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March 6, 1920

Two Sections—Section Two

INDEX TO VOLUME CVIII

July 1 to December 31, 1919

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INDEX TO VOLUME CVIII

July 1 to December 31, 1919

EXPLANATORY NOTE

Illustrated articles are denoted by an asterisk (*); book notices by a dagger (†). This index is made comprehensive but concise. Pains are taken to bring together matter belonging to the same subject, so that when a reader looks up an article, he will be cited to related data. Series of simple page numbers, following names of mines or companies, usually refer to news notes. With a major entry or series of entries, may be placed several minor ones, relating to the same subject in order that its history may be followed. If the author's name be known, it is the simplest means of reference. Productions are indexed under names of metals and countries or states. The mere juxtaposition of a mineral and geographical name usually signifies an output, but may cover other statistical or news matter. Not all news are indexed but a liberal selection of them is made.

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Engineering and Mining Journal

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Number 1

A Few Words About Ourselves

WITH the opening of its 108th volume the *Journal* appears in a new editorial garb. If there were nothing more than mere caprice or whim in determining the typographical style and make-up of a modern magazine, the matter would not be worth the reader's attention; but if, as happens in this case, the changes are the result of deliberate study of the *Journal's* editorial purpose and the best mechanical means of accomplishing it, they may be worth passing comment. For ourselves, we look upon the new garb as the outward and visible sign of an inner zeal in the welfare of the mining industry, and a determination to promote its interests in a very definite way. The extent to which we achieve this declared purpose will be measured by our readers' approval. Success can come only through service.

The first and most noticeable change to attract the reader's attention is the shift of the editorial pages from their former position to the front of the book. In homely phrase, this enables the editors to greet the reader at the front door of what they hope will prove for him each week a storehouse of appropriate knowledge and information; and if, in addition, he finds therein material that affords him pleasure and recreation, the result will be doubly gratifying.

In the typographical style and arrangement of the contents of the magazine, consideration has been given to those rules and dicta that have been developed from the concrete experience of the printing craft, and a definite effort has been made to produce a prospect pleasing to the eye. In this respect, thoughtful typography serves a purpose in reaching the reader's mind similar to that of bright silver and snowy linen in tempting the diner's appetite. In the interest of certainty regarding our market quotations, we have set these in larger type, so that there will be no confusion in the integers or fractions, particularly the latter, when occasionally an accident mars the type face and gives a poor imprint. The *Journal's* market quotations are prepared with too much care to permit poor printing to vitiate their usefulness or leave room for doubt as to their exact meaning.

Close personal contact with the mining industry is an essential part of the *Journal's* editorial policy, to be accomplished by frequent and regular visits into the field by members of the editorial staff. In this respect the importance of the Rocky Mountain and Pacific Coast region has been specially recognized by the establishment of a Western editorial office in San Francisco, in conjunction with other McGraw-Hill engineering publications. The *Journal* will be represented there by a Western Editor, who by travel, correspondence and participation in local affairs will be able to reflect adequately the activities of a great mining region; but what perhaps is of greater importance, he

will at the same time personalize the *Journal's* service and usefulness to those who are engaged in mining. Thus, not only will the West find expression in the *Journal*, but the latter, as the exponent of the industry, will function most effectively in Western mining affairs. We shall be pleased if members of the fraternity will accept our cordial invitation to make personal use of this San Francisco office. It is established for the convenience of our readers and others engaged in the mining industry, and may be used as their personal headquarters, for the receipt of mail, or for conference with the Western Editor when he can be of assistance.

But the *Journal* has a still larger field of usefulness in reflecting world-wide mining conditions. It has become a trite saying that the war created new relations in our industrial life, but it is none the less true. Certain it is that the war demonstrated as nothing else could the far-reaching importance of the mining industry, the apparent dependence of the world on the peculiar mineral resources of certain countries, and the necessity for every nation to know its neighbors' resources as well as to survey carefully its own. Accordingly, we in the United States face the necessity of extending our horizon and adjusting our concepts of the mining industry. Henceforth we must think internationally as well as nationally, and view the world as the field of action for American mining engineers. No longer will it suffice to be well posted on conditions in the United States alone. We must be prepared to seek opportunities elsewhere for the investment of American mining capital, and we must view domestic enterprises in the light of possible foreign competition. In the reflection of these new conditions the *Journal* will draw upon authentic and reliable sources of information.

The publication of a magazine is a co-operative enterprise in which the reader, the advertiser and the publisher share the benefits. Contributing mainly to the reader's interest, and through him to the advertiser's, is the editorial staff, on which all concerned rely for the production of a magazine of reliability and unquestioned integrity. In the case of an engineering magazine the character of the editorial staff becomes of primary importance on account of the technical nature of the subject, requiring special knowledge and sound judgment. Manifestly, the requisite qualifications cannot reside in an individual; hence the *Journal* is the joint product of a staff of trained and experienced engineers, working as a unit for a common purpose. In this respect we have similarity with a college faculty, composed of specialists and combining a variety of talents. This makes for breadth of view and sympathy, and catholicity of judgment that appeals to a wide circle of readers. Conversely, it avoids the pitfalls of prejudice and narrow-mindedness.

The *Journal* is naturally restricted as to the subjects to which it can devote its pages, but the staff will

endeavor to take a broad view of the economics and practice of mining, mining geology, and appropriate phases of ore-treatment, continuing to rely on the valued support of old contributors and inviting the co-operation of new ones.

The Signing of the Peace Terms

A FRIEND of ours related the following incident, which we will tell in his own words: "During the war I had been in the habit of buying my evening paper at a little news-stand close to my apartment. The owner of the news-stand was a gruff, morose old fellow, who shuffled up and gave me my paper with little regard for my greeting or for custom. He was evidently German born. Last Saturday evening, however, as I entered the place, I was greeted with a cheery hello and a smile which was evidently sincere. Puzzled, I walked away, opening my paper as I went. Suddenly I comprehended, as I read the bold headlines 'Peace Treaty Is Signed.'"

The incident of the old German may or may not be typical, but it at least indicates that among many the tension produced by the war has been broken and replaced by a happier frame of mind. June 28 marks the consummation of a progression of events occurring during the last five years and profoundly affecting individuals and nations. Whatever the terms of the peace treaty may be, and however they may affect the several nations signing it, the fact remains that in that treaty we have, as near as it is possible to attain by human efforts, a world constitution.

Our experience with our own constitution may well lead us to feel that the peace treaty will clarify and strengthen international relations. There will be doubts and misgivings, but the important fact remains that the treaty will become just what we make it. A broad spirit of acceptance and tolerance will make it a success. The world grows smaller, population increases, elbow-room becomes harder to get; more and more is it imperative to cultivate a spirit of amity, comradeship, and understanding among nations.

Americanization

AMERICANIZATION as we understand it has for its object the saving of 30,000 lives per annum in the United States, the saving of 100,000 injuries, and the saving of millions of dollars to our mines and industrial plants, but more than all these its object is to save the United States for our children and ourselves. Secretary Lane, in an address before the Washington Conference of Americanization Specialists, in May, said:

The right of revolution does not exist in America. We had a revolution 140 years ago which made it unnecessary to have any other revolution in this country, because it was fundamental. One of the many meanings of democracy is that it is a form of government in which the right of revolution has been lost by giving the Government wholly to the people. Revolution means revolt. Against whom are we to revolt in the United States excepting the people of the United States?

If we Americans do not like officials, programs, policies, measures, systems, we can try others, but in Europe the right of self-determination as to domestic concerns has been denied, and therefore the right of revolution has been preached.

No man can be a sound and sterling American who believes that force is necessary to effectuate the popular will. As we have taken from the duelist his pistol and compelled

him to seek redress in the law, so in the larger affairs of the nation we have said, "This is your country. Make it what you will; but you must not use force, for when you came here and became a citizen you gave over the right to resort to anything but public opinion and the methods of the law in the determination of national policies. If you are in a minority you must wait until you become a majority, and as a majority you must be content to prevail by processes which respect the rights of the minority."

Americanism does not mean that any one economic system is right, or that the United States is a perfected land; it does not mean that any one social philosophy must be accepted as the final expression of truth; but Americanism does mean that we have evolved for ourselves machinery by which revolution, as a method of changing our life, is outgrown and outlawed.

That the foreign-born citizens may grasp this idea, the start must be made with the English language. John H. Finlay aptly said in his remarks before the same conference:

To make here in America a permanent Pentecost that all the people of the land may understand one another, we must begin with a common language. I know that this is not the sufficient thing, but we must begin with words, for all the good and bad that gets done in the world is done through words.

The large mine or reduction works has a duty to itself and the community in bringing about a condition on its properties requiring that notices be printed in but one language, the English language. With the small mines the duty is no less imperative, but is more difficult of accomplishment. Here it means co-operation between the mine management and the local community.

Americanization will not be accomplished through closing our ports to immigrants over a period of four years or any other period, but much may be accomplished through teaching those already with us, and teaching the others as they come.

Worth-While Men

CAN-DO men are worth-while men. The urge of necessity develops self-reliance. Can-do and self-reliance are complements of each other. On the battle-fronts of Europe men were compelled to think fast and to act. They were compelled to do with what they had. The construction of a billet, a bridge, a road, the extrication of a motor truck from a shell hole, or the rescuing of the wounded under fire became imperative necessities. Our soldiers did all of these things. They also vanquished the enemy. And in doing these things they were under a great co-ordinated system, the American Army.

It is difficult to estimate the value of the Army experience to each individual. Each was the better for it. The returning soldier is a greater asset to the country than he formerly was as a citizen before he donned the uniform. The Army has been quick to realize that it is a great training school where men are made. How to take care of himself; how to work with others; how to obey orders; how to use his time to best advantage—these are a few of the fundamental lessons that the Army has instilled in the soldier.

That the new plane attained by the Army may be made permanent is the wish of all who have its interests at heart. At the recent meeting of the New York Section of the American Institute of Mining and Metallurgical Engineers, Major Stuart elucidated and explained the new purpose of the Army. He impressed those present with the economic importance of the Army

when considered as a training school for men. All who heard him were quick to catch the drift of his argument. There will be substantial agreement that the Army has contributed a large number of creditable and valuable men to our citizenry.

Increasing Iron-Ore Resources

THE heavy drain upon the domestic iron-ore resources caused by the enormous production of iron and steel naturally raises the question of the life of the deposits and the probability of maintaining the grade of the ores produced. Despite the productiveness of the Minnesota deposits, there is a limit. It is true that this limit is in the future, but that future may not be so far away. Both the grade of the ore and the proportion of bessemer ore have sensibly diminished. Were the present merchantable ores of Minnesota our only resource in that state, the prosperity of the iron-mining industry there might be seriously curtailed within several decades. Fortunately, however, there exists a large tonnage of low-grade taconite which contains upward of 30 per cent of iron in the form of magnetite. Until recently this ore was not merchantable, for obvious reasons.

At the recent meeting of the New York Section of the American Institute of Mining and Metallurgical Engineers, Horace V. Winchell, president of the Institute, related how, by well-known metallurgical methods, the low-grade taconite can be treated and a merchantable ore of bessemer grade and higher in iron content than the Mesabi ore obtained. This is a significant and important achievement. It was not obtained casually, but is the result of careful and persistent experimentation. Mr. Winchell paid special tribute to Walter G. Swart for his able work in conducting the investigation which has resulted so happily. The intelligent application of engineering principles to the solution of problems of this kind gives further emphasis to the value of the engineer to the community.

When actual exploitation of these deposits along the proposed lines will take place is problematical. In all likelihood this will be when plant and operating costs reach a level that will insure an adequate margin of profit to justify the large capital expenditure.

Nevertheless, great credit is due the men who have solved this vital problem.

Sealing Off Water in Oil Wells

THE wholesale development of oil-bearing formations has brought with it a number of peculiar engineering problems, among the more important of which is the necessity of preventing the contamination of the oil with water which leaks in from contiguous strata. Individually, the operations of a producer may be of importance to himself alone. He may lose the product of a well by excessive infiltration of water. This may be due to his own carelessness or ignorance. For this he pays his own price. Where, however, there are a number of producers operating in the same field, the operations of each company become of considerable importance to the others.

Carelessness or ignorance is never excusable, even when the guilty individual is the only sufferer, but if his neighbors also suffer, through no fault of their own,

there should be a strict accounting. The continuity of structural conditions in the large oil fields necessitates a considerable degree of co-ordination of the efforts of individual companies, particularly where there are important water-bearing formations in close proximity to the oil sands, either above or below. The infiltration of water caused by a single well may adversely affect the product from a number of wells. It is on this account that geologists and oil men combine to study the conditions in a given field, to the end that all of the recoverable oil from the field can be obtained, and the greatest length of life of the particular area assured.

