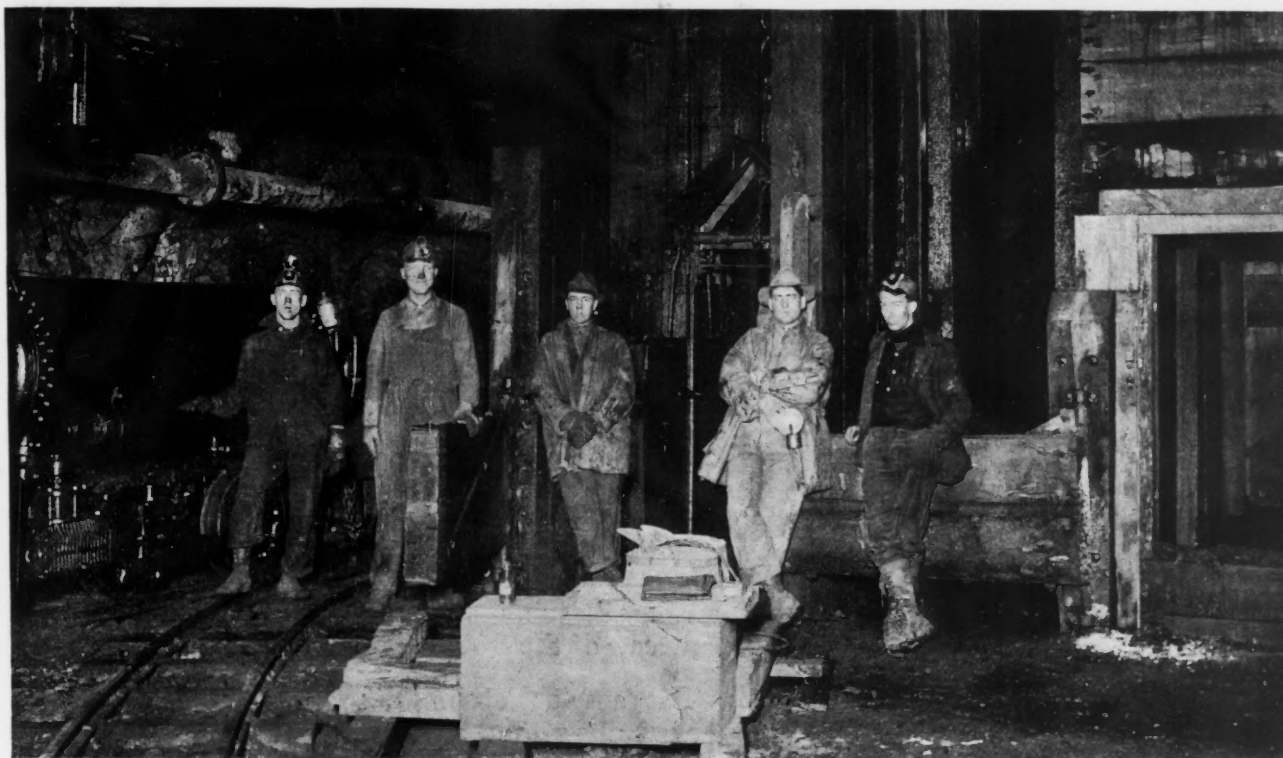


ENGINEERING AND MINING JOURNAL

McGraw-Hill Co., Inc. **December 3, 1921** 25 Cents Per Copy



Station on 1,550 Level of Old Abe Shaft, Homestake Mining Co., Lead, S. D.

Geological Methods of the Homestake Mining Co.

By Lawrence B. Wright and Joseph O. Hosted

Reclaiming 6-Oz. Silver Tailing at the Coniagas Mines

By H. E. Cawley

The Placers of the Johnnie District

By Charles Labbe

War Problems in Minerals V—United States Geological Survey— 1914-1918

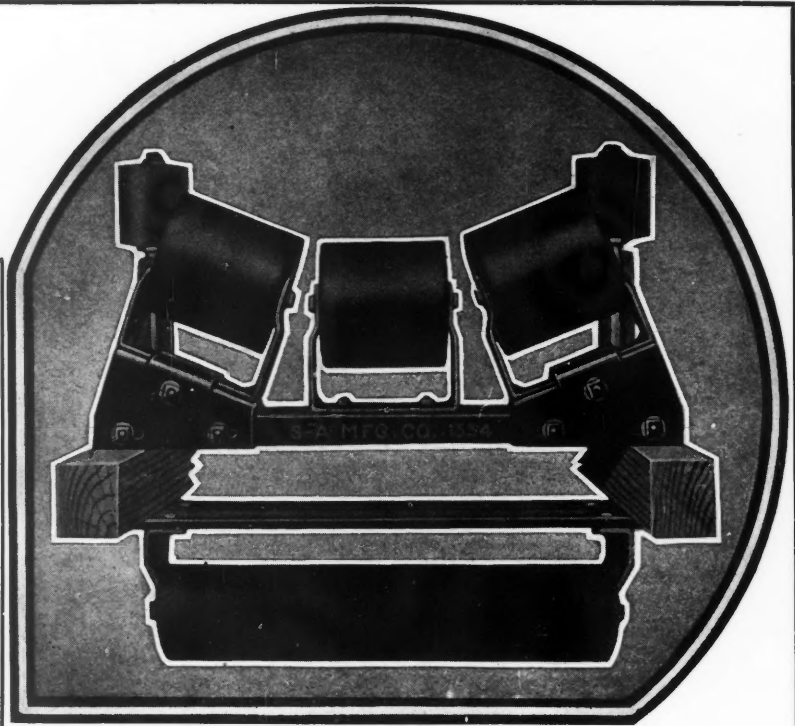
By George Otis Smith

Biography of Eugene Meyer, Jr.

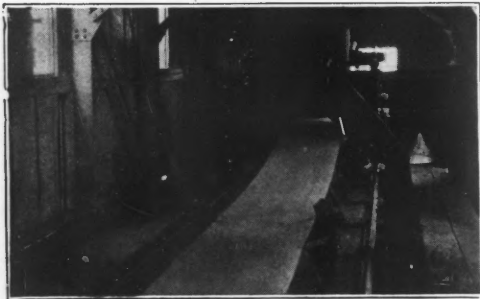
The discussion of a foreign and domestic mining policy is of intense interest in view of the limited metal and mineral supplies and the acceleration of their consumption. Problems of international trade in minerals, merchandising methods, and the potency of international cooperation are some of the subjects discussed at a recent meeting of the Mining and Metallurgical Society, a report of which appears on page 904.

The new War Minerals Relief bill, in effect an amendment of the original act, has been signed by the President. The crippling feature making it necessary to reappropriate the unspent balance of the War Minerals fund before it could be used to pay new awards was finally removed through joint action by the House and the Senate, as told in a special letter in the News From Washington that is featured in this issue.

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Volume 112

New York, December 3, 1921

Number 23

The Mining Industries in Washington

IT IS DIFFICULT for us, engaged in playing our little individual parts in the vast stage of the world, to visualize how the whole play would look to the audience. Even in our little section of the great spectacle, the detached and unofficially remote view and perspective of the problem of the mining industry is very difficult. What shall be our major policies as a mining group? Shall we have a mining group, working together?

Recently, the Representatives in Congress from the great farming states have organized for mass action, to represent and further the interests of the farmer or the agrarian group—and have formed what is known as the agricultural "bloc." It has naturally proved a powerful and successful political device. We understand that, impelled or compelled by this example, the Western group of Senators are contemplating or have already arranged for a similar organization, which would essentially form a mining "bloc," for although many interests other than mining are represented in the West, it goes without saying that the West will stand up for the mining industries, against the indifference of the agricultural Middle States and the commercial East.

All this represents an important and serious permanent tendency. The foundations of our Republic were based on representation by population and by geographic groups. Each Congressman represented, and theoretically still represents, a certain number of constituents of all occupations and varieties, and so the Government is ostensibly conducted. But the days of the foundation of the Republic were simple days—of agriculture and local and simple small trade. Modern mechanical inventions have made possible and entailed vast industrial grouping—great corporations, combinations of corporations, and the segregation, into great central areas, of agriculture and manufactures of various types; and have resulted in the growth of a vast and complex urban civilization.

Unquestionably, a certain socialization is being naturally accomplished, as compared with the days when the Lexington farmer dropped his scythe and grasped his musket, to uphold his ideals of personal freedom and independence. Therefore, in actual practice, we are slowly discarding the government by geographical representation, and substituting the government by industrial groups—not by classes, for that is already far in the past. Accordingly, we have numerous organized and highly respectable organizations in Washington—lobbies in the clean sense of the word—whose object is actively to represent, in the Government at Washington, special industrial groups.

Senator Thomas once said that we have a hundred and eighty organized lobbies. That was over a year ago—probably there are two hundred by this time. In our own industrial group or groups, we have the Amer-

ican Mining Congress, representing the mining group, and the Federated American Engineering Societies, representing the engineer group; and we have others representing individual mining industries and metal trades. The coal operators have also their well-organized representation.

It has become an apparently necessary though unofficial part of our government—these group advisers and special advocates who make it possible for the actually elected members of Congress to evaluate the numerical, industrial, and political strength of these various groups, and to shape their legislation accordingly. For this is what Congress—the Congress of the Constitution—essentially does; steers its legislative way, as skillfully as may be, between the rocks as indicated by the lighthouses of organized unofficial industrial representation, so as to come out whole and unbroken at the end of the elective term.

One correspondent has called our present government "a government by noise," which is an accurate way of putting it, for those industrial groups not vociferous, and not represented by organization in Washington, will make little impression. In this organization the technical and scientific bureaus of the Government act as consulting engineers to Congress, frequently consulted, important as balance wheels, frequently an important factor, frequently overruled for practical considerations. For in the end it is the *vox populi*—the voice of the whole people—since each one has a vote and, therefore, an equal right to consideration—to which Congress, and the President as well, is bound to listen, and act accordingly, and not to any group of advisers, whether special industrial representatives or fellow Government servants.

The Conference at Washington

THE CONFERENCE on limitation of armaments at Washington, off to a better start than any of us had expected, gives promise of achieving real results. A cessation of the mad race of England, Japan, and the United States to build the most and biggest warships seems to be virtually assured, and there is some prospect of land forces also being curtailed and that certain subjects likely to cause trouble will be settled. As armament and munitions are composed of metals and chemicals, one might think that the industries producing these materials would be affected adversely by any policies of military curtailment. However, the amount of iron, copper, zinc, and tin used for military purposes is, over a long term of years of peace and war, insignificant compared with the total amount produced. Even the Bethlehem Steel Co., one of our premier munition plants, would not, according to Mr. Schwab, suffer to a great extent, and others seem to agree with him, for shares in that enterprise are not falling below their general price level in the stock market.

Without doubt the nickel industry would feel the loss of armament business, which, before the Great War, took a considerable percentage of the world's nickel production. However, we do not believe that the International Nickel Co. would be likely to suffer greatly, for the increasing use of Monel metal may more than offset the possible loss. Eliminating even a part of the enormous normal expenditures for military preparedness would be sure to hasten the return of prosperous times and international solvency, without which our mineral industries must remain impoverished. Therefore, from a selfish and sordid point of view as well as from a humanitarian standpoint, we hope that maximum armament limitation can be arranged.

In fact, this conference appears the last chance for the United States to gain even one desirable end from the so-called Allied victory. Of course, the Allies had to fight Germany, or we would all have been German slaves; but from the victory we expected greater things. We hoped that America would be made "safe for democracy"; so far it is not as safe as before the war. We hoped to chastise Germany; if there is any general chastened spirit there or inclination to accept responsibility for the conflict, our information is in error. We were going to do away with the German war-lords; our last bulletin was that the Kaiser, von Hindenburg, Ludendorf and the rest were still as healthy as ever and enjoying more of the perquisites of luxury than the average Allied soldier—far more.

After winning our military victory we had a right to expect that just punishment would be meted out to the perpetrators of the war and to those guilty of atrocities. The actual result has been that a high degree of leniency has been shown to those who gave the orders, because they did not actually do the deed; and to those who did the dirty work, because obedience to orders is expected of a man when in the military service of his country. A case in point has just been reported in the newspapers. During the war the Canadian hospital ship "Llandovery Castle" was torpedoed. The submarine commander who ordered that her lifeboats be fired upon was given a sentence of *four years* in a German jail for this outrage. He has just broken out of confinement, and we are sardonic enough to believe that he will not be compelled to flee from Germany to escape the clutches of the law.

We had a right to believe that Germany would not be a haven for our slackers. Yet there is Grover C. Bergdoll, an escaped American prisoner whom we should, in all justice, have the right to apprehend if Germany refuses to do so. Germany merely laughs at us in this case. We expected that if we won we would be more prosperous thereafter than our enemies. Reports from abroad indicate, however, that conditions are better in Germany than in France, or in England, and we are certainly not in the throes of general prosperity here.

Another thing that we were fighting for was the right of self-determination for small nations. Yet we have seen no referendum on this subject offered to the people of Ireland, India, French Africa, Southern Manchuria, or the Philippines. Some of the Allied nations profited to the extent of some of Germany's foreign possessions, but these were paltry pay for the sacrifice of human lives and wealth. As far as the United States goes, we did not even get one of these souvenirs of the party; at least we do not remember what it is if we did. A few reparations payments have also been made, but compared to the cost of the war the amount

is decidedly insignificant. And already Germany is reported having difficulty finding funds to meet the next payment, which has already been postponed, and the Allies do not know what to say. How about taking some of the gold out of the German treasury, which is said to be there in approximately the same amount as before the war? Is that to be considered sacred?

We have mentioned these things briefly to indicate that our military victory was a defeat in every other sense of the word. This is not to say that we made a mistake in entering the war against Germany, for we would probably have been much worse off if we had offered no resistance. But anything which will make nations less likely to launch wars of aggression is to be promoted. We believe the Washington conference will have certain favorable results in this way. Limiting armaments is a small matter, if we consider simply the dollars and cents part of it. We should all work toward the division of this earth among the various groups of peoples so that the maximum of happiness may come to all the inhabitants; then, should any nation attempt, by armed force, to extend its territory, every other nation should automatically become its enemy. Of course the first difficulty lies in making the division of the earth an equitable one.

All success to the distinguished gathering!

State and Local Mine Taxation

THE PROBLEMS of Federal mine taxation are not giving much concern to our specialists in mining taxation these days. There is a general feeling that the existing conditions are as favorable as can be expected, given the fact of onerous general taxation. The individual applications of the existing laws, of course, do not offer any simple solution, and important cases are being worked out more or less painfully. Therefore, our various taxation committees of the mining societies are devoting more of their thought to state taxation, which varies widely in principle and in weight in the different states, ranging all the way from giving mining a fair show to taxing it all the traffic will bear; stopping, in theory, apparently, only so far short of confiscation as to allow the mines to operate. This considerate plan does not always work to the extent of securing the necessary continuity of operation, and the result is the closing down of the mines, and the net loss in tax revenues to the state. In some of these states socialistic ideas have become strong, especially among the dominant agrarian and farmer class—in such states as the Dakotas and Minnesota, for example. An underlying belief and conviction comes to be held that mineral supplies belong to the state—that is to say, to the people in general. Why they do not extend the same theory to agricultural lands is difficult to see in theory but easy to discern as a practical proposition. It is the same reason why the income tax has come to stay, for it enables ninety-five per cent of the voters to compel the other five per cent to pay inordinately the expenses of the state, though without corresponding beneficial or even government-participating privileges.

Conditions in Biblical times, which exemplified the text "Unto every one that hath shall be given. . . but from him that hath not shall be taken away even that which he hath" have been happily subverted to "from him which hath shall be taken." The dangerous point is reached in this policy when the incentive of the getter and payer to get more is destroyed. This has been done on a whole-

sale scale in this country, and is one of the many contributing factors to our business lethargy.

The taxes of the Mahoning iron mine, on the Mesabi Range in Minnesota, we are reliably informed, have increased since 1916 in the following ratio (the figures are per ton of product): 1916, \$0.17; 1917, \$0.19; 1918, \$0.30; 1919, \$0.62; 1920, \$0.68; 1921, \$4.02. Going some! as the small boy would observe. The taxes, it must be remarked, are based on an ad valorem figure, and the rate mentioned is not directly assessed, but is obtained by dividing the ad valorem taxes assessed on the ore reserves by the tonnage shipped, thereby producing the exceptional figure quoted for 1921, a year of the conjunction of high taxes and low production.

Socialism, and the approach to socialism, is attractive and promising. Easy work and good feed appeal to us all, and relief from the necessity of strenuous competition. The only trouble with the leveling ideas is that they fail to retain individual and corporate incentive and initiative, and the production of wealth dwindles, and all hands get poorer together.

A comparative study of our state mining laws will be valuable. Of course, uniform state mine taxation would be desirable, but is probably impracticable in the near future. It is even not desirable that we should have too complete federalization. On the other hand, in our economic system, state mine taxation is not purely a state affair. The Minnesota taxes of the United States Steel Corporation in 1921 approximate \$1 per ton of ore produced. Unavoidably, this charge is handed on to the ultimate consumers, the railroads, the factories, and so to the increased expense of every one of us. It is not the Steel Corporation that is being penalized, but American industry in general.

Factors of Safety

NOT LONG AGO we heard a financier who, in addressing a body of engineers, mining, civil, electrical, mechanical, and others, indicted them somewhat in the following manner: "You engineers provide elaborate formulæ for the solution of your many calculations and plans and then you calmly multiply or divide your result by five, or some other factor of safety, and use the product in the practical application of your work." Those were not the exact words used, but the idea is there. At first blush it would appear that our financier friend had indulged in a fine bit of sarcasm or had pulled a rich joke on the engineers. A moment's serious reflection, however, shows that either our friend does not have the right conception of engineering analysis and the solution of engineering problems, or engineers have created a wrong impression with the term factor of safety and its use.

A factor of safety is an important little number. It represents contingencies, human, material, and otherwise, which the engineer is unable to gage precisely in his calculations. An unknown flaw in a hoisting rope may affect its strength; the flywheel of an engine may be run at a speed far above that specified by the engineer; a storm of unusual severity may threaten a head-frame; machines may be subject to use and abuse beyond the original plans of the designing engineer. How can such important contingencies be accurately measured and reduced to exact formulæ? They cannot, but that is no reason for discarding the application of some precise formula and substituting guesswork in engineering analysis.

Consciously or unconsciously the banker also uses a factor of safety when he withholds dividends or profits in the form of a surplus. Were the events that are likely to influence his activities known with any degree of precision, a surplus would be unnecessary, but, as all prudent financiers realize, it is required to cushion the blow of unforeseen business conditions or reverses outside of the banker's control.

The element of safety enters into practically every human endeavor. The factor of safety argument has been aired frequently before, but we think there is not much to it.

Unprofessional Practice

WE ARE ALWAYS GLAD to receive comments, be they criticisms or encomiums, regarding articles appearing in *Engineering and Mining Journal*, and it is for that express purpose that we have established our "What Others Think" pages as the readers' forum, in which we purpose publishing such correspondence and discussion as may reach us through the customary channels. Every publication of repute is provided with similar means for the expression of readers; some adopt a rigid censorship, and a very few, if any, maintain an "open door" course. We believe that our policy is liberal and strikes a happy medium.

Some of the letters received are specifically marked for publication; others are confidential, and are so indicated; and a third class includes that correspondence which reaches us in the regular course of business and is sent in with no intention save comment. Editorial judgment governs the publication of the first and third mentioned letters, although the publication of the latter is subject to the permission of the writer; respect for confidences governs the disposal of the second type. So much for our *modus operandi* with regard to correspondence.

But the adoption of such a course does not completely relieve us from all responsibility, even if we did wish to assume an attitude of aloofness—which we don't. Let us quote a particular case.

We have recently received a letter criticising the appearance of a certain article; the attitude of the correspondent is a just one from his point of view, but he withholds permission to have his letter published. The instance involves our sponsorship or a denial of unprofessional procedure, so we feel in duty bound to make our attitude clear in the matter.

In our issue of Nov. 5, we published a short article detailing a method of measuring the depth of an oil well by means of a transit. The criticism expressed was to the effect that the article embodied a suggestion for securing information rightfully belonging to another, namely the person or company which was paying for the drilling.

We believe our readers are possessed of sufficient discrimination to enable them to realize that our purpose in publishing the article was not to promulgate a practice which engineers cannot recognize as professional or honest. We know that the writer of the article is an engineer of high standards, and we do not believe his intention was other than that of giving a method that had been used, regardless of the abuses to which it might be put. Our idea in publishing the article was solely for the purpose mentioned. We wish to make it plain that the *Journal* does not at any time sponsor unprofessional practice.

WHAT OTHERS THINK

The Disposal of Copper and Copper Products

The article entitled "The Opportunity for Copper Producers," on page 601 of the Oct. 15 issue of *Engineering and Mining Journal*, appeals to us as an excellent idea of great worth, and one that could best be put into action by the Copper and Brass Research Association for the greatest benefit to the public and the copper-producing and copper-selling industry.

To establish stores in leading cities, as suggested in this article, would greatly increase the demand for copper, and to such an extent, in fact, that never again would it be necessary for the copper mines of the country to suspend, either entirely or in part.

It would seem better for the Copper and Brass Research Association, composed of the leading producers and fabricators of the metal, to establish and control these important distributing agencies than for a few of the producers to handle such a great undertaking.

Stores where real copper products of quality—not the thinly coated kind made to look like the real article—such as copper sheets, wire, copper screens, shingles, roof gutters, drain spouts, coils, radiators, hot-water tanks, pipe and fittings, copper radiators for automobiles, kitchen utensils, locks, door knobs, hinges, screws, gas and electric fixtures, copper, bronze and brass articles of all kinds, and other manufactures of copper, either of utility or ornamentation, could be bought if offered at reasonable prices, would provide a real demand for copper metal. Together with the better-known uses for copper, such as are required in the building and equipment of power plants, power lines, trolley lines, railways, tramways, telegraph and telephone, transports, and similar applications, it might prove to be a question of importance where sufficient copper could be found to meet the requirements. There might even be danger in time of the demand exceeding the possibilities of supply to such an extent as to advance the price for the metal to where such general use would become prohibitive.

A general public, once aroused to the merits of a given cause and having a trend in that direction, is likely to progress in action to such a state of momentum that the happy medium of affairs is past with a rush and they are carried on to the opposite extreme. This perhaps could be guarded against by providing a balance wheel, such as an accurate barometer of the red-metal trade, edited and published periodically, under supervision of the Copper and Brass Research Association.

In the beginning it might be well to stimulate the buying of these commodities by conservative and constructive advertising broadcast throughout the country. In the Southwest we now have the slogan, "Buy Something Made of Copper." Display advertisements in the various journals and magazines, acquainting the public with the duration value, superior appearance, and cheapness in cost of such products, as compared to those made of less suitable metals, should produce the desired results. I note that *Engineering and Mining Journal* is willing to devote a lot of space free to such a cause. Now that we have turned the corner of depression, and business in general is on the upward trend, it would

seem fitting for these measures to be put into immediate effect.

JAMES W. MCALPINE.

Pinos Altos, N. M.

Early Records of the Michigan Copper Industry

I do not think that the article "Early Records of the Michigan Copper Industry" on page 776 of your issue of Nov. 12 conveys a correct impression. "Radisson's Voyages" were translated from the French manuscripts in the British Museum and Bodleian Library prior to 1885. In that year they were published in Boston by the Prince Society, Gideon D. Scull, editor. This publication contains *in toto* all the exact words quoted.

These extracts from Radisson's narrative have been taken from fifty different pages of the account and are descriptive of widely separated localities. The "small river" referred to was reached east of "Pictured Rocks." The passage beginning "Having passed that place" undoubtedly refers to the discovery by white men of the Keweenaw Peninsula. The last two extracts given refer to Indians living far to the west of the Keweenaw Peninsula.

The impression I obtained from these extracts is that Radisson is giving a description of one locality. It seems to me that inasmuch as Radisson's account has been quite widely known and was translated in English in 1885, and that as your extracts represent descriptions of widely separated places, the account conveys a wrong impression in both these respects.

However, I am glad to see attention called to Radisson's account, which is one of early Americana of extraordinary interest.

F. W. PAINE.

Boston, Mass.

Converting Dolomite Into Magnesite

In *Engineering and Mining Journal* of Oct. 15, in the contribution by Djevad Eyoub on the subject of "Converting Dolomite Into Magnesite," the statement is made that "samples were subjected to calcination at 800, 1,200, and 1,500 deg. F." (The equivalent Centigrade temperatures are 427, 649, and 816 respectively.) Also, "from 950 to 1,000 deg. F. was found the most suitable for the purpose of the investigation." (The equivalent Centigrade temperatures are 510 and 538, respectively.)

According to Richards, the decomposing temperature of calcium carbonate is from 600 to 800 deg. C., or 1,112 to 1,472 deg. F. In my own experience I have never noted any decomposition of calcium or magnesium carbonate below a dull red heat, approximately 1,200 deg. F., or a little above 600 deg. C.

In *Chemical and Metallurgical Engineering* of Nov. 9, on page 891, under the heading "Separation of Lime From Dolomite," H. G. Schurecht's study of the subject shows that "Magnesium carbonate in dolomite is decomposed by calcining for one hour at 800 deg. C. Calcium carbonate is not completely decomposed until after calcination at 960-1,040 deg. C. for one hour. (The equivalent Fahrenheit temperatures are 1,472, 1,760 and 1,904 respectively.) And that "The best results by flotation were obtained by removing the fine material from the raw dolomite and the calcining at 920 deg. C." (1,688 deg. F.)

So it is clearly evident that the temperatures stated in Mr. Eyoub's article should be Centigrade and not Fahrenheit.

WILLIAM H. HAMPTON.

New York, N. Y.

Concerning California Magnesite

Harry C. Boydell contributed an interesting and illuminating article in the issue of Nov. 12 of *Engineering and Mining Journal* on the subject entitled "The Eubœan Magnesite Field." Ill advisedly, Mr. Boydell asserts, "Greece produces . . . the world's purest magnesite." Having recently been a joint purchaser in some cargoes of Grecian magnesite amounting to several thousand tons, as well as being a producer of California magnesite for nearly five years, I feel qualified to make a positive statement regarding the comparative quality of the two magnesites.

California does produce and is producing a purer and better magnesite than Greece. Perhaps Mr. Boydell has never visited any California magnesite mines. It would not be difficult to show him mines that are producing ore that needs no "cobbing" or "dressing" like Grecian.

It is obvious that selected ore could be taken from any mine or mines, wherever situated, but it is distressing to note this bold assertion of the "world's purest" passing unchallenged in the editorial columns, considering the article of the Editor's in the issue of Oct. 22, where he dwells on the fact that he had all the data of the war minerals in the United States at his finger tips. If this were correctly stated it would have been possible to have either personally or editorially modified Mr. Boydell's superlativeness.

San Francisco

C. S. MALTBY.

Still Further Air-Receiver Calculations

Theodore Simons in *Engineering and Mining Journal* of Aug. 13, 1921, made some rather pointed criticisms of my article, "Air-Receiver Calculations," which appeared in the issue of June 11, 1921. Mr. Simons deduces the formulas in what he says is a "simpler manner." The relative simplicity of two expositions is, I should say, a matter of individual opinion.

In deducing formula No. 1 of Mr. Simons' paper, he states: "Then, from Boyle's law, volume, V_1 , the free air occupied in the receiver before being withdrawn, is

$$V_1 = \frac{V_{at} P_2}{P_1},$$

where V_{at} is the volume of free air withdrawn during t minutes, P_2 is the atmospheric pressure and P_1 is the initial absolute pressure in the receiver.

This statement is incorrect.

V_1 is the volume of compressed air that will be withdrawn in t minutes.

In formula No. 8, as Mr. Simons has deduced it, the right-hand member should be inverted.

In this problem of the storage of air to help compressors, Mr. Simons states that the hoists use and the compressors supply a certain amount of compressed air. A statement involving compressed air is meaningless unless the pressure is stated.

The hoists consume air and the compressors deliver air at a constantly reducing pressure, and so the assumption that is made in the calculation, that the pressure in the receiver is constant at 102 lb. per sq. in. absolute, is incorrect unless the actual weight of the air or the number of cubic feet of free air which the receiver must supply is determined, and then the volume that this weight or volume of free air would occupy at 102 lb. is calculated for substitution in the formula. If this was done it should be so stated.

The volume of free air per minute supplied by a compressor is nearly constant through a pressure range of 13 lb. because the volumetric efficiency of the compressor changes very slightly.

The third problem in my paper shows how this receiver problem is attacked from the point of view of free air. I gave the formula for determining the size of a stationary storage of a compressed-air haulage system, so that the tanks of the locomotives might be charged instantly to a given pressure.

In regard to this Mr. Simons offers the following:

"This presumes that no air is supplied to the storage system while the locomotives are being charged, a condition that does not obtain in practice, except where there has been an accident to the compressor. In that event no amount of storage will keep up the pressure long enough for practical operations. Receiver or storage capacities are therefore not calculated according to the above formulas."

It is exactly what it presumes. We may conceive an automobile tire to be the tank on the locomotive. When the tire gets flat there are two methods of inflating. First we may connect with the air receiver at a service station, and in a few seconds our tire is inflated; or second we may get out the hand pump. Charging a locomotive is comparable with the first.

One of the main arguments for compressed-air haulage is the absence of peak load. A locomotive is charged and starts on its trip, which may take half an hour. During that time a comparatively small compressor plugs away replacing the air in the stationary storage against the time when the locomotive will need another "shot." The charging usually occupies but a fraction of a minute, so the amount of air supplied by the compressor in that time is usually neglected. Of course the locomotive could be run up to the compressor and pumped up, but it is not done.

I took the trouble to go to Pittsburgh to visit the H. K. Porter Locomotive Works, that I might get first-hand information as to that company's methods of calculation. Its operators calculate the stationary storage as I have shown. A model calculation may be found in the company's catalog.

