. S. No. 22), 3 parts wood creosote oil (Pentarco No. 400), and 1 part of coal tar (G. N. S. No. 28). Sodium silicate exhibited attractive possibilities for differential flotation.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Courses for Vocational Training of Miners Outlined by M. & M. Society

Mitke Committee Reports — Miners, Shift Bosses and Foremen Considered

The Committee on Vocational or Occupational Training for Metal Miners appointed by the Mining and Metallurgical Society of America in the spring of 1919 has published a report under the date of Aug. 31, 1919, which appears as "Bulletin 149" of the society. The committee consisted of Charles A. Mitke (chairman), Stanly A. Easton, and B. F. Tillson. Their efforts were directed principally toward preparing a series of courses dealing with subjects necessary for the education of employees, in order to "fit the practical man for the job." These courses range from elementary types, for foreign-born employees, to practical and technical classes, for shift bosses and foremen.

The first elementary miner's course recommended deals with daily operations in a brief and concise manner. Sample lessons are given covering "Riding on Cages," "Going to the Working Place," and "Mucking Out a Drift," but these are only suggestions. The character of instruction must depend on local conditions, and the material for the lessons and instruction should be obtained from different foremen, in conjunction with the various mine superintendents and the instructor, and should represent the standard practice in connection with the various mining operations at the particular mine in question, correlated with the best mining practice in other camps.

The committee also outlines the topics to be considered in a series of thirty-six lessons in the Miner's Course. These include: Safety; Hygiene; Americanization; Mine Equipment; General Description of a Mine; Rock Drills; Drill Steel; Drilling Operations; Standard Rounds; Explosives; Mine Tracks; Shoveling and Tramping; Timbering; Sinking; Stopping; Waste Filling; Contract or Bonus System; Haulage; Ventilation; Mine Fires; Company Policies; and Citizenship. The mine management may prepare the detailed lessons, suitable for local use, from the outline given.

The second course recommended is to be taken by miners who are ambitious to fit themselves to be shift bosses, and who have already taken the first course. This also embraces thirty-six lessons and covers more advanced topics, as follows: Duties of a Shift Boss; Safety; Citizenship; Mine Equipment; Maps; Drilling Machines; Standard Rounds and Their Determination; Costs and

Methods of Drifting, Sinking, Raising, Timbering, and Repair Work; Explosives; Transportation; Drainage; Stopping Methods; Waste Filling; Sampling; Compressed Air; Elementary Geology, Milling and Smelting; Ventilation and Mine Fires.

The third course is for those preparing themselves to become mine foremen. The topics already mentioned, together with some others, are given in more advanced form.

Much information of a general character is also included in the report, covering reasons why work of this nature should be done, benefits to be derived, incentives, character of instruction, and the organization of classes and selection of an instructor.

The committee invites suggestions as to improving the courses outlined.

Chairman Rhodes Defines Federal Aid in Mining Industries

The following is an abstract of a paper read by Representative Marion E. Rhodes, chairman of the House Committee on Mines and Minerals, at the International First Aid and Mine Rescue Meeting, held at St. Louis, Mo., on Sept. 3:

"In 1920, mine products, raw and manufactured, provided 60 per cent of all tonnage carried in carload lots by Class 1 railroads. The raw mine products alone contributed 58.3 per cent of all railroad car-load tonnage. Manufactured mine products were alone greater in tonnage than all other manufactures. Excluding all shipments of bituminous coal, the mining industry still provided in its raw materials twice as much tonnage as agriculture; two and one-half times as much as non-mining miscellaneous commodities; three times as much as forestry, and approximately twelve times as much as animal industry.

"The mineral resources of the nation are limited. The supply is an ever-decreasing one. Mineral products cannot be grown, like agricultural products, year after year from the same ground. With each year's production of minerals, the point of ultimate exhaustion approaches closer by the amount of that year's consumption. It is the duty of the Federal Government to safeguard the welfare of the nation by requiring that this one supply must serve for both the present and future needs, the future needs to be far greater than those of the present day.

"It has been the policy of the Federal Government to develop processes for the utilization of low-grade fuels and ores, that they might be made available for use and also that the small operator, unable himself to finance necessary experiments, might share equally with the larger mine operator in the development of these properties.

"Research by the technical experts of the Federal Government and a proper

dissemination of the results achieved does away with the duplication of effort and the attendant increased expense which would ultimately be paid by the consumer if similar researches were carried on simultaneously by the interested states or by individual concerns capable of financing such work.

"But there comes to the Federal Government an appeal which is stronger than those requests which refer to commercial processes or the economics of waste elimination. It is the united voice of the millions of men working in the various branches of the mining industry. It is the humanitarian appeal for the development of safer and more healthful working conditions in the mines. It comes from the miners themselves, the men who are working under hazardous conditions, and it is a call which the Federal Government has listened to and will continue to listen to.

"The Bureau of Mines, established in 1910, was charged with the specific duty of improving health conditions and increasing safety in mines. Its authority, however, is merely advisory, for in the authority of the states lies the power for the enforcement of mine inspection laws. The Bureau of Mines, and a consulting committee thereto, has prepared what is considered a model mining law.

"The Federal Government advises and the state government enforces regulations, and but little progress could have been made in the past, and little will be accomplished in the future, unless the Federal and state agencies are supported by a spirit of co-operation on the part of the miners and mine owners. Careless workers who regard neither their own safety nor that of their fellow workers are often responsible for accidents of a kind which could easily be avoided by a proper regard for safety suggestions developed through the united efforts of the Federal and state governments and thoughtful mine owners."

Iron and Steel Institute Meets Great Britain Declared Not Dependent Upon Foreign Ore—Destruction of French Plants by Germans Systematic

By Cable from Reuters to "Engineering and Mining Journal"

Paris, Sept. 6—At the meeting of the Iron and Steel Institute, on Sept. 5 and 6, which was largely attended, Professor Louis, of Newcastle-on-Tyne, denied that Great Britain is dependent upon foreign iron ore. He said that 3,400,000,000 tons is available in the British Isles, much of which is not utilized because foreign ore is cheaper.

Monsieur Guillet, at the concluding meeting of the Institute, described the scientific destruction of French collieries and metallurgical works by the Germans. He showed that this was not caused by shell fire but by deliberate explosion by dynamite cartridges below water level.

MEN YOU SHOULD KNOW ABOUT

Henry M. Payne will arrive in New York from Mexico on Sept. 26.

A. L. Flagg, mining engineer of Phoenix, Ariz., is in Providence, R. I.

Hoyt S. Gale has returned from a transcontinental trip and is now in Washington.

J. E. Spurr and D. E. A. Charlton are attending the Institute meeting at Wilkes-Barre.

Paul A. Gow, general manager of the Tuolumne Copper Mining Co., was in Milwaukee last week.

Lewis Sanders, who has recently been on professional business in Arkansas and Georgia, has returned to New York.

Eugene Dawson, who has been investigating mining projects in Ecuador, is expected in New York early in October.

C. K. McFadden has resigned as president of the Colombian Emerald Syndicate and has been succeeded by J. A. Arroyo.

L. M. Cockrell, of London, recently arrived at Chihuahua on a general inspection trip of various properties in Mexico.

W. H. North, manager of the Standard mine at Silverton, B. C., was a visitor at Spokane during the first part of September.

F. E. Kurz, of Green Bay, Wis., has been appointed mine superintendent of the Great Eagle Fluorspar Co., of Lordsburg, N. M.

W. F. Eaton, superintendent of the Inlaterra mine, owned by the Compañía Minera de Petroleo, has resigned to accept a position in Colorado.

Vernon Keech, chief mechanical engineer for the iron mines of M. A. Hanna & Co., has returned to Duluth after a month's absence in the Pennsylvania anthracite district.

Heath Steele was recently elected president of the Campaña Minera de Peñoles, S. A. (subsidiary of the American Metal Co., Ltd.), to fill the vacancy caused by the resignation of Dr. K. B. Heberlein.

H. S. Mulliken, technical assistant of the U. S. Bureau of Mines, Washington, D. C., has been in Salt Lake City on a tour of the stations of the Bureau, in Arizona, California, Washington, Nevada, and Idaho.

C. E. Drayer, secretary of the American Association of Engineers, was tendered a banquet at the Duluth Commercial Club by a group of professional engineers, at which time Mr. Drayer spoke on the subject of "The Broader Field of Engineering Service."

C. E. Williams, who recently succeeded Oliver C. Ralston as superintendent of the Northwest Station of the U. S. Bureau of Mines, is at Berkeley, Cal., conferring with D. A. Lyon, chief metallurgist, regarding work on sponge iron

now being carried on at the Seattle station.

Henry M. Lancaster, manager of the St. Lawrence Copper Mining Co., Salt Lake, Mont., is in Pittsburgh to attend a meeting of the directors of the company. It is expected that arrangements will be made at this meeting to resume operations at the mine, which has been idle for two months.

C. W. Whitley, C. A. H. de Saullés, Roy White, and Kuno Doerr, officers of the American Smelting & Refining Co., recently made a general inspection of the company's properties in Chihuahua. Accompanied by Sam G. Long, A. S. & R. agent at Chihuahua, they will visit the Parral group of properties.

Mining engineers and metallurgists recently in New York included: Mat Sample, Chuquicamata, Chile; David White, Washington, D. C.; W. R. McIver, Cambridge, Mass.; Arthur Notman, Bisbee, Ariz.; Charles W. Goodale, Butte, Mont.; Arthur Thacher, St. Louis, Mo.; W. M. Small, Tampico, Mexico, and John I. Thomas, Johnstown, Pa.

R. C. Wallace, commissioner of northern Manitoba, whose term of office terminated Aug. 31, was presented with a case of silver and an illuminated address at a farewell picnic held near The Pas, as a mark of appreciation for his services to the community. He is returning to Winnipeg to resume his duties at the University of Manitoba as head of the geology department.

Governor Emmet D. Boyle of Nevada has announced that he will retire from political life after his present term as Governor has expired, and will become associated with W. E. Hindrey in a mining engineering firm to be known as Hindrey & Boyle, which will open offices in Reno at once. Until the election to the governorship seven years ago Governor Boyle devoted his time exclusively to mining engineering, having been connected with several of the largest companies and mining operations in the State of Nevada. W. E. Hindrey is widely known in engineering circles. At one time he was assistant superintendent of the De Lamar properties in Lincoln County, and later was employed by the Esperanza Mining Co. of London and New York, as general manager of the Esperanza property in Mexico.

SOCIETY MEETINGS ANNOUNCED

West Virginia-Kentucky Association of Mine, Mechanical and Electrical Engineers will hold its first annual convention at Huntington, W. Va., Sept. 20 to Sept. 23.

The Tenth Annual Congress of the National Safety Council will be held at Boston, Sept. 26 to Sept. 30. Meetings of the mining section will be held on Sept. 27, 28, 29, and 30, and include sessions on Underground Transportation,

Mine Prevention and Fire Fighting, Maintaining Interest in Safety, and Mine Hygiene, Sanitation, and Safety.