Methods for coping with infiltrating water have been progressively developed. At present there are a number of effective processes for handling both top and bottom water. All involve the sealing off of the troublesome stratum by the use of either cement or mud-laden fluid in conjunction with the steel casing. Structural conditions and the nature of the water-bearing stratum determine largely the selection of the method and the details of its application. The degree of success attained depends upon the thoroughness of the knowledge of the underground conditions and the skill and experience of the operators who are engaged in conducting the sealing operations.

Knowledge of underground conditions cannot usually be obtained entirely from a single well, but should be derived from the detailed logs from a number of wells in the same field, as well as from the behavior of the producing wells. This implies that there should be some clearing house of information in each field from which data could be obtained to guide the individual operator and to warn him of the dangerous horizons. The necessity for this has been recognized, and in oil fields where water troubles are critical operators have co-operated with one another to minimize the difficulty.

In California a law providing for the protection of oil deposits in that state against water and other damages following improper development methods has been in operation for three years. A department of the California State Mining Bureau administers the law, and considerable progress has been made in establishing records and field procedure useful in controlling the situation. A report recently issued by the California State Mining Bureau contains descriptions of many interesting examples of the practice of sealing water-bearing formations, and should be useful to operators and engineers. On the whole, this state control has resulted in material benefit to the California oil industry. It emphasizes the important results that accrue from organized, intelligent direction.

In the current number we are publishing, on page 11, an article by Seth S. Langley, which gives in detail an insight into the practical details of this all-important problem.

Progress in Milling

IN THE Milling Number of the *Journal*, published on June 28, the last paragraph of the editorial, "Progress in Milling," is to be taken as referring solely to the Minerals Separation "means" of introducing air. The mining industry still has the possibility of the "bubble-column" process, commonly called the pneumatic-cell process, with an economical use of oil. The recent decision of the U. S. Supreme Court clearly indicates the intention of that court to hold the patentees strictly to the "means" disclosed in their patent, No. 835,120.

Some Prominent British Engineers



ALFRED JAMES

Distinguished metallurgist of international reputation, who has been particularly identified with the development of the cyanide process.



THOMAS KIRKE ROSE

Assayer of the British Mint. Author of "The Metallurgy of Gold," and a distinguished authority on that subject.



HUGH F. MARRIOTT

A mining engineer who has been prominent in the operation of gold-mining interests in the Transvaal.



F. W. HARBORD

A metallurgist closely associated with the British iron and steel industry, and of wide experience and high attainments in general consulting practice.

Developments in Lake Superior Milling

Copper Ore-Dressing and Leaching Practice—Two Types of Ore Necessitate Different Methods, Of Which the More Complicated Includes Stamping, Regrinding, Tabling, Leaching Of Sands by Ammonia Solutions and Flotation of Slimes

By C. H. BENEDICT

Metallurgist, Calumet & Hecla Mining Co., Calumet, Mich.

AS IS WELL KNOWN, two principal types of copper ore are mined in the Lake Superior region, both of which contain native copper, but which differ materially, not only in the physical character of the gangue but also in the physical character of the contained copper. The conglomeratic ore is a hard, close-grained rhyolite, characteristically composed of pebbles, and in which the copper forms the cementing material in the interstices between the pebbles. In the amygdaloidal ore, on the other hand, the copper occurs in more massive form than in the conglomerate and the rock is much softer.

of the nature of the ore and the general simplicity of the metallurgical treatment, it is not always economical to carry that recovery to its highest point, as the additional value is not warranted by the increased cost incurred. The richest ore now milled in the Lake Superior region comes from the Champion mine of the Copper Range Co., which throughout 1918 gave a recovery of 36.6 lb. copper per ton of ore milled, with a tailing loss of probably six to seven pounds per ton. The lowest-grade ore profitably milled in the district during the same year was from the Kearsarge lode of the Osceola Consolidated Mining Co., which yielded only



FIG. 1. AHMEEK STAMP MILL, HUBBELL, MICH.

Numerous amygdaloidal lodes are being worked, and each lode differs to some extent from all the others, both in physical characteristics and in rock constituents, and more particularly as regards the richness of the ore and the size and distribution of the copper particles. The only conglomerate ore mined at present is from the Calumet & Hecla mine, and, inasmuch as the lode is rich and the copper is in a fine state of subdivision, metallurgical development has been more pronounced in the treatment of this "rock" than in the case of any other "rock" in the district.

The question of the best metallurgical treatment of the amygdaloidal ore is most often a compromise between the possible metallurgical recovery and of the economics of that recovery. That is to say, though it is possible to get a high metallurgical recovery, because

12.62 lb. per ton, with a tailing loss of less than four pounds.

It is obvious that it is possible to carry the metallurgical treatment of ore further when one is treating material assaying 40 lb. copper per ton than would be possible with corresponding material assaying but 16 lb. copper per ton. If one is inclined to criticize the lack of fine grinding or some other relatively crude method prevailing in some mills, one must take into account the fact that the value of the fine copper may not be present in sufficient amount to warrant a better process. The amygdaloidal ore mined by the Isle Royale Mining Co., for example, contains a large percentage of heavy copper, so that it is possible to make a recovery of more than 80 per cent by stamping it in a steam stamp and screening it to a maximum size of $\frac{3}{16}$ in. without the

necessity of finer grinding of the $\frac{3}{16}$ -in. material. On the amygdaloidal ore of the Kearsarge lode, and also on that of the Pewabic lode, the metallurgical recovery is not nearly as good for the same degree of crushing. To get satisfactory results it is necessary to resort to regrading of the coarser tailings.

COPPER IS COARSER IN AMYGDALOIDAL LODES

In all of the amygdaloidal lodes the copper is in a coarser state of subdivision than in the Calumet conglomerate. Thus, to release the mineral values, it is necessary in the case of the Calumet conglomerate to grind to a finer size than for the amygdaloidal ore. The big problem for the metallurgist is not so much to devise a method of saving the copper when liberated as it is to decide to just what extent he is justified in going into the matter of saving. His judgment in this respect must be based on many factors, some of which are within his control and some of which are not. The equipment that would have been justified at 26c. copper would not be economical at 15c. copper,

efforts have been made in this direction, but until some one can devise a plan whereby the large masses of copper can be automatically removed from the heads at the same time, there will be no saving of labor in having the automatic feeder, because it is essential to have an attendant present at the feed shoot to remove the large masses of copper. If they get into the mortar they may cause serious damage, such as the breaking of the shoe, stamp stem or piston rod, and if they do not do this they will accumulate in the mortar to such an extent as to make necessary the removal of the grates and the shoveling out of the mortar contents. This refers to masses of copper eight or ten inches in size.

Provision has been made for the removal from the mortar of masses up to three or four inches in size by means of two devices patented in about 1900 independently by F. E. Woodbury, now deceased, and by Charles and Henry Krause. The devices are known as mortar discharges and have for their object the removal of coarse copper from the mortar, for which purpose they are most effective.

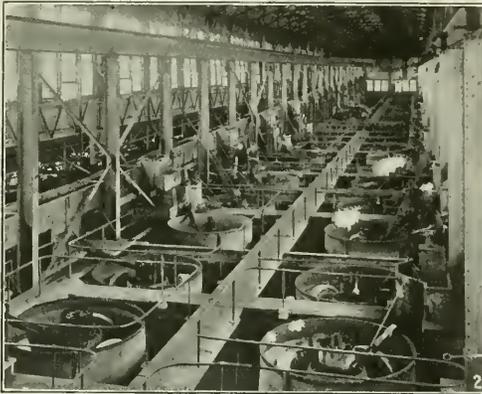


FIG. 2. OLD REGRINDING PLANT OF THE CALUMET & HECLA MINING CO.



FIG. 3. PRESENT REGRINDING PLANT OF THE CALUMET & HECLA MINING CO.

and, in the same way, an equipment that would be justified for a given price of copper for a given quality of ore might, in turn, not be justified in case the ore became two or three pounds leaner. That is the reason for a statement made earlier in this article that the complexity of treatment and the choice of the flow sheet are, to a great extent, a question of the value of the copper per unit of ore.

One feature that must be clearly understood in any review of the metallurgy of Lake Superior is the influence of the presence of coarse metallic copper, because of the fact that it is metallic and therefore not subject to subdivision at the will of the operator. As is well known, one may have masses of metallic copper underground of almost any size up to hundreds of tons' weight, but as the ore comes to the mill the largest masses of copper have been cut up and one must reckon with pieces that might be contained in rock of the maximum size of, say, 12 by 12 by 14 in. in dimensions. It is because of the possible presence of masses of copper of this size that the automatic feeding of stamps has not been practiced in the Lake Superior region.

It would be easy to devise a feeder for a stamp that would maintain the proper load in the mortar, and many

The Krause discharge is a plain hydraulic discharge opening into the mortar through the staves at a point about five inches below the level of the bottom of the mortar grate. The Woodbury device also operates through the staves, but at the level of the bottom of the mortar grate, and is in the nature of a jig with a pulsating current, as opposed to the constant hydraulic pressure used in the Krause discharge. These two devices are effective in removing from the mortar such copper as may be within their range, which is roughly from $\frac{1}{2}$ up to 4 in. in size, and any copper coarser than this should be removed by the stamp attendant, or "head feeder," as he is locally known. It is the presence of these large masses of copper that makes it impracticable to use a gyratory crusher or even coarse rolls for the preliminary crusher, and the steam stamp has been unique and unchallenged for this purpose.

It is not only on account of the size of the copper that the steam stamp is so efficient, but also, strange to say, because of the shape of the copper. This is really worth consideration, as those who operate mills in the Lake Superior region find a great deal of confusion of ideas on the part of the sulphide-ore operators in respect to the last-named feature.

Before the days of flotation the most common criticism heard of Lake Superior practice was the opinion that the steam stamp caused too much abrasion and consequent loss of copper. To anyone who has tried to abrade copper, and then at the same time attempted to crush amygdaloidal rock, the fact would quickly be forced home that the rock will slime while the copper still remains in its original form. Further than this, it is really necessary that the copper be somewhat "punished" before it is given jig or table treatment. A great part of the copper is in such shape that the surface is out of all proportion to the mass, and by the action of the stamp it is either hammered into a more compact body or is subdivided into a number of pieces each more compact than the original. This matter of the shape of the copper particles becomes much more important in the finer states of subdivision, where forces other than gravity have free play.

In the early days the inefficiency of the metallurgical process was recognized just as keenly as it is at present, but there was no form of fine grinder that was sufficiently cheap in operation to warrant its installation on these relatively low-grade ores; more particularly because, even with the release of the copper particles from the ore, their recovery was problematical.

USE OF ROLLS NOT SUCCESSFUL

The use of rolls for fine grinding was not a success and could not have been a success, because they simply cracked the particles of rock and released the copper in its original shape, which ordinarily is so pronged and irregular that it could not be saved on a vanner or on a Wilfley table. The same general effect occurs with the Huntington mill, the crushing action of which is similar to that of a roll. The effect of the shape of the copper was definitely recognized by the early operators, who attempted to use grinding devices that would put the flat copper particles into more of a pellet form. For this reason the old Herberle grinder found great favor in the Calumet & Hecla mills before the days of the Wilfley table, because its action was such that the copper was rolled up into a globular or pellet form which was easily saved by a jig.

At present a crushing device is being developed which it is confidently believed in some quarters will accomplish the same result. The device is known as the Lovett grinder. It is a horizontal disk grinder, one of the disks having an oscillating and the other a circular motion, so that the grains of rock are torn apart and the copper is rolled up into a more compact form than it originally had in the ore.

It was not, however, until the introduction of the Chilean mill, taken in conjunction with the Wilfley table, that it was possible in the Lake Superior region to obtain an economical recovery of copper from particles finer than $\frac{3}{16}$ in. The Chilean mill had not met with great favor in Western practice, because of its sliming proclivities, which made it, on the other hand, acceptable to native-copper metallurgy. The copper freed by the Chilean mill was in the shape of flat grains and was in excellent condition for a good recovery by the Wilfley table. Up to the time of the introduction of the pebble mill, the Chilean mill was the only type of fine grinder used generally in the Lake Superior region, and it found a place in the stamp mills, not only of the Calumet & Hecla Mining Co. but also of the Copper Range, the Mohawk, and the Lake Milling Co.