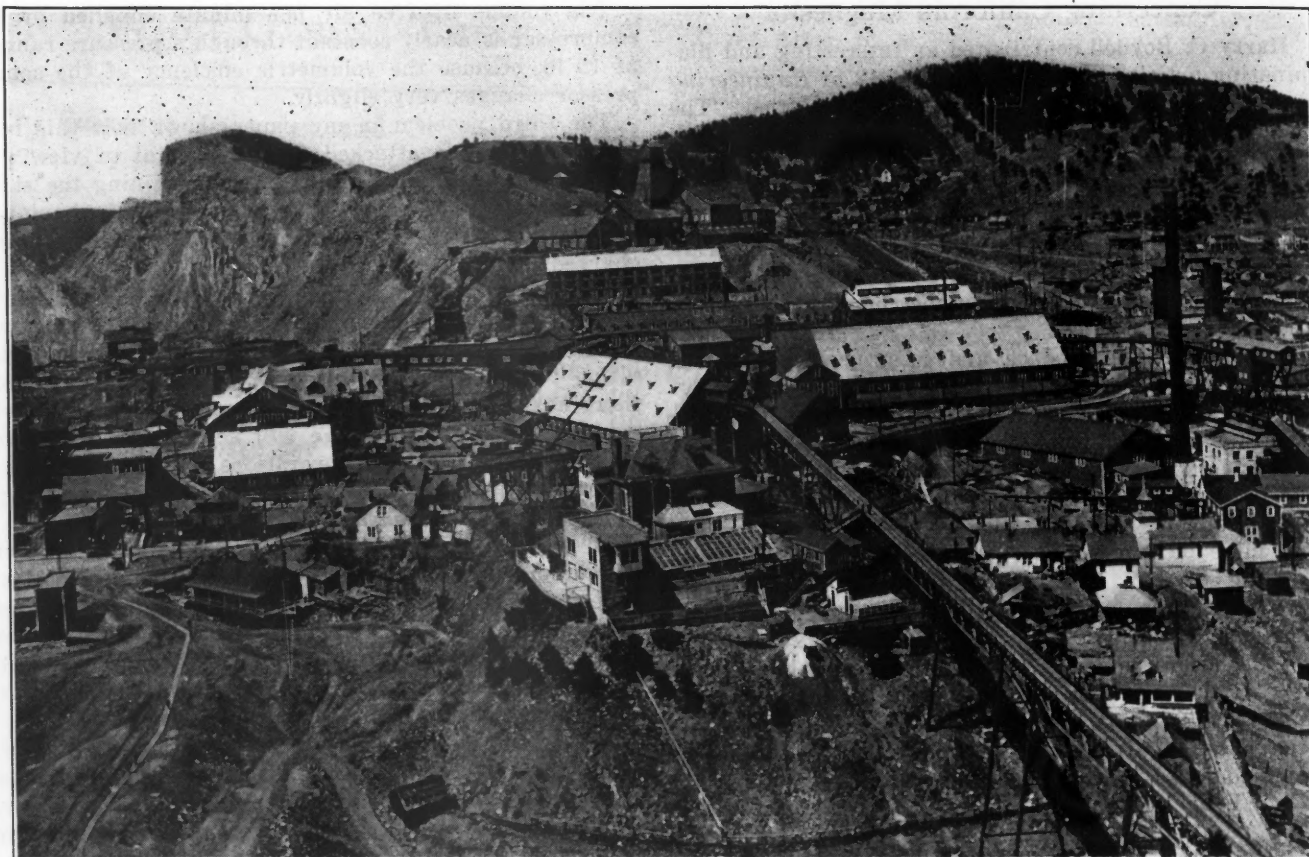
The danger of explosion in air receivers is great with such high pressures, so the pipe is made the storage whenever possible. The makers of the high-pressure pipe furnish a table showing the number of feet of each size necessary to give 1 cu. ft. of storage. When, however, the pipe line is too short to give adequate storage, receivers must be put in. These receivers look more like giant air bottles than like the ordinary receiver.

In regard to Mr. Simons' statement that in case the compressors are stopped no amount of storage will keep up the pressure in an operating system, I think we all agree.

WALTER S. WEEKS.

Berkeley, Cal.

[Both Mr. Weeks and Mr. Simons have used different methods in making their deductions. Mr. Weeks' method of using weights of air is much less confusing than Mr. Simons' use of volumes of air under different pressures. Less confusion would have resulted if Mr. Simons had reduced each volume to the free-air volume. Our knowledge of the operation of compressed-air locomotives leads us to agree with Mr. Weeks in his contention that the amount of air received from the compressor while the locomotive is being charged is negligible.—EDITOR.]



PARTIAL VIEW OF MILLS AND SHOPS OF HOMESTAKE MINING CO. OPEN CUT IN BACKGROUND

Geological Methods of the Homestake Mining Co., Lead, S. D.

Work Covers Determination of Location and Structure of Major and Minor Folds On Surface and Underground—Colors Used Together With Conventional Signs in Mapping on Co-ordinate System—Complete Records of Diamond Drilling Kept

BY LAWRENCE B. WRIGHT AND JOSEPH O. HOSTED

Written for Engineering and Mining Journal

IN THE HISTORY of the Homestake operations, the records show that geological work was formerly considered unnecessary; but after spending a large sum in driving prospect crosscuts with no more definite aim than to open up virgin ground, it was decided to make an exhaustive geological study of the mine, so that future prospecting could be carried on in a more intelligent manner.

In June, 1920, the geological department was instituted. It consists of two geologists working in conjunction with the engineers, metallurgists, and chemists. The work, roughly outlined, entails the detailed mapping of about twenty-five square miles of surface area and twenty-two mine levels, with a total of sixty-six miles of drifts and crosscuts besides stopes in various stages of development. Up to the present time about nine square miles of the surface in and around Lead and fourteen mine levels have been mapped in detail and the important features of the structure developed.

Inasmuch as the methods of procuring geological data are somewhat dependent upon the character of the area involved, a rough outline of the conditions encountered without reference to the paragenesis of the ore should be of interest.

The rocks in the immediate vicinity of Lead may be classed under three broad groups: (1) Tertiary intrusives and extrusives; (2) Cambrian conglomerate, quartzite, and dolomite or "flat formation"; and (3) pre-Cambrian (Huronian) slates, schists, quartzites, limestones, and intrusives. This last group is locally termed the "vertical formation." The pre-Cambrian rocks have been uplifted and dynamically metamorphosed, making the group a series of plunging, tilted folds. The axes of the folds strike N. 60 deg. W. to N. 35 deg. E., and axial planes dip steeply to the east, with few local exceptions. The plunge of the folds is to the southeast. The relation of the other groups to the pre-Cambrian is best shown by the accompanying section.

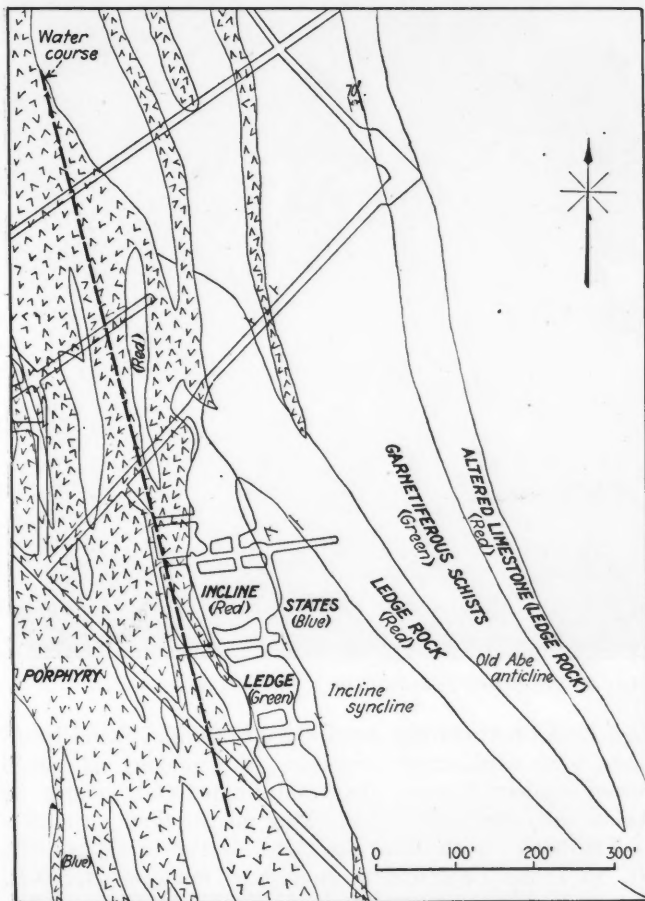
The ore has been found to be associated with the folding, so that the problem in the district has resolved itself into one of working out the location and exact structure of the major folds and then the location and structure of the minor or drag folds.

The surface geology is transferred from field notes, sketches, and enlarged topographic maps to the permanent surface map made on tracing cloth to a scale of 400 ft. to 1 in. The data are usually sketched in with

pencil until rechecked and accurately located before being inked. A 1,000-ft. co-ordinate system is used on both surface and underground maps.

STUDY OF ROCK TYPES

Owing to the intense metamorphism of the pre-Cambrian rocks, a study of the outcrops with a view to their origin has been made. There are many outcrops of green chloritic massive beds that are in some instances derived from a rather basic intrusive and in others from limestone. The whole is schistose, and color, texture, and general appearance are such as to lead one into difficulty unless a study of their origin is made before attempting to work out structure. The Tertiary and Cambrian rocks are easily recognized and classified, for metamorphism has played an unimportant part in their development. The only difficulty encountered in correlating strata in which the younger series is involved is to be attributed to the similarity of the general appearance of the Cambrian and pre-Cambrian quartzites when they are not found actually in place. However, a study of these rocks has disclosed characteristics that make errors in identification improbable.

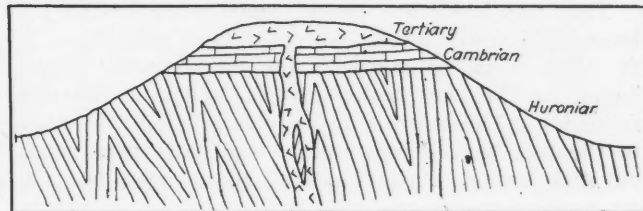


A PART OF THE 1,100 LEVEL GEOLOGY MAP, SHOWING INTRUSIVE DIKE CUTTING FOLDED LEDGES

A color system is used in combination with usual conventional signs, giving rise to the following legend: Tertiary: Yellow (conventioned), rhyolite; brown (conventioned), phonolite. Cambrian: (undifferentiated) Orange. Pre-Cambrian (Huronian): Blue, slates and phyllites; green, garnetiferous schists and slates; green (conventioned), igneous intrusives; red, limestone; blue with red dots, impure calcareous slates; brown, quartzite, and red with black dots, pay rock.

The general topography being rugged and vegetation

plentiful, the best exposures are to be found along the road and railroad cuts, creeks, and on the ridges. In the covered areas there are many prospects that are a great help where exposures are few. After the general classification of rocks and the adoption of a suitable legend, the next step is the mapping of all exposures, careful attention being paid to strike and dip. A regional schistosity was in many cases mistaken for strike by early geologists in this field, and, the planes of schistosity having a uniform northwest trend, the



RELATION OF GROUPS IN LEAD, S. D., DISTRICT

impression was first prevalent that the rocks in this area were simply a series of tilted slates and schists, little thought having been given to the possibility of folding.

TRACING KEY BEDS

The tracing of certain prominent or key beds has been found the best means of working out structure in conjunction with general exposure mapping. In so doing it has been the rule that their course across country is a devious one, and by carefully locating them on the map the structure is gradually completed. The quartzites serve as the best key beds, and being more resistant than the slates and schists, their outcrops are more prominent. However, due caution is taken, as they are often broken and disconnected along the strike and especially around the noses of folds, not being as amenable to distortion as the softer beds. Where the quartzites are absent, reliance must be placed on the continuation of beds nearest the quartzite horizon. In some formations the sedimentary strata have been cut or displaced by igneous intrusions.

Many of the hill tops are capped by the Cambrian "flat formation," which is in turn capped by the Tertiary rhyolite and quartz porphyries. The structure under this capping can only be deduced by data gathered around the edges or rim. In some instances reliance is placed on the material that has been hoisted from below the Cambrian in old prospect shafts. In areas covered by dense growths, attention is concentrated on float, provided it does not lie on a slope so steep as to render its location unreliable.

In tracing key beds it is found necessary to keep in mind the alterations that may take place along the strike. These are as follows: Variations in deposition; change in general appearance due to dynamic metamorphism in the more intensely folded areas, and metamorphism due to the proximity of igneous intrusives.

RELATION OF TOPOGRAPHY TO STRUCTURE

In this particular region there is a direct relation between the topography and the structure of the folded strata, and although it is as a rule not advisable to give too much weight to a feature of this nature, there are covered areas where some reliance can be placed in this relationship. In areas where the structure has been definitely proved, it has been observed that the southerly

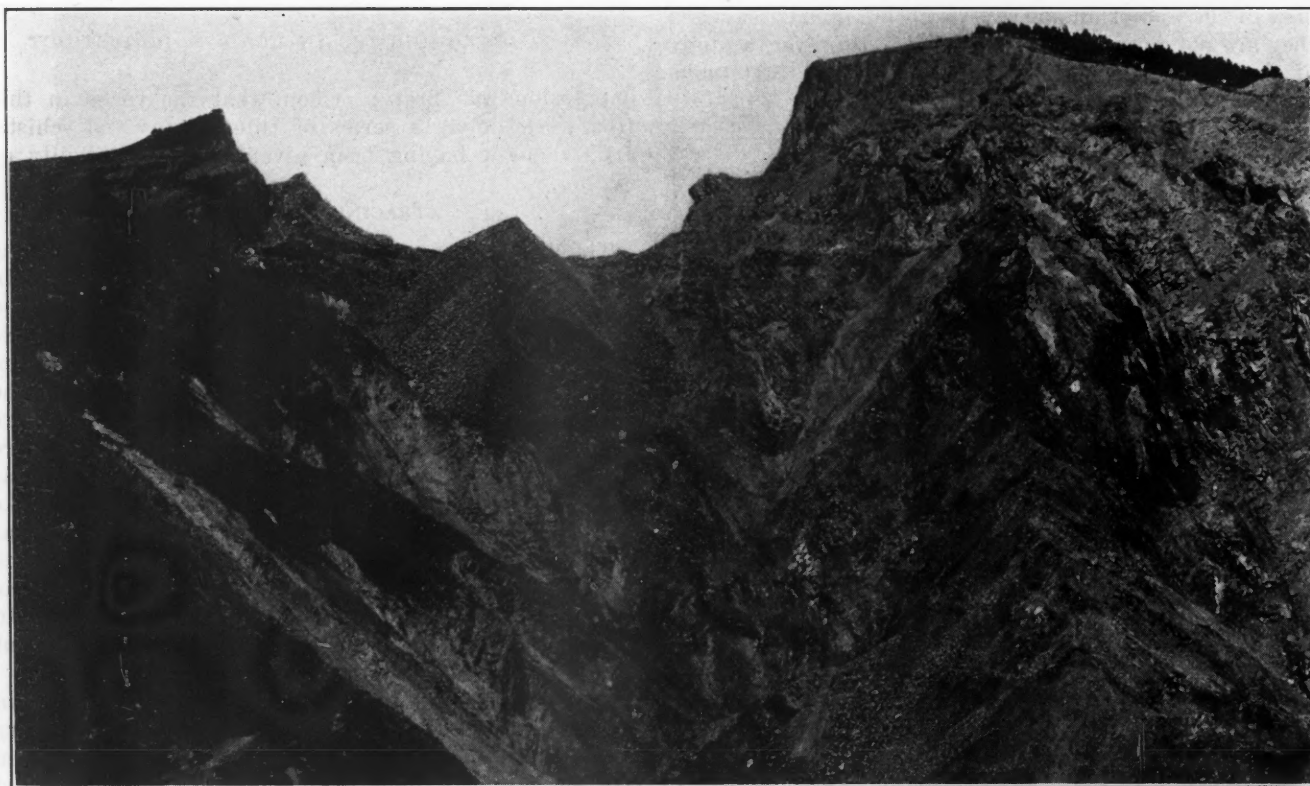
sloping ravines are cut in the troughs of southerly plunging synclines, and that the ridges are rounded in accordance with the strike of the beds around the southerly plunging anticlinal noses. The reverse is true of the northern slopes, the ravines being cut northward through the axes of southward-plunging anticlines. Wherever an exception to this relationship occurs, the reason is always quite apparent, in that later intrusives of a resistant nature form the ridges.

UNDERGROUND GEOLOGY METHODS

The mine levels are 100 ft. apart down to the 1,100 level. The lower levels have a vertical interval of 150 ft. The work of mapping the underground geology began on the 200 level, with the 300 and 400 levels following. These upper levels were studied first, owing to the fact that they were for the most part worked out and caving. After finishing these upper levels the

preserved for hand specimen, and usually a thin section is made from a representative chip. These are numbered in the order taken, the thin section, hand specimen, and assay sample being given the same number and a note made on the map of the number at the place where the sample was taken. Car sampling and channel sampling of pillars, stopes, and crosscuts are done by three samplers.

My mapping the drifts and crosscuts from north to south in order, the various beds are traced from pillar to pillar and the structure is finally completed. Each day's work is sketched on an office map of the same scale. This map is usually made on tracing paper and is only temporary. The final map is made on tracing cloth, and is not made until the levels above and below have been studied, as many projections of data from above or below are needed for a complete map, owing to the fact that many of the stopes are completed, drawn,



OPEN CUT AT HOMESTAKE GOLD MINE SHOWING FOLDS

lower levels, namely the 2,000, 1,850, 1,700, 1,550, 1,400, 1,250 and 1,100, were mapped in the order named. The middle levels will be studied this winter. The scale of the maps used is 100 ft. to 1 in. and they are also divided into 1,000 ft. co-ordinates. Blueprints and tracing paper maps are used in sketching. The legend is the same as that used on the surface maps, and the same color scheme is carried out.

PROCEDURE IN UNDERGROUND MAPPING

The mapping of levels is usually started on the north end and the work carried southward, both geologists working on the same drift or crosscut. This is done as a matter of safety and also as a check on the interpretation of data. On very long drifts, one geologist studies the rocks and keeps notes, the other keeps paces and takes strikes and dips. All rocks, contacts, water courses, and faults are mapped in detail. Many specimens are taken, a part being sent for assay, another

and backfilled and the entries boarded up. Some levels have long exploration crosscuts, the geology of which when projected upon the level immediately above or below aids materially in building up the final structure.

The scale of the cross-sections of the mine are 100 ft. to 1 in. Vertical sections are made at 1,000-ft. intervals along the east-west co-ordinate lines. This method of making the cross-sections on the even co-ordinate distances saves much time, as the data can be projected directly from the level maps. This is made possible by the fact that the east-west co-ordinates cut the ledges at nearly right angles. Taking sections 1,000 ft. apart gives four vertical divisions of the developed orebody. They represent on the average a vertical area 2,350 ft. (depth) by 3,000 ft. (surface). The axes of the folds being at nearly right angles to the sections, it will be seen that the crests of the anticlines and the troughs of the synclines can be accurately traced along the direction of plunge from section to section, showing

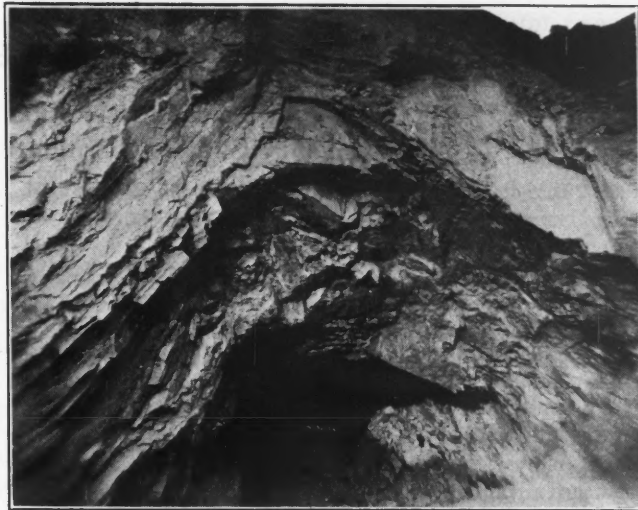
the length of the limbs of the folds, their height, and the crest of the nose or bottom of the trough at any given point. The porphyry dikes that cut through the Homestake orebody on the hanging wall have picked up, disconnected, and completely inclosed blocks of ore. This condition is nicely brought out in the sections.

EXPLORATION BY DIAMOND DRILLING

Most of the exploration work is done by diamond drilling. All cores are saved. Cores of ledge matter are split, half being sent for assay and half preserved for geological record. All of the sludge is sent for assay. Five-foot samples are the rule. The geology of the hole is plotted on the map of the level on which the hole is drilled. If the hole is drilled at an angle from the horizontal, correction is made for dip. If the angle is greater than 30 deg., a separate cross-section is made through the course of the hole and the geology mapped in accordance with its relation to that of the adjoining levels.

The holes are surveyed every hundred feet, a compass in gelatine in a glass tube and hydrofluoric acid in a glass tube being used. If the hole deviates greatly from its intended course, it is stopped, as continuance would mean the drilling over the nose of the anticline or under the trough of a syncline, thereby missing the objective. The core is examined upon being brought to the surface, the rock classified, and the angle of the bedding to the hole carefully noted. A complete record of the hole shows the date of drilling level location, description of the hole, distance drilled, kind of rock encountered, sludge assay, and split core assay; also the percentage of core recovery. The sludge assays average about 25 per cent greater value per ton than the core assays. Thin sections of the core are frequently made and labeled according to their location in the hole. Besides the maps of holes, written logs are kept describing the location of hole, the thickness of each formation penetrated, and a detailed description of the various rocks.

Records of petrographic work are kept on forms which include the following data: Specimen number; locality; occurrence; hand specimen description, and microscopic study. Under microscopic study the following are noted: Texture; original structure; secondary structure; percentage and kind of primary; secondary and metamorphic constituents; percentage and kind of accessory minerals; nature of the ground-



ANTICLINAL STRUCTURE AT HOMESTAKE

mass, and description of mineralization. From the assembled data the origin of the rock and its classification are deduced.

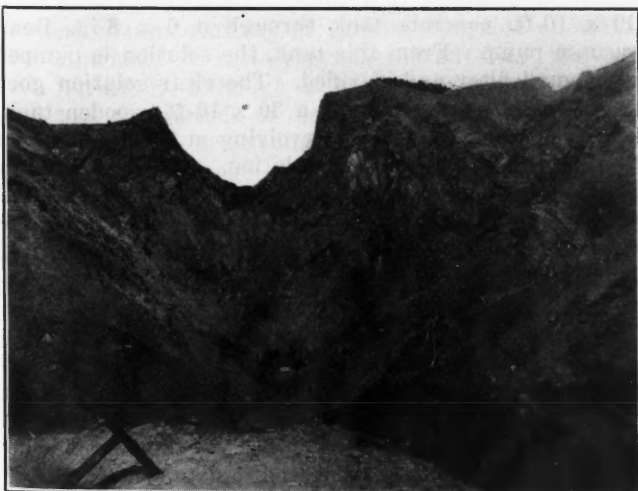
Whenever practicable, photographs are taken of rock exposures, contacts, and folds. These remain as indisputable evidence of structure after the rock has been mined or caved from its original position. The different formations are colored with water colors according to the legend used.

Iron Ore Resources of the World

A monograph published by the mining and metallurgical section of the East Europe Institute, Breslau, Germany, in the interest of German retention of Upper Silesia, gives some interesting figures on the developed iron-ore resources of the world. From these *The Iron Age* has compiled the subjoined table. Poland's interests have been pooled with those of France in this tabulation, as have those of Austria with Germany, and special emphasis is placed on the large share of control over iron ore now exercised by the French. The tabulation covers the German resources without Upper Silesia and gives to Poland Upper Silesia.

EUROPEAN GROUPINGS OF IRON ORE RESOURCES

	Iron Ore (Million Tons)	Percentage of the World
France.....	2,300.0	
Lorraine.....	2,330.0	
Poland.....	17.8	
Upper Silesia.....	16.6	
France-Poland.....	5,664.4	25.2
Germany (without Upper Silesia).....	1,262.0	
German Austria.....	215.2	
Germany-Austria.....	1,475.2	6.6
Great Britain.....	1,300.0	5.8
Scandinavian countries.....	1,525.0	
Spain.....	711.0	
Luxemburg.....	270.0	
Larger European neutrals.....	2,506.0	11.1
Russia.....	830.9	3.7
Other European countries.....	254.5	2.1
United States.....	4,250.0	19.0
Newfoundland.....	3,630.0	16.2
Other countries.....	2,780.0	12.4



ANOTHER VIEW OF HOMESTAKE OPEN CUT

To Study Electrothermic Metallurgy of Zinc

Employing co-operative funds furnished by the State of Missouri, an investigation relating to the electrothermic metallurgy of zinc is under way at the Mississippi Valley Experiment Station of the U. S. Bureau of Mines at Rolla, Mo. The physics and chemistry of the condensation of zinc vapor will be accorded especial attention.

Reclaiming 6-Oz. Silver Tailing at the Coniagas Mines

Dragline Excavator Found the Best Means of Collecting The Dry Slime—Cyanidation Reduces Silver Content to 1 Oz. per Ton at a Cost of 35c. per Oz. of Silver Recovered

By H. E. CAWLEY

Mill Superintendent, Coniagas Mines, Ltd., Cobalt, Ont.

Written for *Engineering and Mining Journal*

A PROBLEM recently before the Coniagas Mines at Cobalt, Ont., was to reclaim and treat an accumulation of 40,000 tons of slime tailing, having an average value of 6 oz. of silver to the ton. By experiment it was found that the slime could be treated to best advantage by the cyanidation process, and so, to carry out the work, the Buffalo cyanide mill was leased from the Mining Corporation of Canada.

The greatest difficulty encountered was in collecting and conveying the slime to the mill. It was decided to reclaim the slime as dry as possible to avoid subsequent settling and filtering, which would have been necessary had a hydraulicking scheme been adopted.

The slime is collected with a Sauerman dragline excavator, dumping into a hopper. About 100 tons per twenty-four hours is handled. A steel mast 45 ft. high is set on a concrete pier, allowing a 35-deg. sweep from hopper edges to the extreme limit of the tailing pond. Another similar hopper, at right angles to the original one, has been constructed to give 15 deg. more sweep without shifting the mast. A double-block tension system is employed at the masthead for raising and lowering track cable. This track cable is 1½-in. plough-steel rope, anchored to rock which conveniently outcrops along the pond edges. The tension cable is ¾-in. crucible cast-steel rope and the hauling cable is ¾-in. rope of the same kind.

The excavator bucket was constructed at the mine. It is 4 ft. wide by 2 ft. deep by 2 ft. long, being 6 in. wider at the digging edge than in the rear, to aid in the rapid dumping of the sticky material from the pond bottom. When loaded to capacity with dry slime, the bucket picks up 1,500 lb. Attempts to use a back-dump bucket were not successful.

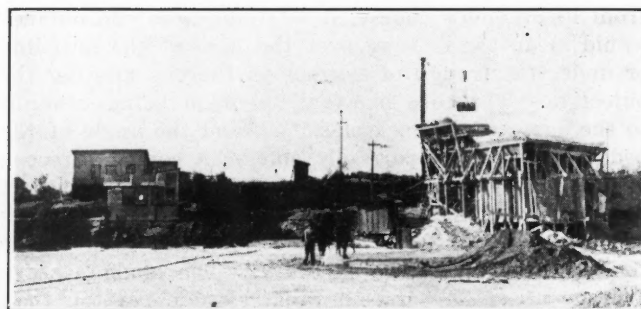
A 12 x 15 Jenckes double-drum hoist is used to operate dragline and bucket. The weight of the bucket and roller carrier is sufficient to run it back along the track line by gravity to the extreme limit of the pond, a distance of 400 ft. from the collecting tank. A team and scraper is used periodically to drag in slime from parts inaccessible to the bucket.

The hopper is equipped with a grizzly bottom and is placed above a wooden collecting tank 30 ft. in diameter by 10 ft. deep. The tank has an agitator driven by a 10-hp. motor. The agitator shaft revolves at 10 r.p.m.

The slime, which has the nature of clay, falls onto the grid bottom of the hopper and is washed into the tank by the discharge from a 4-in. centrifugal pump, which circulates the pulp already collected. This pump has a speed of 1,100 r.p.m., and is driven by a 40-hp. motor. The circulation of the pump to wash the slime into the hopper has the additional advantage of aerating the cyanide solution and aiding in the treatment. About 50 per cent of the valuable metal is in solution by the time the charge is pumped to the mill.

When starting to collect a charge, a sufficient quantity

of barren solution is pumped into the collecting tank to give a pulp dilution of 1 to 1 by the time the tank is filled. Cyanide is then added until the solution has a strength of 0.25 per cent KCN. When the charge is completed, the circulation through the hopper is stopped and the pump is utilized to pump the charge to the cyanide plant, a distance of 1,350 ft. against a head of 60 ft. Charges have been pumped over at a dilution of 0.75 to 1. The daily charge of one hundred tons of dry slime is pumped to the mill in about four hours.



RECLAIMING SLIME FROM TAILING POND

The pulp, arrived at the mill, goes into four Pachuca tanks, each 30 ft. high by 15 ft. in diameter, where it is agitated by air from an Ingersoll-Rand compressor, driven by a 40-hp. motor. Connection is also made with local hydraulic air lines in case of power trouble. The pulp must have at least twenty-four hours' treatment in the Pachuca tanks. The slime gives an alkaline reaction, and the cyanide consumption is three pounds per ton.