American Electrochemical Society will hold its fortieth general meeting at the Lake Placid Club, in the Adirondacks, Sept. 29, 30, and Oct. 1. The technical program will be featured by two sessions on non-ferrous metallurgy and electrodeposition. Among the papers to be presented are:

"Graphic Control of Electrolytic Processes," by B. G. Worth; "The Influence of the Electric Furnace on the Metallurgy of Non-Ferrous Metals," by H. M. St. John; "Comparison of Electric Furnace Practice With That of Fuel Fired Furnace Practice," by N. K. B. Patch; "Recent Developments in Electric Furnace of the Muffled Arc Type," by H. A. Winne; "Electric Furnace Purification of Zirkite," by J. G. Thompson; "Physical Characteristics of Specialized Refractories—Part IV," by M. L. Hartmann; "Researches on the Electrodeposition of Iron," by W. E. Hughes; "Electrolytic Solution and Deposition of Copper," by T. R. Briggs; "Electrometallurgy of Zinc," by W. R. Ingalls; "Deposition of Zinc From the Zinc Cyanide Solution," by C. J. Wernlund; "Electrolytic Deposition of Lead-Tin Alloys," by Wm. Blum and H. E. Haring.

Plans have been made for recreations and outdoor sports, including a golf tournament for the society championship.

The American Mining Congress, in making further announcement regarding its forthcoming convention at Chicago on Oct. 17-22, states that all delegates will be entitled to a return rate of one-half the regular fare. The headquarters of the convention are at the Congress Hotel, and further particulars may be obtained by writing E. C. Porter, the convention manager, at his address. Delegates are advised to make their reservations for hotel accommodations early.

In the program that has been arranged special attention will be given to the following topics covering different phases of the mining industry: Railroads and the Mining Industry; Co-operative Effort and Government Regulation; Standardization; the Gold Problem; Increased Use of Metal Products; Taxation; the Coal Industry; the National Petroleum Conference; the Educational Conference; and an American Foreign Mineral Policy. Provision has also been made for the entertainment of delegates. On Oct. 19 a luncheon will be given for members of the A. I. M. E. The annual banquet of the Mining Congress is on the program for Friday evening, Oct. 21. There will also be an informal smoker.

In conjunction with the convention will be held the National Exposition of Mines and Mining Equipment. Exhibits from Alaska and from Mexico will be featured. In addition there will be about 200 representative exhibits illustrative of the latest forms of mine machinery and mine equipment.

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

Utah Consolidated Co.'s Appeal Heard in Denver

Action Outgrowth of Decision in Utah Apex Case—Hearing Completed

The appeal of the Utah Consolidated Mining Co. from the decision in the Utah Apex case, involving a question of extralateral rights and the ownership of ore valued at upward of a million dollars, came up for hearing in the U. S. Circuit Court of Appeals, in Denver, Sept. 6 and 7. The case originated from the suit brought by the Utah Apex Mining Co. against the Utah Consolidated Mining Co., both of Bingham Canyon, Utah, before Judge Tillman D. Johnson, of the U. S. District Court in Salt Lake City. (See *Engineering and Mining Journal*, Oct. 20, 1920, p. 875). The action involved the ownership of ore mined by the latter company from within the side lines of the Utah Apex company's property, but which was claimed by virtue of extralateral rights. Judge Johnson ruled that the plaintiff have judgment and decree for full value of the ore wrongfully extracted, with interest thereon. An appeal was taken by the Utah Consolidated Mining Co.

The appeal involves title to certain orebodies found in the Bingham mining district, Utah. These orebodies occur in what is commonly known in that district as the Yampa limestone. A companion case, involving orebodies situated in what is known as the Highland Boy limestone, was tried immediately prior to the trial of the Yampa case, in the lower court, and it was stipulated that all testimony which was pertinent in either case could be used by the other. The trial court handed down its decision in both cases, but the Highland Boy case is still pending in the lower court on the accounting phase of that litigation. Two other suits were consolidated with this action for purpose of trial. In each case the Utah Consolidated Mining Co. asserts ownership of the orebodies in question by virtue of an extralateral right resulting from the inclusion within the boundaries of its properties of that portion of the Yampa limestone bed where it outcrops or comes nearest the surface. The company contends that the entire Yampa limestone bed constitutes a lode.

The Utah Apex company denies that the Yampa limestone bed is sufficiently altered or generally mineralized to justify its designation as a vein or lode.

WEEKLY RÉSUMÉ

In Washington the Senate Finance Committee continues besieged with pleas for duties or removal or lowering of duties on this and that mineral product. The Denison Blue-Sky bill, recently introduced, has been indorsed by the National Association of Securities Commissioners. Purchases of silver by the Government under the Pittman Act now total more than 71,500,000 oz.

As to the industrial situation, Tonopah is again normal and busy; the Colorado Fuel & Iron Co. has curtailed its operations drastically; iron-ore shipments from the Lake Superior district remain slow, and further shutdowns are reported; labor disturbances bordering on violence have recently occurred in the Elizabethtown-Rosiclare fluorspar district of Illinois; and, in Mexico, the Peñoles smelter at Torreon has shut down.

The appeal of the Utah Consolidated Mining Co. from the decision in the Utah Apex case was heard in Denver on Sept. 6-8, the court reserving decision. The Utah Steel Corporation has voted to increase its capital. Freight rates on ore and concentrates between Seattle and Tacoma and the Bunker Hill smelter have been increased by a ruling of the Interstate Commerce Commission. The publication of a weekly news letter from Johannesburg, South Africa, is begun in this issue.

It asserts that the orebodies in controversy are closely associated with distinct fissure veins which were the source of mineralization of their particular bodies; and that these veins, together with all their orebodies, including those held in controversy, are situated vertically beneath the surface of mining claims owned by the Utah Apex company. In other words, the Utah Apex company denies that the Utah Consolidated company has extralateral rights which will include the orebodies in dispute, and asserts that they belong to the Utah Apex company by virtue of ownership of the overlying surface.

The great outstanding question upon which the entire controversy turns is whether or not the Yampa limestone bed is sufficiently mineralized to constitute a vein or lode within the contemplation of the mining statute. The lower court found that the Yampa limestone bed does not constitute a lode. The case was completed Sept. 8, and was taken under advisement by the court, decision to be rendered later.

Union Makes Trouble in Illinois Fluorspar District

Threatens To Force Mining Companies at Elizabethtown and Rosiclare To Recognize It—Situation Quiet at Present

Elizabethtown, Ill. — At the end of August there was a gathering of union men at Elizabethtown, Ill., who claimed they were going to make Elizabethtown headquarters for the union in the future, and were going to have five thousand miners come here for an outing and that they would have a barbecue for the visitors. The Rosiclare fluorspar mining companies learned of the gathering and thought it possible that there would again be trouble like that of 1916. Then came the news that the union was going to force the mines to recognize the union.

The Rosiclare and Fairview mines, as well as the Hill Side mines, thereupon secured seven detectives as guards. Four of these remained at Rosiclare and the others at Elizabethtown, four miles away. In an attempt to run the detectives out of Rosiclare, the union men first fired upon the ex-city marshal from cover, wounding him badly. Four union miners were wounded by the detectives.

Soon after this a man named Ed Carbine, who claimed to be vice-president of the labor union, came to Rosiclare and opened a "local." Later it was reported that the union men had blown up their own building and then said that the non-union men did it. At this time the union men were ordered by the citizens to leave Rosiclare, whereupon they moved to Elizabethtown and established the local there. Threats were made against citizens and business men. This matter went from bad to worse. The union men quietly brought in arms and again made threats that they were going to clean up Rosiclare and Elizabethtown and force the mines to recognize them. It is reported that the wife of Carbine went to Rosiclare in the night and told a number of women that the non-union men were going to shoot up the town, and that they should go to Elizabethtown, where it was safe. The chief of police at Rosiclare heard of these people leaving, and as there was no trouble, requested the marshal to send them back to Rosiclare. This was done the next morning. It is alleged that this move was made in order to get a moving picture of the women and children for propagandist purposes.

After repeated orders to move, finally backed by force, the union men left Elizabethtown, camping that night a few miles out of town, where it is reported that they were responsible for several hold-ups. These men were routed by a sheriff's posse on Sept. 7 and some arms and three automobiles taken. No shots were fired.

A strong guard has been kept on the two roads leading into Elizabethtown and also at the river front, all persons coming in being turned back at night but allowed to come and go in daytime. It has also been reported that union men and their families were ordered out of Rosiclare and Elizabethtown, but this is untrue.

All fluorspar mines have been closed down in this district for from four months to two years on account of the lack of demand for fluorspar. None of the mines have ever recognized the union at any time.

George Graham Rice's Affairs Wound Up in Nevada?

Attorney Sues to Recover Fees—Action Discloses That Promoter's Office Furniture Belongs to Another

George Graham Rice's office furniture in Reno, Nev., does not belong to George Graham Rice, according to a complaint filed in district court Sept. 6 by Ben Barbash, to quote from a Reno paper. The furniture is the property of Barbash himself, says the complaint, with which suit is brought against Sheriff J. D. Hillhouse for its recovery.

Sheriff Hillhouse took possession of the furniture recently under a writ of attachment brought by James T. Boyd, who alleges that the Fidelity Finance & Funding Co., headed by Rice, and whose Reno office the furniture now equips, is indebted to him in the sum of \$1,917.40.

In commenting on this a correspondent says:

"It appears that James T. Boyd, who is a local (Reno) attorney, to secure for himself attorney fees due him, brought a suit and attachment proceedings against the Fidelity Finance & Funding Co. as mentioned. This has been followed by other complications, as referred to. The very important thing about these transactions, in so far as such concern the mining world and in which the legitimate operators of Nevada are most concerned, is that it is perhaps the wind-up of Mr. Rice, as far as his future operations in Nevada may be connected either as to himself or that of any corporation he might seek to find shelter within. Doubtless, one or two prominent attorneys of Nevada will miss him and the absence of his payment of good round fees for advice, but the people of the mining fraternity will welcome his departure from out their midst and that of his corporation, permanently, as now seems assured from this piece of news announcing the advent of financial difficulties, indicating the end has come at last."

Part of Mines Laboratory at Seattle To Be Dedicated

Will Be Used Jointly by U. S. Bureau of Mines and the University of Washington

By E. N. PATTY

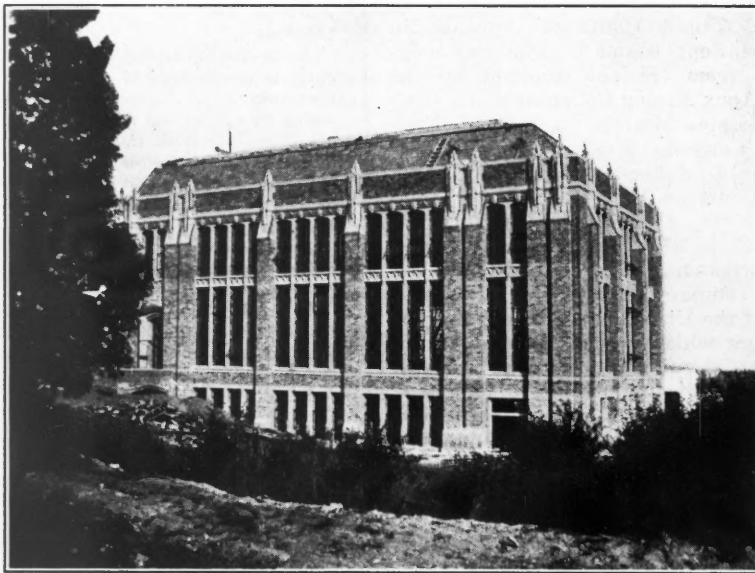
The first unit of the mines laboratory of the College of Mines of the University of Washington at Seattle is now completed and will be formally dedicated on Sept. 24. H. Foster Bain, Director, and D. A. Lyon, chief metallurgist, of the U. S. Bureau of Mines; Clyde Williams, superintendent of the Northwest station of the Bureau; President Suzzalo of the University of Washington, and Dean Milnor Roberts will be the principal speakers at the dedication. Speakers will also be present to represent the Northwest Coal Operators' Association and the Northwest Brick and Clay Association.