With the introduction of the Hardinge grinder, which

fortunately occurred at about the same time that cheap power became available, owing to the adaptation of the low-pressure turbine to the utilization of the exhaust steam from the stamps, fine grinding may be said to have secured an established place in the metallurgy of the Lake Superior district. Each important plant now has one or more mills in operation, and each operator has attempted to find the economical point to which this fine grinding can be carried on his particular ore under the varying conditions of the copper market.

In the Isle Royale plant, which has a capacity of about 2,000 tons of ore per 24 hours, one mill is in operation, regrinding middlings from the jigs and tables; and this seems to be about the proper practice for the ore, as it contains a large percentage of the copper in coarse particles. In most of the mills treating amygdaloidal ore, however, the practice is to have at least one pebble mill for each stamp unit of 700 tons' daily capacity. This might be termed standard practice for medium-grade amygdaloidal ores.

The Champion and the Baltic mills of the Copper Range Co. stamp the highest-grade amygdaloidal ores in the Lake Superior district, and in both there are a sufficient number of ball mills in use to regrind all jig tailings. The Quincy plant has two Hardinge ball mills in operation and is now installing five Marcy ball mills for the regrinding of its jig tailings.

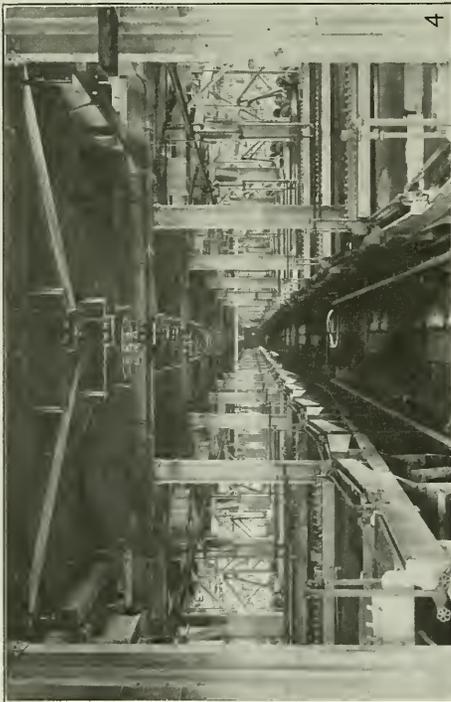
On the conglomerate ore of the Calumet & Hecla Mining Co. there are sufficient pebble mills in operation to regrind all jig and table tailings so that the product passes a 28-mesh screen and about 40 per cent passes 200 mesh. In all of the plants the product of the ball and pebble mills, with little preliminary classification, is treated on Wilfley tables, and a recovery of from 35 to 60 per cent of the copper is effected. The resultant tailings in all mills except those treating conglomerate ore is sufficiently low in copper to throw away. Only in the mills of the Calumet & Hecla does further metallurgical treatment follow the tables.

CALUMET & HECLA CONGLOMERATE ORE CONTAINS FINELY DIVIDED COPPER

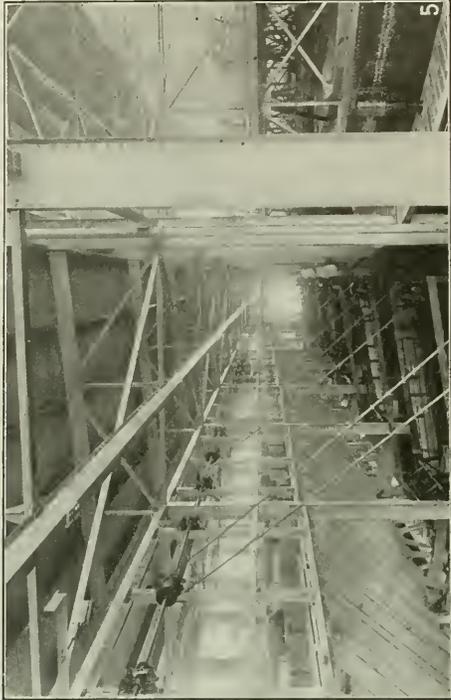
The conglomerate ore of the Calumet & Hecla Mining Co. is in a class by itself, because of the fact that, as stated earlier in this paper, the copper is in a fine state of subdivision and also because the ore is richer than any of the amygdaloidal ores except the product of the Champion and the Baltic. The pebble mill regrinding followed by table treatment still left copper amounting to seven or eight pounds per ton, and it was realized that the limits in mechanical separation had been reached.

Efforts had been directed for many years to find a leaching method that would recover the copper commercially, and finally, in 1912, a process was invented by the author¹ which solved the problem. The leaching plant has now been in operation three years, and has been an entire success. For 1918 there was recovered 8,035,156 lb. refined copper from the treatment of 1,005,015 tons of sand, at a cost, excluding smelting and selling, of 7.71c. per lb. This showed a copper recovery of about 75 per cent on the material treated by leaching, and brought the recovery on the original ore up to better than 90 per cent. The cost of the leaching operation is about 40c. per ton under normal conditions, which would necessitate a grade of ore assaying at least six pounds per ton before one could hope to make the

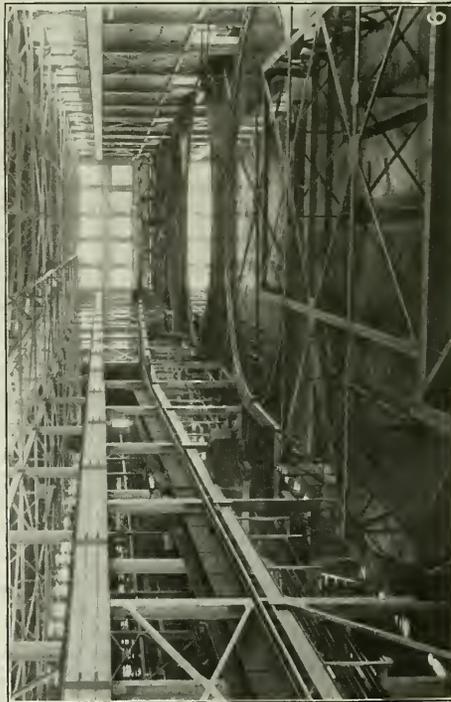
¹Eng. and Min. Journ., July 14, 1917.



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FIG. 4. WILFLEY TABLES FOR FIRST TREATMENT OF REGRIND. FIG. 5. SEPARATION OF SLIME FROM LEACHING SAND BY DOHR CLASSIFIERS. FIG. 6. LEACHING PLANT, SHOWING TANKS AND DISTRIBUTING LAUNDER. FIG. 7. SAND DISTRIBUTOR AND REMOVABLE LAUNDER

process commercially available, and, as most of the amygdaloidal ores of the district yield a tailing just under this, there does not seem to be much hope for the extension of the ammonia leaching process to such ores, although it is perfectly adaptable to them and will effect a good metallurgical recovery.

FLOTATION IN TREATMENT OF COPPER ORES

The latest development in the treatment of Lake Superior ores is the adoption of the flotation process. The leaching process has been worked out only for the treatment of the sands, and flotation is so efficient for the treatment of slimes that it is not conceivable that the leaching process could compete with it, even were the many mechanical problems worked out that would arise in an effort to adapt ammonia leaching to slimes. None of the amygdaloidal mines has installed the flota-

recovery of about 65 per cent on the material treated, so that the final mill recovery is fairly satisfactory.

It is on the conglomeratic ore of the Calumet & Hecla Mining Co. that the only flotation plant of any size is in operation. Up to the time of the introduction of flotation, slime practice had consisted of treatment of the pulp on round tables and of the concentrate produced by these on Wilfleys. This round-table Wilfley practice has now been discontinued, and the slimes, as they leave the Woodbury classifier following the stamp, are subjected to the action of a two-spigot hydraulic classifier, and the resultant spigot products are treated on Wilfley tables. The overflow of this classifier goes to a 25-ft. diameter three-tray Dorr thickener, and the product of this thickener is treated in flotation machines of the Minerals Separation type. For each conglomeratic-ore stamp unit of 350 tons' daily capacity there is one



FIG. 8. FLOTATION PLANT OF CALUMET & HECLA

tion process as part of the mill practice, although the Winona mill had made a beginning toward this end at the time it was closed down following the signing of the armistice.

Both the Copper Range and the Quincy are doing some experimenting with flotation, but neither company has even an experimental unit in operation. At the White Pine mill, where the ore is neither conglomeratic nor amygdaloidal, but consists of sandstone and slate, flotation is part of the regular practice, and all the tailings are subjected thereto. In this mill, the flotation is applied to the ore following the table treatment and as a final process. The ore consists of copper in a fine state of subdivision in sandstone, and in an almost microscopic state of subdivision in slate, so that the mill recovery, previous to the introduction of flotation, did not exceed 60 per cent. Flotation processes effect a

25-ft. thickener, and the thickened product from four thickeners, amounting to about 400 tons daily, is treated on a 24-in. Minerals Separation machine of 600 tons' nominal capacity. Of the sixteen cells of this M. S. machine, two are used for mixing only, and two for cleaning up the concentrates of the other twelve.

The concentrates go to a Dorr thickener, and from this to an Oliver filter, from which the material is scraped into the concentrate cars for treatment at the smeltery. The plant has been working for just about a year and indicates a recovery of about 65 per cent of the contained copper and at a cost of possibly 20c. per ton, including royalty. In addition to this plant of 2,000 tons' daily capacity on the Calumet & Hecla conglomerate, a second plant of like capacity is being built, which is to treat the slimes resulting from the regrinding operations, both of the current tailings and of the tail-

ings from the lake. This plant will consist of eight Dorr thickeners, 40 ft. in diameter, three-tray, and for the treatment of the thickened product will have four M. S. type machines of 600 tons' nominal capacity each. The plant should be in operation some time during the summer and will give a total flotation capacity of 4,000 tons. The capacity of the leaching plant is also 4,000 tons, so that the combined re-treatment plants will be able to handle the normal production of 5,000 tons daily of ore from the mine and 3,000 tons from the accumulated tailings.

With the successful working out of the leaching and flotation processes on native copper ores, the operator in the Lake Superior copper region has at his command all necessary means for good metallurgical recovery. Milling costs are low, and can be lowered by cheaper power resulting from a more general installation of low-pressure turbines, which have been found universally satisfactory. Grinding costs may be still further reduced by improvements in machines or methods. Neither jig nor table practice has been improved for some years, the re-treatment of the tailings from these machines making them of lesser importance than formerly. It is to the economics of the problem that the mill man must give greatest attention.

Report of Chile Copper Co.

Reserves, Production, Equipment, Improvements, New Construction—Twelve Shovels Are Now Operating—Leaching Recoveries High

THE third annual report of the Chile Copper Co., for the year ended Dec. 31, 1918, shows that 3,745,248 dry tons of ore was treated, averaging 1.64 per cent copper, the recovery from which averaged 82.17 per cent, or 51,068 tons of copper produced, compared with 2,905,156 tons treated in 1917, averaging 1.76 per cent, with recovery of 81.81 per cent, or 44,185 tons of copper produced. The positive and probable ore reserves as of Dec. 31, 1918, are estimated as follows: Oxidized ore, 336,510,349 tons, of 1.91 per cent copper; mixed ore, 151,000,000 tons, 2.98 per cent copper; sulphide ore, 210,000,000 tons, 1.84 per cent copper; total, 697,510,349 tons, 2.12 per cent copper.

In 1918, there was produced 102,136,658 lb. of copper, of which there was sold and delivered 84,695,299 lb., at an average price of 24.713c. per lb. of copper. The total cost of production was 17.885c. per lb. of copper sold, distributed as follows: Cost of production, including depreciation, selling, delivery, New York expenses, taxes, and less miscellaneous income, was 15.318c. per lb. Cost of plant and equipment installed in prior years and abandoned or superseded by other structures or machinery has been charged against the year's income, equivalent to additional cost of 0.049c. per lb. Depletion of mineral deposits has been charged against income at a cost of 2.518c. per lb.

OPERATIONS AT THE MINES

Ten hectares of ground situated along the northern border of the district were acquired for use as a dump site and railroad right of way. Only five prospect holes were drilled, with total footage of 642 ft. There was loaded, to be sent to the reduction plant, 3,401,627 metric tons of 1.71 per cent copper. A total of 557,800 cu.yd. of waste was removed from all benches, averaging 0.37 per cent copper. Underground development

was advanced 34,721 ft. Since the beginning of the underground blasting tunnel development a total of 70,950 ft. of tunnels has been driven, of which 23,739 has already been blasted.