The usual Cobalt practice of filtering and washing rules. The tailing, since beginning operation, averages 1 oz. in silver per ton.

The pregnant solution goes from the filter to a 30 x 30 x 10-ft. concrete tank through a 6 x 8-in. Dean vacuum pump. From this tank, the solution is pumped to a small filter and clarified. The clear solution goes through a vacuum pump to a 30 x 10-ft. wooden tank, equipped with an agitator, revolving at 8 r.p.m., driven by a 10-hp. motor. This solution, assaying between five and six ounces silver per ton, is then precipitated by the addition of 0.05 lb. of sodium sulphide, double strength, per troy ounce of silver to be precipitated. When sufficient time has elapsed for precipitation, agitation is stopped and the precipitate allowed to settle. The barren solution is then decanted to a concrete tank, immediately below. Agitation is again started, and precipitate is pumped through a 3-in. Dean Triplex pump to a 24-in. Perrin press. The barren solution from the press runs by gravity back to the barren-solution tank. Precipitates recovered to date contain 23,500 oz. silver per ton, with a moisture content of 42 per cent.

A 2-in. centrifugal pump is used to pump the necessary solution for dilution purposes back to the collecting tank. This pump runs continuously, circulating and aerating the barren solution through open launders.

The mill operates continuously in eight-hour shifts, employing one foreman and three filtermen over the twenty-four-hour period. At the collecting end, two hoistmen operate during daylight hours, with a man day and night on pump and hopper. For all operations, 120 hp. is required. Air power is used for hoisting. The operating time for the year is limited, owing to climatic conditions, extending from about May 15 to Oct. 15. Costs have been approximately 35c. per ounce of silver recovered, during this year's operation.

New Method for Determining Noxious Gas

In Technical Paper 249, "The Determination of Oxides of Nitrogen," by A. C. Allison, W. L. Parker, and G. W. Jones, just issued by the U. S. Bureau of Mines, a new method for the determination of this noxious gas, sometimes formed after blasting in metal mines, is described. The Bureau of Mines, in the course of its work looking toward the minimizing of accidents in mining operations, has occasion to make analyses of gases in determining the ventilation conditions and the hazards that may develop from exposure of the workers to gases liberated in mines. Not only is it important to identify such gases as form explosive mixtures and are at times liberated in large quantities, but, in addition, it is necessary to determine what gases have harmful effects upon miners who are exposed to them while at work. In metal mines where much blasting is done, the shots are often prepared improperly, and oxides of nitrogen may be formed after firing. Moreover, other industries than mining produce oxides of nitrogen, which have a deleterious effect on individuals breathing them for any length of time.

Two gases that result from the firing of explosives are, because of their physiological effects, important in mine ventilation. They are carbon monoxide and oxides of nitrogen. Other gases produced at the same time, including carbon dioxide, hydrogen, methane, and nitrogen, are unimportant unless in proportions sufficient to diminish appreciably the oxygen content of the mine air. Carbon monoxide and oxides of nitrogen usually occur together, and are very harmful even when inhaled in small quantities. About 0.01 or 0.02 per cent is the maximum quantity of carbon monoxide allowable continuously in mine air without affecting the workmen harmfully, although as much as 0.04 per cent is harmless for periods of time not exceeding one hour. Not much data are available on the maximum quantity of oxides of nitrogen that may be tolerated in the mine air without danger to the men working therein. The general conclusions are that 0.01 to 0.02 per cent of oxides of nitrogen is dangerous and that under no conditions should 0.05 per cent be reached. Carbon monoxide can be determined to an accuracy of about 0.02 per cent by the usual Haldane analysis, but an accurate method of determining oxides of nitrogen at low concentrations has heretofore been impossible without using a large quantity of gas for a sample.

A method was desired by which small quantities of oxides of nitrogen could be determined from a minimum quantity of gas, for samples of mine gases are taken most conveniently in vacuum bottles of about 250 c.c.

capacity. The nitron method used by Gutbier and Busch is difficult to perform and cannot be used at such low concentrations as are present in the usual mine-air samples. To be of value in mine-gas analysis, a method should be accurate to at least 10 parts per million, or 0.001 per cent.

After explosives have been fired, especially in ventilated working faces, the products of the explosion are, of course, diluted with large quantities of air, and the amounts of oxides of nitrogen present will usually be lower than 100 parts per million (0.01 per cent). To determine these small quantities, a method was adapted from the usual procedure for the determination of the oxides of nitrogen in water analysis, applying the diphenyl sulphonic acid method to give the total oxides of nitrogen as nitrogen peroxide or as nitrates. By the use of the method evolved, ten parts of oxides of nitrogen as nitrate could be detected in one million parts of the air oxides of nitrogen mixture with an accuracy of five or six parts per million.

Copies of Technical Paper 249 may be obtained by applying to the Director, Bureau of Mines, Washington, D. C.

Seeking To Utilize More Wisconsin Iron and Zinc

Graduate students in the department of mining and metallurgy of the College of Engineering of the University of Wisconsin are engaged in research into metallurgical processes with a view to discovering means of utilizing large quantities of low-grade ore existing in Wisconsin.

Because of the lack of a commercial process of desulphurization, the enormous tonnage of high-sulphur iron ore of northern Wisconsin has never been worked. Research to evolve a method of desulphurization of such ore in the blast furnace is in progress. At the same time pure science investigations are being conducted to determine the physical properties of blast-furnace slag.

With a view of finding means of utilizing the great tonnage of low-grade zinc in southwestern Wisconsin, experiments in applying selective flotation to these ores are being made. An economic location for an electric furnace foundry somewhere on the Great Lakes is also the subject of investigation.

Formula for Strength of Rope

The Bureau of Standards laboratories in the Department of Commerce have made tests from which it has been possible to deduce a formula that will give the strength of ropes.

For three-strand, regular lay manila rope from $\frac{1}{2}$ -in. to $4\frac{1}{2}$ -in. in diameter, the following computation will give the breaking load of the rope:

The average breaking load in pounds equals 5,000 multiplied by the diameter of the rope in inches, multiplied by the diameter of the rope increased by one.

This will give, of course, the average maximum weight that the rope will hold, but the working load or the load that a contractor or safe-hauler may apply with proper safety and precaution would be considerably less than the load given by the formula.

Other data on rope are contained in Technologic Paper of the Bureau of Standards No. 198, by A. H. Stang and L. R. Strickenberg, which has just been issued.

War Problems in Minerals

V—United States Geological Survey, 1914-1918

BY GEORGE OTIS SMITH

THE WORLD WAR put minerals on the map. The discovery that mineral resources are essential in a war was spontaneous and widespread. In Washington, as the hurried development of a war program brought into being one after another new agency, the quickly assembled personnel of each Government organization at once found that most of the raw materials needed in the long-delayed preparedness campaign were of mineral origin. The Railroad Administration learned that coal was both the largest item in its purchases and the largest article of freight; the War Trade Board discovered not only that minerals make up, in value, one-third of the foreign trade of the United States, but that certain imported minerals are almost indispensable to our domestic business; the Food Administration early became concerned as to the adequacy of the supply of mineral fertilizers and mineral insecticides; the Shipping Board at once realized its responsibility in devoting available cargo space to the essential mineral imports and exports; the Fuel Administration necessarily thought in terms of coal and oil; and the War Industries Board soon began its campaign for procuring, at whatever cost, the metals without which our munition plants, new and old, could not serve the cause of humanity.

WAR DEVELOPED ACUTE MINERAL SUPPLY PROBLEM

In considering these absolutely essential fuels and ores the question naturally arose what were our country's available resources, and where and how could they be most quickly developed? Each newly created board sensed these critical problems and set out to solve them. The scholastic atmosphere pervaded Washington, and the spirit of independent research was everywhere, investigators crossed and recrossed each others' trails, and wide-flung questionnaires added to the burdens of the Post Office Department and to the troubles of producers and consumers. The campaign for information was waged with the fervor shown by fresh converts to an idea; the new faith in minerals as large items in the war program was so strong as to tolerate no delay, and co-ordination of effort was therefore impossible, nor was there even time for searching the rapidly accumulating files of the new organization.

The questionnaire habit was easily formed and rarely broken. The first step of a new board was to devise questionnaires which might be working while the program of activity was being formulated. The need for facts was usually keenly realized and sometimes no less apparent to others, as in the case of the two young men who in their investigation of the pyrite situation brought their questionnaire, while still in the dough or at most only half-baked, to a geologist who had specialized on pyrite and sulphur for several years. In the course of the instructive interview, one of the callers caught sight of a glistening object on the geologist's desk and inquired its nature; on being told that this was common pyrite, he remarked that he had never before seen any pyrite—and the discussion of the pyrite questionnaire was resumed on the same plane.

The discovery of the war-mineral subject early in 1917 by so many new Federal agencies raises the perti-

nent inquiry: Had there been previous to this time of special need no adequate study of this important subject by some Federal bureau? To answer that question in part is the task set for this article.

However well intentioned our historical sense, we are in danger of mixing hindsight and foresight—of unconsciously pre-dating ideas and purposes. It is therefore well for me to limit my review of the war-mineral policy of the U. S. Geological Survey to excerpts from contemporaneous statements.

In an interview in mid-August, 1914, Secretary Lane brought to public attention the new conditions then about to be imposed upon industry by the necessary readjustment in the world's commerce and specifically mentioned the varying effect of these readjustments upon the market demand for the metals and the mineral fuels. He clearly defined the issue of the necessary development of neglected mineral resources in our own country, and the Geological Survey followed up this interview with more detailed press statements on such subjects as manganese, antimony, and potash. In those first weeks the need of information found expression in a considerable volume of correspondence regarding possible new sources of mineral products that had hitherto been imported as well as regarding the expected increase in the demand for other products for export; and on Sept. 4, 1914, the Survey issued a short bulletin on how to make America industrially independent in its mineral supplies. In this bulletin (No. 599) the outstanding deficiencies in domestic supply of mineral raw materials were stated, and the impregnable position of the United States in both its reserves and its current output of the mineral fuels as contrasted with its weakness in two essential mineral fertilizers, nitrates and potash salts, and in three very useful metals, tin, nickel, and platinum.

GEOLOGICAL SURVEY'S IMPORTANT WAR SERVICE

In the wording both of this sketch of the economic situation and of the call for American enterprise to begin at once to investigate and exploit neglected mineral resources, so as to "make our industries safe from the interruptions of war," no important changes would be made even now, after seven long years of experience with the problem of war minerals. The Geological Survey at once realized its duty of acting as an agent in bringing together consumer and producer of mineral raw materials and of pointing out possible domestic sources of minerals to replace imports or to meet new demands for exports, and the performance of this duty made up the largest part of the work of the Federal geologists and statisticians for the four years that followed. The policy of the Geological Survey as an investigative agency outlined in August, 1914, continued to be its policy throughout the war.

As America's entrance into the war gradually became inevitable, the Geological Survey's part in the preparedness program became more clearly defined. At the request of the War and Navy departments, summary reports on water supply and soil drainage were made in advance of the selection of possible cantonment sites,

a division of military surveys was formed, a program of topographic work was drawn up by the General Staff of the Army, and the Survey's map-printing plant was devoted largely to confidential and urgent work for military use—all this before April 6, 1917. The product of years of field and office investigation was made available in special reports prepared for the information of the general public or for the immediate use of some commission, committee, or bureau at work on war problems. A relatively large number of members of the Geological Survey entered the military service, a fact that weakened the personnel available for the civilian duties but strengthened the purpose of those remaining for the tasks behind the lines. The mobilization of the Survey members on war work was not spectacular, but it was complete.

GEOLOGISTS' WAR CAMPAIGN

Geologic field work was concentrated on the essential minerals, and an intensive campaign was started in the search for commercial deposits. Every geologist available was at work in some area where increased production might be expected to follow geologic exploration. To meet the increased demand for later information than was contained in the earlier and less complete review of the mineral situation, Bulletin 666, "Our Mineral Supplies," was issued in 1917, first in thirty-three separate chapters, each devoted to a "war mineral," and the first chapter was published one week after the United States entered the war. Twenty geologists contributed to this publication, which had wide circulation, and as the much smaller bulletin (599), "Our Mineral Reserves," had already been issued in several editions, aggregating 21,000, it is evident that this widespread publicity helped to instruct and arouse the public.

Yet the Geological Survey tempered its stimulation activities, even as early as 1917, with advice to those engaged in mineral development not to overlook future conditions. Even with the speeding up already attained, the pace had not yet been reached that the emergency justified; still, to quote further from my administrative report for 1917, I urged that both the consumer and the producer of war minerals should strive to adjust their projects to post-war conditions as well as to the emergency needs, "lest this expansion of productive capacity involve after-the-war losses that will swallow up war profits." A geologist can sometimes forecast the future as well as interpret the past.

SURVEY'S SERVICE TO DOMESTIC INDUSTRY

The policy of the Survey during the war did not include any change in administrative machinery or any new appropriations for special war work, but consisted simply in the diversion of every investigative activity into channels that would contribute to the prosecution of the war. Thus the whole geologic branch became a "war minerals" unit; and even the hydraulic engineers of the Survey, in their country-wide study of our power situation, were seeking to save coal by substituting water power for it or by interconnecting steam plants. The increasing demand for facts led the Geological Survey to take the initiative in organizing a joint information board as a clearing house for inter-bureau inquiries regarding mineral products, thus making the Survey's store of information, as well as that of the other bureaus and boards, more quickly and fully available for all the Government organizations, new and old. All the interested official bodies had membership in this

co-operative information board, of which a representative of the War Industries Board, Pope Yeatman, was chairman, and a Survey geologist, Dr. E. S. Bastin, was executive secretary.

The need of co-ordination of effort also expressed itself in the organization of the War Minerals Committee, whose valuable activities have been well described by its chairman, Mr. Westervelt. At the outset I could not agree with some of my friends as to the need of this unofficial agency to serve as a catalyzer for the two Government mineral bureaus as well as a link of connection with the outside bodies of mining engineers, but I realized that no one should let his personal opinion block or retard any possible move toward a better functioning of all the agencies that could be hitched up to the war-mineral work. The co-operation of the Geological Survey with the War Minerals Committee was therefore intended to be as complete as possible under the conditions, justly appreciated by Mr. Westervelt in his opening article of this series, and the extra load placed upon the Survey's representative on the committee, David White, and his associated geologists, was justified by results.

CENTRALIZED AUTHORITY ESSENTIAL

The War Minerals Committee in devoting itself later to the movement for the creation of a war minerals administration expressed what was apparent to all those nearest the problem of keeping up the supply of raw materials—that some centralized body or, better some one official with administrative powers equal to his responsibilities, was absolutely essential to stop the drift in policy and the changes in direction of executive acts by boards and committees that were not co-ordinated.

That the Geological Survey did not take to itself a more prominent place on the Washington horizon may have been due to a lack of administrative initiative, but it was not due to any lack of keen realization of the nation's need of information and of a definite policy based on facts. Indeed, it was seen then that an investigative bureau of the Government could find the facts and even decide, to its own satisfaction, upon the policy determined by those facts and yet not be best fitted to put that policy into effect. The thinker and the doer are commonly distinct personalities; they represent two types of minds. This is not a new division of labor; even in pioneer days the pathfinder was not the builder, as Kipling has set forth in his poem, "The Explorer."

Nor was a war needed to teach some of us that the research worker is not the best executive, and, indeed, that an investigative bureau is organized on a plan, possessed of precedents, and manned with a type of personnel that unfit it for work of construction or operation. In these days bureaus, like men, must specialize; and during the war period the part that the Geological Survey was called upon to play was plainly a part behind the scenes. The fact finder contributed to the action of those who had more prominent parts—those who were to apply the facts to the strenuous operations of the World War.

A mineral administrator was needed to stimulate the production of certain war minerals, but, as Mr. Moore has noted in his article, the spokesmen for the industry¹ opposed the legislation, preferring "relief"

¹Mr. Moore evidently refers to the American Mining Congress.—EDITOR.

to "administration"—that is, curative to preventive measures. In the absence of a mineral administrator the Geological Survey had continued to do its part in stimulating the production of needed raw materials, and later in the settlement of claims for reimbursement its geologists helped as disinterested witnesses, freely testifying to the dates and circumstances of requested stimulation, but quite as freely protesting against claims later submitted by those on whom it was known that the stimulation had failed "to take."

In the utilization of the Geological Survey and its store of specialized information, two of the newly created agencies with executive powers stand out from all the others as attaining a maximum of results with a minimum of duplication of effort. As Professor Leith has stated, in the second of this series of papers, the Committee of Mineral Imports and Exports knew of the two mineral bureaus in the Interior Department and was content to take the facts at hand there and start with them as the raw material for its own special investigation. Time and effort were thus saved, not to mention the satisfaction felt by the specialists already in service in seeing their work of years utilized to so great advantage. Under those circumstances co-operation was easy and fruitful.

The use made of the Geological Survey by the Fuel Administration was larger, though it included a less variety of subjects. Instead of building up a new organization to handle the many statistical inquiries connected with the all-important subject of coal, the Fuel Administration at once began to utilize the coal statistics of the Geological Survey. Already the Survey had under way a system of weekly reports on coal production, started in July, 1917, and the personnel of the Geological Survey engaged in this and other statistical work under Mr. Leshner became the nucleus of a much larger organization financed by the Fuel Administration but administered by the Geological Survey. Not only was valuable time thus saved, but the resulting investigative service was independent of the executive function of the Fuel Administration, a relation that was later found advantageous in cases of dispute between the Fuel Administration and the Railroad Administration on questions of car shortage. Indeed, the experience of Mr. Leshner in his successful conduct of this large work for the Fuel Administration afforded abundant proof of the inherent difference between fact finding and executive action and of the real advantage of independent control of these two functions.

Lloyd George recently remarked that "man is the most unteachable of animals," yet this chapter in the record of the handling of the war-mineral situation in Washington is not worth publishing unless the bit of history shall carry its lesson. Looking back, like Mr. Spurr, I am "finally thankful it was no worse"; but how could it have been better?

The Geological Survey, with its four decades of study of our country's mineral resources, had the information and experience needed when the country had to prepare for war. This "stock in hand" was of the kind required, and it was, in a sense, available, but the fact stands out that the available knowledge was not utilized to the full extent. As already suggested, I attribute this seeming failure to a condition of organization, and this condition is not local but general. Scientific investigation too often lacks follow-up machinery; facts may be dug out of the ground and eternal truths may be dis-

covered, but their application to life often depends upon chance. Many have noted the unfortunate circumstance that the world has a much larger supply of science than it uses, even though every consideration of economy and efficiency should lead us to apply our science to making the world a better place to live in.

The year 1914 thus found the U. S. Geological Survey, and possibly other scientific bureaus, without adequate "sales management"; there was a good stock of ideas on hand, but no one to push them on the waiting market. The operating part of the works speeded up, and both increased and improved the stock, but the stock did not move as might have been expected or as was hoped.

Without explaining the scientific ideals and standards of an investigative bureau like the Geological Survey, and without making any apologies for its responsible officials, I wish to suggest a controlling condition even more fundamental than this lack of selling ability. The general public, which is well represented in Congress, does not give to the scientific bureau full credence as a source of dependable and useful information, except when its findings agree with ideas and opinion already held or give support to some scheme in which there is some special interest. Disinterested belief that the scientific bureau is more than one of the luxuries of modern civilization is held by so small a majority as to discourage sometimes the most enthusiastic public servant. It is not simply that the scientist is so often lightly referred to as a theorist; there is a widespread and deep-seated lack of faith in experts and specialists. The man of practical affairs is regarded as a better guide; it is not realized that science is nothing but organized practical experience.

It was this same blindness to the value of specialization and the usefulness of specialists that in 1917 led those in high places to put men who had been trained in one line of business into places of responsibility where they had to learn anew everything but the executive habit of prompt action. Thus those men lost opportunities for service in fields for which they were better fitted by being called to serve in fields for which they were unfitted. As an example of this disregard of fitness through training—the success of the Geological Survey in quickly organizing a weekly inventory of the copper, lead, and zinc production and stocks for the use of the Army and Navy buyers of these metals led to the suggestion that the Survey also organize a similar service for hides and mahogany. The obvious reply was that the experience that enabled the geologists who had specialized for years in those metals to render this special service would by the same token unfit these or other Survey members to qualify as experts in leather and wood.

When this incident was afterward related to an assistant secretary of war he expressed surprise that any bureau chief should have failed to appropriate for his bureau any line of activity offered, especially if it was outside his field; and the comment was justified, for not only does the public place too little value upon specialization in science, but the ambitious administrator sometimes forgets his own faith in specialization.

Looking forward to the no less important activities of peace, we may conclude that co-ordination of activity, which presupposes specialization of function, is the goal in an organized scientific and administrative service just as much as in a steel plant.

The Placers of the Johnnie District, Nevada

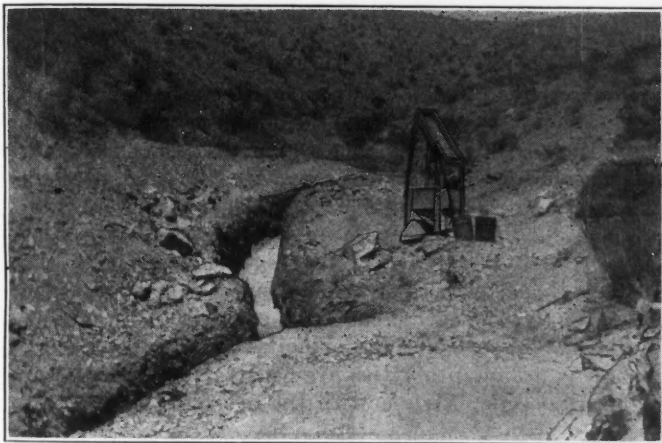
Area Recently Discovered Covers Ten Square Miles—Mexican Air Jig Being Used To Treat Gravel, With Good Results—Source of Gold Near By

BY CHARLES LABBE

Written for *Engineering and Mining Journal*

IN THE EARLY PART of 1921, placer gold was discovered in the Johnnie mining district in Nevada, and the usual staking rush occurred soon after the first news reached the other mining communities. The district is situated at an altitude of about 3,500 ft. on spurs trending westerly from the Spring Mountain Range close to the border of Clark and Nye counties, Nev., or about twenty miles east from the California boundary line. The nearest supply center is Death Valley Junction, Cal., twenty-five miles distant by wagon road, but the mail route is by way of Shoshone Station and the Pahrump Valley.

The western slopes of the Spring Mountain Range are low undulating foothills merging at lower levels



PLACER WORKINGS IN MILL CANYON, JOHNNIE MINING DISTRICT, NEVADA

into the gently sloping surfaces of the Tertiary deposits of the adjacent valleys.

The enormous deposits of faceted boulders occurring at higher levels, principally of the harder rocks of the main range, are evidences of a former glacial period. The remains of a morainic deposit filling the depression of an old valley can be seen on the top of several ridges in the eastern part of the district.

The rocks of the Johnnie district are limestone, shales, schists, quartzites, grits, vein quartz and plutonic quartz, and in few places andesite and rhyolite. The probable geological age of the sedimentary rocks is Paleozoic and possibly as old as Cambrian.

The principal placer diggings are at the bottom of the gulches, below or near gold quartz lodes. The gold in the quartz veins is in a free state. All the placer prospecting formerly done was near the veins, and the results were far from encouraging, as it has been proved since that the bedrock in the channel must be reached, the depth varying from 3 to 25 ft. It can safely be said that in most of the placers the gold has been eroded from the veins now visible, but in Mill gulch and south of the Congress mine placers have been found much higher than the quartz veins. Here the gold may possibly have been derived from rich stringers in the shale

or schist. In other places all indications have been obliterated.

The placer ground follows the general trend of the main lode of the district, extending from a point two miles north of the Johnnie mine to four miles south of the Congress mine, a total distance of ten miles and approximately a mile in width.

Nearly half of the proved placer ground is within the quartz properties. A great number of claims have been located, some of which have hardly paid for the location work, but others have opened valuable showings. In general only the prospecting stage has been reached, and few have attempted production.

The pay dirt is found on bedrock distributed rather evenly through a foot of slightly rounded gravels in a soil-like, sometimes clayey matrix, loose boulders being encountered close to bedrock. The conditions are essentially the same in all the gulches, and the thickness of the pay gravel varies little from place to place. The thickest pay streak is 8 ft. thick and is in the Tonopah Syndicate ground, in the main Johnnie gulch at a depth of 25 ft.

The channels are split and reunited, and the width varies greatly. The most satisfactory bedrock is schist or shale so lying as to form natural riffles. Some altered and partly decomposed quartzites and limestones have formed a porous ground, which acted as a good gold catcher. In some places on level bedrock the boulders have acted as riffles and have stopped mostly coarse gold. The gold is fairly and evenly distributed through the pay dirt, and several yard samples from different places have given very close results.

The gold is coarse and angular, with fragments of quartz, showing that the place of its origin is close by, but the gold in the placer is very much coarser than any seen in the ores actually produced even in specimen rock. With every panning a quantity of black sand is obtained, which is composed of pyroxene, titaniferous iron, and iron pyrites. The pyrites occurs in all sizes, from the smallest pieces which can be observed with a strong magnifying glass to fragments half to three-quarters of an inch in size. An assay made of the pyrites of the Mae gulch gave \$850 in gold and 58 oz. in silver. In some pyrites coarse free gold can be easily seen.

The climate is arid, and the summer is hot, though the spring and fall are often pleasant. Snow may fall occasionally, but it melts in a day or two. Vegetation is scanty, and if a water level exists it will be found at the level of the water in the Pahrump Valley or of the Amargosa.

In the hills at timber line are numerous springs, most of them three to six miles away and capable of being developed, but it is doubtful if a sufficient volume of water could be obtained for hydraulicking. There are three pipe lines to mine camps and stamp mills, and the supply is ample for milling and domestic purposes. Some of the water could be used for rocking, but since

the introduction into the district of the Mexican air jig, very little water is now used for placering.

Either water for rocking has to be brought to the working places or gravel has to be hauled to the water, where sluice boxes are built, but as the pay gravel is very dry and seldom contains any clay, being mostly soil, the dry washer has proved the best. It is a small self-contained machine, inexpensive to build, and can be moved anywhere. It is operated by one man, and the extraction is good.

The air jig or dry washer consists of a screen of $\frac{1}{2}$ to $\frac{3}{8}$ -in. mesh on which the pay gravel is either dumped or shoveled, the undersize falling into a hopper holding about 150 lb. of gravel, then on a movable frame held in place by tapered wood keys.

The frame is made of wood with 1 x 1-in. riffles placed about 4 in. apart. The bottom is covered with cheesecloth or flour sacking, kept from sagging by a light screen (window screen). The bellows underneath is made of 10 or 12-oz. canvas, the bottom of which is a 1 x 12-in. board, with one end fastened with hinges and the other extending to permit the rope to be tied to the handle. The machine stands on four legs 2 x 4 in.

The operation of the jig is as simple as the construction. With the frame tight in place, the hopper is filled (the bottom plank of the hopper nearly touches the frame) and the gravel runs on the frame, only a few inches being stopped by the first riffle. The bellows is worked rather rapidly, and the air is compressed and acts on the cheesecloth exactly like the water in the regular jig. The gravel is now jumping very smoothly over each riffle. By observing closely at the compression stroke, the air holes can be seen through the gravel bed, and on the return stroke the suction helps to bring the heavy mineral to the bottom. The dust, which one would think must be in quantity, is hardly noticed.

According to the value of the material treated, but usually after three to five hoppers full have been handled, a clean-up is made. The two tapered keys are loosened, the frame is slid out and its contents are dumped on a canvas and panned out in the usual way. The ratio of concentration is 8 to 1 per hopper or 24 to 40 to 1 or more if several hoppers are used. The time required to jig a hopper does not exceed four minutes. It is much faster than panning and cheaper than it is to take the gravel to water. The extraction, which is 75 to 90 per cent, is just as good as can be expected with the rocker.

According to operating figures a cubic yard of pay dirt will yield from \$2 to \$30 in gold, but no definite figure can be given to show how low a grade of gravel can be made to pay, all this depending on the amount of overburden to be removed, the boulders that may be encountered, the nature of the bedrock, and the facility of handling.

There are on the market dry concentrators that would make just as good a saving and of much larger capacity, but for the prospecting stage the air jig has proved successful.

Value of Compass Exploration

A series of observations is being made in the brown iron ore district of Alabama for the purpose of determining definitely whether the dip compass can be relied upon in the location of ore deposits. A study of the method of mining and handling the ores of this district is also being made by the Southern Experiment Station of the U. S. Bureau of Mines.

Iron-Ore Deposits in Finland and Sweden

Considerable iron-ore deposits have recently been discovered at Kittilä, in Finland. The Finnish Geological Society started investigations there in the summer of 1920, and a report has just been issued giving details of the results attained. It appears that the formation of the ore fields, as well as the properties and appearance of the ores, are quite different from those in the northern Swedish ore districts, with which the Kittilä fields are connected through Norway. On the other hand, the Kittilä ores are stated to closely resemble the Canadian iron ores. If the extent of the Kittilä ore districts are to be determined by a magneto-metric map, the total size would approximate 141,000 square miles and that of the visible part of the field about 104,600 square miles. The ore content of some parts of the latter is stated to be so poor that mining on a revenue-paying basis seems hardly possible. Sites of 4,000 to 8,000 square miles of pure iron deposits have been explored, on the other hand, extending over several hundreds of meters in length and having a width of from forty to sixty meters. The richness of the upper strata of deposits is estimated at 51,400,000 tons and the lower strata are calculated to contain 17,700,000 tons.

Investigations of the Mertainen ore fields (North Sweden), which had been unexplored so far, by the ore commission appointed by the Swedish government, have now come to an end. It was found that the fields contain valuable workable ores rich in iron and poor in phosphorus. An analysis of samples showed an iron content of 65.5 to 68.5 per cent and a phosphorus content of 0.09 per cent. Expert calculations put the total available tonnage at 35,000,000 to 40,000,000. The commission is now engaged on a calculation of mining and operation costs for the exploitation of the deposits, and the railroad authorities are considering the costs of a line connecting Kiruna with the ore fields.