The present structure represents five-

than is the general rule with most laboratory structures. The building is well lighted; in fact, the walls are practically a series of columns and windows. The cost of this unit, for the building alone, was \$130,000.

When the remaining four-ninths of the laboratory is built it will house all the heavy machinery of the mining and metallurgy department. Mines Hall will ultimately be built just in front of the laboratory building. It will contain the offices, classrooms, and analytical chemistry laboratories.

The new Mines Laboratory was planned by Professor Joseph Daniels, for the fuel work, and Professor Hewitt Wilson for ceramics, and Dean Milnor Roberts, E. A. Holbrook, assistant director of the U. S. Bureau of Mines, and Superintendent Oliver C. Ralston and E. R. McMillian, of the Northwest Station, advised as to the Bureau's needs in the laboratory.



NEW MINES LABORATORY FOR COLLEGE OF MINES, UNIVERSITY OF WASHINGTON, SEATTLE

ninths of the projected mines laboratory. This unit will be given over to coal and ceramics laboratory work for the joint use of the College of Mines and the Northwest experimental station of the U. S. Bureau of Mines. The laboratory is so designed that it will be possible to handle efficiently all kinds of experimental work with fuels and ceramics. The capacity of the equipment is such that, when necessary, carload lots of coal can be subjected to coal washing or other tests.

The interior construction is entirely of steel and concrete, and all floors are sloped. The equipment has been well planned, and includes such accessories as water, steam, gas, electricity, compressed air, electric elevator, and automatic fire doors.

The Collegiate-Gothic type of architecture, which has been adopted for all new buildings at the University of Washington, was used with excellent effect on this structure, thus causing it to present a more pleasing appearance

Iron-Ore Shipments From Lake District Small

Iron-ore shipments from the Lake Superior district show a marked decrease to date in comparison to those of 1920. To date, this season's shipments show a decrease of a little more than half of what was shipped in 1920, being approximately 13,726,000 tons, compared with 28,820,000 tons for the 1920 season. In like manner the monthly shipments for this season are low, as approximately 3,890,000 tons were shipped during August, 1921, against 7,397,000 tons shipped during the same period in 1920.

German Iron Market Active

By Cable from Reuters to "Engineering and Mining Journal"

Berlin, Sept. 6—The activity recently reported in the Rhineland-Westphalian iron market is increasing. Orders are so numerous that the plants find it impossible to execute them within a normal period. Prices are still advancing.

Proposal To Move Hibbing, Minn., In Court

Date Set for Hearing—Neither Side Expected To Be Satisfied With Outcome

Another chapter in the injunction case of H. P. Reed and seventy-five others against the Oliver Iron Mining Co., the Mesaba Railway Co., and the Village of Hibbing is about to be written, as the clerk of the Supreme Court of Minnesota has designated Sept. 22 as the date of the hearing. The case relates to the moving of a portion of Hibbing for mining purposes, as ore underlies the part that is being moved. This ore will be mined by the Oliver Iron Mining Co. and at present is within the proposed extension of the Mahoning-Hull-Rust pit.

The plaintiff seeks to restrain the vacating of the old Hibbing townsite on the grounds of civil conspiracy among the defendants and seeks to enjoin the sale of the village hall, the change in the route of the street railway, and an alleged plan to destroy the North Street bridge. Should any one of the three main points of the plaintiffs be upheld, it would greatly handicap, if not totally ruin, the contemplated mining operations. A new town has been built south of the present village of Hibbing, and nearly all property in the old townsite has been acquired by the Oliver Iron Mining Co. to date. The case is regarded as of great importance.

The plaintiffs were denied a permanent injunction in the district court when the case came up for trial this summer. It is anticipated that a decision will be rendered within a month after the case is heard, but it is assumed that neither side will be satisfied by a decision of the State Supreme Court, and it is likely that the final decision will be rendered by the U. S. Supreme Court.

Replogle and Associates Acquire Interest in Hapsburg Estate

Organize Trust Company To Manage Property of Archduke Frederick—Rene Viviani as Counsel

American capitalists, including J. Leonard Replogle, Charles S. Sabin, Frank A. Munsey and others, have organized a company recently incorporated at Geneva, Switzerland, as the General Real Estate & Trust Co., which will manage the estate of Archduke Frederick of Austria and his family. The capitalization of this company is \$500,000. Two-thirds of the stock is owned by the Hapsburg family and the remaining third by the American syndicate. Rene Viviani has been retained by the latter to effect a release of such properties belonging to the estate as have been confiscated by the various governments of Central Europe.

It is said that negotiations for the control of the estate began two years ago when Mr. Replogle conferred with Eugene Schneider, the French steel manufacturer, to obtain an interest in the

Bergenhütten steel plant at Teschen, Czecho-Slovakia. This deal was consummated, Mr. Replogle becoming a director of the company. Later it was proposed to take over additional properties, and finally the aid of other capitalists was enlisted. The estate includes over a million acres, numerous factories, coal mines, miscellaneous real estate, and a valuable art collection.

Mining in British Malaya

Tin Operations in 1920 Profitable—Prospectors Successful in States of Johore and Trengganu

By Reuters Agency

Official reports from the East show that the quantity of tin exported from the Federated Malay States last year was 34,934 tons, as against 36,935 tons in 1919, a decrease of just over 5 per cent. Notwithstanding the lower prices obtaining at the end of the year, and the smaller quantity exported, the firmer position of tin in the earlier part resulted in an increase in value for the whole year of £1,580,261, as compared with 1919, so that the mining community has little cause for complaint on the result of the year's trading.

Prospectors are actively engaged in seeking new tin fields in the adjoining Malay States, and have been successful in Johore and Trengganu. The chief mining areas of the State of Trengganu are at the head waters of the Kemaman River. The Bundi Tin Mining Syndicate has for many years worked lode deposits which are possibly continuations of the lode worked by the well-known Pahang Consolidated, Ltd., in the adjoining territory of Kuantan. Lode formations have also been found on lands now being developed by other companies, the Kajang (Kemaman) Tin, Ltd., Tebak Tin Fields, Ltd., and the Sungei Ayam Tin Mines. In other parts of the state, tin and wolfram have been found. The mining potentialities of the state are considerable. There are large areas of ground absolutely unprospected, which would undoubtedly repay thorough examination.

Development at present is greatly hampered by difficulties of transport and communications, and by the absence of a properly organized land and mining department. These drawbacks will gradually disappear. It is hoped to make an early start on the construction of a system of roads for the development of the interior, and it will not be long before the state has telegraphic communication with its southern neighbor, Pahang, and with Singapore and the Federated Malay States. A telegraph line is in course of construction between Kuala, Trengganu, the state capital, and Kuantan, in Pahang.

Many applications are being made for prospecting licenses in Johore. In the northern state of Kelantan, there has been some prospecting for gold and tin, but so far as is known officially it has not yet met with success.

Development of Water Power Planned in Arkansas

Project Expected To Benefit Mining Industry in Northern Part of the State

BY TOM SHIRAS

The promised development of the available water power in the White River and its tributaries in North Arkansas by the Dixie Power Co. has caused mine operators and owners of mineral property in the North Arkansas zinc field and the Batesville manganese field to take a more optimistic view of what the future holds for the industry in these parts. The development of this power holds out the promise of lower operating costs, water transportation for a large part of the zinc district, and possibly a ferromanganese plant at Batesville and a zinc smelter at some point in the zinc field.

The Dixie Power Co., which has a core drill in operation at present testing the foundations for a gigantic power dam, is completing the preliminary work on the project. This work has been in progress a large part of the time since the fall of 1919, when the first survey of the basin was made. Colonel Henry Allen, of Chicago, a former member of the last Panama Canal Commission, who is consulting engineer for the project, states that it ranks fifth among water-power projects of the country.

Two sites are under investigation, one of which will be chosen after the drilling is completed and the final figures are computed. One, known as the Wildcat site, is situated eight miles above Cotter; the other, known as the Cotter site, adjoins the town of Cotter on the east bank of the river.

The greatest benefit the mining industry will derive from the project, in my opinion, will be that of water transportation, which will be available to sections that now have to drag their ore for long distances over nearly impassable roads. The lake created by a dam at Cotter will afford transportation to a large part of the northern section of the zinc district in Marion, Boone, and Baxter counties. The construction of a dam on the Buffalo River, near the mouth, will afford such transportation for the entire Buffalo River district, from which the greatest tonnage of the field has been produced.

Freight Rates on Ore Advanced In Northwest

Freight rates on carload shipments of ore and concentrates from Seattle and Tacoma, Wash., to the Bunker Hill smelter at Bradley, Idaho, and on copper matte and lead matte from Bradley and Kellogg, Idaho, to Seattle and Tacoma, are to be increased sharply under a decision recently made by the Interstate Commerce Commission. The commission granted the petition of the Oregon-Washington Railroad & Navigation Co. and connecting line to establish and maintain rates based on the value of the shipments instead of on their weight.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

New Federal Blue-Sky Measure Approved

Denison Bill Indorsed by National Association of Securities Commissioners

The Blue-Sky bill, introduced by Representative Denison, of Illinois, has received the unanimous approval of the National Association of Securities Commissioners. That organization held its fourth annual convention in Washington, D. C., Sept. 6 to 8. The principal subject of discussion at the convention was Federal blue-sky legislation. The security commissioners from forty states are members of this association. They pledged their support to the Federal Trade Commission and commended that body for its efforts to protect the public from the sale of worthless or fraudulent securities.

The Denison bill, which was indorsed by the convention, would make it unlawful to deposit in the United States mails any communication or printed matter tendering for sale any securities to a person residing in a state having a law against the sale of such securities. The same inhibition against the procurement of advertising of such securities is provided. Another section of the bill prohibits the handling of such communications, or printed matter, by express or other interstate transportation agency and precludes the interstate transportation of such information by telegraph or telephone. A penalty clause provides a fine of \$2,000, imprisonment for not more than two years, or both. For subsequent offenses, both the fine and imprisonment must be meted out. Any sale or contract for sale of such securities is declared illegal, and each person participating in the benefits or proceeds of these transactions is to be jointly and severally liable to the purchaser for the full amount paid by him and for the costs of any action taken to recover such a loss.