During the year, 1,458 holes were drilled, with a total footage of 53,268 ft. Since operations began, 3,812 holes have been drilled, with a total footage of 145,398 ft. The ground broken was 4,140,318 cu.yd. No ore has been taken from the dumps. The tonnage remaining in the several piles is 207,267 tons, averaging 3.85 per cent copper.

Twelve shovels are in operation, two of which are standard 103-C Bucyrus electric machines. These electric shovels are giving excellent service, their operation being in every way more economical than steam shovels. One Baldwin, seven Porter and thirteen Panama locomotives are in service attending shovels. Two more 103-C electric shovels have been erected and will go into service when main hoisting motors are received. One 225-B electric shovel is under erection and will be put into service within ninety days (report dated Feb. 5). Two 1,050 ft. motor-driven compressors were installed.

In the secondary crushing plant, the operation of rolls was discontinued early in 1918. The third section went into service on Mar. 21, and on July 2 a complete installation of eighteen fine reduction Symons disks were in operation. The feature of the completed disk installation was the gradual cutting down of the oversize on .371-in. screen. During the first quarter this oversize was about 50 per cent, whereas for the last quarter it averaged 18.5 per cent.

In the leaching division, the important feature was the increased extraction. An average of 87.9 per cent was reached, as against 82.2 per cent for 1917, owing principally to the finer grinding of the ore. The maximum was reached during November, when an average of 91 per cent was obtained.

The new de-chloridizing plant should be in operation before the middle of 1919, with greatly improved equipment. The feature here was the development of a cylindrical copper drum for precipitating cement copper, in place of the trommel.

The following were among the important additions to the plant equipment completed during the year: Symons crusher house, first west extension; solution sump; foundry and oxygen generation plant. The following features are well under way and should be completed early in 1919: sewage system and disposal plant; machine shops; Toconce pipe line, and eleven-bay extension to electrolytic tank house. Progress in all construction work is still seriously retarded, owing to difficulties in obtaining material on account of embargoes on exporting from the United States, as well as shortage of shipping facilities.

The average rate of exchange between Chilean currency and United States currency was 3.37 for 1918, as against 3.90 in 1917. This low exchange had the effect of increasing the payroll for native labor by \$800,000 United States currency over what it would have been at the previous year's exchange.

The Record of Tax Receipts of the Ontario Government for the year ended Oct. 31, gives the total amount paid by mining companies as \$863,547. The principal items are: Hollinger Consolidated, \$70,473; International Nickel, \$600,000; Nipissing, \$64,927; Mond Nickel, \$45,769; Kerr Lake, \$34,460; McIntyre-Porcupine, \$3,937; Miller Lake-Obrien, \$8,781.

Sealing Water in California Oil Fields

Productivity of Oil Formations Is Sometimes Seriously Affected by Water Penetration—Improved Methods of Sealing Water-Bearing Formations Have Been Devised

By SETH S. LANGLEY

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IN CALIFORNIA, all drilling operations are under the supervision of the California State Mining Bureau, which maintains an office in each of the principal fields. A definite procedure under supervision of the bureau is followed from the time of location of the well, while it is being drilled, and through its productive life to final abandonment. The purpose of this is to provide proper protection of the underground oil and gas resources. Each major operation is inspected, and either accepted or rejected, by a deputy inspector, and there has grown up a cordial cooperation between the bureau and the operators. The California State Mining Bureau should be congratulated for its personnel and for the results that have been obtained.

Before describing the various methods of sealing water, or water shut-off, as it is more generally designated, it is necessary to present some figures to show the necessity of successful water control in the California oil fields. I am indebted to the California State Mining Bureau for some of the statistics given in Table I.

TABLE I. TOTAL OIL AND WATER PRODUCED BY ALL WELLS DURING FISCAL YEAR, JULY 1, 1917, TO JULY 1, 1918

Field	Oil, Bbl.	Water, Bbl.	Water, per Cent.
Coyote Hills.....	11,743,952	894,534	7.1
Olinda.....	2,909,421	432,899	12.9
Brea Canyon.....	1,615,240	661,779	29.0
Puente.....	19,415	1,838	8.6
Whittier.....	1,102,453	1,013,680	48.0
Montebello.....	3,263,389	214,283	6.1
Salt Lake.....	1,134,797	764,975	40.2
Newhall.....	119,289	132,656	52.7
Total and average.....	21,907,956	4,116,644	15.8

TABLE II. AVERAGE DAILY PRODUCTION

A—Average Daily Production of Fields in Ventura County.

Field	Oil, Bbl.	Water, Bbl.	Water, Per Cent.
Piru.....	378.5	629.8	62.5
Simi.....	202.0	26.8	12.1
Bardisale.....	3,597.6	123.5	7.2
Sespe.....	112.6	19.7	9.4
Santa Paula.....	94.8	44.8	33.4
South Mountain.....	591.0	0.3	0.05
Ojai.....	210.4	408.1	66.0
Ventura.....	161.8	527.6	76.7
Total and average.....	3,348.7	1,782.6	34.5

B—Average Daily Production in Santa Barbara, San Luis Obispo, Monterey, and Santa Clara Counties

Field	Oil, Bbl.	Water, Bbl.	Water, Per Cent.
Santa Maria.....	8,765	4,089	31.8
Cat Canyon.....	2,604	161	5.8
Casmalia.....	6,182	1,786	22.4
Lompoc.....	1,273	1,304	50.6
Los Alamos.....	202	20	9.0
Arroyo Grande.....	57	4	6.6
Sargent.....	.....	.....	.....
Summerland.....	.....	.....	.....
Total and average.....	19,083	7,364	28.0

C—Average Daily Production in Fresno, Kings and Other Counties.

Field	Oil, Bbl.	Water, Bbl.	Water, Per Cent.
.....	45,044	10,197	18.4

D—Average Daily Production per Well in Kern County.

Field	Oil, Bbl.	Water, Bbl.	Water, Per Cent.
Midway.....	51.9	10.9	17.3
Sunset.....	61	21.5	26.0

The following figures in Table III, for Sections 4 and 5, Township 11 N., R. 23 W., S. B. B. M., and

Section 32, Township 12 N., R. 23 W., S. B. B. M. illustrate the complex problems to be met in the Sunset field:

TABLE III. WATER AND OIL PROPORTIONS IN SUNSET FIELD

Well No.	Zone	Oil, Bbl.	Water, Bbl.	Water, per Cent.
1	A	60,461	1,349	2.18
2	A	1,040	2,145	67.3
3	A	100,568	7,521	6.9
4	A	100,485	1,521	1.49
5	A	270,634	400,000	59.3
6	A	501,214	60,357	10.7
1	B	856,322	66,685	7.2
2	B	144,893	143,632	4.9
3	B	112,839	13,456	10.7
1	C	87,308	48,395	38.8
2	C	5,037	80,527	94.1
3	C	795,039	139,802	14.9
4	C	6,527	54,634	89.2
5	C	500	25,000	99.6
6	C	121,166	880	0.63
7	C	264,556	1,161	0.43
8	C	452,669	.....	.....

Zone A, the uppermost oil horizon, is about 100 ft. in thickness, and has a water zone 50 ft. above it. The top of Zone A is about 2,600 ft. from the surface. Zone B, the top of which is approximately 100 ft. below the bottom of Zone A, has a thickness of 200 ft. There is a water zone between Zone A and Zone B. The top of Zone C, which is 400 ft. thick, is 100 ft. below the bottom of Zone B. There is a water zone with two water sands between zones B and C. The total production to Feb. 1, 1918, of oil and water from the three zones is shown in Table IV.

TABLE IV. TOTAL PRODUCTION TO FEB. 1, 1918, IN SUNSET FIELD

No. of Wells	Zone	Oil, Bbl.	Water, Bbl.	Water, Per Cent.
25	A	1,433,173	496,417	20.5
9	B	1,226,856	224,002	11.3
26	C	2,175,530	211,995	38.0

Per cent water means the percentage of water in the fluid, fluid being the mixture of water and oil.

It would be expected that the failures to exclude water would be greatest at the greatest depth. This is found to be true, but Zone B has a greater percentage of success than Zone A, which lies above it. The explanation of this is that there is a more favorable structural condition between the water sand and Zone B than above zones A and C.

It is readily seen from the conditions outlined that one of the most serious problems in California operations is the control of underground water. The operators have been fortunate in that the men who have been called upon to solve these problems have been drawn from all the fields of the world. Broad experience and the breadth of vision to meet new conditions with new methods or adaptations of old methods have solved many trying situations, and the outlook for future progress is encouraging. The technology of all branches of the oil industry is advancing, and none more rapidly than that appertaining to underground operations.

Four types of water must be excluded: top, intermediate, bottom, and edge. Top water is water

originating above the first oil horizon. Intermediate water is water originating between oil sands. Bottom water is water originating below the lowest oil sand from which the well is producing. Edge water is water in an oil sand following the oil, and may appear in one oil horizon while other oil horizons are still productive. Should water appear in the second oil horizon while the first and third are productive, it would be an edge water in its own sand, but an intermediate with respect to the first and third.

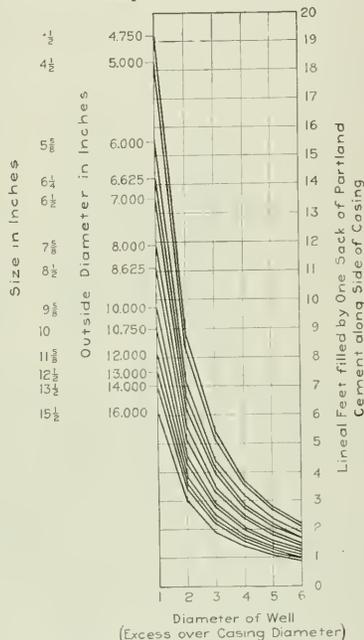


FIG. 1. GRAPH FOR THE DETERMINATION OF NEAT CEMENT FOR DIFFERENT CASINGS

The migration or movement of water from one formation to another is prevented by one or all of the following methods: formation shut-off, cementing, or the use of mud-laden fluid.

FORMATION SHUT-OFF

A formation shut-off is attempted when the casing is tightly driven into, or landed, in shale or clay, without the use of a packer or cement. The success of this method depends upon the selection of a shale or clay stratum as a landing for the casing. Shale or clay offers the greatest probability of being impervious to water. If possible, correlative data should be gathered to show the location and probable thickness of the best landing stratum. If this is not possible, the drilling should be closely followed and the casing landed too high rather than at such depth as to involve a chance of encountering a productive sand before having shut off the water. It is always possible to go back and ream the hole to size if a lower landing stratum is found.

When the place selected has been reached, the operation consists in drilling a smaller hole, 10 to 20 ft. in advance, and driving the casing into it. It is not good practice to raise the string of casing 20 ft. or

more and let it drop free, to sink by its momentum into the formation. This is too severe a shock for any casing. The driving should be done with driving clamps, and an experienced driller knows when to stop driving.

A plain or tapered casing shoe is used, the length depending on the thickness of the landing stratum. A tempered steel tapered shoe is best, as it will set more firmly and withstand corrosion longer. When the casing has been landed, the hole is deepened 5 to 10 ft. ahead of the casing shoe, and bailed for testing the effectiveness of the shut-off. Care should be taken not to bail below the collapsing point of the casing. It is best to allow a safety factor of two in determining the resistance of the casing to collapsing pressure. The water level is known from the level to which the water rose in the casing while drilling.

If the bailing test shows no water coming in, the Mining Bureau is notified to send an inspector to witness a second bailing test, which is made at least twelve hours after previous bailing. If the test is satisfactory, the shut-off is approved; if not, the operator and the Mining Bureau agree upon a plan of operation to remedy the failure. If the total depth of the hole is not too great to allow bailing to bottom, the most satisfactory test can be made by bailing dry. The collapsing strength of casings is shown in Table V.

TABLE V. COLLAPSING PRESSURES OF CASING

Size, In.	Weight per Ft., Lb.	Inside Diameter, In.	Collapsing Pressure per Square Inch, Lb.	Equivalent Water Column, Ft.	Water Column With Safety Factor of 2, Ft.
4½	16	4.082	4,710	10,850	5,425
4¾	12.85	4.506	2,900	6,680	3,340
4⅝	15	4.424	3,610	8,320	4,160
6¼	20	6.049	2,380	5,480	2,740
6⅜	24	5.921	3,220	7,420	3,710
6½	26	5.855	3,650	8,410	4,205
6¾	28	5.791	4,070	9,380	4,690
6⅞	28	8.017	1,670	3,850	1,925
7	32	7.921	2,150	4,950	2,475
7½	36	7.825	2,630	6,060	3,030
8	40	10.054	1,420	3,270	1,635
10	45	9.360	1,800	4,150	2,075
12½	40	12.438	500	1,150	575
12¾	45	12.360	750	1,730	865
15½	70	15.198	790	1,820	910

CEMENT SHUT-OFF

A cement shut-off is the operation of sealing between the formation and the casing shoe by the use of hydraulic cement. There are two methods of cementing, with many variations of each.