Experiments on Sponge Iron

Results of work done at the Northwest Experiment Station of the U. S. Bureau of Mines in Seattle, Wash., indicate that fine grinding of sponge iron and wet magnetic concentration give a higher recovery of metallic iron than dry magnetic concentration on either coarse or fine material and that dry magnetic concentration is not improved by fine grinding. In melting sponge iron in a direct arc furnace using amorphous carbon as a carburizer, 2½ per cent carbon is readily reached, with a practical limit of 3 per cent. Using graphitized carbon as a carburizer, 3 per cent carbon is readily attained and 4½ per cent is easily possible.

Rapid Determination of Mercury

In making tests for the rapid determination of the percentage of mercury in its ores, according to the *Journal of the Society of Chemical Industries*, a mixture of the ore and quicklime is heated in a tube closed at one end and held almost horizontal. The portion of the tube in which the mercury has sublimed is separated from the remainder, the end sealed, and the mercury dissolved in about 1 c.c. of nitric acid (sp.gr. 1.48—1.50); a few drops of N/10 permanganate are added to oxidize mercurous salts, and the solution after neutralization is titrated with N/20 potassium thiocyanate.

Mining Men of Note

Eugene Meyer, Jr.

SO FAR, our biographical articles have dealt principally with men of note in the mining world on account of their technical achievements. There is, however, an important class of mining men composed of those who have had the direction of mining policy in a large way. A man may become eminent in the mining field through the direction of technical procedure, of business management, or of finance, and just as it is impossible to draw an exact line between the activities of the mining lawyer and the geologist engaged as an expert in mining litigation, so it is at times hard to frame a distinction among mining men between the technical expert who contributes to the making of mines by his knowledge of metallurgical and mining problems, and the financier skilled in mining problems who makes possible such success by providing the necessary funds. In this class, which we may call men of mining policy as distinct from men of mining technique, are to be found such distinguished names as those of Daniel Guggenheim, John D. Ryan, C. F. Kelly, Adolph Lewisohn, W. B. Thompson, and

Eugene Meyer, Jr. Mr. Meyer was born in Los Angeles, Cal., on Oct. 31, 1875, which reminds us that if Ohio is the mother of presidents, California is the mother of mining men. He was educated in the public schools of San Francisco, spent one year in the University of California, and was graduated from Yale University in the class of 795, taking honors in political economy. After graduation he spent a year in the banking business in New York, followed by two years of intimate study of banks and banking houses in Europe, returning to enter the employ of the foreign exchange and banking house of Lazard Frères in New York.

In 1901 the firm of Eugene Meyer, Jr., & Co. was formed, which until 1906 was principally known for its activities in connection with placing and marketing railroad issues. Mr. Meyer's interests turned toward copper in 1906, when he became a director and officer of the Boston Consolidated, which was later consolidated with the Utah Copper Co. in 1909. The properties formerly owned by Boston Consolidated have furnished

the most important part of the ore mined by Utah. With the development of the silver mines in the Cobalt district, Mr. Meyer became interested in silver as well, and his name appears as a director in Nipissing in 1907 and 1908. Thereafter the firm of Eugene Meyer, Jr.,

& Co. became one of the best known in the field of copper finance, underwriting and placing the bond issues of such properties as Braden, Inspiration, and Chile. The firm was well known to the engineering profession, many of the principal consulting engineers in the mining field having been called in from time to time by Mr. Meyer for professional advice. It has been said that if you want a thing done well, call on a busy man. It may also be said that if you wish a thing done well and also done promptly, call on a busy mining man. We therefore see Mr. Meyer summoned to Washington soon after the outbreak of war, and taking charge of the Council of National Defense, and later for the War Industries Board, of the non-ferrous metals, in which capacity he was succeeded by Pope Yeatman early in the year 1918.

With the formation of the War Finance Corporation in 1918 as an emergency banking organization to meet the needs of industries necessary or contributory to the prosecution of the war, and of banks financing such industries, Mr. Meyer was appointed one of its directors, was later elected managing director, and served in that capacity until 1920, when operations of the corporation were suspended. In the spring of 1921 the activities of the War Finance Corporation were revived, and Mr. Meyer was reappointed to the board by President Harding and re-elected Managing Director.

Though the activities of the War Finance Corporation in connection with agricultural relief would appear to be a field large enough to keep any man pretty busy, Mr. Meyer found time to take on the marketing of securities for the Director General of Railroads.

During a recent address to bankers and business men in Los Angeles, Mr. Meyer was heard to utter this thought, "Pessimism follows, rather than precedes, the event," an inspiring message to the mining industries.



EUGENE MEYER, JR.

CONSULTATION

Procedure for Patenting Lode Claims

"Will you kindly inform a prospector what steps are necessary to procure a patent upon two lode claims, the probable cost and how long it ordinarily takes?"

The legal steps required to obtain a patent from the United States Government covering one or more lode or placer claims are fully described in many textbooks and Government publications. A prospector wishing to go through this process will do well to send for a copy of the pamphlet "United States Mining Laws and Regulations Thereunder," published by the General Land Office, Department of the Interior, Washington, D. C., and to inform himself about the law. It is furnished free of cost, and contains all the laws and regulations that directly affect his action. Briefly the necessary steps are as follows:

At his own expense the owner must have a correct Government survey made of his claims. To do this he will have to apply to the surveyor general of his state, specifying what claims he wishes to have surveyed, when the locations were made, and inclosing with his application certified copies of the location certificates. The surveyor general will appoint a mineral surveyor in the owner's district (usually a mineral surveyor whom the claimant proposes) to do the work, upon the receipt of a deposit intended to cover the cost of the clerical work in the surveyor general's office. The mineral surveyor can have nothing further to do with the patenting of the claim after having made the survey and having had it approved by the surveyor general and the Commissioner of the General Land Office. One copy of the approved plat and field notes is retained by the surveyor general, one copy of the plat is given the claimant for posting on his claims, and one copy of the plat and field notes given to the claimant is to be filed with the proper register of the General Land Office. This copy is ultimately transmitted with other necessary papers to the Commissioner of the General Land Office. One plat of the claim is also sent to the register to be filed.

The claimant's plat is to be posted in a conspicuous place upon his claim, and must include a notice of patent application, containing date of posting, name of claimant, name of claim, the number of the mineral survey, mining district and county, and the names of adjoining or conflicting claims, as indicated by the plat. It is next necessary to file with the proper register and receive a copy of the plat and field notes, accompanied by the affidavit of at least two witnesses that such plat and notices are posted in a conspicuous part of the claims giving the date and place of such posting and a copy of the notice so posted.

Accompanying the field notes must be the sworn statement that the claimant has possessory right to the premises by virtue of a compliance with the mining rules and regulations of the mining district, state, or territory in which the claim lies and with the mining laws of Congress. The affidavit must state the facts constituting such compliance, the origin of his possession, and the basis of his claim for patent. The application should contain a full description of the vein

or lode, the kind of mineral, the extent thereof, whether ore has been extracted, amounts and value, and such other facts as will support the claimant's allegation that the claim contains a valuable mineral deposit. This sworn statement must be supported by a copy of each location notice, certified by the legal custodian of the record thereof and also by an abstract of each title certified by the legal custodian of the records of transfer, or by a duly recognized abstractor of titles. The certificate must state that no conveyances affecting or purporting to affect title to the claims appear of record other than those set forth.

Then at the expense of the claimant, the register will publish notice of the application for sixty days in a local newspaper so that public notice is given to anyone holding an adverse claim. After this period, an affidavit of publication must be furnished the register and another of posting upon the claim; also a certificate from the surveyor general testifying to the performance of at least \$500 worth of work upon the claim, after which the claimant may pay for the land at the rate of \$5 per acre, and if all the papers are found to be regular and in order, a patent will be issued through the General Land Office.

It will be seen that the procedure is both long and intricate, and that many delays can occur in the various steps that are required by law. For this reason it usually takes at least a year from the time an application is made to the surveyor general for a patent survey, until a patent is granted.

Standard forms have been evolved which facilitate the proper execution of each part of the procedure. These forms can be consulted in practically any legal work on mining, such as "Morrison's Mining Rights," published by the Bender-Moss Co., San Francisco, Cal. It is unwise, unless a prospector or claim owner has competent guidance, to undertake to perform the many steps necessary to procure a patent. Governmental regulations are exceedingly strict and punctilious, so that the slightest deviation from a proper and acceptable form is likely to subject claimant to much annoyance and delay in completing his application. The claimant can readily proceed as far as the approval of his mineral survey, but beyond that it is advisable to place his papers in the hands of an experienced attorney.

It is difficult to give an estimate of the cost of procuring a patent to a claim. Usually it is small compared with the value of the land it covers. All expenses must be borne by the claimant, particularly those in which the Government is an interested party. The mineral survey is made at the claimant's expense, the clerical work of the General Land Office in correcting the mineral survey is paid for by the claimant, the advertisements inserted in the local paper and the final payment of \$5 an acre are also part of the general expense, to say nothing of the cost of placing the matter in the hands of an attorney. Where the claimant enters into individual negotiations with parties aiding him, the fees he pays are subject to the contracts he makes. Thus the mineral surveyor's charges depend upon the bargain the claimant drives with him. Similarly, attorney's fees.

HANDY KNOWLEDGE

Neighborly Chats With the Foreman Laying Out a Job

BY DUNCAN MACGREGOR

Written for *Engineering and Mining Journal*

Laying out a job depends to a certain extent upon the kind of a job it is. Nevertheless, there is a similarity in all jobs. There is one kind of a job which is carefully planned beforehand and there is the other kind that grows like Topsy, and when finished reminds you of Topsy herself, slightly down at one heel, her hat tilted and chewing gum from ears to eyes and from chin to hat. It's the carefully planned job that generally goes through without those uncomfortable hitches and embarrassments—not to mention accidents.

Take a leaf out of the notebook of the engineer. He first determines exactly what is wanted. He takes plenty of time to do this, for he knows that some people are fickle and need be pinned down in black and white, with pay in advance, before he can tell just what they want. Then he works out plans on paper; builds the whole structure beforehand in those pictures on the brown detail paper. Next he takes off all the quantities he will have to use and decides on the kind of material necessary. He writes these down in the form of specifications and knows pretty well the sort of thing that he is up against.

You can handle your ordinary jobs and some of the exceptional ones in the same way. Get a sheet of paper and make a rough sketch and mark on it the dimensions and kind of material you want. Make out a bill of material. Next think over the tools you will require and make out a tool list. Then figure out the number of men and the time the job will probably take. Lastly, figure on the staging that will be required and make a sketch of it. Take off the material and prepare a bill of material.

The economical way to run your job is to have all the material go first through the shop and then have it delivered along with the special tools close to the job. Now you are ready to turn your men loose. First decide on the order in which things have to be done. Decide what parts of the job can be done simultaneously, without the men interfering with one another. Lost time results when one gang has to wait on another to finish up. A little planning ahead of time will prevent these delays.

After completion, when you are satisfied, have one man retrieve all the tools and get them back to the station, and a couple more clean up all superfluous material and get that back to your station. Finally, go over the whole job and see that it comes up to your expectations and is amply strong enough for the purpose.

Then, note in your work book the labor required and any improvements in handling the particular job, so that when you repeat it you can make these improvements. Lastly, compute the total cost. This is essential, for you have to think in terms of cost. If you are going to keep down costs you will find it quite necessary to think dollars and cents on each job and measure your results in units of cost and units of work.

When you go off shift and get your pipe working after supper, run over the whole day's work and criticize your own handling of the work of the day. If you do this from day to day the time will come when you won't miss a single trick and you will get your gray matter so trained that the "super" will stand around and listen pretty respectfully when you have anything to say.

Rail Linings for Ball Mills

BY H. W. HARDINGE

Written for *Engineering and Mining Journal*

The article on the subject of "Railroad Rails for Ball-Mill Linings" on page 778 of *Engineering and Mining Journal* of Nov. 12, 1921, by Perry G. Harrison, is certainly interesting, even though the cost which he finally gives for this class of lining, 1c. a ton, I consider rather high.



FIG. 1. METHOD OF LINING A HARDINGE MILL WITH RAILS

The new adaptation of old ideas is constantly recurring, and it will be of further interest to your readers in out-of-the-way places to utilize their scrap material as indicated in the inclosed photograph, showing how we tried out this class of lining in conical mills several years ago. In our application of this idea, the rails were held in place by lugs passed through the shell and further held in place by cement. The cement gradually wore away, and its place was automatically filled in with the grinding media and material being ground, which prevented the shifting of the rails. See Fig. 1.

A photograph of another class of lining more particularly used in light ball mills and adopted by the

THE PETROLEUM INDUSTRY

Petroleum Investigations of the U. S. Bureau of Mines

At the petroleum experiment station at Bartlesville, Okla., of the Bureau of Mines, the field investigation on losses of crude oil by evaporation from lease storage tanks has been completed. In one producing district a thorough study of evaporation losses was made; first, under ordinary storage conditions, and, later, with the lease storage tanks equipped with gas-tight roofs. The saving due to the installation of new, up-to-date equipment amounted to from two to four barrels of oil per day for each tank covered. An investigation has been started to determine the loss of crude oil through evaporation at pipe-line measuring stations, and arrangements have been made for a series of tests on a trunk pipe line from the Cushing and Glenn Pool fields to a station at Powderly, Tex.

A field investigation of pumping equipment used in the Mid-Continent field is being made by the Bureau. Tests at the Bartlesville station on low-pressure gas burners used in oil-field boilers have been completed. Eleven low-pressure burners were tested in this investigation. Arrangements have been made to obtain additional field data on steam consumption under different drilling operations.

At the Boulder, Col., field office of the Bureau of Mines the co-operative oil-shale laboratory has been enlarged, and much new equipment has been added preparatory to more extensive work on Colorado shales. Additions to the staff at the laboratory include Douglas A. Fell, a native of New South Wales, whose father is the owner of the only producing oil-shale company in Australia. Important changes have been made in the temperature-measuring apparatus and in the drive mechanism of the horizontal retort at this station. A new location of pyrometers in the retort proper and the retort furnace is expected to indicate more accurately the temperature of the shale in the retort and also make possible more definite control of retorting conditions. During the last two years several attempts have been made to classify oil shales by chemical determinations of various sorts, but these have not been successful.

It has been suggested that the quality of oil to be obtained from a given oil shale will be most influenced by the C:H:O ratio in the organic matter of the shale. Work is now under way seeking to determine this ratio for several representative shales. The plan of work involves (1) the separation of the organic from the inorganic constituents of the shales; (2) the elementary combustion analysis of the recovered organic matter; (3) the retorting of a sample of the same shale in the assay retorts; and (4) a distillation analysis and chemical examination of the oils produced by the assay retorts. This work is now well under way, although at the start considerable difficulty was experienced in making a clean separation between the organic and inorganic parts of the shale. A method for the separation has been developed, however, that appears to be quite satisfactory.

Experiments in refining the oils produced from Colo-

rado oil shales have been started. Various methods of procedure will be tried, and the concentration of the refining reagents changed until the most satisfactory results have been obtained. For the purpose of comparing different oil shales it has been tentatively agreed that the most satisfactory oil is that which yields the highest percentage of crude naphtha containing the lowest percentage of unsaturated hydrocarbons.

A survey of the Mexia oil field, in Texas, will be begun soon by the Dallas office of the Bureau of Mines. It is expected to define the strata in the proved area and to outline the best methods of production and conservation for this particular field.

Montana Fields Increase Production

SPECIAL CORRESPONDENCE

Bringing in a well on the Soap Creek structure, southeast of Billings, Mont., by the Box Co., showing an initial flow of 2,000 bbl., is emphasizing the importance of this new field, in which about a half dozen producers have been found. A well owned by the Western States Co., a subsidiary of the Midwest Refining Co., is reported to have production of 5,000 bbl. A pipe line will be constructed by the Midwest interests. Cat Creek field, in central Montana, continues to report increased output. The Ohio Oil Co. now has attained a depth of about 3,000 ft. in the Big Wall field, with slight oil showings.

Prospecting for Oil in Australia and Papua

SPECIAL CORRESPONDENCE

When the last mail left Australia it seemed not unlikely that the great interest that was being taken in the prospecting for oil in that country would have some practical results. It is recognized that the discovery of petroleum in commercial quantities on this big continent would be of such importance that if the commonwealth government has to pay the £50,000 which it is offering for such a discovery it will prove a remarkably good investment.

Regarding the investigations that have lately been made in the northwestern part of Western Australia, a government geologist (Mr. Blachford) after inspecting and having analyses taken of samples from an area known as Rough Range, has come to the conclusion that the rock formation is limestone, probably overlying beds of shale and similar rocks, and is of the Carboniferous age; that, owing to earth movements, the limestone has been flexured in the spur of the range, forming a distinct anticline, which has been traced along the crest of the range; that geological conditions are favorable to the storage of mineral oil; and that mineral oil has been found in the bore sunk on the property examined. Immense areas have been taken up under license in this state as prospecting ground.

Professor David, an Australian geologist, has spoken highly of Mr. Blackford's work, but recommends more prospecting before expressing a definite opinion on the value of the discovery from a commercial point of view.

Hardinge company about ten years ago is also shown. This is formed by cutting off the sections of old rails and imbedding them in cement. The cutting was done with a steel disk revolving at about 2,500 r.p.m. acting as a circular saw, without teeth. It required about three minutes to cut a section of an 80-lb. rail when

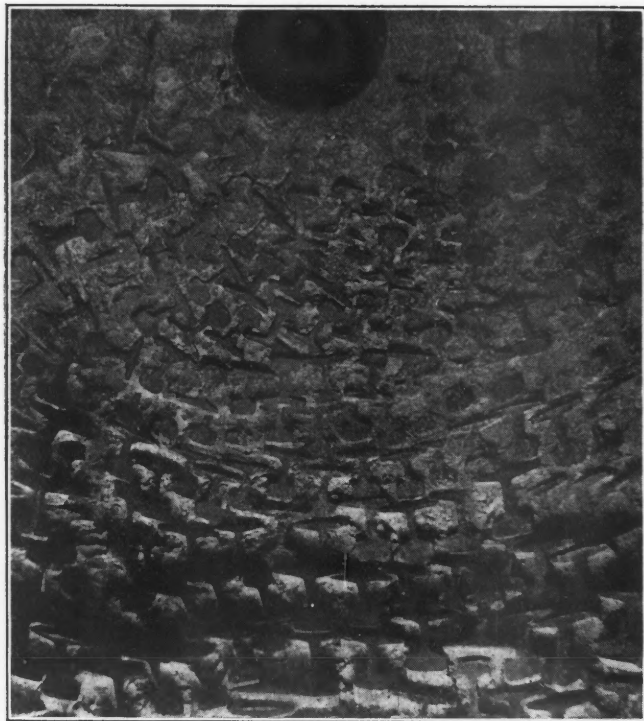


FIG. 2. RAIL AND CEMENT LINING

cold, but when heated in a forge to a cherry-red heat about fifteen seconds sufficed to perform the cutting. Note rail sections in Fig. 2.

In connection with Fig. 2 a peculiarity appears which is well worth study and explanation. For instance, looking at this photograph in the position with the discharge trunnion at the top (as shown here), it will be seen that the cement appears to protrude from around the rail sections. If this photograph is turned upside down, one immediately notes that the rails appear to protrude out of the cement—a curious effect that is about as hard to explain as the classification of balls in the Hardinge mill.

The cost in consumption of this class of lining is less than 1c. per ton. It should be used only when small balls (2 in. and less) are the grinding media.

A Water-Tight Underground Dam

BY G. C. BATEMAN

Written for *Engineering and Mining Journal*

At Cobalt, Ont., on account of so many properties being connected with one another, it is found necessary to build a number of small concrete dams or bulkheads underground in the workings. Usually dams about two feet thick can be used. Some trouble is experienced in keeping these tight, owing to shrinkage from the back and from the sides near the top. To overcome this, when we are building a bulkhead, we leave an opening in the center large enough for a man to get through. The opening is made by putting in a box open at both ends which fits tight to the form, front and back. The top of the box slopes to the back of the dam.

After the form is filled with concrete and has set for a few days, the boards in front of the opening are taken off. Then the boards at the back are knocked off. A man then goes through the opening, takes off the rest of the boards and cuts out a V-shaped section at the sides and top of the bulkhead. This is then made tight by putting in cement and sand with a trowel. To help fill in any small cracks which may later develop, some manure is put in behind the dam. If the water starts coming through, this will help plug up the openings.

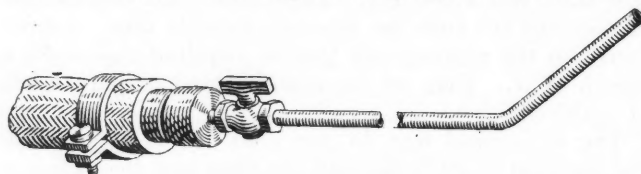
After the concrete has set firmly, the boards, which form the sides, top, and bottom of the opening, are removed and a tight cover is fitted over the back. The opening is then filled with concrete, the slope from the front to the back helping to make a perfect seal. Since we have adopted this method we have had very little trouble from the dams leaking. It is, of course, necessary to put in a pipe through the bottom of the dam of sufficient capacity to carry all the water until all the concrete has set firmly.

Thawing Device for Harz Jigs

BY JAMES T. KEMP

Written for *Engineering and Mining Journal*

A device which greatly simplified the work of keeping Harz jigs thawed out during cold weather is shown in the accompanying illustration. It was devised by the foreman of an eastern concentrator, who had difficulty keeping four cast-iron jigs operating during a severe cold snap when the usual abundant steam supply was cut short. The device consists of a lance of 1/2-in. pipe about 30 in. long bent up at the end and a T-handled stopcock fitted into the end of a steam hose. The slide of a frozen spigot was first thawed and opened by playing a small jet on the outside. Then the jet was turned on full and shoved up into the spigot opening. It quickly thawed through into the hutch. Each spigot was thawed and the concentrate drawn in less than a minute. It had previously taken three to four



STEAM HOSE, FITTINGS, STOPCOCK AND 1/2-IN. PIPE USED IN THAWING DEVICE

minutes' treatment with the open hose to thaw each spigot and the plates around it. This saving of time permitted one man to attend to the jigs at all times and made it unnecessary to use a second hose, as had been the case occasionally. Much less steam was required. Furthermore, the elimination of the steam clouds that had filled the building ended belt troubles and discontent among the men.

A new method for evaluating zinc dust is given in *Metall u. Erz*, as follows: One gram of dust, ground to 90 mesh, is shaken with 20 c.c. of water until evenly suspended. A mixture of 20 c.c. of 10 per cent sulphuric acid and 25 c.c. of 3 per cent hydrogen peroxide is added. Let stand and stir occasionally. All except a small amount of lead sponge should be dissolved in ten minutes. Add 20 c.c. of 40 per cent sulphuric acid and titrate the excess hydrogen peroxide with permanganate (15 g. per liter) that has been standardized against sodium oxalate.

Technical Papers

Underground Loading—The use of scrapers underground is described in a five-page article by Lucien Eaton in the Nov. 19 issue of the *Mining and Scientific Press*, (San Francisco; price 15c.). Some recent types are illustrated and the field of application is mentioned.

Potash—A description of the alunite deposits of the United States was published in the *Compressed Air Magazine* for October (New York, N. Y.; price 35c.) and in the November issue is a six-page article describing the present condition and the future prospects of the Alsatian mines.

Mining in Tasmania—The annual report of the Acting Secretary for Mines, for 1920, a book of 105 pages, is now available for 1s. 6d. from the Secretary for Mines, Mines Department, Hobart, Tasmania. The principal products were copper and tin. The Mount Lyell Mining & Railway Co., Ltd., produced 4,836 long tons of blister copper.

Round Mountain, Nevada—Bulletin 725-I of the U. S. Geological Survey describes the geology and ore deposits of the Round Mountain district in Nevada. The Round Mountain Mining Co. is the dominant producer of the district. Gold and silver is obtained from both lode and placer deposits, and during the war tungsten ore (huebnerite) was mined, and worked with dry-washing machines.

Phosphates—A monograph on "Phosphates" is the latest to be issued by the Imperial Mineral Resources Bureau. It is a bulletin of seventy-two pages, and may be obtained for 2s. 1½d. from H. M. Stationery Office, Imperial House, Kingsway, London, W.C. 2, England. Data on deposits, production, and consumption, prices and technologic methods throughout the world are given. The United States is by far the largest producer.

New Mexican Tin—"The Taylor Creek Tin Deposits, New Mexico," are described in U. S. Geological Survey Bulletin No. 725-G, thirteen pages, obtainable on application. It is generally considered that the United States has no tin deposits of commercial importance, and there is nothing in this report to make one think otherwise. Stream tin has been found in the gravels of Taylor, Squaw, and Hardcastle creeks, and cassiterite, with specular hematite, occurs in veinlets in soft altered rhyolite at several places in the Taylor Creek district.

Mineral Resources—Recent publications of the U. S. Geological Survey in the "Mineral Resources" series include "Gold, Silver, Copper, and Lead in South Dakota and Wyoming in 1920," nine pages; "Secondary Metals in 1920," fifteen pages; "Cobalt, Molybdenum, Nickel, Tantalum, Titanium, Tungsten, Radium, Uranium, and Vanadium in 1919," sixteen pages; "Gold, Silver, Copper, Lead and Zinc in New Mexico

and Texas in 1919," eighteen pages; "Silver, Copper, Lead, and Zinc in the Central States in 1920," forty-one pages; and "Artificial Gas and Byproducts in 1917-18," sixty-one pages. Any of these may be obtained on application to the Survey at Washington, D. C.

Properties of Slate—"Tests of Physical and Electrical Properties of Slate," thirty-four pages, has been published by the Fritz Engineering Laboratory, Lehigh University, Bethlehem, Pa. Details and mean results of physical tests are given in tabular form. Tests of material from the "soft vein" of Pennsylvania indicate that a slate quarried three months has about twice as great resistance in ohms as freshly quarried slate. When slate was tested on a 110-volt line between two metal surfaces of opposite polarity spaced one inch apart, a resistance of 400,000 ohms was found to be a safe working value for switchboard use. The factor of safety for the slate tested was from four to nine, depending upon the length of time it had been quarried.

Mining in Alaska—"The Alaskan Mining Industry in 1920" is the title of Bulletin 722-A, just issued by the U. S. Geological Survey, Washington, D. C., obtainable upon request. This volume, of seventy-four pages, is the seventeenth of a series of annual bulletins summarizing the results achieved during the year in the investigation of the mineral resources of Alaska, and treating especially of the statistics of mineral production. The value of the mineral production in 1920 was \$23,303,757, which was slightly more than in 1919 but only about half of the record figures of 1916 and 1917. The increase over the preceding year is to be credited chiefly to the four leading copper mines of the territory. The output of the gold placers decreased, but that of the gold lode mines was maintained.

Superpower Survey—The report of the Superpower Survey for the region between Boston and Washington has been issued by the U. S. Geological Survey as Professional Paper 123. The book is a volume of 261 pages, amply illustrated by maps and charts. It may be obtained on request. The idea behind this project is that the vast amount of electrical energy required in this territory can be better supplied by a few generating stations of extremely large capacity than by the hundreds of small plants now in use. The estimated requirement for energy supplied through the electrical utilities for municipal, private, industrial, and railroad purposes in 1930 is 31,000,000,000 kw.hr. This energy could be supplied by a co-ordinated power system such as is described in this report at an estimated annual cost of \$239,000,000 less than by the system now in use, which is not co-ordinated.

Microscopic Mineral Determination—"The Microscopic Determination of the Non-opaque Minerals," a book of 294 pages, has recently been published as Bulletin 679 by the U. S. Geological

Survey, Washington, D. C. (obtainable on request from the Survey). Optical methods of determining minerals with the petrographic microscope have long been used and have been carried to a high state of development in studies of the minerals in thin sections of rocks and ores; yet out of about 1,000 mineral species, comparatively few can be identified readily in thin sections. A mineral whose optical properties are known can be accurately and quickly identified, however, by the immersion method, that is, by immersing its powder in liquid media whose indices of refraction are known, and determining its optical constants. In this bulletin the author gives a set of tables for the systematic determination of minerals from their optical constants, describes briefly some methods for the rapid determination of optical constants, gives the results of measurements of the optical constants of more than 500 species for which data were not previously available, and presents statistics on the optical properties of minerals. The methods discussed in this book should prove valuable in other fields than mineralogy. Metallurgists with concentration problems to solve, especially flotation, and those engaged in a study of smelter byproducts will find the book of interest. The use of the microscope should be extended. The author is Esper S. Larsen, and the bulletin shows the result of much painstaking labor. It should find a place in the libraries of all mining engineers interested in experimental work.

Book Reviews

The Mineral Industry During 1920. Edited by G. A. Roush. Cloth; 7 x 9½; pp. 907. McGraw-Hill Book Co., New York. Price, \$10.

The latest volume of this well-known book has just been received. To those who are not familiar with it we can do no better than quote from the preface: "The object in the compilation of the annual volumes of 'The Mineral Industry' is to bring together, in as short a time as possible after the close of the year, a review of the progress during the year in the mining and metallurgical industries. While production figures are a necessary part of any record of this character, they are not the real meat; the production figures merely make up the skeleton around which the discussion of the general conditions in any particular phase of the industry is arranged. Our desire is to combine the leading statistics with such extracts from the current literature as have a bearing on the subject in hand, and sufficient discussion of the prevailing commercial conditions to show the financial side of the industry, in order to make a well-rounded review of general progress."

All the important minerals and metals are covered in the customary satisfactory manner.