Appropriation for Alaska Inadequate

Despite the urgent need for stimulating mineral mining enterprises in the territory tributary to the Alaska railroad, this year's appropriations for such investigations are declared to be entirely inadequate. This situation will be brought to the attention of Congress by the Alaskan delegate and by the chairmen of the committees on Mines and Mining of the Senate and of the House.

Purchases of silver by the Bureau of the Mint totaled 1,145,000 fine ounces during the week ended Sept. 10. This brings the total purchases under the Pittman Act to 71,592,430 fine ounces.

Finance Committee Besieged With Tariff Briefs

Pleas Made for Tungsten, Magnesite, Manganese, Graphite and Other Minerals—Mining Congress Compiles Tariff Data

Numerous briefs have been filed with the Senate Finance Committee covering various phases of the metals schedule of the tariff bill. A brief submitted on behalf of the tungsten producers of Colorado, California, Nevada, and Arizona emphasizes the fact that the tungsten industry in this country is inoperative in all its branches. This includes mining, refining, and the application of this metal to steel making. Attention is called to the fact that the British control absolutely the markets in this country for ferrotungsten, tungsten powder, and high-speed tungsten steel. It is predicted that this control will continue until protection is afforded each branch of the industry by levying duties sufficient to equalize costs as between this country and China on the production of tungsten ore and as between this country and England on the cost of producing the manufactured products of tungsten.

There is some objection to the action of the Ways and Means Committee in changing the method of levying duty from the unit basis to the pound basis. The tariff bill, as it passed the House, provides a duty of 45c. per lb. of metallic tungsten contained in ore. The domestic producers of tungsten prefer the unit basis, but if the pound basis is to be maintained they ask that the duty be increased to 57c., which equals \$9 per unit of tungstic trioxide. The rate prescribed by the House equals \$7.14 per unit.

A particularly comprehensive brief has been filed by Roy N. Bishop for the Northwest Magnesite Co. and for the Western Magnesite Association. The principal points made in the brief are as follows:

A tariff of \$15 per ton on calcined magnesite and \$10 per ton on crude magnesite will add 3 to 5c. per ton to the cost of steel. Only 2c. worth of magnesite enters into the cost of making 500 lb. of tool steel. The domestic industry is asking a tariff which will do no more than will make it possible for American mines to compete with Austrian mines. It is assumed that importations sufficient to supply 50 per cent of the American consumption will continue.

The domestic magnesite producers criticize the steel interests for advocating "a duty on all articles they produce in order that they may have 100 per cent of the steel business in the United States and be able to export their sur-

plus, but do not want a tariff on the articles which they buy that enter into the cost of their product."

It is also pointed out that the present price of magnesite will not be increased \$15 a ton if a \$15 tariff is enacted. Even with a \$15 tariff, it is stated, it will be necessary to reduce costs and sell magnesite for less than it is bringing today.

That numerous consumers of plastic magnesite favor the \$15 tariff has been made very clear to the committee. It is claimed by the builders who use that material for exterior stucco that the quality of foreign magnesite is far from constant and that it is necessary to secure these supplies from the domestic producers, who have standardized their product, and furnish a plastic magnesite of uniform quality entirely adapted to the needs of builders. The committee was informed that exterior stuccos now have reached a state of perfection that is resulting in a great increase in its use.

There is no cessation in the efforts of the domestic producers of graphite to impress the Finance Committee with the need for a duty. They believe that they have proved that American graphite makes the best small and medium sized crucibles and that it only is advantageous to use an admixture of Ceylon graphite for the very large crucibles.

The Finance Committee has had printed for its own use and for the record a very comprehensive table prepared by Herbert Wilson Smith for use in connection with his appearance before the committee as the tariff representative of the American Mining Congress. This table gives the following information for each of the minerals for which a tariff is asked: Present tariff classification; unit of measure; imports for foreign countries, pre-war, during war and at present; imported from; labor costs in those countries; relative trade balance of those countries with the United States; present exchange rates of those countries with the United States; nature and extent of ore deposits, foreign and domestic; foreign cost of production; domestic cost of production; pre-war prices; war-time prices; present prices; annual production in the United States before and during the war and at present; states in which produced; number persons dependent on the industry for support; amount invested; present condition of industry; relative percentage of foreign and domestic product that would be consumed under tariff asked; tariff requested; tariff prescribed in bill passed by House. Information under each of the foregoing heads is shown for antimony, arsenic, asbestos, barytes, bismuth, cadmium, chromite, feldspar, fluorspar, graphite,

gypsum, kaolin, lead, lime, manganese, magnesite, marble, mica, molybdenum, monazite, thorium, pyrites, pumice, potash, quicksilver, talc, tungsten, and zinc.

American producers of ferromanganese have submitted a brief in which they call attention to the wisdom, from a business standpoint, of fostering a ferromanganese industry in a country which is the largest producer of steel in the world. They call attention, however, to the fact that the tariff bill, as it passed the House, carries a duty on manganese

ore as well as on ferromanganese. It was stated that this protection is in the proportion of two-thirds for the ore and one-third for ferromanganese. From that they point out that 66 per cent of the duty objected to by the steel producer would be eliminated if the ore be permitted to remain on the free list.

George H. Crosby, of Duluth, urged that a tariff on manganese ore be provided, so that it might stimulate the exploration and use of manganese-bearing ores. If proper protection were

granted, he states that the Cuyuna Range could produce 75 per cent of the manganese that is consumed in the steel-making trade for many years.

A striking statement made in connection with the plea for a duty of \$4 per ton on iron pyrites was that pyrites can be loaded at the mine in Spain, hauled 125 miles to the seacoast, shipped across the Atlantic and unloaded in the port of New York and its sulphur content sold for one-half the freight rate on the ore from Virginia pyrites mines.

NEWS BY MINING DISTRICTS

London Letter

The Return on Mining Ventures—Rich Gold Finds Reported From Hampton Field—Otavi Mines & Railway Co. Reorganized on Sterling Basis

By W. A. DOMAN

London, Aug 29—Mining, and especially base-metal mining, is admittedly risky, and the people who find the money for such ventures are entitled to a suitable return upon it. Only when annual reports reach them do they realize the extent to which other people have had a finger in the pie—people who incur little if any risk—before any profits remain for division. Two annual reports will illustrate the point. The Broken Hill Proprietary Co., a combined mining and steel manufacturing undertaking, earned a net profit during the twelve months ended May 31 last of £351,331. Taxation, which the directors say is "proving a very heavy burden," required no less than £242,584, or almost 70 per cent. The other company, the Ropp Tin, Ltd., is mulcted by the Nigerian Government Railways in mileage of £11 per ton for the carriage of tin ore. In another colony similar mineral can be conveyed for the same mileage at a rate of 14/2 per ton. Extravagance and inefficiency on the railway, which is a government monopoly, can be made good out of the mineral industry. But the Ropp Tin has another grievance. Previous to the war the returning charge was £6/5/0 per ton. For the calendar year 1920 it was £15. As with the railways, the mining companies are unable to protect themselves, for export duty from Nigeria is recoverable only by the producers on their satisfying the local customs that the tin concentrates have been dealt with by a firm in Great Britain.

It may seem right to the Nigerian government to confine the smelting of the locally produced concentrates to Great Britain, but it is unquestionably penalizing the companies, and forcing them to send business where it would not otherwise go. Governments are entitled to tax, though the demands should be moderate.

Just when the public was beginning to imagine that the recently discovered Hampton gold field was about to go out of existence because the reefs opened upon were too patchy to be worked profitably, comes another cable dispatch from the Hampton Gold Mining Areas stating that prospectors are working "rich alluvial" and that there is "rich reef gold." Presumably there is some connection between the alluvial and the reef, and the discovery now, after the field had been tested and abandoned years ago, is rather surprising. Ounce nuggets are making their appearance again. This new gold field, one of so many in Western Australia, has been proclaimed the "Transfind." The province sadly needs a new find, as gold production has fallen to a very serious extent. The government is fairly liberal in its treatment of prospectors, and there is generally some kind of expedition under way for the purpose of making new discoveries of gold.

The Otavi Mines & Railway Co., originally a German undertaking with a mark capital, of which a portion had been introduced to the London market, is to be reorganized with a sterling capital. The mark capital is 4,000,000, and conversion is to be effected at the rate of 20 marks to the pound with a cash amount of 20 marks per share. Initially, then, the new capital is £200,000. But there are 200,000 *genuss-scheine*, and they are to be exchanged for the £1 shares, making £400,000. As, however, the company required funds for prosecuting operations, the nominal capital is to be £300,000. The new working capital is needed to repay loans contracted during the war, to extend machinery, and sink a new shaft. Apparently the bank loans were used reproductively, for 500,000 tons of new ore has been opened up. The "exportable ores" of the current and the next financial year have been sold firm.

No improvement in the business depression in Chile is expected until there is a revival of nitrate exports, say cable advices to the Department of Commerce.

Johannesburg Letter

Engineering Societies of South Africa Now Housed Under One Roof—The Arc Diamond of Gong Gong—The Wage Situation on the Rand

By JOHN WATSON

Johannesburg, Aug. 2—A Scientific and Technical Club, with suitable rooms for the holding of meetings, has now been opened in this town under the aegis of the Associated Scientific and Technical Societies of South Africa. The building is centrally situated at No. 100 Fox St., and was formerly occupied by the Johannesburg Club. The purchase has been effected largely through the generosity of the Transvaal Chamber of Mines. The joint housing scheme for the local scientific societies has been discussed for a number of years, and in November, 1919, ten societies accepted the idea and elected a joint committee.

In the past, the scientific societies have been holding their meetings at the Chamber of Mines, the University College buildings and elsewhere. Among the ten societies mentioned above are the South African Institution of Engineers, the South African Institute of Electrical Engineers, the Chemical, Metallurgical and Mining Society, the Transvaal Architects, the Geological Society of South Africa, and others, all of which are now housed under the one roof.

South Africa has produced several of the world's largest and finest diamonds; the "Star of South Africa," found half a century ago, was purchased by the Earl of Dudley for £25,000. The "Excelsior," found in 1893 at Jagersfontein, weighed 971 carats. The Cullinan diamond, found at the Premier mine in 1905, weighed 3,025½ carats. It was divided into nine large stones, the first and second being still the largest brilliants in existence. W. V., writing in *The Star* of July 2, describes the romantic finding of a fine alluvial diamond at Gong Gong, near Barkley West, in June of this year. It was found to weigh 381 carats and was sold for several thousand

pounds sterling to Messrs. Allan, Russel and Crudginton, whose initials spell the word "arc."

Government official figures show that the average miner, machine-stopping on day's pay, was earning 27s. 4d. per shift in June, 1920, compared with an average of 18s. 5d. per shift in June, 1914. The underground fitter was earning 30s. 7d. per shift in June, 1920, as compared with 20s. 6d. in June, 1914. The mine carpenter on the surface was earning 28s. 2d. per shift in June, 1920, whereas in June, 1914, the average was 20s. per shift. The amount of pay for other trades had increased in similar proportion.

Owing to the premium on gold in London and to the increased cost of living, increases of pay were made by the Transvaal Chamber of Mines during the war.