Dump-Bailer Method—The same operations are followed in the dump-bailer method of cementing as in the formation shut-off up to the time of cementing. The shale or clay landing stratum is chosen, and a small hole drilled ahead 10 to 20 ft. When ready to cement, the bottom of the hole is bailed clean of cuttings, and the casing is raised about 18 in. off the bottom of the full-sized hole. Enough cement must be used to fill the small hole and to flow up back of the casing 20 ft. or more. A sack of cement is figured as 1 cu.ft., and, when mixed with water to the consistency of gruel, will be increased to 1½ cu.ft. A graphic illustration of the amount of neat cement required to fill the space back of the different sizes of casings is shown in Fig. 1. The usual amount of cement in practice varies from 8 to 75 sacks, and the amount necessary can be determined only by the size of the casing, the condition of the hole, and the depth of the small hole.

The cement is dumped into a shallow rectangular tank in such quantities as to fill the bailer to be used. The bailer may be either cast iron or glass bottom, with a moving plug below, which breaks the bottom

when landing, or it may be a trip-valve bottom, to drop its load, rather than to pick up a load as the usual bailer does. The glass or cast-iron bottom bailer can be used only when cementing on a plug or bridge, or original bottom with no small hole drilled ahead. When ready to cement, the bailer is lowered into the casing with its top just below the top of the casing.

The tank for mixing cement is set close to the top of the casing, with the back end raised and a pipe leading over the casing to discharge into the bailer. The cement is mixed with water, no sand or rock being used, and when thoroughly mixed it is emptied into the bailer. The bailer is lowered to the bottom of the hole and its load dumped. If more than one bailer load is used, the procedure, as outlined above, is repeated until the entire charge is dumped. The casing is now lowered to the bottom and driven into the formation.

The depth driven will be governed by the good judgment and experience of the driller. Should it be desirable to force the cement along the outside of the casing above its natural level, the casing is raised 20 to 30 ft. off the bottom. It is then filled with water and a plug screwed on the top, and the casing then lowered to position. As the water cannot leave the casing at the top, the cement is forced ahead of the lowered casing and travels up the sides of the hole.

Should a condition be met where the water runs off into some formation, so that the casing cannot be filled, it becomes necessary to use a cement plug, unless the pressure method is substituted for the dump bailer. Several kinds of plugs are suitable for this purpose, and they work on the principle that, when lowered below the bottom of the casing, a portion of the plug expands so that, when the casing is lowered to the bottom, the expanded plug acts as a seal and prevents the cement from entering the casing. These plugs are of cast iron and are easily drilled out when the cement has set.

The hole is allowed to stand idle a week or more, the time generally depending upon whether or not the drilling crew can be kept at work elsewhere while the cement is allowed to set. When ready to test, a hole is drilled ahead of the shoe for 5 or 10 ft., and the same test is made as in the formation shut-off.

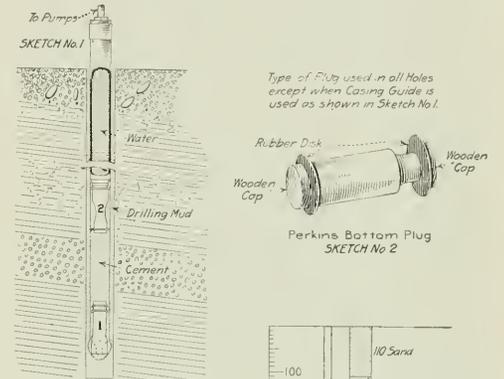
Cementing by Pressure—The pressure methods are known by the names of the inventors, or by the means of placing the cement, and are called the Perkins, the Huber and Wilson, and the Scott and tubing. The Perkins method is that used by the inventor after whom it is named. Equipment is maintained in the principal fields of California, with an operating crew for each unit. The charge is \$250, regardless of the depth of the shut-off or the quantity of cement used.

The equipment consists of two pumps for handling cement and two rectangular mixing tanks, which are built to nest one within the other. One pump will operate up to 300 lb. pressure and the other up to 1,000 lb. The pumps are mounted on a motor truck, behind the driver's seat, and the tanks carried behind the pumps. A small box, to act as a sump, is also furnished. The contractor furnishes two wooden plugs, the equipment described, and the labor of two men, the owner of the well furnishing everything else—cement, steam, water, and all additional labor.

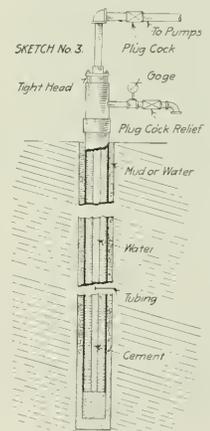
Upon arrival at the well, the steam line from the drilling boilers is connected to the pumps. A hole is dug and the sump box placed with its top level with

the ground. The suction lines of the pumps and the main water-supply line are run to the sump. After the mixing tanks are unloaded from the truck, they are set up to discharge into the sump. Two tanks, each of a capacity of about 500 gal., are filled with water, and are also connected to the sump. The discharge line of the pumps is connected to the casing head by a long swing joint. This is to allow movement of the casing while cementing, in order to keep it free in the hole.

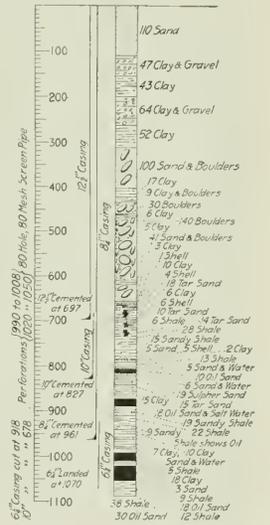
The drillers first secure circulation. By circulation is meant fluid pumped into the casing passes down



Cross Section showing Perkins Plugs, lower Plug at Bottom, upper Plug has begun to force Cement into Hole through Bottom Plug



Tubing Method of Cementing



Graphic Log of Typical Well Elevation of Collar 620' Total Depth 1088'

SKETCHES NOS. 1, 2 AND 3; GRAPHIC LOG OF TYPICAL WELL

inside the casing and returns up between the casing and the wall of the hole to the surface, or passes into some formation before reaching the surface. The casing is then lowered to bottom. A rise of pressure on the pumps will show that the landing is tight and the casing does not leak.

It is necessary now to describe the two plugs which are to be used. One plug precedes the cement down the casing and the other follows the cement; both are

made of redwood. No. 1 plug is put in the casing after circulation has been obtained, and the casing raised 18 in. off the bottom. This plug is 3 ft. long, and at its lower end is $\frac{1}{2}$ in. smaller in diameter than the casing in which it is to be used. This diameter is maintained up the plug 9 or 10 in., at which point it is reduced about 3 in. for the remainder of its length. At the upper end, the plug consists of two wooden disks, which unscrew by means of a wooden screw in their center, which is right-and-left threaded to retain it in the body of the plug. Between the lower wooden disk and the plug a rubber disk, just the diameter of the casing, is placed; the wooden disk is screwed on, and another rubber disk placed above it. The second wooden disk is then screwed on top of the second rubber disk. (See Sketch 1, Plug 1.) Thus the plug has two rubber disks firmly seated, which prevent the cement above them from passing down and the water below from coming up, and which, when the plug reaches bottom, will bend downward, allowing the cement to pass. In the large portion of the bottom of the plug, a hole is bored upward which meets two holes bored diagonally downward, from opposite sides, forming a Y. The upper parts of the Y, or inlets, of these holes enter the plug in the reduced portion, thus making a passage through the bottom of the plug for the cement to pass when the plug reaches the bottom.

The type of bottom plug just described is used when lowering the casing into a rotary hole with an egg-shaped casing guide, as shown in Sketch 1. The plug shown in Sketch 2 is the type of bottom plug used when lowering casing with a plain shoe into a standard hole.

After the plug is in the casing, the casing head is screwed in place and connected to the pumps. By this time the cement has been mixed and is now discharged into the sump as rapidly as the low-pressure pump will pick it up and force it into the casing. The volume of the mixed cement is known and also the lineal feet which it will occupy in the casing to be used. When all the cement has been pumped into the casing, the casing cap is removed and the second wooden plug put in on top of the cement. The casing cap is replaced and again connected to the pump.

A water meter is connected on the main supply line to record the amount of water consumed. As enough water must be pumped into the casing to replace its total contents, an accurate record of the water must be kept. The total volume of the casing less the volume of cement will show the amount of water required to land the first plug at the bottom, and the total volume of the casing will show the amount necessary to land both plugs at the bottom. The two tanks of water are kept full, to be used if the main supply line fails, and, in that case, the water used is computed from the size of the tanks.

The upper wooden plug is 36 in. long, with the lower end about 3 in. less in diameter than the casing. A rubber disk is placed on the lower end and acts as a guide. Above the disk, the plug is reduced in size to a point about 12 in. below the top. In the top is placed a rubber disk, with a wooden disk above it, and, on the top of that, a leather cup disk, such as is used on a deep well pump. This leather cup is placed so as to prevent any water above the plug mixing with the cement below it.

The water is now pumped into the casing as fast as the low-pressure pump will handle it. The meter is

watched, and when the lower plug should reach bottom a rise in pressure should be noted on the pump gage, as the pumps are now forcing the cement and mud up the wall and the weight of the column of water in the casing is not equal to that of the mud and cement outside of the casing. From this point on, the pressure will rise more rapidly, and when the second plug lands on the bottom plug, there should be a sudden rise to 300 or 400 lb. pressure. The rise in pressure is more conclusive evidence that the plugs have come together than the meter readings of water pumped. If the meter fails, as sometimes happens, the pressure gage will show when the plugs have come together. Although the low-pressure pump may finish the work, it is well to use the high-pressure pump and hold the pressure long enough to be sure that the upper plug has actually landed and not temporarily jammed before reaching the bottom. The casing is then lowered to the bottom, a valve in the pump line close to the casing head is closed to keep the pressure on the casing, and the pump line disconnected.

If it be necessary to use 100 sacks of cement, and a third of it is left in the casing, all of the benefit of the shut-off may be lost when drilling out the cement remaining in the pipe. The jar of drilling out 50 to 100 ft. of cement may crack the bond between the casing and the wall of the hole. The cement is given a week or more to set, and the same tests of shut-off are made as in the other methods.

The tubing method, as its name implies, is the use of tubing as a means of placing the cement. It is common practice to use 2- or 3-in. tubing, such as is used in pumping a producing well. It is necessary to provide a tight head in the casing, so that the cement will pass outside the casing. The basic principle of a tight head is that of a stuffing box. In some cases the stuffing-box collar screws into the box without packing, instead of in the usual manner. This method is most successful when working under high pressure.

The tubing method is not applicable if there is a possibility of the casing freezing while lowering tubing and cementing. The most successful operators stand the tubing in the derrick before beginning operations, thus lessening the time required and consequently reducing the chances of the casing becoming tight by caving.

The drillers get circulation before starting the tubing in the hole. The tight head is slipped on the last joint of tubing, and, when the tubing has been lowered to the position it will occupy during cementing, the head is tightened around the tubing. Clear water is pumped in the tubing with the casing on bottom until the gage shows about 50 lb. pressure, thus showing that casing can be landed tight on bottom and has no leaks.

Before cementing, it is necessary to calculate the quantity of water necessary to fill the tubing, and the water-supply tanks should have a capacity sufficient to furnish this amount. The cement is either mixed as in the Perkins method, or in a mechanical mixer, and pumped into the tubing. When all the cement is in, the pumps are connected to the water-supply tanks, and the calculated amount of water is pumped into the tubing. When this has been done, all cement should be back of the casing, except that occupying the space between the lower end of the tubing and the bottom of the hole. The casing is now landed on the bottom, and the operation completed, unless it is desired to

leave very little cement in the casing, in which event the tubing is raised or lowered to the required point, the tight head loosened, and clear water pumped into the casing. This is continued until all cement above the lower end of the tubing has been flushed back to the surface, as will be shown by the water coming out at the collar of the casing.

If it is not possible to seat the casing on the bottom, either because of the presence in the hole of side-tracked casing, lost tools, or collar-bound casing, in which case the cement will return inside the casing, it is necessary to use a cement retainer. The Baker cement retainer is a device well suited to meet this condition. It works upon the principle of a check valve, which can be firmly seated at or near the bottom of the casing after the casing is in the hole, and cement can be pumped down through this check valve, but cannot return.