Professor David also has directed attention to the fact that in Papua there exists a continuation eastward of the great oil belt (only perhaps about one-tenth as old as that of the West Australian area), which runs from Burma through Sumatra, Java, Borneo, Timor, to Dutch New Guinea and Papua. There are numerous oil-bearing springs and oil-gas wells in Papua, the strata having been folded into anticlinals and troughs, but the explorations of the geologists of the Anglo-Persian Oilfield Co. show that these arches are mostly intensely disturbed by earthquake cracks or geological faults. This repeated cracking of the rock lid, Professor David says, has allowed the oil gas to escape over large areas.

Geologists are still at work pressing eastward in the direction of the Purari River, and are confidently hoping to be able to trace the oil belt in the more settled country. According to Mr. Blachford's examination, the west Australian region is far more settled than that of Papua, and so may have advantages over the latter.

Petroleum Production Continues Decrease During October

Production of petroleum in the United States, according to the U. S. Geological Survey, continued to decrease during October. The daily average for the month, 1,149,613 bbl., was 70,887 bbl. a day less than the production for September and was the smallest for any month since February, 1920. California, as a result of the strike in the oil fields, dropped to third rank, and decreased daily average production is also reported for all the other states with the exception of Wyoming, Illinois, and Montana, where small gains are recorded. Only 752 producing oil wells are reported to have been completed during October, as compared with 2,086 wells in October a year ago. This falling off in domestic production was offset by an increase in imports of Mexican petroleum, amounting to a daily average of 373,400 bbl. Consumption also increased by 180,352 bbl. a day and was the greatest for any month of the year since January.

There was a net increase of stocks at the end of October, amounting to 884,000 bbl. An increase of 2,029,000 bbl. of Mexican petroleum held in the United

States by importers is contrasted with a decrease of stocks of domestic crude oil amounting to 1,145,000 bbl., which marks the first net decrease in pipe-line and tank-farm stocks east of California since April, 1920.

The accompanying figures, compiled from company reports to the Survey, show the quantity of petroleum removed from producing properties. Oil consumed on the leases is not included. This item and net changes in producers' stocks at the beginning and end of the year are obtained by annual canvass and are included in the final statistics of production.

Active Developments in Arizona

SPECIAL CORRESPONDENCE

Oil sand, lying beneath 10 ft. of blue shale, is reported to have been found at 372 ft. in a well being drilled by the Colorado Delta Oil Co., near Yuma, in the extreme southwestern corner of Arizona. The company, which is capitalized mainly at home, is sinking deeper.

In the northeastern part of the state, around Holbrook, sinking is being continued on at least two of the wells, which are fully 2,000 ft. deep and which generally have been driven through very hard formations, with occasional strata of shale, with at least one salt bed, though most of the way has been through sandstone and limestone. Dorsey Hager, of Los Angeles, has been making close examination of the ground and has been comparing the logs of several of the wells; this work in the interest of a syndicate, headed by Dr. S. Earl Taylor, that has secured drilling rights on about 250,000 acres in this field. Hager finds resemblances to Illinois and Indiana fields. The Taylor interests have brought in a drilling rig.

The newest exploration field is one that is being leased west and northwest of Douglas, in the southeastern part of the state. The leases have been taken by H. C. Buemler, who is representing a California company.

South of the border, the western parts of the Mexican states of Sonora and Sinaloa are being given geological examination for oil indications by a party led by W. P. Haynes, of New York, with him being R. P. Walters, of Oklahoma; L. Gibson, and Fred Ely.

PETROLEUM PRODUCED IN THE UNITED STATES IN SEPTEMBER, 1921, OCTOBER, 1921, AND OCTOBER, 1920

State	September, 1921 (a)		October, 1921		October, 1920	
	Total	Daily Average	Total	Daily Average	Total	Daily Average
Oklahoma.....	9,790,000	326,333	9,716,000	313,419	9,437,000	304,419
Central and Northern Texas.....	4,710,000	157,000	4,833,000	155,903	6,659,000	214,806
Coastal Texas.....	2,796,000	93,200	2,730,000	88,065	2,619,000	84,484
California (b).....	7,894,000	263,133	7,065,000	227,903	9,459,000	305,129
Kansas.....	3,005,000	100,167	2,825,000	91,129	3,269,000	105,452
Northern Louisiana.....	1,859,000	61,966	1,846,000	59,548	2,511,000	81,000
Coastal Louisiana.....	128,000	4,267	124,000	4,000	150,000	4,839
Wyoming.....						
Salt Creek.....	826,000	27,534	959,000	30,935	987,000	31,839
Big Muddy.....	156,000	4,533	141,000	4,548	179,000	5,774
Rock Creek.....	106,000	3,533	110,000	3,548	168,000	5,420
Grass Creek.....	93,000	3,100	99,000	3,194	164,000	5,290
Elk Basin.....	47,000	1,567	49,000	1,581	76,000	2,452
Other districts.....	156,000	5,200	124,000	4,000	102,000	3,290
Total Wyoming.....	1,364,000	45,467	1,482,000	47,806	1,676,000	54,065
Arkansas.....	(c) 1,400,000	46,667	(c) 1,300,000	41,936	.....	.....
Illinois.....	806,000	26,867	890,000	28,710	872,000	28,129
Kentucky.....	729,900	24,330	716,400	23,110	759,700	24,506
West Virginia.....	613,000	20,433	628,000	20,258	673,000	21,710
Pennsylvania.....	602,000	20,067	580,000	18,710	646,000	20,839
Central and Eastern Ohio.....	417,000	13,900	405,000	13,064	446,000	14,387
Northwestern Ohio.....	172,000	5,733	166,000	5,355	182,000	5,871
Montana.....	137,000	4,567	153,000	4,936	56,000	1,806
Southwestern Indiana.....	73,000	2,433	70,000	2,258	61,000	1,968
Northeastern Indiana.....	21,000	700	22,000	710	24,000	774
New York.....	88,000	2,933	77,000	2,484	82,000	2,645
Colorado.....	9,000	300	9,000	290	9,000	290
Tennessee.....	1,100	37	600	19	1,300	42
Totals.....	36,615,000	1,220,500	35,638,000	1,149,613	39,592,000	1,277,161

(a) Revised. (b) Average of figures reported by Standard Oil Co. and Independent Oil Producers' Agency. (c) Estimated in part.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

New York Section of the Mining and Metallurgical Society Discusses Foreign and Domestic Mining Policy

The New York Section of the Mining and Metallurgical Society of America met on the evening of Nov. 22, at the Harvard Club. After the usual dinner, C. M. Weld, the chairman, introduced the subject of the evening, the report of the society's committee on foreign and domestic mineral policy, and called upon J. E. Spurr to present the first discussion. Mr. Spurr's address follows in part:

"The report of this committee is one of maximum importance. We need now, more acutely than ever before in the world's history, to get down to a fundamental basis of hard fact on which to build our policies and actions. We need it for our personal course of action, and for that of our government much more.

"Now, engineers and geologists have some obvious though fundamental truths to sell to the public—and not only to the public, but to the influential men of the world, and even in the first place to all members of this and other geological, engineering and other scientific and technical societies—for the significance is not yet clearly grasped. The first is that the metal and mineral supplies of the world are limited, calculable, and measurable, and, with the recent enormous acceleration of consumption, will be exhausted in a limited lapse of time, susceptible of calculation and prognostication. Moreover, if the curve of consumption increases, that the exhaustion will come about sooner than our present figures, startling though they are, will indicate. That the existing metallic supplies are all that mankind will ever have for all time—unlike wheat, rubber, hides or even lumber, the production, once used, can never be renewed. There is no second crop.

"Now, civilization will either fall at the present crisis, as Mr. Wells apprehends, or it will recover itself, and proceed with its amazing industrial and social progress and evolution. The latter is likely, and when the consumption of metals per capita in some of the more backward countries shall have reached the figure of the consumption in the United States, what about the supplies? I have had many inquiries as to whether I thought that mining would ever be active again, and whether there would ever again be a brisk demand for metals. I think that the owners of ore deposits may safely take heart as to the future of mining. It requires only a common or garden prophet to foresee that the ore mineral crop will be carefully reaped, and that the gleaners will go over the field many, many times in search of the last grains.

"Again, of our major minerals we have had recently a number of quantitative estimates of our petroleum reserves, very valuable and brilliant, and unquestionably accurate enough for

practical purposes. These go to show that while we have coal and iron for a century or more, we shall probably exhaust our petroleum in anywhere from ten to thirty years. The cheerful-as-usual optimist (which is as much as to say the cheerful idiot), the bull on the United States, especially the petroleum producer, who wants a tariff on foreign petroleum, assures the public that this is all scientific rubbish, just as the chromite producers of California assured Congress that that state's supplies were inexhaustible. When I consider those people who are unable to comprehend that when we have spent the metals in our subterranean treasury, the treasury will be empty, and that in many departments the treasury is very limited, I should like to take them to the old abandoned chrome mines of Maryland. I should like to remind them of the time—over half a century ago—when Maryland was the chief chrome-producing region of the world; yet during the war various operators tried to revive these mines even at war prices for the ore at the door of the markets—but all in vain."

Dr. H. Foster Bain commended the report of the committee. He spoke of how the United States had been caught napping during the war and the growth of international distrust kept alive by the desire to make each country economically independent. He dwelt upon the necessity that the flow of minerals in international trade should be free—and pointed out the sufficiency of the United States in copper and coal, and of Canada in nickel. Engineers should find the facts, and action should be taken in accordance with these facts.

F. M. Feiker, of the U. S. Department of Commerce, discussed the interdependence of industry, both domestic and international. In his judgment, it has become necessary to think in terms of the merchandising problem. He believes that we do not know enough of collective efficiency and that we spend more time on production than on marketing. He said that we must study sources, quantities, markets and merchandising methods and that as a nation we must stop drifting and evolve a national program.

J. J. Broderick, commercial counselor of the British Embassy at Washington, was the next speaker. Unofficially, Mr. Broderick in a direct and entertaining way discussed the association of the British government with the Anglo-Persian Oil Co., and he said that, in his opinion, this association did not have any special significance to the petroleum business. He asked that the facts be ascertained before conclusions are drawn. He saw much to commend in the work of the committee, and expressed the belief that its report contained the nucleus of a satisfactory method for international understanding.

Dr. A. R. Ledoux discussed the ethical value of the report and pointed

out the growing importance of the foreign sources of ore supply in relation to the metal refineries along the Atlantic seaboard.

E. F. Gay, of the *New York Evening Post*, pointed out the importance of the committee's report, and then discussed the potency of international co-operation. He advocated the getting together of the Mining and Metallurgical Society with a similar organization in Great Britain and the frank discussion of international questions in an unofficial way.

J. Morgan Clements, H. H. Knox, A. C. Veatch, Samuel H. Dolbear, H. W. Smith, and Alfred H. Cowles joined in the discussion.

Accidents in Metal Mines During 1920 Show Reduction

Accidents in 1920 at mines producing gold, silver, and miscellaneous metals caused the death of 117 men and the injury of 5,704, according to reports received by the U. S. Bureau of Mines from operating companies throughout the country. Reports from 2,358 mine operators show that 29,933 employees worked 8,354,830 shifts, an average of 279 working days per man. This group of mines includes all metal mines except those producing copper and iron and those in the Mississippi Valley states producing lead and zinc.

The figures show a reduction, as compared with the previous year, of 72 operating companies, 2,197 employees, 222,265 shifts, and 9 fatalities. There was a gain of 12 working days per man, and an increase of 235 in the number of men injured (an injury signifying disability for more than one day). The accident rates for 1920, based upon a standard of 300 working days to the year, were 4.20 killed and 204.82 injured per 1,000 employees, as against 4.41 killed and 191.29 injured in 1919.

States having the highest fatality rates for each thousand employees were New York (22.73), Washington (12.30), Utah (6.29), California (5.83), Colorado (5.35) and Arizona (5.34). Those having the lowest fatality rates were New Mexico (1.34), South Dakota (2.86), Idaho (3.02), Alaska (3.31), Nevada (3.58), and Montana (3.77).

The highest non-fatal injury rates were 316.8 for Utah; 298.0, Idaho; 275.4, California; 266.7, South Dakota; 242.4, New York; 196.6, Montana; 157.7, Colorado; 134.4, Arizona, and 124.0, Nevada. States apparently having the lowest injury rates are not shown, because the abnormally low rates are believed to be due to the absence of state laws compelling mine operators to furnish complete reports to state officials.

Of the 117 fatal accidents, 81 occurred in underground mine work, 19 in

shafts, 2 at open-pit workings, and 15 at surface shops and yards. The non-fatal injuries were segregated as follows: There were 4,602 underground, 192 in shafts, 75 at open-pit mines, and 835 at surface shops and yards.

The principal causes of non-fatal accidents underground were: Fall of rock from roof or wall, 990; loading at working face, 575; timber or hand tools, 524; haulage, 522; drilling, 474; falling down chute, winze, and other working places, 220; stepping on nails, 151; run of ore from chute or pocket, 115, and explosives, 99. Of the shaft accidents, 59 were caused by cages and skips, 57 by objects falling down shafts, and 18 by persons falling down shafts. Accidents at open pits were due to the following causes: Falls or slides of rock, 13; hand tools, 11; haulage, 9; falls of persons, 6; and by steam shovels, 5. At surface yards and shops the principal causes of accidents were: Hand tools, 131; machinery, 99; mine cars, 98; falls of persons, 95; stepping on nails, 52, and railway cars, 17.

Alta and Cottonwood Districts Outlined at Commercial Club Meeting

At a meeting of the mining committee of the Salt Lake Commercial Club on Nov. 19, J. J. Beeson gave an outline of the geology of the Alta and Cottonwood districts, pointing out that the most important horizons in these districts awaiting development were those in which overthrust contacts existed, which are intensely brecciated zones affording excellent opportunity for replacement by mineralizing solutions. The large orebodies of the Cardiff, the old Columbus Consolidated and the Columbus-Rexall occur along these contacts.

Salt Lake representatives of R. G. Dun & Co. and of the Bradstreet company, George Rust and E. C. Mitchell, explained how reports on mining engineers and mining companies were made by their respective organizations.

Engineers' License Suggested in Utah

The question of licensing and regulating engineers in Utah has been recommended by the Ogden chapter of the American Association of Engineers in a report made by its legislative committee. The report, among other things, says: "Engineers in Utah intend to apply to the state for laws to regulate and protect engineering practice in the state. To a large extent Utah is dependent upon engineering work for development and prosperity, and anything which raises the standard of practice is for the public good. A license and registration law is a means to this end, and endeavors will be made to secure the enactment of such legislation. Twenty-one states now have such laws, and the number will be increased. Action in this matter has been indorsed by the American Association of Engineers, and the question will be submitted to the Engineering Council of Utah."

MEN YOU SHOULD KNOW ABOUT

F. W. Denton was in New York last week.

E. B. Latham, of Los Angeles, was recently in San Francisco.

Frank M. Estes has gone to Honduras to examine mining properties.

John V. Richards, of Portland, Ore., is at Long Beach, Cal., for the winter.

J. B. Tyrrell, of Toronto, has returned from a visit to British Columbia.

Paul A. Gow, general manager of the Tuolumne Copper Mining Co., is in Boston.

Jesse T. Boyd has been appointed consulting engineer to the Silver Mines Co. of America.

Arthur V. Corry is examining mining property near Butte, Mont., for New York clients.

W. W. Avery, geologist of the United Comstock Mines of Gold Hill, Nev., was recently in San Francisco.

Kirby Thomas has returned to New York from Gowganda, Ont., and Quebec, where he has been examining mines.

Thomas B. Crowe has resigned as superintendent of the Portland Mill, at Victor, Col., and will go to California.

John C. Febles has been appointed general superintendent of the Boston & Montana Development Co., at Wise River, Mont.

Charles D. Kaeding, consulting engineer for the Simon Silver Lead Mines Co. and other properties in Nevada, is in Reno on professional business.

Charles Rees is inspecting iron ore deposits twenty miles northwest of the Balsas River, in Michoacan, Mexico, for the Midvale Steel & Ordnance Co.

Captain William Wearne, general superintendent of the iron ore mines of Inland Steel Co., recently left for San Diego, Cal., where he will spend the winter.

F. J. Siebert, formerly with the Goldfield Consolidated Mining Co., succeeded A. L. Chappell on Nov. 20 as manager for the Standard Metals Co. at Peavine, Nev.

Michigan College of Mines has announced the conferring of degrees for the year 1921. Nineteen men received both degrees as Bachelor of Science and Engineer of Mines.

B. L. Johnson, in charge of the foreign minerals section of the U. S. Geological Survey, has been appointed a member of the Federal Interdepartmental Liaison Committee.

R. J. Hutchins, assistant manager of the Phelps Dodge Corporation, Burro Mountain Branch, has returned to Tyrone, N. M., to resume his duties after a vacation in California.

Lloyd Roby, who for the last three years has been manager for the Colorado Mining Co., at Arroyo, Sorsogon,

Philippines, is looking over the Lordsburg, N. M., mining district.

E. L. Bruce, professor of the department of mineralogy in Queen's University, Kingston, Ont., has declined the position of Commissioner of Northern Manitoba, offered him by the government of the province.

Captain Frank Kent, vice-president and general manager of the Chandler Mining Co., has returned to Ely, Minn., from a four months' European trip. He will leave about Jan. 1 for his winter home in San Fernando, Cal.

Tate Siebenthal, formerly assistant superintendent of the Gordon Mining Co. at Crosby, Minn., will leave soon for Rio Janeiro, Brazil, where he will have charge of extensive steam-shovel and hydraulic stripping operations for the Schlesinger interests.

Dr. Ernest Fox Nichols has resigned the presidency of the Massachusetts Institute of Technology and his resignation has been accepted by the executive committee of the corporation. His decision resulted from "certain physical limitations, some of them probably permanent," which his physicians said would make it unwise for him to continue. Dr. Elihu Thomson, of Swampscott, chief consulting engineer of the General Electric Co., has been appointed to the position. The educational affairs of the institute will continue to be directed by a faculty administrative committee consisting of Acting Dean Henry P. Talbot and Professors Edward F. Miller and Edwin B. Wilson.

Mining and metallurgical engineers visiting New York last week included: G. A. Swanquist, Salvador, C. A.; G. J. Kennedy, Easton, Pa.; H. W. Gillett, Ithaca, N. Y.; E. B. Holt, Columbus, Ohio; C. T. Van Winkle, Salt Lake City, Utah; K. H. Donaldson, Cleveland, Ohio; and K. Yashizawa, Tokio, Japan.

SOCIETY MEETINGS ANNOUNCED

The New York Section, A.I.M.E., will hold its regular monthly meeting at the Machinery Club, 50 Church St., on Dec. 7, preceded by the usual informal dinner. C. F. Kelly, president of the Anaconda Mining Co., and Thomas H. Watkins, president of the Pennsylvania Coal & Coke Corporation, will talk on the subject, "What Can Be Done To Revive the Mining Industry?"

OBITUARY

J. F. Hays, mining engineer of Asheville, N. C., died on Nov. 17. He was largely instrumental in the development of corundum and other non-metallic minerals in western North Carolina.

Bunker Hill & Sullivan smelter, who resides in and maintains offices in Spokane as smelter director and representative of the Bunker Hill company.

The first witness called was L. E. Hanley, secretary for the Hecla company, who was followed by Carl Landsee, of Milwaukee, a director of the Hecla and a large stockholder. On Nov. 22, President McCarthy, of the Hecla, was on the stand and was subjected to an extended cross-examination by Attorney Plummer.

Attorneys on both sides were warming up to their work in good style by the first part of the week, with promise of brilliant legal repartee, when experts later were summoned to give evidence along more technical lines.

"Even if, as the plaintiffs hold, they had not an opportunity to present their case to the stockholders before the Aug. 18 meeting, yet since that time they have been sending circulars to the stockholders and should have had ample time to gain the proxies for a majority of the stock," was the argument of Attorney Gray in outlining his case. "It looks as though the stockholders had little confidence in the plaintiffs."

Attorney Plummer maintained that the Bunker Hill backed the Star litigation against the Federal Mining & Smelting Co., charging trespass through Morning mine workings, because the Bunker Hill smelter wanted to get the tonnage from the Star. It was further charged that Mr. McCarthy, as president of the Hecla, had obtained control and "elected the directors he wanted." It was held the loss to the Hecla company on the handling of the Star ore would amount to \$2 per ton, with a substantial profit to the Bunker Hill smelter, which was anxious to get the tonnage.

New York & Honduras Rosario To Recover Gradually

The New York & Honduras Rosario Mining Co., which recently resumed operations at its mines at San Juancito, Honduras, states that it will probably be the end of the year before its operations reach a normal basis. It will take some time to get the plant ready for active work and to gather the necessary labor, which was scattered at the time operations were discontinued. Work will be continued on the same scale as formerly.

Ontario Refuses Further Time for Soldiers' Assessment Work

The Ontario government has announced that no further time extensions will be granted for the doing of assessment work on soldiers' claims. There have been several postponements of working time on these claims during the war and after the Armistice in order to help the soldier to retain his property. Though this has resulted in helping the soldiers it has also tied up a lot of ground from development, and the government has decided that, to clear the whole situation, no further extensions will be granted.

Simon Silver-Lead Mill Started Plant Being Tried Out at Part Capacity and on Low-Grade Ore

Electric power was turned on at the Simon Silver-Lead Mines Co.'s mill, at Mina, Nev., on Nov. 15. The mill will operate for the present at part capacity and on low-grade material, to give the entire plant a thorough try-out and eliminate possible mechanical troubles. The mill is designed to have 250 tons' daily capacity, and uses a selective flotation process, making two concentrates, silver-lead and silver-zinc.

The mine is opened by a shaft and tunnel. The shaft is vertical to 230 ft., then an incline on the vein, with levels at the tunnel and at 130, 230, 300, 400, and 600 ft. Ore pockets are used on all main levels. The ore is a carbonate to about 200 ft. and sulphide below. Carefully prepared reports give ore reserve estimates as 600,000 tons, which will yield a net profit of about \$7 per ton. Considering the strength and persistence of the outcrop, and of the vein where developed underground, and the comparatively meagre amount of development work done to date, the future of the property as a producer appears good, with some possibility that the mill capacity will soon be increased.

Investigating Bauxite Deposits in Australia

By Reuters Agency

Various deposits of bauxite in Australia are being investigated. The best of these show alumina contents equal to the American standard, but special attention is being devoted to ore from Wingello, near Moss Vale, in New South Wales. This ore carries a recoverable alumina content of about 35 per cent. This is not considered attractive, but if a treatment could be devised for employing the iron oxide in the deposit (about 40 per cent), aluminum manufacture would become a paying proposition. Efforts are being made to interest some of the steel companies in the matter. The quantity of easily accessible ore in sight is set down at about 4,000,000 tons. The only deposit at present being worked is one at Marracan, in Gippsland, Victoria, where the Sulphite Company of Victoria is carrying on operations.

Pump Readily Started After 17 Years' Submergence

In the course of reopening the old silver mines of Hecla, Beaverhead county, Mont. the Cleave shaft is being unwatered. Recently the station pump was reached, cleaned and started after having been submerged for seventeen years.

The pump, a Smith-Vaile, was well greased and protected when suspension took place in 1904 and had been in service for a year, up to that time.

When cleaned up and steam turned on it started off without difficulty and is pumping against a 600-ft. head through the incline shaft, using steam at 80 lb. boiler pressure, as though it had been shut down over night only.

Butte & Superior Co. Owes \$11,904,913, Minerals Separation Claims

Hearings on Accounting Adjoined in New York—To Be Resumed in February

The opening of the accounting proceedings for the determination of the amount of damages which have accrued through the infringement in the milling operations of the Butte & Superior Mining Co. during those periods in which infringement has been found by the courts to have taken place was held in New York at the rooms of the New York County Lawyers' Association, Nov. 3 to 16.

Minerals Separation accepted without dispute the Butte & Superior company's statement as to these periods of infringement. Then, taking Butte & Superior's account of results, Minerals Separation introduced evidence to show that the only standard of comparison by which to measure the recovery to which Butte & Superior was entitled was water-gravity concentration. Minerals Separation introduced evidence tending to show that this method would have given, at best, a recovery of 65 per cent of the zinc, and a grade of 48 per cent zinc.

Comparing the results upon this basis with those which had been obtained with Minerals Separation process, over the period 1913 to 1919, Minerals Separation presented a claim showing that the profits, gains, and advantages resulting from the infringing operations amounted to \$11,904,913.95.

Minerals Separation also introduced evidence to show that the only features contributing to the defendant's results, during this period, were those involved in patents No. 835,120 and the "Soluble Frothing Agent Patent," No. 962,678, and that although both patents contributed to the result, these contributions were so merged as to make it impossible to apportion to the respective patents the share to which each was entitled.

On this basis the plaintiff closed its *prima facie* case, and an adjournment was taken until Feb. 14, 1922, when hearings will be resumed in New York.

On Aug. 12, 1921, Judge Bourquin handed down an opinion bearing upon this question of the standard of comparison (*E. & M. J.*, Aug. 27, page 349), in which he states the law to be that any process is open to the defendant, as a standard of comparison, which was in existence at the time of the *infringement*. Minerals Separation, in the motion upon which this decision was announced, had contended that the defendant must be held to a process known at the time of the *discovery* of the process infringed. Should the results by flotation with oil in excess of 1 per cent, which the Supreme Court has declared to be outside the patent, be set up and allowed by the court as the standard of comparison, it is said that there would be due to Minerals Separation only a small fraction of the sum claimed.

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

The Day-Smith injunction suit against the Hecla and Bunker Hill & Sullivan companies, involving the Star mine, recently came to trial in Spokane but was adjourned by request until January because of the illness of the trial judge.

Arizona business men have decided to come together this month at Phoenix in what will be the first Arizona Industrial Conference, to discuss the pressing problems confronting the various industries of the state.

The new mill of the Simon Silver-Lead Mines Co., at Simon, Nev., has been started on a test run on low-grade ore.

Further extension of the time for doing assessment work on soldiers' claims will be refused, the Ontario Government has announced.

A smallpox epidemic is feared in the Joplin-Miami district and efforts are being made to avert it. One case has been reported thus far at Picher, Okla.

East Butte has decided to continue its smelting operations on concentrates in storage. Davis Daly remains shut down.

The strike at the coal mines of the Colorado Fuel & Iron Co. is reported to have failed. It is half promised that the reduced wage scale now effective will result in cheaper coal for the metal mining and steel making industries, among others, in the state.

It is reported that Michigan copper producers are not keenly desirous of engaging in the manufacture of copper products.

A new wage scale has become effective in the Grass Valley district of California, where operating conditions are said to be improved.

Two important bills have recently been signed, the Tax Revenue bill and the War Minerals Relief measure. The latter was finally amended so as to make reappropriation of the balance of the War Minerals fund unnecessary.

Arizona's Industrial Problems To Be Discussed

Conference Approved by Hoover To Be Held at Phoenix, Dec. 15-16
—Call Sent Out

Business men of Arizona have decided to get together at Phoenix on Dec. 15 and 16 and talk over the most pressing industrial problems confronting them. A state-wide call for this the first session of the Arizona State Industrial Conference has been indorsed by seventy-two representative men from all branches of industry. The topics for discussion thus far suggested include: water power and reclamation, freight rates, taxation, marketing, encouragement of manufacturing, colonization and economy in government. Mr. Hoover, the Secretary of Commerce, has approved of the proposal.

The idea of the conference was born a few weeks ago at a small meeting of business men, when P. G. Spilsbury, of Phoenix, suggested that possibly co-operation and a study of the problems from the viewpoint that they were problems of the state would be of benefit to all. Mr. Spilsbury was urged to follow the matter to a definite conclusion. Finding the project was widely approved, he got together a committee and worked out the details for the proposed conference.

Among the mining men indorsing the proposal are: Louis D. Ricketts, P. G. Beckett, Grant H. Dowell, John C. Greenway, Julius Kruttschnitt, Jr., Robert E. Tally, R. W. Moore, W. S. Boyd, and Cleve Van Dyke.

French Asked To Exploit Anatolian Mines

By Reuters Agency

Paris, Nov. 2—Youssouf Keman Bey, Foreign Minister of the Angora Government, has addressed a communication to the former French Minister, M. Franklin-Bouillon, the tenor of which is as follows:

The Angora Government has authorized the foreign minister to declare that it is disposed to grant a concession for the iron, chrome and silver mines in the Harchite valley for a period of 99 years to a French group which would be bound to commence the exploitation of the concession within five years from the signing of the agreement through a company formed in accordance with Turkish laws and with the participation of Turkish capital to the extent of 50 per cent.

The government, moreover, is ready to examine other requests which might be made by French groups regarding mining, railway, port and fluvial concessions, on condition that such demands are in accordance with the mutual interests of the two countries.

Turkey also wishes to avail herself of the collaboration of French specialists in her professional schools.

Gogebic Range Mines Increase Working Schedule

The Oliver Iron Mining Co., the iron mining subsidiary of the U. S. Steel Corporation, began Dec. 1 to work six days per week, instead of four days, at its properties on the Gogebic Range in northern Michigan.

Day-Smith Suit Adjourned After Brief Hearing

Illness of Presiding Judge Causes Postponement of Action Over Star Mine

BY HILLIARD W. POWER

The hearing in the injunction suit brought by Eugene R. Day and Mrs. Sarah E. Smith, minority stockholders in the Hecla Mining Co., to prevent the Hecla and the Bunker Hill & Sullivan companies from joining to operate the Star mine, began in the Spokane County Superior Court Nov. 21. President McCarthy, of the Hecla, was on the witness stand for nearly two days and other evidence had been taken when Judge Huenke, presiding, became ill. Defendants thereupon insisted upon postponement rather than to continue under another judge. Postponement to Jan. 16 was agreed upon.