On Aug. 1, 1915, miners received an increase of 7s. per week, and the following month mechanics were paid "time-and-a-quarter" for overtime. In 1916, the hours of mine mechanics were reduced to forty-eight per week at the standard rate of 2s. 6d. per hour. In August, 1917, the war bonus to mine employees was again increased on a sliding scale, and mechanics received an increase of 3d. per hour. The Chamber of Mines at that time also granted twelve days' holiday per annum on full pay without any demand from the workers. In September, 1918, a fresh sliding scale of war allowances was brought into force. A further readjustment was made in December, 1918, to accord with the rise in the cost of living. From Nov. 1, 1919, a flat rate increase of £2 8s. per week, in lieu of the war bonus, was given to all employees other than officials, improvers, apprentices, and learners. The price of fine gold in London on July 27 was 114s. 10d. per oz.

It has been pointed out here that when the price of gold reverts to the normal pre-war figure (84s. 11d.) about one-third of the gold mines now crushing on the Rand will have to close down. Some economists, of course, maintain that the cost of living will fall and wages will come down to the old pre-war rates.

The Chamber of Mines, in *The Star* of yesterday (Aug. 1), points out that in 1914, £7,140,000 was paid to Europeans in wages and salaries. In 1920, £11,350,000 was paid.

In 1914, holiday privileges for white workers cost the industry £27,000; in 1920 over £600,000. In 1914, phthisis contributions cost the mines £580,000 and the men £73,500; in 1920 they cost the mines £800,000 and the men *nothing*. Other items bring up the total additional cost of white workers to the industry to more than £5,000,000 per annum. The Chamber is now asking for a reduction of about £250,000 per annum, that is, about one-twentieth of the additional cost. The local cost of living has been falling during the last eight months, according to the official figures of the Government Director of

Census. In this period it has dropped from 57 per cent above pre-war rates in October, 1920, to 31 per cent in June, 1921.

AUSTRALIA

Victoria

Interest Reviving in Walhalla Field

Melbourne, Aug. 9—Walhalla, one of the famous mining fields of Victoria, has been practically deserted since the Long Tunnel and Long Tunnel Extended mines ceased operations. Considerable interest has been stimulated in the field recently by the results of prospecting undertaken by the Overseas Exploration Syndicate, which holds a part of the old areas held by the companies mentioned but never worked. The Syndicate's £10 shares have sold as high as £50, and enthusiasts are talking wildly regarding the "revival" of Walhalla.

CANADA

Ontario

Dome Mines Announces New Ore on 7th Level

Porcupine—It is officially stated that new ore has been discovered on the 7th level of the Dome Mines, the extent and values of which have yet to be determined. It is not known whether this find is connected with the orebodies on the 10th level. The workings below the 10th level are being deepened, but it has not been decided to what further depth the shaft will be put down.

Kirkland Lake—At the Queen Level, where a number of gold-bearing veins have been found on the surface, camp buildings are being erected, and an extensive plan for development has been laid out.

MEXICO

Coahuila

Peñoles Smelter at Torreon Closed Down

Torreon—The Cia. Metalurgica de Torreon, smelting plant operated by the Cia. Minera de Peñoles, which has been running one copper and three lead furnaces, closed down early in September. Some of the American employees have been transferred to Monterrey, where they will be employed at smelter No. 2, owned by the same company. In the meantime the Torreon plant is to undergo general repairs. A large amount of machinery and other equipment is to be taken from the old Mapimi smelter and placed in use here to increase the capacity.

New platforms and loading stations are being constructed at Bermejillo, where the ores from the Peñoles mines are transferred from the narrow-gauge line belonging to the company, to the standard-gauge of the National Railways of Mexico. After completing this work and the repairs at the Torreon smelting plant, all of the ores from the Mapimi camp will be brought to this city for treatment. The Mapimi smelter will remain idle indefinitely.

CHOSEN

Oriental Consolidated's Stope Fire Apparently Out—New Mine Sorting System Introduced

Unsankinko—The manager of the Oriental Consolidated Mining Co. writes his home office under date of Aug. 4 as follows:

"There has been no sign of gas, smoke or fire in the Tabowie mine since April 25. We therefore think that the fire has been put out.

"We ran sixty stamps most of the time in the Tabowie mill during July, but had eighty stamps dropping for a few days. Since Jan. 1, 1921, we have instituted a rather thorough sorting system in the Tabowie mine. The Koreans object to the system, as it means more work and more care for all stope contractors. We do not have enough men yet to break ore for eighty stamps, but we hope to have enough willing workers before long, as we expect the natives will realize that the sorting system has come to stay.

"The rainfall since the morning of July 16 has enabled us to operate our hydro-electric plants at full capacity, and everything has been driven electrically with the solitary exception of the Tabowie mine steam surface hoist. Since July 24 we have had dry weather, and this unusual condition at this time of the year led us to fear that we had another year of drought in store. Fortunately it started to rain last night. As it costs us over \$250 per day to drive our two mills only on steam, the importance of plenty of rain is apparent."

CALIFORNIA

Tailings Dump of Kennedy Company's Chlorination Plant Sold to Selby Smelting Works

San Francisco—Conditions in gold mining continue to show gradual improvement. Strikes appear to have been settled and more mines are getting into line for production.

A. J. Pillsbury and Will J. French, commissioners of the State Industrial Accident Commission, completed ten years of service as commissioners on Sept. 1, 1921. Employees of the commission tendered them an impromptu reception.

During August 776 ft. of a 11-ft. diameter tunnel was driven from a single heading at Priest's Portal of the Hetch-Hetchy aqueduct. This is a remarkable record, and credit is given to R. C. Dennis, subcontractor, for the achievement. Our informant stated that the men at the tunnel face worked like a college football team. Team work and incentive to better existing records are responsible in a measure for the excellent work.

Randsburg—The Randsburg district is booming, and a recent traveler stated that many are sleeping in the streets, as rooms are unobtainable.

Jackson—The Kennedy Mining and Milling Co. is clearing out the bottom of its shaft, following the recent un-

watering of the property. Production is expected to be resumed by the end of September. The tailings dump of the chlorination plant has been sold to Selby Smelting Works. The iron content is in excess of 50 per cent, making the material a desirable basic flux. A low gold and silver content is also present.

Portola—The Plumas Eureka Annex, north of the Plumas Eureka, is driving a prospecting adit to cut the extension of the old Plumas Eureka vein. The Walker Mining Co. is expected to curtail operations further at its copper property. For some time only development work has been in progress.

NEVADA

Bluster Consolidated Sold to Los Angeles Company—West End Consolidated at Tonopah May Cut Wages Soon

Jarbidge — It is reported that the Bluster Consolidated mine has been purchased by the Bonanza Gold Mining Co., of Los Angeles, and that operations will be started soon. The Bluster mine has produced over \$100,000 in gold and silver. There are several thousand feet of underground workings, mostly drifts, with a considerable tonnage of milling ore blocked out. Previous owners were unable to handle this grade of ore because they could not finance the construction of a complete cyanide plant, so that only ore of shipping grade was mined.

Mina—The West End Consolidated Mining Co., of Tonopah, has bonded the Mabel group of claims, about twenty miles northwest of Mina, and development work is to be started at once. This group adjoins the Garfield mine, a famous producer of high-grade gold and silver ore many years ago, and contains the extension of the Garfield vein system to the west.

Silver Bow—The Blue Horse Mining Co. has made the third payment on the Silver Bow group of claims, situated about forty-five miles east of Tonopah. The company has had the group under option for more than a year and has spent over \$80,000 in development work. Conditions are favorable, and development is to be continued.

Tonopah—Operating conditions in the Tonopah district are good. Mines and mills are running at capacity, small development properties have resumed work, business in the district has improved, and the entire community appears prosperous. The labor problem is not entirely a dead issue as yet, as in two of the principal mines of the district very few old employees have been re-employed, on account of personal friction between them and the imported men. It is to be hoped that all parties concerned will soon bury the hatchet, so to speak, and mix on friendly terms. The few remaining state police will probably be withdrawn. The West End has not as yet reduced wages, but it is likely that a reduction will be made in the near future, thus putting the camp

and district under a single wage scale.

No discoveries of importance have been reported recently, although development footage is about normal and underground conditions are satisfactory.

Klondyke—The Golden State Divide Mining Co., controlled by the Knox Divide Mining Co. and operating the Golden State mine, in the Klondyke district, is reported to have purchased the entire surface equipment of the Mutual Divide Mining Co. This equipment is first class, and its purchase is indicative of a broader development policy. The southeast drift on the 130 level, which is the lowest level in the mine, has been connected by a short raise to the winze sunk from the 60 level. The vein has been cut on the 130 level, and shows some good spots and a variable width of low-grade quartz. Conditions are regarded as encouraging, and work is being pushed at two faces on this level. No ore is being broken, as the stopes are full, but shipments to the Tonopah Mining Co.'s mill at Millers will be resumed soon.

Gold Hill—The United Comstock Mines Co. has completed its railroad spur, has erected a tower for concreting at the mill site, and has started work on the mill foundations. Freight is being delivered at the mill site.

Virginia City—An excellent showing is being made in the new stope opened by Con. Virginia on the 1,650 level, 250 ft. south of the shaft and under the old bonanza stopes. The stope is four sets wide and five sets long and shows ore faces on the north, south, and west sides. The mill has operated to capacity. Experiments in flotation treatment are being conducted, and the results are promising. The production for August is estimated at approximately \$40,000. At the Savage mine No. 2 raise, 60 ft. north of the No. 1 raise on the Sutro level, has been started. Encouraging assays are reported.

Pioche—Deep development work has been temporarily suspended at the Prince Consolidated mine. The decision was reached after several breakdowns in the power plant and after the heavy cost of operation had made it evident that larger equipment would eventually have to be installed before the water could be economically handled and the mining operations pushed without delay on the 833 level. The last work done in the East drift was most satisfactory, and every effort will be made to install heavier pumping and power equipment as soon as possible.

UTAH

State Industrial Commission Orders Accident Payments—Furnaces in Blast—Utah Steel Corporation to Increase Capital

Salt Lake City—The State Industrial Commission has ordered a number of Utah mining companies to make payments to employees suffering injuries, as follows: The Ohio Copper Co., through its insurance carrier, has been ordered to pay John Zupano \$704.45 in a lump sum as a complete settlement

for permanent disability suffered through his left shoulder and arm. The Tintic Standard Mining Co. or the state insurance fund is ordered to pay to James Burrison compensation of \$16 per week from Dec. 23, 1920, to Jan. 3, 1921, as a result of injuries suffered while employed by the company at Dividend. The Peerless Coal Co. must pay to the state treasurer \$750 as a result of fatal injury to Frank German, an employee of the coal company at Peerless, Utah. The action was brought by the state treasurer on behalf of the state insurance fund to determine whether or not the decedent left any dependents. No dependents presenting themselves at a hearing before the State Industrial Commission, the sum will be paid into the state insurance fund as required by law. A number of applications for compensation were denied.

Lead furnaces in operation at the Salt Lake valley plants at the end of August were as follows: the United States company at Midvale had three lead furnaces and one furnace on matte concentration. The A. S. & R. at Murray had three lead furnaces in operation, as compared with four furnaces during the first half of the month. There were no furnaces in operation at the International Smelter at Tooele.