The Scott method is really a process of mixing, rather than of placing the cement, and can be used with any cement method, but it is principally used by W. F. Scott, of Taft, Cal., the inventor, in placing cement by the tubing method. The mixing equipment consists of a steam-driven cement pump, a steam-driven cement mixer, a small suction tank, and a water tank. All but the suction tank are permanently mounted upon a wagon or motor truck.

The cement mixer consist of a 6½ ft. length of 12½-in. casing, lying horizontally, and acting as a mixing barrel, in which revolves a shaft with radial blades. Above the working barrel, and discharging into it, is the feed hopper. Water is piped into the working barrel at the feed end by two pipes tapped into the plug which forms the end of the working barrel. One of the water inlets is on each side of the stuffing box of the drive shaft.

Upon arrival at the well, the equipment is connected to the steam and water lines. A small platform with steps is moved beside the mixer, and all the cement sacks are untied, being placed within reach of the mix-

ing crew. As a ton (20 sacks) can be mixed in 2½ to 3 min. it is necessary that the cement be handled rapidly. The suction tank is placed on the ground below the discharge of the mixer, with the suction of the cement pump laid to it. The procedure from this point is similar to that described in the tubing method, the principal variation being that a relief valve is connected to the tight head. The purpose of this relief valve is to avoid the necessity of loosing the tight head when pumping clear water into the tubing, either before or after cementing.

The Huber and Wilson method can be used with any

cement shut-off. Its distinguishing feature is the addition of a secret solution which it is claimed produces quick setting of the cement.

Of more than 800 shut-off operations, 89 per cent were successful. The cementing shut-offs do not show as high a percentage of success, but it must be borne in mind that cementing is attempted at greater depths, with correspondingly greater hydrostatic pressures to overcome. This is well illustrated by the data in Table VI, which shows the depths at which the respective methods were used.

The relative success of these methods at different depths with cable and rotary tools is shown to be in favor of the formation shut-off in cable-drilled holes above 2,000 ft., whereas the formation shut-off is not common practice with rotary tools above 2,000 ft. This is shown by Table VII.

TABLE VII. RELATIVE SUCCESS OF FORMATION AND CEMENT SHUT-OFFS

Shut-Off, Depth and Method 100 to 1000 ft.	Success		Total	Percentage Failures	Cable Landing			Rotary Landing		
	Success	Failure			Success	Failure	Per Cent. Failure	Success	Per Cent. Failure	
Formation shut-off.....	57	8	65	12.3	57	8	12.3	40	8	16.7
Cement shut-off.....	154	27	181	14.9	114	19	14.3	40	8	16.7
Totals.....	211	35	246	14.2	171	27	13.6	40	8	16.7
1001 to 2000 ft.										
Formation.....	15	1	16	6.2	14	1	6.7	1	17	18.1
Cement.....	184	39	223	17.5	107	22	17.0	77	17	18.1
Totals.....	199	40	239	17.4	121	23	16.0	78	17	17.9
2001 to 3000 ft.										
Formation.....	22	2	24	8.3	2	..	..	20	2	9.1
Cement.....	179	40	219	18.3	70	8	10.2	109	32	22.7
Totals.....	201	42	243	17.3	72	8	10.0	129	34	20.8
3000 plus ft.										
Formation.....	90	23	113	20.4	67	15	18.3	23	8	25.8
Cement.....	..	..	..	..	..	..	..	..	..	..
Totals.....	90	23	113	20.4	67	15	18.3	23	8	25.8

In the Belridge Field, San Joaquin Valley, Cal., the underground conditions are so complex that one of the operators is combining all of the shut-off methods with fair success. For example, a formation shut-

TABLE VI. TOOLS, LENGTH AND DIAMETER OF CASING AND METHOD OF SHUT-OFF

California, All Districts, All Fields
July 1, 1917, to July 1, 1918

Diameter..... Method R. = Rotary C. = Cable Depths, ft.	15½ in.		12½ in.		11½ in.		11 in.		10 in.		9½ in.		8½ in.		6½ in.		4½ in.		Totals
	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.	
100-1000.....	3c.	4c.	40c.	18f.	..	11f.	..	..	..	16f.	..	5f.	..	11f.	..	3f.	..	1f.	65f.
1001-2000.....	..	1f.	31c.	51c.	..	..	..	..	..	4c.	5c.	1c.	..	7c.	..	..	..	..	16f.
2001-3000.....	10c.	..	..	..	..	..	..	54c.	50c.	1c.	..	25c.	..	2c.	..	..	223c.
3000 plus.....	4f.	1f.	..	..	1f.	..	..	..	..	24f.
Rotary totals.....	3c.	..	..	..	..	..	..	..	..	95c.	16c.	..	..	23c.	48c.	..	12c.	..	219c.
Cable totals.....	..	1f.	81c.	..	..	..	..	..	..	19c.	1c.	..	..	10c.	44c.	2c.	33c.	..	113c.
Totals, rotary and cable.....	..	1f.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	23f.
Totals, rotary and cable.....	..	1f.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	315c.
Totals, rotary and cable.....	..	1f.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	82f.
Totals, rotary and cable.....	..	7c.	..	185c.	..	11f.	17f.	..	..	..	28f.	..	5f.	..	14f.	..	3f.	..	105f.
Totals, rotary and cable.....	..	7c.	..	185c.	..	8c.	16c.	..	..	..	294c.	..	2c.	..	170c.	..	49c.	..	736c.

f. represents formation shut-off; c represents cement shut-off.

off may be made after mudding under pressure, or dump-bailer cement shut-off or pressure cement shut-off after mudding under pressure.

The hole is drilled by rotary to a point below the first tar sand, which is usually at a depth between 600 to 750 ft., 650 ft. being the average. From the surface to 500 or 575 ft. the formation is alternating shale, clay, sand, and boulders. The first indication of approach to the first tar sand is a thin stratum of very hard formation, known locally as shell. This shell is seldom more than 5 ft. in thickness. Following this will be a stratum of clay or shale, seldom more

than 10 ft. thick, with another thin shell stratum immediately below. The tar sand is usually next below the second shell. There are exceptions to this. It may be said that there are exceptions to everything in this field. There may be several shell strata between the depths of 200 ft. and the first tar sand, but a tar sand should be watched for under the first shell passed below a depth of 500 ft. From the first tar sand and to the bottom of the lowest oil horizon the succeeding tar and oil sands are so lenticular that they cannot be correlated further than two or three locations, 800 to 1,200 ft. apart. It is sometimes impossible to correlate from one location to another. The first tar sand can usually be correlated accurately and is the "marker" for cementing the first water string, which is 12½-in. casing. The 12½-in. casing is usually cemented with 160 sacks by the Perkins method.

The rotary is then moved to another location and the cable tools are rigged up, and a week or ten days are allowed for the cement to set. When ready to test the shut-off, the hole is drilled ahead by cable tools, about 5 ft. below the shoe of the casing, and then bailed dry, to stand 12 hours. The usual test is made in the presence of a Mining Bureau inspector.

Because it is impossible to foretell whether or not lower water sands will be encountered between the bottom of the 12½-in. casing and productive oil horizons, a string of 10-in. casing is carried as a possible second water string, and if sands are encountered they are tested for water. These sands may be tar, dry, or oil sands, in the adjoining wells, yet prove water-bearing in the new hole, or they may be dry in the new hole, though wet, tar, or oil in the adjoining wells.

Should water be found while carrying the 10-in. casing, it is landed for a temporary shut-off in the first suitable shale or clay stratum below the water sands. This shut-off may be formation, or the dump-bailer method. The 8½-in. casing is then carried as a prospect string until it is known if the 10-in. casing should be carried lower for a permanent shut-off. When the 10-in. casing is cemented for a permanent shut-off, mud-laden fluid is pumped under pressure into all formations back of the 10-in. casing. If the 10-in. casing becomes a water string, it is between the depths of 780 and 825 ft. It sometimes happens that when drilling ahead to complete with the 8½-in. casing, it also must be cemented for a shut-off and the hole completed with 6½-in. casing, in spite of the fact that the average depth of the wells is between 1,000 and 1,100 ft. An example of this condition is shown in the accompanying graphic log. Attention is called to the fact that the two upper oil sands are shut off, as shown by the depth of cementing with 8½-in. casing. The 10-in. and 6½-in. casing are cut and pulled above the shoe of the next larger casing and adapters placed.

Portable Lamp Guard

The necessary repair work about mine hoist houses and boiler rooms can best be done in daylight and under such conditions as will permit of a full view of the part or parts that require attention. But this is not always possible, and it frequently happens that inaccessibility of parts allows little choice in the matter, and the work must be done in a cramped position and with little light. The latter condition prevails to a great extent in underground mine pump stations and repair shops, but, wherever electric connections are to be had, the

difficulty may be partly overcome by the use of a portable lamp properly provided with a guard. The uses about the mine for such a device are not confined to the above-mentioned instances, for the portable lamp will be found invaluable in shaft work, motor-locomotive repairs, and under many other conditions where it is possible to obtain the necessary current for illumination.

In drifting and crosscutting where electric current is available a flexible cable and tungsten lamp, protected by a lamp guard, are used for illumination.

A successful portable lamp guard, which is quickly attached and fulfills all the requirements of durability and safety, is made by the Flexible Steel Lacing Co., of Chicago. It consists of a split handle attached to an expanded-steel lamp guard. The halves of the guard, including the handle itself, open wide from the hinge at the bottom of the guard and can be instantly closed and locked around the socket at the end of any extension cord.

Fuller's Earth in 1918

U. S. Geological Survey

Fuller's earth, which is used principally in filtering petroleum, was in good demand in 1918, and, in consonance with the increase in production of petroleum, showed a large increase in output, notwithstanding the handicaps of shortage of labor and fuel, and unsatisfactory conditions of transportation. A report on fuller's earth in 1918, by Jefferson Middleton, shows that the output in 1918 was 83,968 short tons, valued at \$1,143,854, or \$13.62 per ton, at the mine. This was an increase of 11,401 tons in quantity and \$371,767 in value, compared with 1917, and was the largest output and the greatest value in the history of the industry. The output in 1918 was twelve times as great and the value twenty-eight times as great as in 1895, the first year in which fuller's earth was commercially produced in the United States. The average price per ton in 1918 was the highest on record and \$2.98 higher than in 1917.

Deposits of fuller's earth are found in many states, but the deposits in only seven states were worked in 1918. Named in the order of output these states were Florida, Texas, Georgia, California, Arkansas, Massachusetts, and Nevada. Of the output in 1918 about 99 per cent came from Florida, Georgia, Arkansas, and Texas. Nevada appeared for the first time as a producer of fuller's earth. A large deposit of earth in Ash Meadows, Nye County, known as "Death Valley Clay," has been used experimentally in refining petroleum and is said to be excellent for this purpose. Florida, which has been the leading state in the production of fuller's earth since the beginning of the industry, reported about four-fifths of the output and value in 1918.

Though the production of fuller's earth increased in 1918, the imports fell off, owing to shortage of bottoms and high ocean freight rates. The quantity imported was 12,607 short tons, valued at the port of shipment at \$165,535, or \$13.13 per ton, a decrease of 4,387 tons in quantity and of \$10,882 in value, compared with 1917.

The apparent consumption of fuller's earth—that is, the production plus the imports—was 96,575 tons in 1918, an increase of 7,014 tons, compared with 1917. The domestic production therefore constituted 87 per cent of the consumption in 1918.

Graphite Mining and Milling in Alabama

Adoption of Oil Flotation Is Responsible for Recent Progress Made in the Graphite Industry, And That Process Will Probably Supersede Other Methods of Concentration

By H. P. H. BRUMELL

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SINCE the appearance of an article¹ on graphite mining in Alabama, by Irving Herr, little has been published regarding conditions in this district, and, in consequence, it may not be as generally well known as its importance warrants. For the last two years there has been considerable local activity, the result being the establishment of what promises to be one of the country's important minor industries.

There are in Alabama large deposits of low-grade disseminated graphite ore that are easily mined. The graphite is of excellent quality and entirely of the crypto-crystalline variety, known in the trade as "flake graphite." Until recently the deposits were considered to be pre-Cambrian, but later investigations have demonstrated that they are of Carboniferous age, though the rocks are highly metamorphosed and consist entirely of quartz schists.