Mining men and engineers were much in evidence in the court on Nov. 21 when the hearing began. A strong array of legal luminaries appeared on both sides, including Post, Russell & Higgins, of Spokane, representing the Bunker Hill; W. H. Plummer, of Spokane, and John W. Wourms, of Wallace, for the plaintiffs. The defendants were represented by John P. Gray and Judge Turner; and the firms of Nuzum & Nuzum and Wakefield & Witherspoon, of Spokane.

Decision as to jurisdiction of Spokane county courts in the case was reached but recently, when it was held by Judge Huenke that service in the case of Bunker Hill could be made upon Frank B. Smith, director of the

was, in my opinion and in the opinion of most of those who have studied the matter, the original intent of the Congress touching these claims. There cannot be a dollar paid or a dollar obligated beyond the sum already available, and in my opinion there will be a comparatively small number of claims added to those already presented in consequence of this amendment. I do not anticipate that the

amendment of today will very largely increase the Government expenditure. It will enable a number of claimants of comparatively small means who went to considerable expense, for them, in the endeavor to meet the demand and need of the nation for those war metals, to receive equitable treatment. Under the narrow construction formerly placed on the bill, those people, mostly people of very

moderate means—prospectors and small individual operators—were entirely barred from any participation in the relief contemplated. This simply performs an act of justice in behalf of people of small or moderate means who have suffered losses in the production of war material and lays no additional obligation on the Treasury."

Secretary Fall is expected to outline the policy under the new act soon.

NEWS BY MINING DISTRICTS

London Letter

Weardale Lead Co. Passes Dividend— Burma Corporation's Report Out

BY W. A. DOMAN

London, Nov. 15.—For the first time in sixteen years the directors of the Weardale Lead Co. are unable to pay a dividend for the year to Sept. 30. This is the direct result of the heavy fall in the price of lead, which has fluctuated between £36/10/0 and £16/10/0 per ton. Only 1,563 tons of dressed lead ore and 6,870 tons of fluorspar were produced, as compared with 2,774 tons and 9,374 tons, respectively, resulting in a loss of £10,828, in contrast with a profit of £15,702 for the twelve months ended Sept. 30, 1920. The company expects to recover £8,822 in respect of excess-profits duty, which rather more than meets the provision for income tax, leaving a deficiency on the year of £3,287. Electric locomotion has been substituted for horse haulage.

The Burma Corporation report for the calendar year 1920 has just made its appearance. In some respects it is disappointing, for although out of a surplus of £455,516 there is an available balance of £246,770, no dividend is recommended. In August, 1920, an issue of £1,000,000 in debentures was made, and it was thought that this money would have freed the profits for the shareholders. The financial position of the company is remarkably strong, but apparently money will be needed. The surplus is calculated with the rupee at 1/4.

The policy of the company was modified owing to financial stringency. The government of India was unable to contribute anything toward the zinc works, and the Tata Iron & Steel Co. desired to limit its participation in the business. As a result the construction of the works was stopped. Further, the company was compelled to discontinue the erection of the new lead smelter, and to rely upon the extension and improvement at a much smaller cost of the existing smelter. It was found necessary, too, to suspend all further expenditure on the development of the Namma coal field.

The program now adopted is based on an annual output of 45,000 tons of refined lead and 4,500,000 ounces of silver, requiring a daily output of 700 tons of ore. The problem of a suitable ironstone flux for smelting has been relieved to a large extent by the discovery of a deposit of good ore. This is now being vigorously developed and gives favorable indications. As regards the lead refinery, the capacity has been increased from 1,800 to 3,000 tons monthly; further extensions are in contemplation, and the capacity of the silver refinery is also being enlarged. Results for 1919 and 1920 compare thus:

	1919	1920
Tons smelted.....	105,560	136,450
Metal contents:		
Lead, per cent.....	28.1	29.57
Silver, oz.....	26.2	26.72
Zinc, per cent.....	16.1	15.50
Production:		
■ Refined lead, tons.....	18,535	23,821
■ Fine silver, oz.....	2,164,856	2,869,727

The 1920 tonnage included a certain quantity of concentrates. For the first half of the current year operations have been on a larger scale, the tons of refined lead being 15,642 and the number of ounces of fine silver 1,563,083.

Ore reserves are slightly less: On Jan. 1, 1921, there was 4,364,110 tons, assaying 23.3 oz. silver, 25.3 per cent lead, 17.7 per cent zinc, and 1.2 per cent copper.

On Jan. 1, 1920, there was 4,402,218 tons, assaying 23.9 oz. silver, 25.7 per cent lead, 17.9 per cent zinc, and 1.2 per cent copper.

The Great Boulder Proprietary and the Bullfinch company, two West Australian mining companies, are taking a keen interest in mining in West Africa around Jebba, and favorable reports are being circulated as to the properties under examination.

BURMA

Namtu—Lead production by the Burma Corporation for October was 3,817 tons gross; refined lead production 3,198 tons; refined silver production approximately 401,300 oz. Refined lead includes 168 tons from September production. Refined silver includes 52,000 oz. from previous month's production and general clean up of plant.

Johannesburg Letter

Roodepoort United To Close Down— Labor Situation Unsettled

BY JOHN WATSON

Johannesburg, Oct. 25.—The management of the Roodepoort United Main Reef G. M. Co. which belongs to the Albu group, recently placed before their workers a profit-sharing scheme. This has not been accepted and as the mine showed a loss of £1,700 during September the management has now decided to close down the mine.

The shop-workers on the East Rand Proprietary decided to strike last week as one mechanic had resigned from their union. At the finish the strike was averted by this mechanic throwing up his job. There is a considerable feeling of unrest among mine workers and a fresh ballot among a section is to be taken this week-end. During the period of high cost of living, following the war, wages went up. Now the cost of living and also the gold premium are falling, these workers seem inclined to strike rather than accept reasonable reductions.

The Magadi Soda Co. Ltd., (incorporated in Great Britain), was registered over ten years ago, to work the deposit of natural soda, some 30 square miles in extent, of Lake Magadi, about 50 miles from Nairobi in what is now known as Kenya Colony. The company also has works for the manufacture of caustic soda on the river Hooghli, 17 miles below Calcutta, India. The operations on Kenya have, the report states, continued throughout the present year without material interruption. Shipments of soda ash are being made in increasing quantities and the reception accorded to them by consumers is said to have been favorable.

AUSTRALIA

Queensland

Mt. Morgan Workers Reject Proposed Wage Cut—Position of State Mining Ventures

Brisbane, October 30.—The Queensland Arbitration Court, in a judgment given yesterday, granted the claim of the Mount Morgan Co. for a reduction of 20 per cent in wages. Although

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Tax Revision Bill Gets Harding's Signature

Receipts Under It During First Fiscal Year To Be \$725,000,000 Less Than Under Present Law

Though the tax bill is admitted by its authors to be an imperfect measure, it does provide for a substantial reduction in the tax burden and greatly simplifies the administration of the law. The bill in its final form will require the payment of about \$725,000,000 less during the first fiscal year that it is in full operation, than would have been raised had the law it supercedes remained in effect. The reduction will be greater when collections from the excess-profits tax cease altogether. The bill was signed Nov. 23.

The repeal of the transportation and so-called nuisance taxes effects a reduction of \$326,630,266 during the fiscal year beginning July 1, 1921. That feature of the bill alone is held by many to justify its enactment. It was stated officially at the White House and by the chairman of the Finance Committee that the bill is intended as a temporary measure only. The great disappointment to business is that the recommendations of the Secretary of the Treasury were not carried into effect in the matter of transferring some of the higher brackets of the income tax to the estate tax title.

In its final form the bill is expected to yield \$3,216,100,000 in the fiscal year beginning July 1, 1922, and \$2,611,100,000 in the fiscal year beginning July 1, 1923. For the fiscal year of 1922, the bill is expected to raise about \$16,000,000 over Government requirements.

The Senate accepted the House rate of 12½ per cent applicable to the corporation income tax. This reduction of 2½ per cent from the rate proposed by the Senate will reduce by \$110,000,000 the annual tax burden on business. The lower rate is particularly advantageous to public-utility companies and other corporations now earning small returns on invested capital.

Nothing in Plan To Consolidate Government Science

Through the publication in the *Congressional Record* of a plan by Arthur McDonald, of Washington, to consolidate Government science in the Smithsonian Institution, wide circulation has been given to a scheme which is not taken seriously in Washington and which does not have the indorsement of the Smithsonian Institution. Dr. Charles D. Wolcott, secretary of the Smithsonian Institution, states that the plan was drawn up and circulated without his knowledge. He is opposed

to the scheme himself, but sees no reason why publication should not be made of the suggestion, so that those concerned could accept it for what it might be worth.

As a result of the publication of this plan, the various scientific bureaus and the Smithsonian Institution have received a flood of comment.

Part 2 of Commercial Atlas Ready Soon

Second Section of Survey Publication Will Show Distribution of World's Water-Power Resources

Important work is being done by the U. S. Geological Survey in estimating the extent of natural resources of various types. In that connection, Director George Otis Smith has made the following statement to the Washington correspondent of *Engineering and Mining Journal*:

"The Geological Survey will be very much pleased if those interested in the development of American resources give the same welcome to Part 2 of the Commercial Atlas of the World as was accorded to Part 1. Part 2 is on the press and probably will be ready by Jan. 1. This part shows the distribution of both the developed and undeveloped water-power resources of the world.

"At first thought, this type of information may not seem to be connected with mineral resources, but there are two points of direct contact between water power and the mineral industry. First of all, water power has a large stimulating influence in the development of mines the world over. In the second place, water power has been regarded generally as a competitor of the mineral fuels, although most intensive studies of the subject, like the recent super-power investigation, show that water power and steam power can be developed most economically when hitched up together. This graphic presentation of the water-power resources of the world, I believe, will be interesting equally to mining men and to mechanical engineers.

"The present plans of the Geological Survey provide for a Part 3 to be devoted to the reserves of the mineral fuels. This will be followed by another part dealing with the principal metals."

Ferromanganese Men Cleared

Charges of unfair competition against Crocker Bros., Frank Samuel, and C. W. Leavitt & Co., importers of ferromanganese, have been dismissed by the Federal Trade Commission for failure of proof.

War Minerals Relief Bill Signed By President

Last Minute Amendment Makes Reappropriation of Funds To Meet Awards Unnecessary

Without the necessity of a rollcall, the House of Representatives on Nov. 22 agreed to a Senate amendment to the War Minerals Relief bill which removed the necessity of reappropriating the remainder of the War Minerals fund for the payment of additional awards. The bill was signed by the President on the following day, thus becoming a law. This measure is in the nature of an amendment to the original War Minerals Relief Act. It reads as follows:

"Add to the first paragraph of Section 5, the following proviso: 'Provided, That all claimants who in response to any personal, written, or published request, demand, solicitation, or appeal from any of the Government agencies mentioned in said act, in good faith expended money in producing or preparing to produce any of the ores or minerals named therein, and have heretofore mailed or filed their claims or notice in writing thereof within the time and in the manner prescribed by said act, if the proof in support of said claim clearly shows them to be based upon action taken in response to such request, demand, solicitation, or appeal, shall be reimbursed such net losses as they may have incurred and are in justice and equity entitled to from the appropriation in said act.

"If, in claims passed upon under said act, awards have been denied or made on rulings contrary to the provision of this amendment, or through miscalculation, the Secretary of the Interior may award proper amounts or additional amounts."

The measure includes an amendment proposed by Representative Anderson, of Minnesota, which broadens the language so as to allow claims when a written notice of their existence was filed prior to the expiration of the time limit. This amendment is understood to have been intended to admit two Minnesota claims aggregating about \$750,000.

The measure, as amended in the Senate, had the approval of Representative Mondell, whose speech indorsing it had much to do with the subsidence of the opposition. An extract from his remarks is as follows:

"The virtue of the Senate amendment is that it strikes out all reference to appropriations and leaves the bill what it was originally intended to be—a measure more clearly stating what

even with this reduction operations can be carried on only at a loss, the company is prepared to arrange to have work resumed at once, but at a meeting of the Australian Worker's Union today at Mount Morgan the proposed reduction was rejected by the men. There are several different trades involved; the unions affected say that if a reduction is accepted at Mount Morgan the members of the same unions working elsewhere will have to submit to lower wages also, and the leaders urged the men at Mount Morgan, who have been out of their jobs since March 24, to continue out, "on principle." The men working elsewhere, however, are not doing much to help their fellow-unionists at the big mine who they acknowledge have been fighting their battle as well as their own for the past seven months. There is still some talk of a possible compromise.

An official statement lately published showing the financial position of some of the state enterprises connected with mining in Queensland is regarded by the opponents of the government as a severe set-back for their socialistic schemes. In each case a loss is shown. Thus, the state arsenic mine, producing 555 tons of arsenic in the year ended June 30 at a cost of £49/1/8 per ton, is in debit for that period to the amount of £4,800; the Bowen coal mine since the inception of the project in 1919 has lost £41,600; the Baralaba coal mine, besides having a loss of £13,000 written off as the cost of a shaft that had to be abandoned, has incurred a further loss of nearly £1,400; and against the Styx River coal mine there is a debit balance of £7,700. In these cases, however, it has to be remembered that the arsenic mine has been supplying arsenic for prickly-pear destruction at a price very much below the market value, that the two coal mines first-named have not long passed the developing stage, and that the Bowen colliery has not yet begun selling coal because the railway to connect the field with the port of Bowen is not yet finished. Two state batteries also show losses, but these were started for the public convenience, and not in the expectation of a profit.

Up to the present a total of £16,286 has been spent on the proposed iron and steel works at Bowen, in addition to £30,000 paid for an iron ore deposit in Western Australia. The work done to date includes the preparation of plans, estimates of cost, and survey of the site of the proposed works. The project is at present hung up for want of funds. The government has recently been fortunate in obtaining a loan of £2,400,000 from New York, and one supposition is that a part of this loan will be devoted to the commencement of the iron and steel works, but no announcement on the subject has yet been made.

The only mine on the once famous goldfield of Charters Towers that is producing any gold worth mentioning has lately been giving some very good

returns. The latest is from a crushing of about 17 tons of ore, which gave a value of £1,312, or an average of £6 10 0 per ton. A small crushing from another mine on the field gave a return of £8 per ton.

On the dying, and indeed almost dead, goldfield of Gympie there were last month also several very satisfactory crushings, which show there are still some rich auriferous deposits at this camp. In one case over 41 oz. was obtained from 3 tons of stone; in another 346 oz. from 49 tons; and in a third 176 oz. from 31½ tons.

Many applications for mineral leases to mine for silver and lead around Brisbane continue to be granted. In most of these cases exemptions from labor conditions for specified terms have been granted and only one holding, the original mine, at Indooroopilly, is actually producing. An output of 131 tons from this mine gave an average return of 70 oz. silver per ton and 42.88 per cent lead, with a small quantity of bismuth. Many of the leases have been taken up on the advice of an electrical "diviner," but, while a good deal of money has been spent in the quest for payable ore on the strength of this advice, so far nothing but disappointment has been the result.

A fresh agreement has been made by the Government with the firm of Rubin Bros., of Paris, for the marketing of the gems of the Anakie sapphire field. This agreement was first submitted to the miners concerned, who approved of it by the narrow majority of 306 to 270. It is for a term of three years, with a provision for an extension.

CANADA

High-Grade Strike Reported at Fish Creek Mine—The Gold Discovery in Whitewater Section

BY ROBERT DUNN

Stewart—It is reported that a strike of some importance has been made on the property of the Fish Creek Mining Co. A raise was started 160 ft. from the portal of No. 1 tunnel to connect with No. 2 tunnel, 180 ft. above, and a shoot of high-grade ore was opened up. This is becoming richer as the raise is continued, and the ore taken therefrom is being sacked for shipment. A considerable amount of ore running from \$300 to \$400 per ton is ready for transportation.

Latest reports from the Premier mine are to the effect that good progress is being made in the work both at the mine and on the aerial tramway. With regard to the latter, all the towers are completed with the exception of the four at the lower end, and these will be up soon.

Penticton—One of the few silver mines in the province which has continued to operate successfully through the period of silver depression is the Sally mine, at Beaverdell, operated by the Wallace Mines, Ltd. This mine is running steadily with a force of fifteen men. Since having been taken over by the present company, considerable de-

velopment has been done and a substantial quantity of ore blocked out. In 1920 about \$80,000 worth of ore was shipped. The ore mined at present runs between 300 and 400 oz. of silver to the ton, with some lead and a trace of gold.

Vancouver—Further particulars of the gold strike in the Whitewater section of the Lillooet district have been obtained from E. J. Taylor, the original discoverer, who recently came to the coast. He brought with him 60 oz. of gold, which he and another man took out in two weeks' work by means of an arrastre. Mr. Taylor's claims, situated near Iron Creek, run up the mountain side, and so far his operations have been confined to the natural dump brought down from the ore shoot through erosion. He describes the ore as being telluride in a serpentine formation, and his observations lead him to believe that the mineralized zone stretches a distance of twenty-five or thirty miles. It is expected that there will be much interest manifested in this district by prospectors next Summer.

Word has been received that the Kitchner Mines, Ltd., Keithley Creek, will open next season's operations under favorable circumstances. During the open months of this year much work was done in the installation of plant. The company is prepared, as soon as conditions are right, to open up an area of virgin ground. This is an unusual condition in the Cariboo, the placer fields of which have been well worked over since the original discovery in 1860.

The Granby Consolidated Mining, Smelting & Power Co. has entered suit in the Supreme Court against the Attorney General of British Columbia. The company seeks a declaration with regard to its rights and liabilities under the British Columbia Taxation Act. It further seeks a declaration to the effect that taxes for which it is liable are not due until Jan. 2 next and will not be in arrears until Dec. 31, 1922.

Quebec

Black Lake—A long-standing dispute between the Black Lake Asbestos & Chrome Co. and Frank Samuels, of Philadelphia, has been settled out of court by the payment by the company to Samuels of an amount approximating \$75,000. The claim was on account of failure to make shipments of chrome during the war.

VENEZUELAN GUIANA

Progress Made in Alluvial Gold Operations—Only One Well-Organized Company

Ciudad Bolivar, Oct. 16—The situation as regards gold quartz mining is little changed, the only two companies working being the New Callao Gold Mining Co. Ltd. and the Goldfields of Venezuela Ltd, both of which continue to crush on a small scale, the latter being chiefly occupied in developing its property.

On the other hand, there has been considerable progress, in regard to the alluvial gold workings, chiefly in the

Cuyuni River district, from which the output has increased up to 2,000 oz. per month. This work in most cases is carried on without any attempt at serious organization or using modern methods. The only exception has been in the case of an American syndicate, which has taken up a property known as Coro Coro, some distance up the Cuyuni River, above the British boundary. Their efforts so far have, however, not been a great success, partly owing to their want of knowledge of the country, and partly to starting work in the wet season, as most of the staff who were newly arrived went down with fever, one of whom unfortunately died.

The place known as Iskiel continues to give good results, most of the gold found being quite coarse, nuggets of several pounds weight being common.

Following the oil boom in the north of the country, large areas of land have been "accused" all over Guiana, but up to now no work has been done to prove indications of oil. A British company has two seaplanes making an aerial survey of the Oronoco delta.

Until the financial situation in Europe improves there is not much chance of obtaining capital for mining prospects from that direction, but in view of the present high value of the dollar and the decreasing output of gold in the world, it is certainly worth the while of American capitalists to take an interest in this region.

In an article on the above district, published in the *Engineering & Mining Journal*, Dec. 4, 1920, there are several errors in names. Calloa should be Callao; Cayuni, Cuyuni; Yuruon, Yuruan; and Yuru, Yuruary. General Juan Fernandez was the discoverer, (apart from the Indians) of the gold placers in the higher Cuyuni River. He has since explored the country above its head waters, in the direction of Mt. Roraima, where he also found gold, as well as balata forrests, and big savannah country.

MEXICO

Chihuahua

Erupcion Company Increases Capital Stock

Chihuahua—The sensational suit against the Naica Mining Co., involving the title to the famous Naica property in southern Chihuahua, is to be taken up again by the supreme court of Mexico. This case threatens complications with the United States and Great Britain.

The Erupcion Mining Co., of El Paso, has filed an amendment to its charter, increasing its capital stock from \$1,000,000 to \$1,500,000. The property of the company is in Chihuahua.

Coahuila

Saltillo—The Mazapil Copper Co. states that it recently blew in two lead furnaces at its Saltillo plant. It reports that prospects do not appear favorable to increasing its operations in the near future.

CALIFORNIA

New Wage Scale in Effect at Grass Valley—Operators More Active in Trinity County

San Francisco—A new wage scale has been mutually arranged between the larger operators and the miners in the Grass Valley district. The agreement is to run to June 30, 1922, and provides for a wage of \$4.25 for machinemen and \$3.75 per day for shovelers, with extra pay for overtime and Sunday work. This insures stability to mining conditions in the district and as a consequence increased prosperity should result. Conditions at the Empire, North Star, and Idaho-Maryland are excellent. A new hoist and pumping plant are to be installed at the Boundary mine, and a power line has been practically completed. As soon as the new plant is available active developments will be started.

Trinity County is shaking off the lethargy that has pervaded so many gold-mining communities. Many minor operations have been started. It is reported that the Estabrook dredge will be put in operation in the spring, after an idleness of two years. A twenty-stamp mill will be started as soon as power water is available by the Bonanza King mine. A new mill is being erected at the Van Ness mine. The Strode, Gold Hill, Holland, and the Yellow Rose are reported in operation.

Alleghany and Forest, in Sierra County, are active, and the Oro mine, near Downieville, is to be operated on a larger scale. At Sonora, Tuolumne County, a lease and option have been taken on the Magente Mines, near Jamestown, and at Mokelumne Hill, Calaveras County, the Morning Star and Gold Star mines are to be reopened.

NEVADA

Leadville Mines To Shut Down Mill for Winter—Production Normal at Tonopah

Virginia City—At the United Comstock Mines Co. about 500 men are employed on surface and underground. Excavation for the fine- and coarse-grinding units of the crushing plant is completed, and the concrete forms for the former are practically completed. Excavation for the cyanide plant has been started. The Pittsburgh Comstock Mines Co., operating west of the United Comstock, has practically completed opening the tunnel, and actual development on the vein will start soon.

Leadville—The Leadville Mines Co. planned to ship two more cars of concentrates during November, making four cars for the month. The plant is to be shut down for the winter. Work in the mine will be continued, and it is also planned to make a few changes in the mill which will increase its capacity to 50 tons per day.

Divide—The official report of operations of the Tonopah-Divide Mining Co. for October shows production of 1,519 tons of ore of an average value per ton of \$30.36, and a gross value

of \$48,518.48. This is practically the same as for the previous month.

Tonopah—Production continues normal in the Tonopah district. The total tonnage mined and milled is about 1,300 per day, with a gross monthly production of approximately \$650,000. Bullion shipments reported to date, and covering operations for the first fifteen days of November, are from the West End \$57,300, and the Tonopah Extension \$46,000. The shipments from the Tonopah Mining, Belmont, and MacNamara should be about as usual. Leasers in the Montana Tonopah, Jim Butler, Midway, and MacNamara are active and regular ore shipments are being made to the Belmont, Tonopah Mining, and MacNamara mills.

Spanish Belt—The fifty-ton mill of the Consolidated Spanish Belt is working satisfactorily and making a good saving. A thorough try out has been made during the last few weeks, and, with minor changes, concentration by both tables and flotation has proved successful. The trial run was made on low-grade dump ore, but higher grade ore from the mine is now being treated. Underground developments are said to be very satisfactory.

UTAH

Chief Consolidated Examines Eureka Lilly

Eureka—Ore shipments from the Tintic district for the week ended Nov. 18 amounted to 167 cars. Shippers were: Tintic Standard, 46 cars; Chief Consolidated, 46; Victoria, 17; Dragon, 14; Iron Blossom, 10; Eagle & Blue Bell, 8; Swansea, 4; Centennial-Eureka, 5; Grand Central, 3; Gemini, 2; Tintic Drain Tunnel, 1; Colorado, 2; Empire Mines, 2; Bullion, 2; Mammoth, 1; Sunbeam, 1; Eureka Mines, 1. At the North Standard drifting to the north is being done on the 1,100 level to reach the No. 2 fissure, which is mineralized with iron at the surface. John Manson is general manager. The work is being done under contract.

The Chief Consolidated has been making an examination of the Eureka Lilly, the control of which has recently passed into the hands of the Chief, in preparation for beginning development work. The present workings extend to a depth of 1,600 ft., and as in other East Tintic properties the lower levels are very hot and gaseous, the temperature in this case being a little higher than in the adjoining Tintic Standard. Before extensive work is carried on, it is probable that a ventilating system will be installed or connections made with other workings. In this regard, it is of interest that the U. S. Bureau of Mines has made a study of temperatures and gases in the East Tintic mines, and has published a pamphlet in which is described the nature of the gases and their origin.

Park City—Shipments for the week ended Nov. 18 amounted to 2,279 tons, as compared with 1,962 for the week preceding. Shippers were: Judge allied companies, 943 tons; Silver King Coalition, 948; and Ontario, 388 tons.

MONTANA

East Butte To Smelt Concentrates in Storage—Butte & Superior May Resume

BY A. B. KEITH

Butte—Decision has been reached to continue smelting operations at the Pittsmont smelter of the East Butte Mining Co., ample tonnage of concentrates being in storage to permit this to be done until arrangements can be made to secure a tonnage of custom ores sufficient to replace that which it had been receiving from the Davis-Daly Copper Co. It also is considered possible that the East Butte may be able so to reduce its smelting costs as to induce the Davis-Daly to resume its shipments. The latter has at the present time the largest ore reserves in its history, but in view of the low price copper is commanding it is not regarded as wise to deplete its reserves at present.

The East Butte has been operating only one of its two furnaces for some time, and as its concentrator has been running at a capacity, which had enabled the building up of a considerable tonnage of concentrates, this pile now can be reduced, with the freeing of a large amount of frozen credit, particularly so with a further advance in the price of the copper metal.

East Butte some time ago constructed a battery of four tanks out of slag, which were used for the impounding of its surplus concentrates, to await any improvement in the price of the metal. These tanks have diameter each of 50 ft. and are about 20 ft. deep. One is filled with concentrates and a second partly filled.

Mine tonnage from the East Butte's own properties will not be ample to maintain continuous operation of the mill, it is believed, but production can be speeded up, should the situation justify. However, East Butte mines its ores in a very clean manner, and the advantage to be gained from milling operations is not as great as it would be were the ore poorer in value. The question of freight charges does not enter, as East Butte's mine, mill and smelter are adjacent to each other.

Butte & Superior and the Anaconda people have been in conference in connection with the possible resumption of the treatment of the former's concentrates. Though nothing official is obtainable, it is believed that this meeting possibly foreshadows a resumption of production by the Butte & Superior.

The working forces of the Black Rock mine of the Butte & Superior were increased somewhat last week. At present the principal work is the development of the body of copper ore recently cut on the 2,200 level.

Davis-Daly will continue development operations at the Hibernia mine, where a crosscut is being driven on the 750 level to reach a point under the 600 level, where ore was discovered, and from which section of the mine the tonnage of silver ore has been mined the past six months.

COLORADO

Coal To Be Cheaper Following Failure of Strike—Colorado & Southern Would Decrease Passenger Service

By Our Special Correspondent

Denver—The Colorado Metal Mining Board will convene early in December to consider the report of the material and supply committee in regard to a plan for procuring cheaper material and supplies; to consider further freight-rate adjustments; a proposition to abandon service on certain branch lines of railroad within the state, and matters in connection with the annual meeting of the Colorado Metal Mining Association to be held in Denver the week of Jan. 16. The board, which is a state commission, will remove its offices from the Tabor Block to the State Capitol on Jan. 1.

With 90 per cent of the normal force of miners at work in the coal mines of the Colorado Fuel & Iron Co. in southern Colorado, the strike called by the United Mine Workers on Nov. 17, against a 30 per cent reduction in wages, appears to have failed. The mines in the Cañon City district operated by this company, where the employees went out on a sympathetic strike, remain closed, the company making no effort to operate.

Officials of the company announce that the new wage schedule will result in approximately \$1 per ton reduction in the price for coal, and will bring about a resumption of the Pueblo steel mills, which have been closed since early in the year. The reduced price for coal will also effect a lower cost in smelting and operating costs for the metal-mining industry, and mining men expect a decided increase in mining activity with the coming year.

Alleging that it is operating at a loss, the Colorado & Southern, which is operating the South Park branch of that road, serving the mining counties of Park, Summit, and Lake, has petitioned the Colorado Utilities Commission for permission to modify its daily passenger service to three days per week during eight months of the year. The company proposes to operate daily service four months of the year and to run trains three days per week the remainder. Hearings have been held in the various counties, and beginning Nov. 22 and 23 formal hearings were held at the office of the commission in Denver. Application for permission to modify service on the Clear Creek branch of the road, and abandonment of service on the Romley branch, has also been made by the Colorado & Southern.

The superintendent of the United States Mint at Denver has received orders from Washington to reduce the coinage of silver dollars from 225,000 daily to 75,000, resulting in a reduction of the force in the coinage department of 140 men. Exhaustion of the available supply of silver on hand or procurable, at the various mints, was given as the reason for the reduction. Since the beginning of coinage of silver

dollars at the Denver Mint in May, the institution has turned out 17,000,000.

The American Smelting & Refining Co. has announced a 3c. increase in the price paid for the silver content of Colorado ores, as it no longer is required to reship its bullion from the seaboard refining plant to the Denver Mint, in order to comply with Government requirements under the Pittman Act.

NEW MEXICO

San Mateo Gold Strike Disappoints—Copper Companies Keeping Skeleton Organizations

BY JAMES P. PORTEUS

Lordsburg—A swing through the mining camps of this section reveals nothing startling in the way of development going on. The copper companies are holding skeleton organizations necessary to the rebuilding of their forces when the time comes. Some of the men are on vacation subject to call and some are working as watchmen. The increased rate of copper consumption is being watched hopefully but no resumption of mining operations in this line is expected before spring. Much needed road work is being done.