Stockholders of the Utah Steel Corporation, which has a plant at Midvale, have voted to increase capitalization from \$2,500,000 to \$5,000,000. Extensive additions to the company's plant at Midvale, and a twenty-one mile railroad from Lund, on the Salt Lake route, are planned, if the projects obtain local support. It is said that if Utah people come forward, a large amount of Eastern capital will be available. The present capacity of the works is 6,000 tons of steel monthly and it is planned to bring this up to 25,000 tons monthly. The company began operations sixty years ago, starting with a monthly output of 400 tons. M. S. Rosenblatt is general manager.

Arrangements have been made to open at greater depth the Victor property in the south fork of Big Cottonwood Cañon near the Cardiff.

Park City—Shipments for the week ended Sept. 3 amounted to 1,914 tons. Shippers were: Silver King Coalition, 771 tons; Judge allied, 705; and Ontario, 438. At the Silver King Consolidated there is still 3 ft. of ore showing in the drift from the raise a short distance above the tunnel level. Water coming in has interfered with the work.

Eureka—Ore shipments from the Tintic district for the week ended Sept. 3 amounted to 185 cars.

WYOMING

Electrolytic Copper Co. Now Shipping Copper Ore

Holmes—Shipments of copper ore are being made from the Electrolytic Copper Co., operating the Rambler group of properties in the Medicine Bow Mountains. A contract has been let to haul eighty tons, and it is expected to continue shipments at the rate of three tons daily.

NEW MEXICO

Great Eagle Fluorspar Co. Changes Management

Lordsburg—A change has been made in the management of the Great Eagle Fluorspar Co. Carl F. Schaber will be in charge, with F. E. Kurz, of Green Bay, Wis., as mine superintendent. New ground will be opened up at once, and extensive changes made in the mill, which is not as yet complete. A series of tests in connection with the milling of this product will be carried out at Salt Lake City, Denver, and El Paso.

The Last Chance mine is preparing to install a compressor and complete air equipment at once. Development work is being pushed with satisfactory results.

MONTANA

Nature of Butte & Superior's Copper Strike Still Doubtful—West Butte Mining Co. Begins Operations

Butte—Locating of copper ore on the 2,200 level of the Black Rock mine of the Butte & Superior company was a feature of the week's news in the Butte district. Reports of the development, however, were somewhat exaggerated, and it will require further development work to determine the worth of this ore, which is bunched and scattered. The belief obtains that what was found is not the downward extension of the shoot had on the level above, the 2,050 level, as the ground is broken up. Doubt also is entertained as to the identity of the vein in which the copper was found on the 2,050, whether it is a "northwest" fissure or a branch of the Rainbow vein, in which the large tonnages of silver-zinc ore have been mined. If it is a "northwester" the importance of the development undergoes considerable of a decrease, as in the Elm Orlu mine adjoining the northwest veins have been found to carry copper at depth, as they have throughout the Butte district, and such a development was not unexpected. But if the copper vein is a branch of the Rainbow, indicating a change in its metal content with depth from high-grade zinc-silver ore to copper, the development is one of much consequence, as showing a change in the large veins of this character at depth.

The West Butte Mining Co. has started operations in the western part of the Butte district on three claims located about 3,000 ft. west of the Nettie of the Anaconda and the Hibernia of the Davis-Daly, and a shaft, which now is down 25 ft., will be sunk to the 200 level and three veins crosscut. These fissures on the surface show strong croppings, with assays of silver running in various amounts. A headframe and engine house have been completed, and a 50-hp. electric hoisting engine and a 680-ft. air compressor are ready to be installed. It will be necessary to construct a power line a quarter mile long. New York interests have financed the West Butte, which is a new corporation to enter the Butte field.

COLORADO

Colorado Fuel & Iron Co. Curtails Operations

Pueblo—The Colorado Fuel & Iron Co. will close down several units of its steel plant, and reduce its working force from 7,500 to about 1,500 men. The company's iron mines in Wyoming and the coking coal mines in the Trinidad district will be closed. The curtailment is the result of deferred orders and overproduction.

Montezuma—Development in the Jerry mine has opened a vein of high-grade silver ore at a depth of about 1,200 ft. The vein is from 12 to 18 in. wide, and carries considerable ruby silver. Selected streaks assay from 400 to 600 oz. silver a ton. H. E. McCray is manager.

Cripple Creek—Lower levels of the Dante mine are being prospected with a diamond drill, and some promising veins have been located.

The Heck Gold Mining & Leasing Co. will resume development on the bottom level of the Empire State property in the near future with the view of prospecting the Maloney vein at depth. Work will also be resumed on the third level. Charles P. Heckler is manager.

The Hardwood property is being developed and operated by the United Gold Mines Co., which has resumed shipments of ore recently.

The LeBrun Mining Co. is performing development work in the Acacia Gold Mining Co.'s property, through the South Burns shaft, under an extension of lease running to November, 1923. Drifting is in progress on the 3d, 13th, and 16th levels.

The Hull City property is being developed under lease by Phillips & Co., who are planning extensive exploration in the near future. At present, the lessees are producing about two carloads of \$40 ore per month from development.

Leadville—The Best Friend property will be reopened and operated by a pool of local capitalists. It is planned to advance the main tunnel, which has already been driven about 2,000 ft.

Twin Lakes—The Yale Mining Co. has resumed operations at the Texas Creek property. The Harland mill has been purchased, and is to be remodeled and equipped with new machinery.

SOUTH DAKOTA

Homestake's New Mill Building Nearly Completed—Clover Leaf at Roubaix Working

Lead—The new 1,800-ton mill structure that the Homestake Mining Co. is erecting is nearly completed. The equipment will be installed as soon as the building is inclosed. The company is now operating at full capacity. The station at the 2,150 level of the Ellison shaft is about finished.

Hill City—Work at the Tin Boom mine of the National Tin Corporation continues, and work has also been started at the Cowboy. The work is in the nature of development, and in all prob-

ability the concentrator will not be placed in operation this year.

Deadwood—The tunnel of the Eagle Bird company on Squaw Creek has been driven over 700 ft. and will be continued to 1,500 ft. It will cut a ledge of ore found on the surface and will give a depth of about 400 ft.

Roubaix—Work has started at the Clover Leaf property, at Roubaix. Arrangements are being made for active work, and in a short time diamond drilling will be begun. It is also probable that the shaft will be unwatered and repaired, which will be followed by underground development.

MICHIGAN

Future of Copper Depends on Use for Purposes Requiring Large Quantities

Houghton—While innumerable uses for copper are being suggested, as part of an extensive campaign to popularize the product, it is the belief in mining circles here that the future of the metal depends largely on its employment more generally for purposes requiring a larger volume of the material. This involves it is said, the necessity of standardization of parts. The building trade particularly, it is believed, holds out much hope in this direction. With standardization of parts in effect the country over, it is argued that a great deal of copper would be used for roofs, skylight frames, window frames, gutters, cornices, doors, panels, ventilators, sash, fronts, pipes, and ornaments. Architects then, it is contended, would be more inclined to specify the use of copper to a far greater extent than now. This, it is asserted, will be part of the work of the recently organized Copper and Brass Research Association. It is a field which has been neglected and pioneering is necessary.

MINNESOTA

Mesabi Range

Biwabik Mine Shuts Down—Stripping Stopped at Buffalo-Susquehanna Pit

Hibbing—The stripping operations at the Buffalo-Susquehanna pit of the Rogers-Brown company have been suspended. This work was being carried on by the Winston-Dear Co. About 115 men have been laid off.

The large coal dock which supplied the engines and steam shovels of the Hull-Rust pit, the largest open pit property of the Oliver Iron Mining Co., was totally destroyed by fire last week. Operations were delayed for a short period.

Biwabik—The Biwabik mine, operated by the Biwabik Mining Co., a subsidiary of the Tod-Stambaugh Co., has suspended operations indefinitely. Ore shipments from this property have been heavily curtailed this year. Normally they would have totaled about 500,000 tons a season, but only 140,000 tons have been shipped to the docks this season. This was the only mine remaining in operation at Biwabik. About seventy-five men are affected.

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.
8	11.875	26.50	27.00	4.50	4.30	4.20
9	11.875	26.00	26.625	4.55@4.60	4.30@4.40	4.20
10	11.875	26.00	26.625	4.55@4.60	4.40	4.20
12	11.875	26.125	26.75	4.55@4.60	4.40	4.20
13	11.875	26.25	26.875	4.60	4.40	4.175
14	11.875	26.125	26.50	4.60	4.40	4.175

*These prices correspond to the following quotations for copper, "delivered": 12.125c. for the week.

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.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
8	67½	68¾	72	159	161½	23½	22½	25½	25½
9	67½	68¾	72	156½	158¾	23½	22½	25½	25½
10	67½	68¾	72	156½	158¾	23½	22½	25½	25½
12	67½	68¾	72	156½	158¾	23½	22½	25½	25½
13	67½	68¾	72	156½	158¾	23½	22½	25½	25½
14	67½	68¾	72	155½	158	23½	22½	25½	25½

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

Silver and Sterling Exchange

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
8	372	99½	63¾	38¾	12	373½	99½	64½	39
9	372	99½	63¾	38¾	13	372	99½	65¾	39½
10	372½	99½	64½	39	14	370	99½	65¾	39½

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. 14, 1921

Excepting satisfactory sales of lead, the metal markets were quiet during the last week, with prices steady. Fundamental conditions are reported improving in some lines of industry, particularly in New England, but no marked changes are taking place, and the recovery of the metal markets is likely to be a slow process.

Copper

The week has been particularly quiet, demand for both domestic uses and export being weak. The fact that domestic consumers have not been tempted to lay in stocks at an advancing market indicates that, regardless of price, they continue to be interested only in

current requirements. The decline of foreign exchange has affected sales abroad. Germany has bought a small tonnage from dealers in London, but practically nothing from American producers during the last week. Japanese demand has also quieted down. Most all of the producers are optimistic, however, and almost every one is quoting from 12.25 to 12.75c. delivered. By diligent shopping around it has been possible to secure copper at 12.125c. delivered for September, and small lots have been sold at that price. One buyer is reported to have been in the market for 1,000 tons in the last day or two, and to have practically cleaned up the market of all copper held at less than 12.25c. Prices for the coming week will depend upon whether there

is sufficient demand to take care of the metal offered by those producers who make a practice of selling current production.

Lead

On Friday, Sept. 9, the American Smelting & Refining Co. advanced its official contract price from 4.50 to 4.60c.

Inquiries and sales have been numerous during the week, and though confined mainly to one- or two-hundred-ton lots, at least one sale of 1,000 tons was made. Most of the business has been for points east of Chicago. The St. Louis market has been quiet, with chemical lead freely offered at our prices, with few takers. Desilverized is somewhat scarcer and might command a slight premium in St. Louis, though obtainable in Chicago at the customary freight differential of 10 points from the St. Louis price. Practically all of the business has been for September delivery or shipment, though it is reported that November or December delivery might be had at about 10 points premium. Manufacturers of lead, with the exception of cable-makers, report business to be improving. Corroders will be kept busy for the winter in catching up with their orders and laying in stocks, so that the demand for paint, which is seasonal, should not react unfavorably on the market for corroding lead.