Dr. W. F. Prouty² describes³ the district as follows: "The rock in which the flake graphite beds occur is a mica schist, generally considered of pre-Cambrian age, for the most part highly metamorphosed and much intruded by both acid and basic igneous rocks, which are for the most part in long dikes, nearly parallel with the trend of the graphite orebodies, but in some cases cutting them at slight angles. Some of the pegmatite dikes have excellent commercial mica and kaolin. Bordering this mica schist on the west, for the entire length of the area, occurs a green-colored schist, originally a basic igneous rock and designated by the Alabama Geological Survey as the Hillabee schist. The graphite area is seldom more than three miles distant from this metamorphosed basic igneous mass and locally is in contact with it."

The ore which is now mined consists almost entirely of the weathered portion of the beds, the weathering usually extending down to the water level in the valleys between the hills on which, almost without exception, the deposits are found, the valley bottoms being usually filled with soil washed down with other detrital matter from the higher ground. This weathered ore is soft and in most instances breaks down on quarrying, like sand. The whole is easily milled, the quartz being friable. The gangue consists entirely of a friable quartz with a small quantity of "a white fibrous mineral, probably sillimanite" and occasionally mica, either biotite or muscovite, cyanite, and tourmaline.

FLOTATION METHODS SUCCESSFUL WITH ALABAMA ORES

Until within the last two years, practically all the mills were equipped with "skin-flotation" machines, known locally as the "Ashland washer," a device identical with the Brumell hydraulic separator, used long ago and abandoned at Buckingham, Quebec. One of the mills obtained concentration by means of the Huff

electrostatic machine and one adopted the use of a Minerals Separation oil-flotation machine.

Since 1917, and with the advent of the oil-flotation method of concentration, the industry in Alabama has made excellent progress, and this method seems to have solved the problem of cheap extraction. Many new mills have been erected, and a few of them have operated satisfactorily, the most successful being those wherein flotation methods were employed. The following is a list of the plants in the three counties of Clay, Coosa and Chilton, showing the method used at each:

ALABAMA GRAPHITE PLANTS AND METHOD OF CONCENTRATION.

Plant	Situation	Type of Concentration
Liberty Graphite Co.	Clay County	Callow
Lineville Graphite Co.	Clay County	Ashland
Carbon Mountain Graphite Co.	Clay County	Ashland
Peerless Graphite Co.	Clay County	Remodelling
Jennings Graphite Co.	Clay County	Ashland
Republic Graphite Co.	Clay County	Ashland
Crystalline Flake Graphite Co.	Clay County	Log washer
Clay County Graphite Co.	Clay County	Ashland
Monitor Graphite Co.	Clay County	Callow
Alabama Graphite Co.	Clay County	Ashland
Graphite Mills, Inc.	Clay County	Pneumatic tables
National Graphite Co.	Clay County	Ashland
Southern Graphite Co.	Clay County	Callow
Acme Graphite Co.	Clay County	Log washer
Ashland Graphite Co.	Clay County	Callow
Griesemer Graphite Co.	Clay County	Wet tables
May Brothers Graphite Co.	Clay County	Ashland
Alabama Graphite Co.	Clay County	Callow
Alabama Graphite Co., No. 2	Clay County	Log washer
Axton-Noe Graphite Co.	Clay County	Ashland
American Graphite Co.	Clay County	Minerals Separation
Guemeda Graphite Co.	Clay County	Ashland
Norway Graphite Co.	Clay County	Ashland
Eagle Graphite Co.	Clay County	Log washer
C. B. Allen Graphite Co.	Clay County	Callow
The Ceylon Co.	Clay County	Callow
Atlas Graphite Co.	Clay County	Callow
Superior Flake Graphite Co.	Clay County	Brown
Crucible Flake Graphite Co.	Clay County	Ashland and Minerals Separation.
Hood-Graves Graphite Co.	Clay County	Ashland
Graphite Company of America	Coosa County	Electrostatic
Goodwater Graphite Co.	Coosa County	Ashland
The Ceylon Co.	Coosa County	Minerals Separation
Parkdale Graphite Co.	Coosa County	Simplex
Diamond Graphite Co.	Coosa County	Simplex
Seminole Graphite Co.	Coosa County	Callow
Duro Flake Graphite Co.	Coosa County	Simplex
Flaketown Graphite Co.	Chilton County	Electrostatic

The superiority of the oil-flotation method of concentrating graphite over other methods employed has been demonstrated, and it is probable that all mills in the future will be equipped with one or other of the various types of machines on the market, or by flotation apparatus of home construction. The types so far used in Alabama comprise Minerals Separation, Callow, Simplex, Brown, and Janney, the latter only, up to the present, being used for purposes of re-cleaning. In those cases where the machine treatment is followed by the use of wet tables, either Wilfley or Deister, concentrates that assay from 80 to 88 per cent, with an extraction ranging from 83 to 90, are being produced. With all the types of machines the extraction is in inverse ratio to the size of the graphite particles in the pulp. Thus, the coarser the graphite, the poorer the extraction; and the greater the proportion of saving of the coarser material, the poorer the concentrates. There is opportunity here for expert mill practice, and the most successful operator will be the one who can best adjust the two conditions.

¹Eng. and Min. Journ., Apr. 21, 1917.

²Assistant State Geologist, University, Alabama.

³Birmingham Age-Herald, Jan. 28, 1917.

It is not the intention to criticize or compare the methods of mechanical or pneumatic agitation, but, in a general way, it may be positively stated that the machine which affords the greater time for the settling of the froth will give the highest percent concentrates, whether the froth be made by one or the other method. In the matter of the recovery of the coarse flake, the question of froth settling is a serious one, as any agitation sufficient to lift the heavier graphite will lift considerable gangue, and, if quick delivery is made, poor concentration will be the result.

PRIOR OILING OF PULP SECURES GOOD RESULTS IN BALL MILLING

In general practice, various crushers are used, both jaw and gyratory, and the crushed ore is, in some instances, further reduced by rolls before going to the ball mill, to which it is fed after oiling. The emulsification of the water before the ball-mill treatment tends to save the freed flake, as the revolving and churning action of the mill creates a froth, which carries the graphite through on the surface of the charge, leaving only the coarser particles of ore to be ground. It was feared that the use of ball mills would prove to be so destructive of the flake as to be inoperative, except for the making of fine flake and dust, neither of which is desired by the producer. But experience has proved that with prior oiling of the pulp, and with care in adjustment and operation, excellent results can be obtained.

The ball mills in use in the district comprise Marcy, Hardinge, Lehigh, and Marathon types. Various classifiers, including the Dorr, Atkins, Gemmill, and Deister, are in use. Heretofore little attention has been given to the operation of classification, and the machines were used entirely for the purpose of returning oversize to the ball mills. It is, however, thought that with proper adjustment a large proportion of barren material might be removed and full advantage taken of this important operation. With an ore in which the graphite separates easily, there is no reason why at least 50 per cent of the gangue should not be eliminated.

GRAPHITE TREATMENT FOLLOWING CONCENTRATION

After concentration is effected, the concentrates are dried and sent to the finishing plant, where the usual methods of refining or finishing are followed. At most of the mills some type of air classifier is used, either an aspirator or apparatus of home construction, and two of the mills use high-speed smooth flour-mill rolls, the action of which is to crack the coarser gangue particles, the consequent dust being removed by screens clothed with silk belting cloth. At one of the latter mills the concentrates were improved from 71.8 to 85.7 per cent and in the other from 51.0 to 82.0 per cent carbon.

After treatment, as above, the finished concentrate goes direct to the buhr mills, where it gets a final grinding and polishing and is then graded for the market, Alabama stocks being known as No. 1, No. 2, No. 1 dust, and No. 2 dust. It has not been found possible to obtain sufficient representative assays from which to make an average, but it may be stated, in a general way, that the average of No. 1 would be about 88.0 per cent carbon, and of No. 2 about 82.0, and both qualities of dust would range from 30.0 to 50.0 per cent pure graphite.

As an evidence of the freedom of Alabama graphite from deleterious substances, more especially iron, lime, and mica, the following complete analysis, a composite of several analyses, is presented, and for comparison an analysis of the Ceylon material. Both analyses are official, being taken from a report by George D. Dub, "Preparation of Crucible Graphite," U. S. Bureau of Mines, 1918:

COMPARATIVE ANALYSES, ALABAMA AND CEYLON GRAPHITES

	Alabama, Per Cent.	Ceylon, Per Cent.
Volatile carbon.....	1.89	1.68
Graphite carbon.....	87.03	85.06
SiO ₂	5.85	7.81
Al ₂ O ₃	4.17	2.82
Fe ₂ O ₃	0.32	1.61
TiO ₂	0.15	0.13
CaO.....	.....	0.19
MgO.....	0.13	0.21
K ₂ O.....	0.21	0.25
Na ₂ O.....	0.04	0.11
SO ₂	0.04	0.005
P ₂ O ₅	0.02	0.05
MnO.....	.....	0.04
ZnO.....	.....	0.03

BUREAU OF MINES EXPERIMENTS AND FUTURE OF ALABAMA GRAPHITE INDUSTRY

Considerable experimental work has been undertaken by the Bureau of Mines, with a view to ascertaining the relative value of Alabama crucible stock as compared with that of Ceylon, which has hitherto dominated the markets of the world. The investigations have proved the stocks for crucible making to be of a parity, and the fact that during the period of embargo on foreign graphite there was no dislocation of the crucible industry, which was forced to use both domestic clay and graphite, would further tend to prove this.

In conclusion it may be stated that Alabama has extensive beds of low-grade ore, easily mined and milled and possessing all the elements necessary to the success of the industry, such as available labor and shipping facilities, so that its permanent establishment and extension are solely matters of proper business organization and management. The industry is not, in the true sense, a mining one, but is rather a milling proposition, and, as such, will become standardized as are other industries.

Crushing Practice at Anaconda

At the concentrating mill of the Washoe Reduction Works of the Anaconda Copper Mining Co. the run-of-mine ore is roughly screened over a shaking screen with 2-in. round holes, the oversize going to a 12 by 24-in. Blake-type crusher set to 2 in. The crushed product is sent over a stationary grizzly with 2-in. openings, the oversize going to two 8 by 20-in. Blake-type crushers set to 1 in. The product of the 8 by 20-in. crushers joins the undersize of the shaking screens and is delivered to a series of trommels. The first trommel has 1-in. round holes, the oversize going to one set of 55 by 24-in. heavy-duty rolls set to about $\frac{3}{8}$ in., the crushed product being sent back to the trommel line. The undersize from the 1-in. trommels passes to the $\frac{3}{8}$ -in. trommels, the oversize being sent to one set of 55 by 24-in. heavy-duty rolls and back to the head of trommel line. These rolls are set to about 5 mm. All material crushed through $\frac{3}{8}$ -in. is further sized and jigged. The jig tailings are then partially dewatered and sent to $1\frac{1}{2}$ by 12 mm. trommels operating in closed circuit with two sets of 55 by 24-in. heavy-duty rolls, where the crushing process is completed to $1\frac{1}{2}$ mm.

War's Influence on the Zinc Industry*

The Meeting of the Zinc Institute at St. Louis an Occasion for Special Emphasis Upon the Development of New Uses for Zinc and Co-operation Between Miner and Smelter

BY POPE YEATMAN

Consulting Mining Engineer, New York

I FEEL greatly honored to be called to this, my native city, to speak to you of the zinc industry, for it was in zinc mining that I spent my happiest, early professional days. Our job is to look forward not backward; to make history in the zinc industry, not to live in the past, considering what "might have been." On the other hand, a study of what has been done, or might or should have been done, may be helpful in the consideration of the future.

Though we do not look on zinc as a "war baby," from a purely selfish and materialistic point of view, the war ended too soon for the zinc industry, not so much on account of the lessened demands for the metal for munitions, as in the line of building up new uses for zinc and therefore new requirements, and a better co-operation of the mining and smelting interests, with a breaking down of old-time antagonism and distrust.

This society of ours can and should be of great assistance in these directions, and it should be aided in every way possible by its members in the future. We need a continuance of the enthusiasm of the directors whom we now have, backed by the loyal support of our membership.

BEGINNINGS OF CO-OPERATION

As you know, just before the armistice was declared, a distinct evidence of co-operation of the miners and smelters was being displayed—of co-operation not against the Government, or in "restraint of trade," but helpfully to further the legitimate interests of the trade.

Quoting Edgar Palmer, president of the New Jersey Zinc Co., regarding an agreement to be entered into: "The proposed plan is designed to bring about closer co-operation between the zinc-ore producers and the zinc smelters. Such a stabilization of the zinc industry is a matter of national importance." The negotiations were, I believe, to have been handled by the Zinc Institute. The numerous conferences have produced a greater feeling of trust on the part of both miners and smelters, and the miners have learned more of the conditions under which the smelters have had to operate; so, as always happens with better knowledge, there is less apt to be misunderstanding between the two interests in the future.