Colorado coal mine labor troubles are not expected to affect the New Mexico fields, where the coal industry is showing a slightly more than seasonable activity. In the Raton section most of the camps on the St.L.R.M. & P. railroad will be operating by Dec. 1. The Gallup American Coal Co., owned by the Chino Copper Co. and others, among other improvements is building individual miner's houses that cost \$1,500 each. A total of \$20,000 will be spent for this purpose.

The San Mateo gold strike is disappointing. The formation which is a Tertiary rhyolite overlying an andesite, carries a sparse showing of thin flakes of gold. There is some silicification and a little iron in places. The deepest hole is 25 ft., showing no values in the bottom. About 100 locations have been made and some nice samples secured, which however do not represent the average nor is there any considerable amount of them.

Silver City—Mining activities in Chloride Flat have been considerably reduced owing to the cancelation of all leases on the Amory Stevens property, on account of an option given by the Stevens heirs to New York parties. The latter expect to begin field work and examinations at an early date. Messrs. Wright, Stauber, Bell and Armstrong are still working on their lease on the Grand Central claim of the Bohemian Mining Co., shipping about two cars of ore weekly. So far the ores shipped have been old fillings which run from 5.75 oz. to 12.5 oz. silver and about 25 per cent lime. As these are desirable for fluxing purposes the smelter has been making a treatment charge of \$1 per ton. Regular mining operations will be begun next week on ores that have been exposed during the cleaning up of the old workings.

ARIZONA

Douglas Smelters May Have Legal Trouble Over Fumes—Jackling Not in Power Scheme

BY J. H. MCCLINTOCK

Bisbee—Nearly all the old Copper Queen smelter slag dump has been taken to the new smelter at Douglas, providing excellent fluxing material and with copper returns up to 5 per cent. A few thousand tons of slag still remain, but probably will be sent down as soon as production is resumed.

There is possibility of smoke litigation over the fumes of the two smelters at Douglas. During the last week a conference has been held between representatives of the Copper Queen and Calumet & Arizona companies and owners of ranches in the vicinity of Douglas. It is noted that no degree of acrimony developed in the discussion and that the farmers expressed appreciation of the efforts of the companies to cut down the volume of the smoke. When there was suggestion that the fumes might be transformed into sulphuric acid, Colonel Greenway, of the C. & A., remarked that his smelter alone might furnish all the acid needed in western America. Undoubtedly affecting the local situation is a judgment of \$1 lately secured in Prescott by farmers of the Verde valley, who claimed to have been damaged by a defendant smelting corporation. At Douglas, the two companies affected own large and adjoining tracts, flanked on the south by uncultivated acreage in Mexico and on the east by the city.

Colonel John C. Greenway states that the Jackling interests have not joined (as stated heretofore) in the Girard power plans as to the Grand Canyon, but that co-operation is to be given by the Phelps Dodge, Inspiration, Verde Extension and Calumet & Arizona companies. Boring for bedrock is now in progress near the mouth of Diamond Creek, where the black granite is near the stream bed. The plans are relatively modest, with probability that a series of dams will be erected, rather than a great monolith such as planned by the Edison Electric interests. Tentative figuring indicates that a dam 250 ft. in height would supply 100,000 kw. of energy, or enough for the present power needs of central and southern Arizona.

An immense saving in mining costs is expected through operation of the mill of the Apache Powder Co., south of Benson. This is a project that has the backing of the larger mining corporations of the state. The saving mainly is to come in elimination of the major part of the transportation cost, for powder takes a high rate.

Kingman—The C.O.D. property is under the management of Arthur D. Storke, succeeding M. B. Dudley, resigned. The mill will be started again in December, though this will depend on freight rates on concentrates to the smelter.

MICHIGAN

The Copper Country

Producers Not Greatly Interested in Fabrication—To Resume Sinking New Baltic Shaft—Lake Shipments Nearing Close

BY M. W. YOUNGS

Houghton, Mich.—There appears to be a widespread belief here that copper could be fabricated in the Lake district and there has been a marked disposition to look to the mining companies to get into the manufacturing field. But it is apparent the companies are not keen about doing so, and it would appear they would rather continue as they have been doing, mining copper and taking their chances in the open market. Once operations are resumed, however, it is unlikely any great surplus of metal ever will be built up again. A rolling mill, independent of the mining companies and using an average of 1,000,000 lb. of copper per month, has recently been advocated. Such a mill would not enter into competition with any of the larger fabricators of copper; it would be too small for that. But it would provide a start in fabrication apart from the mining companies and perhaps open the way for the establishment of other industries allied with copper, ultimately leading to the consumption of considerable metal.

Arcadian Consolidated will resume sinking in its New Baltic shaft early in December, deepening the shaft from the 942 level to a depth of 1,060 ft., corresponding with the 1,050 level of the New Arcadian shaft which is bot-tomed at 1,850 ft.

Copper shipments by boat are nearing a close. Shipments have been speeded up to take advantage of the lower rate, and it is believed the total for the month will compare favorably with the high record of October. Export sales are almost negligible, practically all new business having been placed by domestic consumers. Germany has been in the market for little Lake copper as compared to months earlier in the year. Calumet & Hecla still has nearly half of its battery of furnaces in operation, and no reduction is looked for until the middle of December. The electrolytic plant, it is stated, has sufficient material on hand to warrant operations until spring.

Drifting is continuing from the five levels of the Seneca shaft, from the 3rd to the 7th, inclusive. There is no change in the appearance of the vein. About 1,500 tons of rock is being shipped to the Baltic mill monthly, this rock being taken out during course of development. The Mineral Range railroad will be extended to the Gratiot shaft, a distance of about two miles, this being necessary to provide direct connections over one railroad to the Point Mills stamp mill, which will be used by Seneca when regular production is made.

JOPLIN-MIAMI DISTRICT

Efforts Made To Prevent Smallpox Epidemic—Ore Production Affected Somewhat by Winter Weather

BY P. R. COLDREN

Joplin—Every effort is being made in the Tri-State zinc and lead field to prevent a smallpox epidemic. Recently in Kansas City there have been almost 200 cases, with eighty-nine deaths. The high mortality rate indicates the disease is in a particularly virulent form, and it is feared serious ravages would result should the disease become epidemic among the miners. Only one case has been reported at this writing, a miner living in Picher, Okla., who died after a few day's illness.

The matter was taken up for consideration at the meeting of the Tri-State branch of the American Zinc Institute, held at Picher on Nov. 23, and the city health authorities were urged to burn the small house in which the man resided as the only certain way of preventing spread of the disease from that source. Members of his family have been placed under strict quarantine, and the Institute has proffered both financial and moral support to the health authorities in preventing an epidemic.

At this meeting of the Institute a special treat in the way of reindeer meat, fresh from Nome, Ala., was offered the operators, and the proceeds from the extra assessment for the meal will go toward providing a dinner for the poor children of Picher and their parents, on the day before Christmas.

A touch of winter weather in the last few days has served to handicap production slightly, but not so much as at other times, owing to the fact that most of the production in this field just now is being made by strong companies where weather conditions are not as important a factor as they were with the smaller operators a few years ago. It is believed that production will remain around 5,500 tons per week during the winter.

Little new development is being reported, with the exception that some small operations in lead mining are under way. Recently good lead strikes at shallow depth have been reported on the Shuey land in Newton County, just south of the Jasper County line, south of Joplin, and on the Tate land, southwest of Duenweg, Mo. These operations are small, and the lead produced will at best be an unimportant factor.

F. H. Gartung has resigned his position as general manager for the Bilharz Mining Co., and on Dec. 1 will assume the management of the Kansas properties of the Commerce Mining & Royalty Co. At present these properties are two in number, being the Webber, just north of the Blue Mound mine, and a new mill recently erected on a lease directly east of the Vinegar Hill Zinc Co.'s Bar mine, north of Picher. John Newton will retain his position as manager for the Commerce company's Oklahoma properties.

THE MARKET REPORT

Daily Prices of Metals

Nov.	Copper, N. Y., net refinery*		Tin		Lead		Zinc
	Electrolytic		99 Per Cent	Straits	N. Y.	St. L.	St. L.
24	.....	.....	.....	.....	.....	.....	.....
25	13.25@13.375	.....	29.50	29.75	4.70	4.35	4.625
26	13.25@13.375	.....	29.50	29.75	4.70	4.35	4.625
28	13.375	.....	29.75	30.00	4.70	4.35	4.60
29	13.375	.....	29.625	29.875	4.70	4.35	4.60@4.65
30	13.375	.....	29.50	29.75	4.70	4.35	4.65@4.70

*These prices correspond to the following quotations for copper delivered: Nov. 25th, 13.50@13.625c.; 26th, 13.50@13.625c.; 28th, 29th, and 30th, 13.625c.

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.

Average Metal Prices for November

Copper:	
New York Electrolytic.....	13.035
London Standard	66.614
London Electrolytic	74.386
Lead:	
New York	4.683
St. Louis	4.356
London	24.483
Silver:	
New York, foreign.....	68.234
New York, domestic.....	99.413
London	38.750
Sterling Exchange	396.315
Zinc:	
St. Louis	4.665
London	25.949
Tin:	
99 per cent	28.592
Straits	28.935
London	158.898
Antimony	4.734
Quicksilver	39.804
Platinum	82.609

London

Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
24	66 $\frac{3}{4}$	67 $\frac{3}{4}$	75 $\frac{1}{2}$	160 $\frac{1}{2}$	162 $\frac{1}{2}$	25 $\frac{1}{2}$	24 $\frac{1}{2}$	26 $\frac{1}{2}$	26 $\frac{3}{4}$
25	66 $\frac{3}{4}$	67 $\frac{3}{4}$	75 $\frac{1}{2}$	161 $\frac{1}{2}$	163 $\frac{1}{2}$	25 $\frac{1}{2}$	24 $\frac{1}{2}$	26 $\frac{1}{2}$	26 $\frac{3}{4}$
26	.....	.....	.....	.....	.....	.....	.....	.....	.....
28	67 $\frac{3}{4}$	68 $\frac{3}{4}$	75 $\frac{1}{2}$	163 $\frac{1}{2}$	165 $\frac{1}{2}$	25 $\frac{1}{2}$	25 $\frac{1}{2}$	26 $\frac{3}{4}$	27 $\frac{3}{4}$
29	67 $\frac{3}{4}$	68 $\frac{3}{4}$	75 $\frac{1}{2}$	163 $\frac{1}{2}$	165	26	25 $\frac{1}{2}$	26 $\frac{3}{4}$	26 $\frac{3}{4}$
30	67	68	75 $\frac{1}{2}$	162 $\frac{1}{2}$	164 $\frac{1}{2}$	26	25 $\frac{1}{2}$	26 $\frac{3}{4}$	26 $\frac{7}{8}$

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

Nov.	Sterling Exchange "Checks"	Silver			Nov.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
24	.....	.....	.....	38 $\frac{1}{2}$	28	398 $\frac{1}{2}$	99 $\frac{3}{4}$	67 $\frac{5}{8}$	37 $\frac{3}{4}$
25	.....	.....	.....	37 $\frac{3}{4}$	29	398 $\frac{1}{2}$	99 $\frac{3}{4}$	67 $\frac{1}{2}$	37 $\frac{3}{4}$
26	398 $\frac{1}{2}$	99 $\frac{3}{4}$	66 $\frac{1}{2}$	37 $\frac{3}{4}$	30	399 $\frac{1}{2}$	99 $\frac{3}{4}$	67 $\frac{1}{2}$	37 $\frac{3}{4}$

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. Cables command one-half cent premium.

Metal Markets

New York, Nov. 30, 1921

The holiday on Thursday (Thanksgiving Day) interfered somewhat with the week's business, but sales have, in general, been of satisfactory volume. Copper continues its firm trend, and lead is also somewhat stronger. Tin and zinc are practically unchanged in price.

Copper

The larger producers have been quoting 13.75c. delivered most of the week, and report satisfactory sales. However, most of this business has been for the first quarter of 1922, or at least for January and February. There was no difficulty in obtaining December and

in some cases January copper up to and including Monday for 13.50c. delivered. Copper could be obtained in one direction for second-quarter delivery at 13.75c. delivered, the last two days, though not a great tonnage is available at this price.

Export business has been better than domestic, and satisfactory sales have been made to Germany, England, and France.

Total sales for November, including both domestic and foreign, have been exceedingly satisfactory, and it would not be surprising if the figure would be somewhere between 160,000,000 and 170,000,000 lb. It is likely that a larger proportion than usual, however, has been sold for forward delivery.

Lead

The official contract price of the American Smelting & Refining Co. continues at 4.70c., and this price is also asked by most other interests. Lower quotations have disappeared, and instead there is some talk of 4.75c. Business has been in fair volume. Chemical lead is in free supply in the Middle West at 4.35c. St. Louis, and on desirable business this price might be shaded. Desilverized is somewhat firmer. In Chicago, desilverized lead brought 4.50c. during the week and corroding lead 4.55c.

Lead for export is in great demand, principally for Europe but also for South America and Japan. The Mexican production is not sufficient to fill the orders. Spot lead is quoted at a premium in London, and dealers there are making offers of this premium price for shipment from this side as late as January.

Zinc

Last week the market showed a tendency to decline because of the pressure of metal for sale on an unresponsive market. Prices dropped to 4.60c. East St. Louis, and a small sale at 4.575c. was reliably reported to have been made. Several of the larger producers were unwilling to meet the lower levels, and as the cheaper offerings were soon absorbed, the market has risen to the former level. Inquiries have been generally for prompt shipment, but a few are reported for shipment early next year. Producers are generally not disposed to consider forward deliveries. Business in high-grade continues to be better than for ordinary grades, at a 6c. level, with freight allowed.

Tin

The tin market has quieted down after the rather active sales reported in our last issue. Not a great deal has been on the market, however, and the situation may be characterized as quiet and firm.

Tin for forward delivery has been quoted as follows: Nov. 25th, 30.00c.; 26th, 30.00c.; 28th, 30.25c.; 29th, 30.125c.; and 30th, 30.00c.

Arrivals of tin, in long tons: Nov. 22d, Australia, 25; 25th, London, 25; 28th, Rotterdam, 25; London, 75; Straits, 20.

Gold

Gold in London: Nov. 24th, 102s. 11d.; 25th, 102s. 11d.; 28th, 103s.; 29th, 103s. 2d.; 30th, 102s. 11d.

Foreign Exchange

Foreign exchanges have shown little change. On Tuesday, Nov. 29, francs were 6.98c.; lire, 4.09c.; and marks, 0.3625c. New York funds in Montreal, 9 $\frac{1}{2}$ per cent premium.

Silver

With the near approach of the time for sailings from San Francisco and Vancouver of the last steamers which can deliver silver in Shanghai in time for the Chinese New Year settlements, the price of spot silver has advanced to a premium of $\frac{1}{2}$ to $\frac{3}{4}$ c. over silver for later deliveries. The Indian bazaars have also been small buyers at times during the last week. The price for silver deliverable on the West Coast within the next few days should therefore be maintained, although the tendency of the general market is uncertain.

Mexican Dollars—Nov. 25th, 50 $\frac{1}{2}$; 26th, 50 $\frac{1}{2}$; 28th, 51 $\frac{1}{2}$; 29th, 51 $\frac{1}{2}$; 30th, 51 $\frac{1}{2}$.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—List prices have been reduced 5 to 5 $\frac{1}{2}$ c. per lb., but are still above the market for imported aluminum. Reduction was made Nov. 15, and brings prices to 20c. per lb. for 99 per cent, 19c. for 98@99 per cent, and 18c. for 94@98 per cent. Outside market nominal at 17@18c. per lb. for 98@99 per cent virgin grades.

Antimony—Chinese and Japanese brands, 4.50c.; market dull. W.C.C. brand, 5 $\frac{1}{4}$ @5 $\frac{3}{4}$ c. 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@\$2.10 per lb. in bbls.

Iridium—Nominal, \$150@\$170 per oz.

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

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

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

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

Palladium—Nominal, \$55@\$60 per oz.

Platinum—\$80 per oz. Market dull.

Quicksilver—The market has become stronger. Metal has been sold during the week for \$46 per 75-lb. flask. Some dealers quoted \$48, but no business is reported on that basis. Improvement is ascribed to better demand from chemical manufacturers. San Francisco wires \$41.

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, \$24@\$26; 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, cobbled, 63 per cent, \$5.75; new bed low phosphorus, 65 per cent, \$8.50.

Manganese Ore—\$23@\$24 per unit, seaport; chemical ore, \$55@\$60 per gross ton, lump; \$75 per net ton, powdered. Nominal.

Molybdenum Ore—85 per cent MoS₂, 45@50c. per lb. of contained sulphide, New York. Quotation purely nominal.

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

Titanium Ores—Ilmenite, 52 per cent TiO₂, 1 $\frac{1}{4}$ @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. Chinese, as low as \$2.50.

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—Zirconium silicate, f.o.b. Pablo, Fla., 4 $\frac{1}{2}$ @13c. 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., Nov. 26—Zinc blende per ton, high, \$28.30; basis 60 per cent zinc, premium and Prime Western, \$25; fines and slimes, \$23@\$22; average settling price, all grades of blende, \$24.73.

Lead, high, \$59.15; basis 80 per cent lead, \$52.50@\$53.50; average settling price, all grades of lead, \$56.52 per ton. Shipments for the week: Blende, 8,143; lead, 1,053 tons. Value, all ore the week, \$260,950. Shipments for eleven months: Blende, 263,306; calamine, 102; lead, 55,487 tons. Value, all ores eleven months, \$9,159,620.

The zinc-ore market weakened from the \$26 basis price of last week, but a large tonnage of ore was sold on the lower price. To avoid what is deemed an excessive tax on ore, some Oklahoma producers are cleaning their bins.

A light flurry came into the lead market this week, with the advent of an outside buyer. Purchases were still being made late today, and the regular buyers were unable to ascertain the extent of the demand. The \$52.50 basis price of regular buyers was advanced \$1 per ton.

Platteville, Wis., Nov. 26—No sales or shipments of ore are reported, except 491 tons of blende sent to separating plants.

Non-Metallic Minerals

Asbestos—Crude No. 1, \$1,000@\$1,500; No. 2, \$600@\$850; spinning fibers, \$225@\$400; magnesia and compressed sheet fibers, \$150@\$250; shingle stock, \$80@\$150; paper stock, \$45@\$65; cement stock, \$15@\$25; floats, \$7@\$10, all per short ton, f.o.b. Thetford, Broughton and Black Lake mines, Quebec, Canada.

Barytes—Crude, \$6@\$7 per ton, f.o.b. mines. Ground white, \$23, f.o.b. mills. Off-color grades, \$15@\$17, f.o.b. Southern mills. Foreign barytes, f.o.b. New York, \$28 per ton.

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, \$12 @ \$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@ \$40, f.o.b., quoted at New York.

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

Feldspar—The market is exceedingly dull, and prices are nominal. Consumers reported having offered as low as \$4 per ton for No. 1 crude f.o.b. mines. Transactions reported on a \$5 basis. No. 1 Canadian, ground, \$23 f.o.b. Ohio points.

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; gravel, \$15; 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, 2@ 2½c.

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

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.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phos-

phate, \$11; 75 per cent, \$9.50; 75@ 74 per cent, \$9; 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, 13c.; 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, f.o.b. Texas and Louisiana mines; \$18@ \$20 for export, f.a.s. New York.

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—7@ 7½c. per lb.

Copper Sulphate—Large crystals, 5.35c.; small crystals, 5.25c. per lb. f.o.b. New York.

Sodium Nitrate — \$2.35@ \$2.45 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@ \$22 per ton, New York.

Potassium Sulphate — Powder, domestic, \$1@ \$1.10 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, 11c. per lb. of chromium contained; 4 to 6 per cent carbon, 11@ 12c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, \$58@ \$60, f.o.b. furnace; resale, \$90, delivered; English and German, \$60@ \$63, c.i.f. Atlantic seaports. Spiegeleisen, 18@ 20 per cent, \$25@ \$27 per gross ton, 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, \$57@ \$59; 75 per cent, \$120@ \$125.

Ferrotungsten—Domestic, 70 to 80 per cent W, 40@ 45c. per lb. of con-

tained 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, 21c. per lb.; wire, 14.75@ 15c.

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, 17.25c.; sheathing, 16.25c.; rods, 8 to 3 in., 14.25c.

Zinc Sheets—\$9 per 100 lb., less 8 per cent on carload lots, f.o.b. works.

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—\$48 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, \$55 per net ton, f.o.b. works.

Silica Brick—9-in., per 1,000, \$28@ \$46 in carload lots, f.o.b. shipping points.

The Iron Trade

Pittsburgh, Nov. 29, 1921

The steel market continues decidedly dull, but production is well maintained. The Steel Corporation has averaged above a 50 per cent operation in the last two or three weeks, and most of the large independents have been doing 40 per cent or better.

The withdrawal of prices below 3c. for black sheets and 4c. for galvanized reported a week ago became practically complete by the middle of last week, and on Friday the American Sheet & Tin Plate Co. announced its prices for the first quarter of the new year at 2.25c. for blue annealed, 3c. for black, and 4c. for galvanized. Buying is light except for immediate requirements, but the prices are expected to hold. The \$4.75 price on tin plate for the first half is holding well. In bars, shapes, and plates there is a slight sagging tendency, but when, recently, plates struck 1.50c., they seem to have met with resistance. Bars and shapes are done at 1.50c. only in the case of particularly desirable orders.

Demand for oil-country goods is fair. Wire products are in lighter demand.

Pig Iron—The market continues dull, with prices not quotably changed but showing little evidence of strength. Bessemer, \$20; basic, \$19; foundry, \$20.50, Valley.

Coke

Connellsville—Furnace, \$3.25@ \$3.50; foundry, \$4.25@ \$4.50.

*Wootte Mineral Co., Philadelphia, Pa.

METAL STATISTICS

Monthly Average Prices of Metals

	Silver					
	New York		London		Sterling Exchange	
	1920	1921	1920	1921	1920	1921
January.....	132.827	65.950	79.846	39.985	367.082	372.650
February.....	131.295	59.233	85.005	34.745	337.466	385.932
March.....	125.551	56.023	74.194	32.479	370.870	389.806
April.....	119.779	59.337	68.848	34.250	392.438	391.784
May.....	102.585	59.810	60.010	34.165	383.360	396.580
June.....	90.957	58.510	51.096	34.971	393.663	377.236
July.....	91.971	60.260	53.736	37.481	385.538	362.565
August.....	96.168	61.597	59.875	38.096	360.404	364.505
September.....	93.675	66.160	59.476	40.082	350.370	371.725
October.....	83.480	70.970	54.197	41.442	346.460	386.315
November.....	77.734	68.234	50.952	38.750	342.333	396.315
December.....	64.774	.....	41.845	.....	348.101	.....
Year.....	100.900	.....	61.590	.....	364.840	.....

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1920	1921	1920	1921	1920	1921
January.....	18.918	12.597	118.095	70.964	123.238	79.119
February.....	18.569	12.556	120.188	70.925	126.950	75.925
March.....	18.331	11.976	109.533	67.565	118.348	71.190
April.....	18.660	12.438	103.025	69.381	111.500	71.886
May.....	18.484	12.742	96.750	73.196	109.200	74.298
June.....	18.065	12.697	87.864	71.852	101.909	75.682
July.....	18.576	12.170	90.148	71.155	106.455	75.286
August.....	18.346	11.634	93.935	68.614	111.143	72.705
September.....	18.144	11.948	96.381	67.977	111.905	72.295
October.....	15.934	12.673	93.327	67.327	104.905	73.476
November.....	14.257	13.035	84.807	66.614	94.614	74.386
December.....	13.188	.....	75.702	.....	85.905	.....
Year.....	17.456	.....	97.480	.....	108.839	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London	
	1920	1921	1920	1921	1920	1921
	January.....	8.561	4.821	8.300	4.747	47.095	23.387
February.....	8.814	4.373	8.601	4.228	50.256	20.650
March.....	9.145	4.084	8.894	4.000	46.054	18.911
April.....	8.902	4.356	8.618	4.272	39.225	20.589
May.....	8.576	4.952	8.352	4.784	38.488	23.399
June.....	8.323	4.485	8.169	4.293	34.330	22.563
July.....	8.338	4.410	8.283	4.260	34.960	23.399
August.....	8.687	4.382	8.725	4.217	36.304	23.489
September.....	8.177	4.600	8.160	4.392	35.452	23.148
October.....	7.070	4.690	7.018	4.439	35.238	23.679
November.....	6.159	4.683	6.127	4.356	32.489	24.483
December.....	4.727	.....	4.717	.....	24.089	.....
Year.....	7.957	.....	7.830	.....	37.832	.....

New York and St. Louis quotations, cents per lb. London, pounds sterling per long ton.

Tin

	New York		Straits		London	
	99%		1920		1921	
	1920	1921	1920	1921	1920	1921
January.....	61.596	36.000	.....	36.000	376.512	190.464
February.....	58.466	28.534	59.932	32.142	395.750	166.250
March.....	61.037	27.296	61.926	28.806	369.489	156.024
April.....	61.120	28.990	62.115	30.404	345.450	163.905
May.....	53.230	31.431	55.100	32.500	294.813	177.411
June.....	46.125	28.514	48.327	29.423	250.614	167.506
July.....	45.798	26.755	49.154	27.655	261.886	164.530
August.....	43.856	25.662	47.620	26.301	274.048	155.318
September.....	41.940	26.280	44.465	26.680	270.120	156.750
October.....	39.310	27.278	40.555	27.655	258.190	156.380
November.....	35.667	28.592	36.854	28.935	241.080	158.898
December.....	31.195	.....	34.058	.....	212.440	.....
Year.....	48.273	.....	49.101	.....	295.866	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Zinc

	New York		St. Louis		London	
	99%		1920		1921	
	1920	1921	1920	1921	1920	1921
January.....	9.133	5.413	58.643	25.262	.....	.....
February.....	8.708	4.928	61.338	24.850	.....	.....
March.....	8.531	4.737	53.467	25.077	.....	.....
April.....	8.184	4.747	47.388	25.530	.....	.....
May.....	7.588	4.848	45.088	26.923	.....	.....
June.....	7.465	4.421	41.193	26.750	.....	.....
July.....	7.720	4.239	41.886	26.262	.....	.....
August.....	7.835	4.186	41.220	25.068	.....	.....
September.....	7.661	4.235	39.690	25.256	.....	.....
October.....	7.150	4.605	39.756	26.315	.....	.....
November.....	6.247	4.665	35.028	25.949	.....	.....
December.....	5.824	.....	27.762	.....	.....	.....
Year.....	7.671	.....	44.372	.....	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a)		Quicksilver (b)		Platinum (c)	
	New York		New York		New York	
	1920	1921	1920	1921	1920	1921
January.....	10.577	5.258	90.192	48.440	154.23	73.400
February.....	11.588	5.250	84.432	49.545	151.59	70.227
March.....	11.056	5.282	92.611	46.796	138.56	72.463
April.....	10.500	5.137	102.192	45.423	127.04	73.404
May.....	9.655	5.250	89.560	47.000	97.50	73.740
June.....	8.289	5.087	90.154	46.846	85.19	74.942
July.....	7.500	4.735	90.333	44.950	83.94	70.440
August.....	7.177	4.597	83.806	45.028	111.44	73.222
September.....	7.113	4.564	75.000	42.660	115.20	75.960
October.....	6.723	5.085	67.200	39.840	101.70	81.800
November.....	6.109	4.734	58.417	39.804	84.75	82.609
December.....	5.534	.....	49.577	.....	79.62	.....
Year.....	8.485	.....	81.123	.....	110.90	.....

(a) Antimony quotations in cents per lb. for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1920		1921		1920	
	1920	1921	1920	1921	1920	1921
January.....	\$40.47	33.96	\$39.88	31.96	\$39.86	33.88
February.....	42.95	28.96	42.61	26.96	43.40	30.25
March.....	43.40	28.16	42.90	26.46	43.40	27.85
April.....	43.72	26.96	44.22	24.46	43.90	26.77
May.....	44.00	26.21	44.88	23.84	45.36	25.56
June.....	44.89	24.96	45.41	22.66	46.40	24.38
July.....	47.21	22.84	47.42	20.76	46.56	22.36
August.....	48.90	21.96	49.88	20.29	49.35	21.53
September.....	50.46	21.96	50.46	21.21	51.96	22.82
October.....	49.21	21.96	44.38	20.96	48.58	22.96
November.....	41.26	.....	39.20	.....	42.61	.....
December.....	36.96	.....	34.90	.....	37.73	.....
Year.....	44.45	.....	43.85	.....	44.93	.....

In dollars per long ton.