Zinc

The recent advance in zinc to 4.20c., with some producers quoting 4.25c., was not what might be called a violent one, yet it seems to have been more than the market could stand, and the price has again shown a tendency to ease off. August shipments were reported to be about 7,000 tons over those for July, and production was close to 1,000 tons less. High-grade zinc continues to be quoted at about 6c. per lb. delivered.

Tin

Tin has been even duller than usual during the last week, with most of the sales confined to five- or ten-ton lots. London interests are holding firm and apparently think well of the market. Prices show little change. Chinese tin and other 99 per cent grades have been somewhat more available during the last day or two, but as the demand for these grades has been relatively good compared with that for Straits recently, it is firmly held. Some electrolytic has been sold, the producers netting about the same price as that obtained for Straits. Futures are nominally the same prices as asked for spot.

Arrivals of tin, in long tons: Sept. 6th, Straits, 10; 7th, Rotterdam, 25; China, 225; 10th, Straits, 725; China, 75.

Gold

Gold in London: Sept. 8th, 110s. 1d.; 9th, 110s. 1d.; 12th, 110s. 2d.; 13th, 110s. 3d.; 14th, 110s. 4d.

An analysis of the gold movement to the United States, made by the National Bank of Commerce, shows that present European gold reserves are not being drained to swell America's holdings, but that the increments to this country's hoard since the first of the year, in so far as shipments from European points are concerned, are chiefly accounted for by three great streams of the metal, consisting of newly mined supplies from Africa coming by way of London; of gold yielded up by India, also coming by way of London; and of metal thought to have originated from Russian sources, eventually coming to America through various European countries.

Foreign Exchange

The principal feature of the exchange market has been the violent decline of German marks. The end is apparently not yet in sight, and there is considerable speculation as to a German financial crisis and non-payment of reparation demands. It is estimated that it would take half the world's stock of gold to redeem the outstanding German paper. Other European exchanges have inclined toward weakness, but sterling has held generally steady. Cables continue to be quoted at one-half cent premium over checks as given on page 475. On Tuesday, Sept. 13, francs were 7.17c.; lire, 4.2925c.; and marks, 0.925c. New York funds in Montreal, 11 $\frac{3}{4}$ per cent premium.

Silver

Prices in both London and New York have advanced considerably in the last week, and the market has broadened. Owing to the improvement in Eastern exchanges, China has again become a buyer, with the result that business in San Francisco has been done at higher levels than in New York. Today, however, with the reaction in sterling exchange, buyers are less keen.

Mexican Dollars—Sept. 8th, 49; 9th, 49; 10th, 49; 12th, 49 $\frac{3}{4}$; 13th, 50 $\frac{1}{4}$; 14th, 50 $\frac{1}{4}$.

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.; 18 $\frac{1}{2}$ c. for imports, duty paid.

Antimony—Chinese and Japanese brands, 4.45@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, 6 $\frac{1}{2}$ @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 tonnage, 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—\$72@\$78 per oz., according to quantity.

Quicksilver—Market weaker at \$42.50 @\$43 per 75-lb. flask. Largely a jobbing business. San Francisco wires \$42. Slow.

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, \$25@\$27; ground, \$28; 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, 51 $\frac{1}{2}$ per cent iron, \$5.70; Mesabi non-bessemer, 51 $\frac{1}{2}$ 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, cobbed, 63 per cent, \$5.75; new bed low phosphorus, 65 per cent, \$8.50.

Manganese Ore—20@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, 50c. per lb. of contained sulphide, New York. Quotation purely nominal.

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

Titanium Ores—Ilmenite, 52 per cent TiO₂, 1 $\frac{1}{2}$ @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, f.o.b. Atlantic ports.

Uranium Ore (Carnotite)—Ore containing 1 $\frac{1}{2}$ 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;

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

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.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 10—Zinc blende, per ton, high, \$23.30; basis 60 per cent zinc, premium and Prime Western, \$20; fines and slimes, \$19@\$17; average settling price, all grades of zinc, \$21.68 per ton.

Lead, high, \$56.30; basis 80 per cent lead, \$55; average settling price, all grades of lead, \$51.37 per ton.

Shipments for the week: Blende, 4,169; lead, 1,560 tons. Value, all ores the week, \$170,510.

No change was made in price offerings, but 4,600 tons less blende was purchased, the sales being 3,600 tons, against 8,200 tons last week. Lead ore price continues upward, another dollar being added to the basis price this week. Competition is sharp, and the higher lead prices are accelerating the production of blende in an effort to enlarge the output of lead, owing to the close association of the ores.

Platteville, Wis., Sept. 10—No sales of lead or zinc ore. Shipments for the week: Lead ore, 40 tons. Shipments for the year: Blende, 8,461; lead ore, 1,171 tons. Shipped during the week to separating plants, 546 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) \$23@\$24 in bags, carload lots; (off-color) \$21@\$22 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, 5 $\frac{1}{2}$ c. per lb.; in bbls., 5 $\frac{1}{2}$ c.

Chalk—English, extra light, 5c. Domestic light, 4 $\frac{1}{2}$ c.; 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, \$25@ \$30, 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, \$12.50, 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@2½c.

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.; \$58@ \$64, Chester, Pa. Austrian grade, \$53.80 per ton, f.o.b., Chester, Pa. (Magnesite brick—See Refractories.)

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

Monazite—Minimum of 6 per cent thorium oxide, \$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, 14c.; Spanish lump, 13@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, \$30@ \$40; Canadian, \$18@ \$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; \$20@ \$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, 11½c. per lb. of chromium contained; 4 to 6 per cent carbon, 11@12c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, \$65@ \$67, f.o.b. furnace; resale, \$90, delivered; English, \$65@ \$67, c.i.f. Atlantic seaports. Spiegeleisen, 18 @20 per cent, \$25@ \$27, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, \$2.25 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, \$38@ \$40; 50 per cent, \$60@ \$65; 75 per cent, \$130@ \$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.

Ferrovandium—\$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, 13.75c.

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. shapes, \$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

Pittsburgh, Sept. 13, 1921

Demand for steel products seems to be increasing at a slightly better rate this month than in August. Steel-ingot production in August was at the rate of 30 per cent of capacity.

Finished-steel prices have now become relatively steady. Bars, shapes, and plates are quotable roughly at about 1.70c. Sheets are steady at 2.25c. for blue annealed, 2.75c. for black, and 3.25c. for galvanized.

Wire products actually show an advance, the American Steel & Wire Co. announcing an advance of \$2 a ton on plain wire and \$3 on nails, barb wire, and such products. Independents are concurring. As usual in this trade, customers are booked up for a short time at the old prices. Plain wire is now 2.60c. and nails \$2.90.

Pig Iron—After a little buying recently, foundry iron is quieter, but \$21, Valley, is well held, \$1.50 advance over the recent low point. Bessemer remains at \$20 and basic at \$19.

Steel—Prices are largely nominal, in the absence of actual transactions. Billets, slabs, and sheet bars are all about \$30. The leading interest's price on rods is advanced from \$40 to \$41.

Coce

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

Platinum Market Since 1900 Shows Wide Variations

Prices Now Far Above Pre-War Levels, but a Greatly Diminished World Production, With a Normally Sustained Demand for This Useful Metal, Points to Only a Slow Return to Lower Figures—Russia an Uncertain Element

EDITORIAL MARKET STUDY

PLATINUM is a fascinating metal. Of much rarer occurrence than gold, it possesses valuable characteristics that make its use in certain industries well-nigh indispensable. Were it more plentiful, there is little doubt that platinum would be used for coinage purposes, and that it would be a fitting companion to the two precious metals, gold and silver, in the discharge of their important functions as currency and monetary reserves. Platinum coins once were minted by the Russian government at a time when the metal was less valuable than gold, and only recently announcements were made that the Soviets contemplated the introduction of new platinum coinage. Because platinum is so scarce and its production so erratic, price fluctuations have been wide, a condition which hardly lends itself to the economic use of the metal for coinage.

In 1900, the annual average price of platinum was \$18 per oz.; in 1910, \$32.70, and in 1920, \$110 per oz. The following table, giving the average since 1899, shows how greatly platinum has risen in value in recent years:

1899.....	\$15.22	1911.....	43.12
1900.....	18.09	1912.....	45.55
1901.....	20.00	1913.....	44.88
1902.....	19.00	1914.....	45.14
1903.....	18.91	1915.....	47.13
1904.....	19.50	1916.....	83.40
1905.....	20.34	1917.....	102.82
1906.....	28.04	1918.....	105.95
1907.....	30.98	1919.....	114.61
1908.....	16.32	1920.....	110.90
1909.....	24.87	1921 (Aug.).....	73.22
1910.....	32.70		

In appearance, platinum closely resembles a host of common metals such as iron, nickel, silver, tin, german silver, and many alloys. There is nothing distinctive about its color, and were that characteristic the only appeal, little platinum would be purchased for jewelry. However, as platinum is several times as valuable as gold, it is prized for its higher worth. The craze for luxuries, which found its fullest expression during the war, created a great demand for expensive platinum jewelry.

The decline of platinum from its peak price, \$155 per oz. in January, 1920, to its present level of from \$75 to \$80, is partly accounted for by the decreased consumption in personal adornments.

Russia has been the world's greatest platinum-producing country, and, before the war, accounted for about 90 per cent of the world's production, with an annual output of 250,000 to 300,000 oz. During the war and the chaotic period which followed, operations in Russian platinum fields were severely hampered and production declined to about 25,000 or 30,000 oz. annually. As a consequence, another platinum-producing country, Colombia, which ordinarily produced about one-ninth as much platinum as Russia, is now the world's chief producer. Its leadership is only temporary, and will undoubtedly vanish as soon as the Russian platinum dredges again operate in full force. The following table shows the estimated pre-war and post-war platinum production of the world, the figures being given in ounces:

	1913	1916	1920
Russia.....	250,000	63,900	25,000
Colombia.....	15,000	25,000	35,000
New South Wales and Tasmania.....	1,500	250	1,400
Other countries.....	750	900	900
Totals.....	267,250	90,050	62,300

The great drop in the Russian output during the war, and the strong industrial demand, caused prices to soar, but the present industrial quietness and the uncertain nature of Russian holdings of platinum have introduced some unstable elements into the situation. Russian supplies of platinum are not accurately known, but are placed at not over 100,000 oz. by people in close touch with the market. In normal times this figure would represent about one-third

the world's production for one year, and would occasion no alarm, but this amount is more than twice the present world's production.

Occasionally some Russian platinum has filtered out of the country, and the fear of an imminent deluge has more than once been responsible for some hasty selling of the metal. The drop in platinum which carried the metal recently down to \$65, the lowest price in five years, is attributed mainly to the quick disposal of some Colombian platinum by a holder who had become uneasy over the Russian supplies.

The platinum market is exceedingly sensitive, and a small volume of sales has a marked effect in determining the market price of the metal. Being so valuable, it takes but the trading of a few handfuls to run up in thousands of dollars. Rumor frequently works havoc with any market, and platinum has been no exception. Recently, the U. S. Government announced that it had some scrap platinum for sale, but the announcements showing the platinum content of the scrap mistakenly carried the decimal point in the wrong place, making it appear that a larger quantity of platinum was available. As a result those dealers uninformed as to the true situation became uneasy, and the market showed a decided weakness over the prospect of having to absorb a large amount of scrap.