Monthly Crude Copper Production

	1921			
	July	August	September	October
Alaska shipments.....	3,019,812	4,407,434	3,709,844	6,160,847
Arizona Copper.....	(a)	(a)	(a)	(a)
Calumet & Arizona.....	(a)	(a)	(a)	(a)
Con. Ariz. Smelting.....	(a)	(a)	(a)	(a)
Inspiration.....	(a)	(a)	(a)	(a)
Magma.....	(a)	(a)	(a)	(a)
Miami.....	4,112,000	4,281,000	4,268,000	5,084,000
New Cornelia.....	1,502,927	1,511,964	1,527,493	1,536,725
Old Dominion.....	(a)	(a)	(a)	(a)
Phelps Dodge.....	(a)	(a)	(a)	(a)
Shattuck Arizona.....	(a)	(a)	(a)	(a)
Ray.....	(a)	(a)	(a)	(a)
United Verde.....	(a)	(a)	(a)	(a)
United Verde Extension.....	(a)	(a)	(a)	(a)
Calumet & Hecla.....	(a)	(a)	(a)	(a)
Other Lake Superior.....	4,250,000	4,250,000	4,250,000	4,250,000
Anaconda.....	(a)	(a)	(a)	(a)
East Butte.....	1,000,000	1,278,000	949,980	1,000,000
Nevada Cons.....	(a)	(a)	(a)	(a)
Chino.....	(a)	(a)	(a)	(a)
Utah Copper.....	(a)	(a)	(a)	(a)
Others, estimated.....	8,150,000	7,520,000	9,150,000	5,200,000
Total United States.....	22,033,739	23,248,398	23,855,317	23,231,572
Imports: Ore and concentrates, matte, etc.....	10,924,973	10,888,426	6,268,635	8,445,551
Imports of blister, unrefined.....	20,749,969	12,574,740	8,614,851	23,360,893
Imports of refined, etc.....	595,835	662,885	10,553,792	761,125
Grand total.....	54,304,516	47,374,449	49,292,595	55,799,141
Granby Cons.....	2,255,425	2,485,704	2,720,761	2,593,250
Bolton.....	943,740	770,096	771,305	1,041,863
Cananea.....	(a)	(a)	(a)	(a)
Phelps Dodge Mexican.....	(a)	(a)	(a)	(a)
Cerro de Pasco.....	4,346,000	4,630,000	4,594,000	5,330,000
Chile.....	4,000,000	4,000,000	4,000,000	4,000,000
Katanga.....	7,031,745	6,509,160	6,136,515	6,189,435
Baekus & Johnston.....	1,310,000	720,000	350,000	198,000
Hampden Clonoury.....	(a)	(a)	(a)	(a)
Mount Lyell.....	892,000	940,000	1,204,000	.....
Mount Morgan.....	(a)	(a)	(a)	(a)
Cons. M. & S. of Canada.....	284,000	209,090	261,855	156,940
Falcon Mines.....	486,800	540,880	511,280	550,710
Furukawa.....	2,641,780	.....	.....	.....
Sumitomo.....	.....	1,673,601	1,674,865	1,444,316

(a) No copper produced during this month.

Comparative Annual Copper Production

	1919	1920	1921
January.....	135,733,511	121,903,744	90,596,597
February.....	111,649,512	117,450,000	86,682,941
March.....	102,040,460	120,309,316	91,046,345
April.....	98,808,998	116,078,871	46,946,523
May.....	92,652,975	114,964,207	25,310,511
June.....	95,856,570	116,107,856	24,623,693
July.....	100,369,247	109,729,610	22,053,739
August.....	107,994,040	112,460,254	23,248,398
September.....	108,703,075	104,919,62	23,855,316
October.....	115,143,143	105,231,571	23,231,572
November.....	117,289,735	106,700,178	.....
December.....	102,997,633	95,709,009	.....

MINING STOCKS

Week Ended November 26, 1921

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Ahmeek.....	Boston	57½	54	57½	Sept. '20, Q \$0.50
Alaska-Br. Col. new.	N. Y. Curb	3½	2½	2½	
Allouez.....	Boston	24½	23	24½	Mar. '19 1.00
Anaconda.....	New York	45½	43½	45½	Nov. '20, Q 1.00
Arcadian Consol.....	Boston	3½	3	3½	
Ariz. Com'l.....	Boston	9½	9	9½	Oct. '18, Q .50
Big Ledge.....	N. Y. Curb	*31	*28	*28	
Bingham Mines.....	Boston	13½	13	13½	Sept. '19, Q .25
Calumet & Arizona.....	Boston	54½	53½	53½	Sept. '21, Q .50
Calumet & Hecla.....	Boston	265	255	265	June '20, Q 5.00
Canada Copper.....	N. Y. Curb	*28	*28	*28	
Centennial.....	Boston	9	8½	9	Dec. '18, SA 1.00
Cerro de Pasco.....	New York	34½	32½	34½	Mar. '21, Q .50
Chile Copper.....	New York	12½	12	12½	
Chino.....	New York	27½	26½	27½	Sept. '20, Q .37½
Columbus Rexall.....	Salt Lake	*14	*14	*14	
Con. Arizona.....	N. Y. Curb	*18	*3	*3	Dec. '18, Q .05
Con. Copper Mines.....	N. Y. Curb	1½	1	1½	
Copper Range.....	Boston	36½	35½	36½	Sept. '20, Q .50
Crystal Copper.....	Boston Curb	*41	*39	*41	
Davis-Daly.....	Boston	6½	6½	6½	Mar. '20, Q .25
East Butte.....	Boston	11	10	10½	Dec. '19, A .50
First National.....	Boston Curb	*80	*60	*80	Feb. '19, SA .15
Franklin.....	Boston	1½	1½	1½	
Gadsden Copper.....	Boston Curb	*50	*45	*45	
Granby Consol.....	New York	34½	26½	30½	May '19, Q 1.25
Greene-Cananea.....	New York	27	24	27	Nov. '20, Q .50
Hancock.....	Boston	2½	2	2	
Howe Sound.....	N. Y. Curb	2½	2½	2½	Jan. '21, Q .05
Inspiration Consol.....	New York	38½	37	38	Oct. '20, Q 1.00
Iron Cap.....	Boston Curb	18	16	7	Sept. '20, K .25
Isle Royale.....	Boston	22½	20½	22½	Sept. '19, SA .50
Kennecott.....	New York	24½	24	24½	Dec. '20, Q .50
Keweenaw.....	Boston	1½	1½	1½	
Lake Copper.....	Boston	3	2½	3	
La Salle.....	Boston	1½	1½	1½	
Magma Chief.....	N. Y. Curb	.....	.....	*8	
Magma Copper.....	N. Y. Curb	23½	21	21	Jan. '19, Q .50
Majestic.....	Boston Curb	*7	*6	*7	
Mason Valley.....	Boston	.....	.....	1½	
Mass Consolidated.....	Boston	2½	2	2	Nov. '17, Q 1.00
Miami Copper.....	New York	25½	24½	25½	Nov. '21, Q .50
Michigan.....	Boston	2	2	2	
Mohawk.....	Boston	55½	52	55½	Nov. '20, Q 1.00
Mother Lode Coa.....	N. Y. Curb	5½	5½	5½	
Nevada Consol.....	New York	14½	13½	14½	Sept. '20, Q .25
New Cornelia.....	Boston	17½	15½	17½	Aug. '20, K .25
North Butte.....	Boston	13	11½	12½	Oct. '18, Q .25
North Lake.....	Boston	.....	.....	*18	
Ohio Copper.....	N. Y. Curb	*10	*7	*10	
Old Dominion.....	Boston	25½	23½	25½	Dec. '18, Q 1.00
Oseola.....	Boston	31½	31½	31½	June '20, Q .50
Phelps Dodge.....	Open Mar.	185	175	185	Oct. '20, Q 1.00
Quincy.....	Boston	43½	42	42½	Mar. '20, Q 1.00
Ray Consolidated.....	New York	14½	14½	14½	Dec. '20, Q .25
Ray Hercules.....	N. Y. Curb	*20	*18	*20	
St. Mary's Min. Ld.....	Boston	43	41	43	June '20, K 2.00
Seneca Copper.....	Boston	24½	24½	24½	
Shannon.....	Boston	1½	1	1½	Nov. '17, Q .25
Shattuck Arizona.....	New York	7½	6½	7½	Jan. '20, Q .25
South Lake.....	Boston	*62	*62	*62	
Superior & Boston.....	Boston	1½	1½	1½	
Tenn. C. & C. fcs.....	New York	10½	9½	10½	May '18, I 1.00
Tuolumne.....	Boston	*42	*40	*40	May '13 .10
United Verde Ex.....	Boston Curb	28	27	28	Nov. '21, Q .25
Utah Consol.....	Boston	2½	2	2½	Sept. '18 .25
Utah Copper.....	New York	59½	57	58½	June '21, Q .50
Utah Metal & T.....	Boston	1½	1½	1½	Dec. '17 .30
Victoria.....	Boston	.....	.....	1½	
Winona.....	Boston	*45	*45	*45	
Wolverine.....	Boston	11½	11	11½	

NICKEL-COPPER					
Internat. Nickel.....	New York	13	11½	12½	Mar. '19 .50
Internat. Nickel, pf..	New York	67	67	67	Nov. '21, Q 1.50

LEAD					
National Lead.....	New York	81½	80½	81½	Sept. '21, Q 1.50
National Lead, pfd..	New York	108	105	106½	Sept. '21, Q 1.75
St. Joseph Lead.....	New York	14	13½	14	Sept. '21, Q .25

QUICKSILVER					
New Idria.....	Boston	*40	*40	*40	

ZINC					
Am. Z. L. & S.....	New York	11½	10½	11	May '20, 1.00
Am. Z. L. & S. pfid..	New York	36	34½	35	Nov. '20, Q 1.50
Butte C. & Z.....	New York	5½	5½	5½	June '18 .50
Butte & Superior.....	New York	17½	16½	17½	Sept. '20, 1.25
Callahan Zn-Ld.....	New York	7½	6½	6½	Dec. '20, Q .50
New Jersey Zn.....	N. Y. Curb	.....	.....	124½	Nov. '21, Q 2.00
Success.....	N. Y. Curb	.....	.....	2	July '16 .03
Yellow Pine.....	Los Angeles	*40	*40	*40	Sept. '20, Q .03

*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.

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold.....	New York	.....	.....	.....
Alaska Juneau.....	New York	.....	.....	.....
Carson Hill.....	Boston	15	13	15	
Cresson Consol. G.....	N. Y. Curb	2½	2	2½	June '20, Q \$0.10
Dome Extension.....	Toronto	*73	*71	*71	
Dome Mines.....	New York	19½	19	19	Oct. '21, Q .25
Florence Goldfield.....	N. Y. Curb	*32	*25	*25	
Golden Cycle.....	Colo. Springs	*73	*72½	*72½	June '21, Q .02
Goldfield Consol.....	N. Y. Curb	.....	.....	.....	Dec. '19 .05
Hollinger Consol.....	Toronto	7.90	7.78	7.83	Nov. '21, 4 wks. .05
Homestake Mining.....	New York	55	55	55	Nov. '21, M .25
Kirkland Lake.....	Toronto	*35	*30	*34	
Lake Shore.....	Toronto	1.23	1.20	1.23	
McIntyre-Porcupine.....	Toronto	1.98	1.91	1.98	Sept. '21, K .02
Porcupine Crown.....	Toronto	*15	*13½	*14½	Sept. '21, K .05
Porcupine V. N. T.....	Toronto	*18	*16½	*17	July '17, .03
Portland.....	Colo. Springs	*33	*33	*33	Oct. '20, Q .01
Reorgan. Booth.....	N. Y. Curb	.....	.....	*4	May '19, .05
Schumacher.....	Toronto	*26	*23	*24	
Silver Pick.....	N. Y. Curb	.....	.....	*8	
Teck Hughes.....	Toronto	*17	*15	*14	
Tom Reed.....	Los Angeles	*40	*38	*38	Dec. '19 .02
United Eastern.....	N. Y. Curb	2½	2½	2½	Oct. '21, Q .15
Vindicator Consol.....	Colo. Springs	*22	*22	*22	Jan. '20, Q .01
White Caps Mining.....	N. Y. Curb	.....	.....	*4	
Yukon Gold.....	N. Y. Curb	1½	1½	1½	June '18, .02½

SILVER					
Arizona Silver.....	Boston Curb	.....	.....	*18	Apr. '20, M .03
Batopilas Mining.....	New York	.....	.....	.....	Dec. '07, I .12½
Beaver Consol.....	Toronto	*22	*20	*20½	May '20, K .03
Comiagas.....	Toronto	1.50	1.15	1.50	May '21, Q .12½
Crown Reserve.....	Toronto	*12	*9	*11	Jan. '17, .05
Kerr Lake.....	N. Y. Curb	.....	.....	.....	Oct. '21, Q .12½
La Rose.....	Toronto	*33	*31½	*32½	Apr. '18, .02
McKinley-Dar-Sav.....	Toronto	*17	*14	*17	Oct. '20, Q .03
Mining Corp. Can.....	Toronto	1.18	1.03	1.15	Sept. '20, Q .12½
Nipissing.....	N. Y. Curb	7	6	6	Oct. '21, Q .03
Ontario Silver.....	New York	4½	4½	4½	Jan. '19, Q .50
Ophir Silver.....	N. Y. Curb	.....	.....	*12	Jan. '12, .10
Temiskaming.....	Toronto	*27	*25	*27	Jan. '20, K .04
Trethewey.....	Toronto	*12½	*8½	*7½	Jan. '19, .05

GOLD AND SILVER					
Boston & Montana.....	N. Y. Curb	*95	*81	*83	
Cash Boy.....	N. Y. Curb	*5	*4	*5	
Consol. Virginia.....	San Francisco	166	165	.....
Dolores Esperanza.....	N. Y. Curb	1½	1½	1½	
El Salvador.....	N. Y. Curb	*11	*9	*10	
Jim Butler.....	N. Y. Curb	.....	.....	*7	Aug. '18, SA .07
Jumbo Extension.....	N. Y. Curb	*3	*3	*3	June '16, .05
Louisiana Con.....	N. Y. Curb	.....	.....	.....
MacNamara M. & M.....	N. Y. Curb	*12	*11	*12	May '10, .02½
Tonopah-Belmont.....	N. Y. Curb	1½	1½	1½	Aug. '21, Q .05
Tonopah-Divide.....	N. Y. Curb	*68	*66	*66	
Tonopah-Extension.....	N. Y. Curb	1½	1½	1½	Oct. '21, Q .05
Tonopah Mining.....	N. Y. Curb	1½	1½	1½	Oct. '21, SA .05
West End Consol.....	N. Y. Curb	*87	*80	*85	Dec. '19, SA .05

SILVER-LEAD					
Caledonia.....	N. Y. Curb	*8	*7	*8	Jan. '21, M .01
Cardiff M. & M.....	Salt Lake	*92	*92	*92	Dec. '20, .15
Chief Consol.....	Boston Curb	13½	13	13½	Aug. '21, Q .05
Consol. M. & S.....	Montreal	19	18½	18½	Oct. '20, Q .62½
Daly Mining.....	Salt Lake	.....	.....	.....	July '20, Q .10
Daly-West.....	Boston	.....	.....	.....	Dec. '20, Q .25
Eagle & Blue Bell.....	Boston Curb	1½	1½	1½	Apr. '21, K .05
Electric Point.....	Spokane	*3	*3	*3	May '20, SA .03
Eureka-Croesus.....	N. Y. Curb	*35	*25	*26	
Federal M. & S.....	New York	10	10	10	Jan. '09 .50
Federal M. & S., pfid	New York	35	31½	34½	Sept. '21, Q 1.00
Florence Silver.....	Spokane	*11	*10	*11	Apr. '19, .01½
Grand Central.....	Salt Lake	*40	*25	.....	June '20, K .05
Hecla Mining.....	N. Y. Curb	4½	4½	4½	Sept. '21, Q .10
Iron Blossom Con.....	N. Y. Curb	.....	.....	*17	Apr. '20, Q .02½
Judge M. & S.....	Salt Lake	.....	.....	*2.00	Sept. '20, Q .12½
Marsh Mines.....	N. Y. Curb	.....	.....	*3	June '21, I .02
Prince Consol.....	Salt Lake	*7	*5½	*7	Nov. '17, .02½
Rambler-Cariboo.....	Spokane	*1	*1	*1	Feb. '19, .01
Rex Consol.....	N. Y. Curb	*9	*8	*8	
South Hecla.....	Salt Lake	*50	*20	.....	Sept. '19, K .15
Standard Silver-Ld.....	N. Y. Curb	*10	*10	*10	Oct. '17, .05
Steward Mining.....	N. Y. Curb	*3	*3	*3	Dec. '15 .05
Tamarack-Custer.....	Spokane	1.98	1.75	1.95	Jan. '21, K .04
Tintic Standard.....	Salt Lake	2.00	1.97½	1.97½	July '21, Q .05
Utah Apex.....	Boston	3½	2½	3½	Nov. '20, K .25
Wilbert Mining.....	N. Y. Curb	.....	.....	*2	Nov. '17, .01

VANADIUM					
Vanadium Corp.....	New York	32½	30½	32½	Jan. '21, Q 1.00

ASBESTOS					
Asbestos Corp.....	Montreal	57½	57	57	Oct. '21, Q 1.50
Asbestos Corp., pfid..	Montreal	.....	.....	79½	Oct. '21, Q 1.75

MINING, SMELTING AND REFINING					
Amer. Sm. & Ref.	New York	41½	40½	41½	Mar. '21, Q 1.00
Amer. Sm. & Ref. pf	New York	84½	81½	84	Sept. '21, Q 1.75
Am. Sm. pf. A.....	New York	87	85½	87	Oct. '21, Q 1.50
U. S. Sm. R. & M.....	New York	34½	33		

NEW MACHINERY AND INVENTIONS

Analyzer for Determining Amount of Magnetic Iron in Concentrate

The Davis Tube Analyzer is a simple device for quickly reducing a sample of ore so that the magnetic iron percentage can be accurately computed. It was developed by the experimental mines station of the University of Minnesota, of which E. W. Davis is the head.

Briefly, its operation is as follows: A sample of ore is placed in the glass

provided, with light rubber tubes for connections. It may be necessary to distill the water, for if as much as $\frac{1}{2}$ gm. of solids remains after evaporating a liter of the water, the determinations will be inaccurate. A head of 3 ft. of water at the tube is sufficient for operation.

Computation is easiest when exactly 10 gm. of ore, crushed to 100 mesh, are used. The clamp on the rubber hose at the lower end of the glass tube is tightened, and the tube filled with water to within a few inches of the top. The current through the magnets is then turned on, and the tube is placed in an upright position. The 10 gm. of ore are then charged into the tube, the rubber stopper is placed in the top, and

the carriage and tube are tipped to an angle of approximately 45 deg. The clamp on the rubber tube is then adjusted to deliver about one gallon in ten minutes into the earthenware evaporating pan below.

The motor is then started and adjusted to drive the carriage at a speed of 60 to 100 strokes per minute. The rocking of the tube and carriage should continue for about ten minutes, when the magnetic concentrate should have collected at the poles of the magnet and should be perfectly clean, all tailings having been washed out into the pan below. If the water in the tube is not perfectly

clear at the end of this time, or if the concentrate appears unclean, the operation should be continued for a greater length of time, the tube being tilted to a more nearly vertical position.

When the cleaning has been completed the water supply is stopped. The glass tube is then released from the carriage and is moved upward between the poles, the concentrate moving downward in the glass tube so that it always remains opposite the poles. When the concentrate has reached the lower end of the tube, the rubber stopper is taken out and the rubber tube at the lower end opened, allowing the water to flow out into the pan. When the water level in the tube has reached a point slightly above the concentrate at the magnet, the flow is stopped by the closing of the rubber tube, and the glass tube is taken from the magnet.

The concentrate and the remaining water should then be allowed to flow out into a beaker. A little wash water should be passed through the tube completely to remove all particles of concentrate. Most of the water can then be decanted from the concentrate by placing the bottom of the beaker on the magnet and decanting the water into the pan.

The beaker containing the concentrate should be dried over a hot plate and should be carefully weighed; the concentrate is then ready for assay. The evaporating pan containing the tailings and the water should also be dried over a hot plate. As the water nears the boiling point, practically all of the solid matter will settle to the bottom of the pan. The clear water at the top may be siphoned off. The remainder is evaporated to dryness, and the dry tailing is cleaned from the pan and is analyzed.

A complete computation for magnetic iron may be made when the soluble iron assays of the feed, concentrate and tailing and the weight of the concentrate are known.

The device is now being manufactured commercially by the Dings Magnetic Separator Co., Milwaukee, Wis.

Drilling Operations Shown In the Movies

The U. S. Bureau of Mines is distributing a four-reel educational film entitled "The Story of Rock Drilling," which is of considerable interest to mining men. Pictures of actual drilling operations are shown, in addition to the methods and machines employed for rock drilling of many kinds.

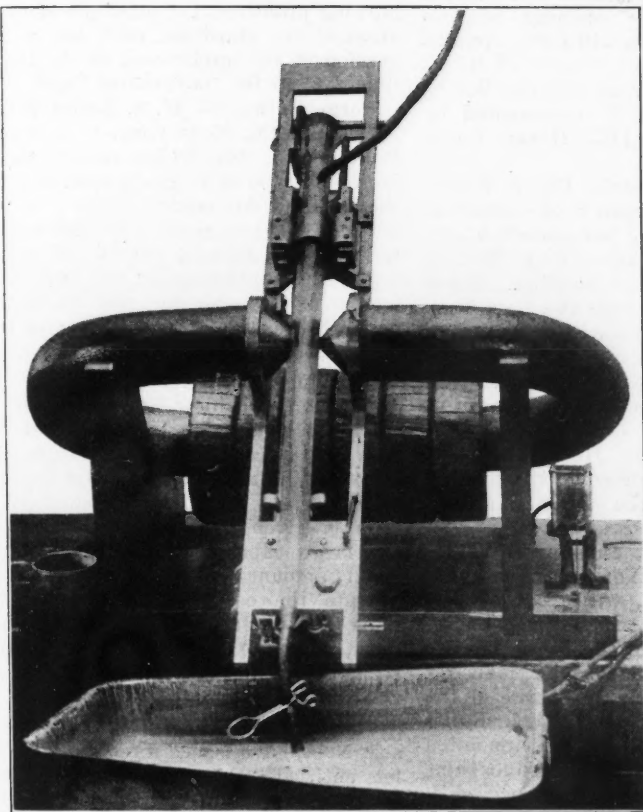
The quarrying scenes were taken at the Westerly, R. I., quarry of the Crumb Quarry Co. The operation of plug drills and rotator hammer drills, as well as of heavy-duty piston drills



SULLIVAN ROTATOR HAMMER DRILLS
1,700 FT. UNDERGROUND, SINKING
THE OTTAWA SHAFT OF THE
MONTREAL MINING CO.
HURLEY, WIS.

mounted on tripods and quarry bars, is interestingly illustrated. Lewis-hole work, steam splitting, and tunneling to open new areas of valuable granite are some of the features.

A Bureau of Mines engineer and the camera men also went to Northern New York, where they photographed scenes at the iron mines in the Adirondacks to show how modern hammer drills of various types are used for mining iron ore. At Ironwood, Mich., and Hurley,

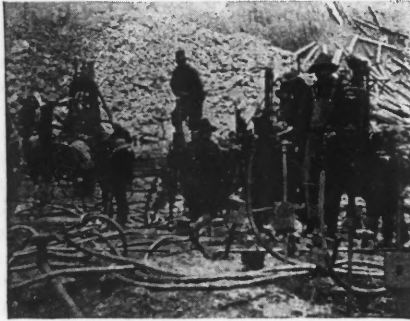


DAVIS TUBE ANALYZER

tube, shown in the illustration, which has previously been filled with water. The carriage and tube are then automatically rocked, the carriage bearings being placed at the poles of the magnet. A stream of water passes through the tube, washing away the tailings from the concentrate, which is held at the poles. When the washing is completed, the magnetic assay is easily made.

Accurate results are obtained on strongly magnetic material when crushed to 100 mesh. The machine can be operated on coarser material, but the results obtained may show slight errors. The power with which the magnetic coils are supplied should be 100 v., d.c., and the motor which rocks the carriage can be operated on either an alternating or direct current of 110 v. A clean wash water supply should be

Wis., in the Lake Superior country, other rock-drilling pictures were taken, including shaft-sinking operations, carried on at a depth of over seventeen hundred feet below the surface. The uses of drill sharpening machines and pyrometer-controlled drill-steel heating furnaces were also photographed.



SULLIVAN ROCK DRILLS ON TRIPODS AND SULLIVAN STONE-CHANNELING MACHINE AT NIAGARA FALLS POWER CO. CANAL

Nearly a week was spent at Niagara Falls, in photographing rock excavation methods on the ten-mile canal of the Hydro-Electric Power Commission of Ontario. This canal is about to be opened, and will develop nearly half a million additional horsepower from Niagara Falls. Nearly one hundred heavy-duty rock drills, one hundred or more rotator hammer drills, and twenty stone-channeling machines of the largest size have been used on this work and are shown in the pictures, with all the details of their operation. Some of the largest steam and electric shovels in the country are also illustrated.

The Sullivan Machinery Co. co-operated with the Bureau of Mines in securing these pictures. They may be secured on loan by addressing the U. S. Bureau of Mines Experiment Station, Pittsburgh, Pa., from which place all moving pictures of the Bureau are distributed.

INDUSTRIAL NOTES

Homer W. Scott is in charge of the Cleveland office of the Jeffrey Manufacturing Co., located at 437 Leader-News Bldg., and C. R. Heller is in charge of the Buffalo office, located at 1108 Marine Trust Bldg.

The Austin Machinery Corp. announces that the Canadian Austin Machinery, Ltd., Woodstock, Ontario, incorporated under the laws of Canada, will henceforth act as sole manufacturers and distributors in Canada of the complete Austin line of earth-moving and concrete-mixing equipment.

Announcement is made of the resignation of A. E. Ratner from the firm of Brile & Ratner, Inc., and of the opening of his own offices at 128 Broadway, New York, where he will continue his activities in the metal and chemical business on a commission and brokerage basis.

The International Ores & Metals Selling Corporation, 280 Broadway, New York, is the exclusive American agent for the Société Minière et Metallurgique de Penarroya, Corocoro United Copper Mines of Bolivia, the Société de Minerais de Cuivre de Naltagua, Chile, and also specializes in all minerals, ores and metals produced in France and the French colonies. This company, which is under the direction of Abraham Blum, is a subsidiary of Minerais & Metaux, the organization of which is an outgrowth of the consortium that handled practically all of the minerals and metals imported and allocated to the various French industries during the war.

The Combustion Engineering Corporation, 43 Broad St., New York, announces the recent opening of two branch offices, one at 216 Latta Arcade, Charlotte, N. C., in charge of T. E. Nott, and the other at Seattle, Wash., where the company is represented by Fryer-Barker Co., 1133 Henry Building.

The Koppel Industrial Car & Equipment Co., manufacturer of industrial cars, at Koppel, Pa., has opened a new district office at Kansas City, Mo., in the Railway Exchange Building. Harry C. Kraft, formerly with the New York office, has been appointed manager of the Kansas City district.

The W. A. Jones Foundry & Machine Co., announces the appointment of Fred E. Holtz as its Milwaukee district representative. He will assume his new duties immediately, making headquarters in the First National Bank Building.

The Bucyrus Co., announces the removal of its New York office to Suite 728, 30 Church St., with E. G. Lewis in charge as Eastern sales manager, effective Dec. 1. M. J. Woodhull has been appointed central sales manager to succeed Mr. Lewis, in charge of the Chicago office, 622 McCormick Building. E. R. Weber has been appointed northern sales manager, at Minneapolis, 1224 McKnight Building, to succeed J. N. Gawthrop, who will become associated with Mr. Lewis in New York.

The Southwestern Engineering Co. of Los Angeles, Cal., announces that it has recently shipped a complete mill to the Pregones Mining Co., of Iguala, Guerrero, Mexico, consisting of a No. 43 Marcy mill, Dorr Simplex Classifier, two Type A, No. 2610K and K flotation machines, Remco redwood pipe and tank, Southwestern ore feeder, Leffel water wheel, and other equipment. This is a silver-gold property which expects to be operating soon.

The Southwestern Engineering Co. also reports that it has an order for, and will ship within the next few weeks, a complete mill to the Cia Minera Metallurgica Regeneradora de Comanja, Jalisco, Mexico. This latter order includes a Marcy mill, Wheeling Crusher, Dorr Classifier, Hamill ore feeder, two K and K flotation machines, Krogh centrifugal pump and a 10,000-gal. Remco redwood tank.

The Traylor Engineering Co., Allentown, Pa., has recently shipped eighteen 7 x 10 ft. tube mills, one 72 x 30 in. type AA rolls, and four 54 x 24 in. type AA rolls, to the Britannia Mining & Smelting Co., Howe Sound, British Columbia.

TRADE CATALOGS

Pulverized Fuels—Catalog No. 9, "Pulverized Fuels," has been published by the Hardinge Co., 120 Broadway, New York. This bulletin is divided into three main sections, viz., the application of pulverized fuel to various burning problems, the principle of operation of the Hardinge mill, and a discussion of the application of the Hardinge system for pulverizing fuels.

Forge Furnaces—W. S. Rockwell Co., 50 Church St., New York, have issued Bulletin No. 239, which relates to an improved type of forge furnace to meet the demand for equipment which will lower production costs. The novel features of the furnace consist of means for better application of the heat, protection of the operator, and utilization of waste gases to preheat air and fuel for combustion.

Crushing Rolls—Bulletin No. 13, "Buchanan Crushing Rolls," issued by C. G. Buchanan Co., Inc., 90 West St., New York, contains general information on this subject. A brief history of the origin and first introduction of rolls is given, together with data on the large capacity and comparatively small amount of power required to operate the early machines. Limitations with regard to sizes and reductions, tables, capacities, and diagrams relating to present machines are included in the pamphlet.

Platinum—Baker & Co., Inc., Newark, N. J., have issued an 83-page booklet entitled "Data Concerning Platinum." The fourteenth edition of this publication contains, in addition to a full list of the various appliances made by the company, new tables and valuable information that are arranged in convenient form.

Mine Cars—The Lincoln Steel & Forge Co., 5,701 Natural Bridge Ave., St. Louis, Mo., have ready for distribution an interesting pamphlet entitled "Why a Journal Box Mine Car Truck?" The text is supplemented by charts showing the principle of this type of construction. The company will be glad to send the books to executives, mine superintendents, and engineers upon request.

Machine Tools—A new machine tool, known as the No. 4F, horizontal boring, drilling and milling machine, built to drive high-speed tool steels to capacity limits, is completely described in the P. & H. Bulletin No. 4P, recently issued by Pawling & Harnischfeger Co., Milwaukee, Wis.