The U. S. Geological Survey estimates that about 115,165 oz. of platinum was consumed in the United States during 1918 and 154,743 oz. during 1919, with the following percentage distribution of consumption:

Industry:	1918	1919
Chemical.....	41	7
Electrical.....	25	19
Dental.....	17	14
Jewelry.....	12	56
Miscellaneous.....	5	4
Metal consumed (ounces):		
Platinum.....	100,810	133,680
Iridium.....	5,302	7,501
Palladium.....	9,053	13,562

The use of platinum in 1918 was greatest in the chemical industries, chiefly in the manufacture of sulphuric acid by the contact process, in which platinum is used as a catalyzing agent. Chemical and electrical requirements, being essentially war needs, carried priority over other uses. In 1919 the war was over and the increased use in jewelry became greater than all other outlets combined.

Consumption of platinum in the United States is normally about 150,000 oz. annually, of which about 40 per cent goes into jewelry, 20 per cent into electrical goods, 25 per cent into dental needs, and 15 per cent for chemical purposes. The platinum resources of the United States are slim, and supply only about 8 per cent of requirements.

No extended calculations are necessary to a realization that if the normal requirements of this country are 150,000 oz., and the world supply is less than half this amount, platinum prices have an excellent opportunity to stay where they are until there is some radical change in the Russian situation. The statistical record of platinum points to more or less of a scramble to make the world's supply go around, and indicates that the return to pre-war prices—if there is to be a return—will be long drawn out.

The present outlook for platinum is quite cheerful. Although the market is still far above a pre-war level, and deflation has not had a great effect upon platinum, the situation is utterly different from that which other metals have passed through. There is no overproduction, and surplus stocks, although not definitely known, are not unusually large. Unfortunately, platinum production in the United States is so small that few miners and producers can take advantage of the present market.

Mexico's Silver and Gold Production

The following official table gives data as to the silver and gold produced in the Republic of Mexico for the first six months of 1920 and 1921 respectively:

PRODUCTION OF SILVER			
In Troy Ounces			
	1920	1921	
January.....	5,301,599	7,206,060	
February.....	5,649,591	5,661,358	
March.....	5,891,070	3,815,176	
April.....	5,081,275	4,846,741	
May.....	5,337,414	3,894,841	
June.....	5,851,718	5,075,328	
Total for six months.....	33,112,667	30,499,504	
Difference in favor of 1920.....	2,613,163		
Value of silver produced (pesos).....	77,483,701	42,599,405	
Difference in favor of 1920.....	24,884,296		

PRODUCTION OF GOLD			
In Troy Ounces			
	1920	1921	
January.....	60,667	69,380	
February.....	64,846	57,709	
March.....	64,975	51,697	
April.....	60,543	45,235	
May.....	55,041	54,751	
June.....	73,913	41,797	
Total for six months' period.....	379,985	320,569	
Difference in favor of 1920.....	59,416		
Value of gold produced for six months' period, pesos... ..	15,980,170	13,463,898	
Difference in favor of 1920.....	2,516,272		

VALUE OF SILVER AND GOLD PRODUCED, SIX MONTHS' PERIOD			
In Pesos			
	1920	1921	
Silver.....	77,483,701	42,599,405	
Gold.....	15,980,170	13,463,898	
Total.....	93,463,871	56,063,303	
Difference in favor of 1920.....	37,400,568		

Zinc Production Declined, Stocks Increased, During First Six Months of 1921

Figures compiled by C. E. Siebenthal and A. Stoll, of the U. S. Geological Survey, from reports submitted by all zinc smelters which operated during the first six months of 1921, show that the production of zinc from domestic ore in that period was 100,781 short tons, and from foreign ore 1,744 tons, a total of 102,525 tons, as compared with 205,269 tons in the last half of 1920 and 258,108 tons in the first half. The stock of zinc held at smelters and in warehouse June 30 was 94,747 tons, having increased from 71,037 tons at the end of 1920 and 29,892 tons at the middle of that year.

From the foregoing figures, and from the statistics of imports and exports as recorded by the Bureau of Foreign and Domestic Commerce, it is calculated that the apparent consumption for the period was 83,965 tons, as compared with 147,783 tons in the last half of 1920 and 175,268 tons in the first half.

In addition to the zinc produced from ore, 11,950 tons was redistilled from zinc ashes, skimmings, and drosses. Much of this zinc was of grades above Prime Western, and the total, added to the primary output, gives 114,475 tons, consisting of 13,358 tons of "high" grade, 1,106 tons of "intermediate" grade, 17,466 tons of "select and brass special" grade, and 82,545 tons of "Prime Western." Electrolytic zinc amounted to 4,617 tons, as compared with 27,591 tons in the last half of 1920 and with 24,035 tons in the first half.

The total number of retorts at plants at which there were some operations during the first half of 1921 is 123,528, as compared with 158,545 at the end of 1920. The number of retorts in operation on June 30, 1921, was 36,000, as compared with 56,000 at the end of 1920 and 95,000 on June 30, 1920.

The demoralization of the zinc industry during the half-year, with imports of 7,405 tons, exports of 2,255 tons, and apparent consumption of 83,965 tons, is strikingly shown by comparison with the two periods of 1919 and the first half of 1920, when imports were nothing, exports from 70,000 to 90,000 tons, and consumption was from 160,000 to 175,000 tons.

The output of zinc by Belgian smelters in the first half of 1921 was 35,858 short tons, as compared to a total of 91,542 tons in 1920. The output in June was 4,817 tons. It is

understood that the monthly output has been limited by the Federation of Belgian Zinc Smelters to 5,000 tons.

World zinc stocks have been recently stated as about 160,000 short tons, exclusive of the stocks of sheet zinc, of which Belgium is reported to hold 45,000 tons.

The Bunker Hill & Sullivan Mining Co. has been experimenting with the electrolytic reduction of zinc ores for some time, and has been recently operating a pilot plant, from the results of which it has decided to install a plant capable of handling the zinc of the Star mine and of the Pine Creek district. An experimental electrolytic zinc plant has been started at Rhodesia, Broken Hill, Africa.

ZINC STATISTICS, 1919-1921, BY SIX-MONTH PERIODS

Supply:	In Short Tons				
	1919		1920		1921
	First Half	Last Half	First Half	Last Half	First Half
Stock at beginning of period.....	41,241	59,651	36,793	29,892	71,037
Production: From domestic ore.....	247,584	204,688	251,065	198,980	100,781
From foreign ore.....	7,918	5,553	7,043	6,289	1,744
Imports (mostly scrap) foreign.....	45	25	13	2	6,674
Domestic returned.....	.....	.....	.....	8,162	731
Total available.....	296,788	269,917	294,914	243,325	180,967
Withdrawn:					
Exports, foreign, from warehouse.....	9,620	2,636	26,690	1,442	384
Exports, foreign, under drawback.....	3,727	806	143	86	9
Domestic exports: Slabs.....	52,989	56,757	55,293	18,753	446
Sheets.....	11,300	8,462	7,628	4,224	1,016
Stock at end of period....	59,651	36,793	29,892	71,037	94,747
Total withdrawn....	137,287	105,454	119,646	95,542	97,002
Apparent consumption.....	159,501	164,463	175,268	147,783	83,965
Zinc smelted in:					
Arkansas.....	14,029	17,408	16,523	14,958	8,631
Illinois.....	(a) 61,701	(a) 56,639	(a) 61,611	(a) 47,240	24,676
Kansas.....	22,034	21,908	21,690	19,354	7,824
Oklahoma.....	65,272	56,716	65,297	45,203	21,341
Pennsylvania.....	37,108	30,413	38,131	36,103	20,690
Other states.....	32,147	23,312	30,821	14,820	14,746
Electrolytic zinc.....	23,211	3,845	24,035	27,591	4,617
Total primary zinc.....	255,502	210,241	258,108	205,269	102,525
Redistilled secondary zinc.....	7,328	12,420	12,474	8,897	11,950
Total.....	262,830	222,661	270,582	214,166	114,475
Grade A (high grade).....	30,154	15,223	41,177	39,536	13,358
Grade B (intermediate)....	25,802	13,371	17,310	16,583	1,106
Grade C (select and brass special).....	43,481	97,436	37,917	21,894	17,466
Grade D (Prime Western).....	163,393	96,631	174,178	136,153	82,545
Total.....	262,830	222,661	270,582	214,166	114,475
Zinc ore imported.....	18,570	30,079	45,388	13,338	7,417
Zinc content of imported ore.....	6,314	10,695	19,952	2,535	2,652
Zinc content of ore in warehouse at end of period (b).....	10,996	18,848	26,801	25,650	18,373
Zinc drosses exported.....	5,010	1,113	1,936	509	38
Total number of retorts at end of period.....	158,988	157,004	157,456	158,545	123,528
Total number in operation at end of period....	82,000	107,500	95,000	56,000	36,000

(a) Exclusive of electrolytic zinc made in Illinois.

(b) Part of this may have been smelted but not shipped, and thus be included in the zinc given above as produced from foreign ore.

Ontario Gold Production Improving

A report of the Ontario Department of Mines for the first six months of 1921 shows that at the present rate of production the total output of gold in Ontario for 1921 will be about \$13,000,000, as compared with 1920, when it was \$11,665,735. Details of production for January to June, 1921, inclusive, are given below:

Source	Daily Milling Capacity, Tons	Ore Milled, Tons	Gold Recovery	
			Ounces	Value
Dome.....	844	152,880	45,426	\$939,053
Hollinger.....	3,500	426,425	171,257	3,420,811
McIntyre.....	550	76,119	40,122	829,408
Total.....	4,894	655,424	256,807	5,189,272
Kirkland Lake				
Kirkland Lake.....	150	22,382	5,285	109,262
Lake Shore.....	60	10,423	9,244	191,190
Teck-Hughes.....	120	16,073	8,022	165,837
Wright-Hargreaves.....	150	8,136	6,537	103,518
Total.....	480	57,644	29,089	569,807
Grand total.....	5,374	713,068	285,897	5,759,079

MINING STOCKS
Week Ended September 10, 1921

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

Table with columns: Stock, Exch., High, Low Last, Last Div. Includes sub-sections for LEAD and QUICKSILVER.

Table with columns: Stock, Exch., High, Low Last, Last Div. Includes sub-sections for ZINC and VANADIUM.

Table with columns: Stock, Exch., High, Low Last, Last Div. Includes sub-sections for GOLD and SILVER.

Table with columns: Stock, Exch., High, Low Last, Last Div. Includes sub-sections for SILVER and GOLD AND SILVER.

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

Table with columns: Stock, Exch., High, Low Last, Last Div. Includes sub-sections for SILVER-LEAD and VANADIUM.

Table with columns: Stock, Exch., High, Low Last, Last Div. Includes sub-sections for VANADIUM and ASBESTOS.

Table with columns: Stock, Exch., High, Low Last, Last Div. Includes sub-sections for ASBESTOS and MINING, SMELTING AND REFINING.

*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.