NEED FOR PUBLICITY

We are more and more being drawn to the belief in the doctrine of publicity. A condition of secrecy causes distrust and dissatisfaction, whereas publicity produces a better understanding, and results in greater co-operation and pursuit of common interest. In the old days, it was the custom in metallurgical establishments to keep everything secret, to hold as an asset some process of which it was believed others knew

nothing, and to struggle along and grope about while seeking knowledge others had. This is now largely altered, and there is a fine exchange of ideas and methods, to the advantage of all. Secret processes do not remain so for long.

During the period of the European war, the zinc industry passed through many phases: from normal conditions, through a period of expansion or inflation, during which time there was an abnormal increase of production, by reason of more mines being operated, as well as a great increase in smelter capacity; thence, as a result of overproduction, back to prices which, though higher than in the pre-war period, were nevertheless not unreasonable when compared with the advances in costs; and now back to a condition of low demand, with higher costs than those prevailing prior to the war.

The inflated prices were by no means an unmixed blessing, for they caused an increased production beyond possible requirements, and the operation of properties which under normal conditions could not be worked at a profit, resulting in a depression of the trade which always follows periods of great and rapid expansion. The zinc-smelting capacity of this country, as well as of the world, is much in excess of normal demands.

ANTAGONISTIC FEELING BEFORE THE WAR

Previous to the war, the relations of the different branches of the zinc industry, one to another, were by no means ideal. There always had been a more or less antagonistic feeling between the smelter and the miner—not only antagonistic but distrustful. It was almost as bitter as the feeling in a long-drawn-out lawsuit, where each of the contending parties feels that he is in the right but cannot see anything good in the case of the other, and, being a partisan, energetically hates and despises his opponent.

Between the different smelters, owing to competition, there was also antagonism; in fact, the whole industry was noted for the lack of co-operation on the part of those engaged in it. Nor, as a whole, was the business a progressive one. There was no community of interest, the main aim of the interested parties being in their own particular business, regardless of the fact that anything done for the benefit of the many might also be of advantage to the few.

It was under these very unfavorable circumstances that the War Committee, appointed by the different branches of the industry to aid the Government, started in. However, immediately after our Government joined the Allies, things changed for the better. It was the object of the War Industries Board, with which your committees and individuals of the industry co-operated, to aid in every possible way the object in view of bringing out a production adequate for the war needs of the Government and, so far as possible, to supply

*An address at the American Zinc Institute Meeting at St. Louis, Mo., on Monday, June 9, 1919.

the commercial needs where to do so would not interfere with the conduct of the war.

It was also the object of the Government to interfere as little as possible with the conduct of the industry, and for this reason the Government officials opposed the fixing of maximum prices except in the case of two products which it seemed essential to stabilize. They endeavored to avoid runaway markets, as well as to prevent prices dropping so low as to cut off the steady and necessary production required, the effect of runaway prices being an excessive production, followed by closing down of properties due to inability to dispose of the product, and resulting later in too little production to supply the demands. Instead of a steady and stable production, this rising and falling of prices proves demoralizing, especially during a period of war.

The two products on which a maximum price was fixed were high-grade zinc and sheet and plate zinc. These maximum prices were fixed high enough to stimulate production by giving some assurance to the producers that the Government regarded these prices as fair under the circumstances, and in order to remove from their minds a possible fear of lower maximum prices being fixed in case the prices were left open.

The amount of high-grade zinc which could meet the Navy requirements was not equal to the demand, and it became necessary to increase the output by re-distilling spelter and by arranging for the use of high-grade metal not quite equal to Navy specifications, for the manufacture of grades of brass for which the very highest grades of spelter had previously been required; and in the case of rolled sheet and plate it was believed that the existent plants would not be able to turn out the quantity necessary, so that the expansion of rolling mills was necessary, and to bring this about a tempting price for the finished product would be required. It is believed that the plan worked out satisfactorily.

DURING WAR NORMAL USES WERE RESTRICTED

During the war, the normal uses of zinc were greatly upset and altered, with increased utilization in one line and almost complete lack of demand in another. For instance, the demand for high-grade spelter for shells was greater than ever known, though the use of spelter for galvanizing was not only diminished but practically wiped out. In the future, there will be little demand for brass for shells, for the business of war for many years to come will, we hope, be done away with. Unfortunately, during the war many substitutes were found to replace galvanized iron, the principal manufactured product for which spelter was previously used, and the use of these substitutes will undoubtedly be largely continued.

Spelter being plentiful, it was found necessary, in order to keep up the output, to find other uses for this metal, and in this direction the most promising field lay in substituting zinc for metals which were either very much more expensive, or in which there was a shortage. Among these may be mentioned the replacement by zinc of tin, aluminum, brass, and other alloys.

The Conservation Division of the War Industries Board, with the Zinc Section, evinced great interest in this direction, and a start was made in getting the manufacturers to substitute zinc for other materials in rather a large way. Some of your own companies also interested themselves in a practical manner, and this not selfishly, in keeping to themselves, but freely

giving of their information to the industry as a whole.

I said "unfortunately for the zinc industry, the war ended too soon," because I believe that through the agencies of the Government further uses for zinc were being inaugurated, and that after experience with this product the public would wish to continue its use. We know it is a hard thing to change precedents and to alter well-tryed and successful plans and introduce something else, unless there are some spectacular features connected with it—something that might help as an advertisement. In the case of many of the manufactured products in which, for instance, tin or other rather high-priced metals were used, zinc could be substituted. It was, however, with the practical certainty of reverting again to the original metals after the embargo on these had been raised. However, zinc could have been substituted for other metals in a great many products with the certainty also of a continuance of its use.

NEW USES FOR ZINC

There has been scarcely time in which to prove this plan to be good, and now persuasion will have to be employed in place of the so-called "force," which was really an appeal to patriotism. The list of articles in which zinc could be substituted for other metals is, to use a common expression, "as long as your arm." Many of these amount to but a few thousand pounds per year, though others aggregate thousands of tons.

It was the view of the Conservation Division of the War Industries Board that, to quote from one of their reports:

The possibilities of increasing the uses of zinc are very large, particularly in the case of rolled sheet. In this country the rolled zinc produced has never been more than 10 per cent of the production of spelter, though on the Continent of Europe many of the largest producers roll 50 per cent to 100 per cent of their output.

The largest tonnage uses of sheet zinc in Europe are for roofing, cornices, architectural ornaments, gutters, leaders and flashing, all of which are more durable when made of zinc than when made of galvanized iron or tin plate, as is usual here. In all of these cases painting is unnecessary, except where desirable for decoration. In the few cases where zinc roofs have been used in this country they have remained in good condition for forty or fifty years, though entirely unpainted.

Zinc, both cast and rolled, can be substituted for other metals in many cases. Possibly the increased use of castings is even more important.

Though the business is an old one, few of those engaged in it have known in a more than rudimentary way the real value of zinc, and few, if any, have taken any active interest toward increasing its use, devoting their time mainly to disposing of their own individual product to the best possible advantage, but doing practically nothing toward building up the business as a whole; growling because the market was limited, but leaving to others the increasing of the markets—but, practically speaking, there were no others.

THE EXAMPLE OF ALUMINUM

One of the best instances of building up trade for an industry which started on the smallest basis is that of aluminum. When aluminum was first manufactured, the cost was high and there were very few uses for the finished product. As it became possible to manufacture more cheaply and in greater quantity, it was found necessary to produce a market, and this was systematically done. This feature became just as im-

portant a part of the business as the production itself.

The largest producer of aluminum carried out a broad and comprehensive program of manufacturing finished products and introducing them to the public, in the way of cooking utensils, containers, instruments, sanitary appliances, sheet aluminum for automobile bodies, cast aluminum crank cases, aluminum wire for conductors, electrical appliances, and in other like applications, and also for alloys, the utilization of which had to be brought to the public's notice, such as employing aluminum in the manufacture of steel, and for paint and other utilitarian purposes.

In introducing the metal, the aluminum company was obliged to exercise the greatest care to see that its products were used under proper conditions, and on many occasions declined to sell to those who wished to employ the metal for purposes for which it might not be suited. The producers of nickel also went through a similar experience in order to make a market for their product, which started with a small demand. Certain uses of zinc have been taken for granted, and the miners and smelters have sought to supply only these particular uses; but that is really a small part of what is possible. The more one studies the proposition, the more one feels convinced of the possibility of increasing the needs for this metal. What has been done with aluminum and nickel can be done with zinc.

PROPOSED PROPAGANDA

We do not like to use the word "propaganda," because it has been associated with so much that was sneaking and underhand, but a campaign of "propaganda" in its best form should be inaugurated by the zinc industry. It will be necessary to educate consumers and possible users in the advantages of spelter over other metals for certain uses, and to let them know for what new uses the metal can be employed.

Get samples of different manufactured-zinc products to show the builders, architects, dealers, and general consumers. Explain by means of literature, and by "spielers" for zinc, sales engineers, and traveling men with samples, the advantages of the zinc articles, and remember that while this program may help certain manufacturers more directly than it may the majority of you, it will build up the industry generally and so help the individual, whether miner or smelter.

First have the matter studied scientifically by research, experiment, and demonstration; then advertise for all it is worth. You have a good thing—do something with it. Do not leave it to one or two companies to exploit, but work it up by the industry as a whole. To recover in volume the old uses for zinc, such as for galvanizing and for paint, should also be an object of great endeavor. The increasing of demands should not be the only aim, for there is great promise in improving metallurgical methods, as has been emphasized by W. R. Ingalls. Zinc smelting has been backward, more so than the metallurgical treatment of other metals, and it is believed, by those who are in a position to be judges, that there are great possibilities of improvement in this field.

UTILIZATION OF BYPRODUCTS

The utilization of byproducts should also be pushed, in order to cut down the cost of the main product—zinc. Of course, in many smelteries the sulphur from blende ores is utilized for the manufacture of sulphuric

acid. Attempts should also be made to utilize that much-abused metal cadmium, which can in part be substituted for a portion of the tin in certain alloys. High prices are not so much required as low costs of production, with an increased spread between price and cost; in other words, greater profit; for the lower the average price—other things being equal—the greater the chance for increased consumption, the larger the volume of zinc produced, and the greater the volume of profit.

Really the most important thing that materialized in the numerous meetings at Washington and elsewhere was the bringing together of old-time interests which previously had been battling, and the birth of a more friendly and helpful feeling. This was made possible by the fact that every one was stirred by a spirit of patriotism, which made him willing to sacrifice his individual material or business interests if necessary, just as his sons and brothers were willing to sacrifice their lives for the good of their country. It made him more unselfish and more willing to help his neighbor, and it brought into especially strong relief the virtues of each individual man.

We know that there may be individual business men who may not be thoroughly unselfish; that with many it has been "every man for himself and the devil take the hindmost," but from the moment our Government entered the war the men of the zinc industry have truly "played the game," and no criticism can be made of any display of selfishness, lack of patriotism, or unethical conduct.

Everyone has been willing to help; everyone has wanted to have the industry meet its requirements; and everyone has had a pride in the business as a whole, and has been anxious for it to do its part. Men who had never pulled together were keen to co-operate in the broadest possible way. The smelter and the miner walked hand in hand: They were like the lion and the lamb who "lay down together." I leave it to you, however, to decide which was the lion and which the lamb.

The miner began to think that the smelter official was a pretty good fellow after all, and the compliment was returned by the latter. I do not know how often I have heard the remark: "Why, I thought So and So was a pretty hard nut, but now I have seen him and talked with him, I find he is a pretty good chap after all."

It is believed and hoped that this meeting together of different interests, resulting in a better "acquaintanceship"—a word made famous at the last dinner of this organization—will have a lasting effect and will produce a condition that it would have taken years to have accomplished in such a thorough manner in normal peace times.

No Important Improvements in Flotation Practice have taken place during the last two years at Anaconda in the kind or method of use of flotation agents. At present, the launder system attached to the spitzkasten of each flotation machine is being rebuilt in such a manner that all middling froth and pulp are returned to a box directly in front of the first cell of the machine. The bottom of this box is below the bottom of the cell. This box is connected to the bottom of the first cell of the machine by a 6-in. suction pipe. The pumping action of the impeller in the cell serves to return all froth and middling to the first cell of the machine, making each machine a separate and distinct unit and doing away with middling return elevators and their necessary upkeep.

Modern Stripping Equipment in Minnesota



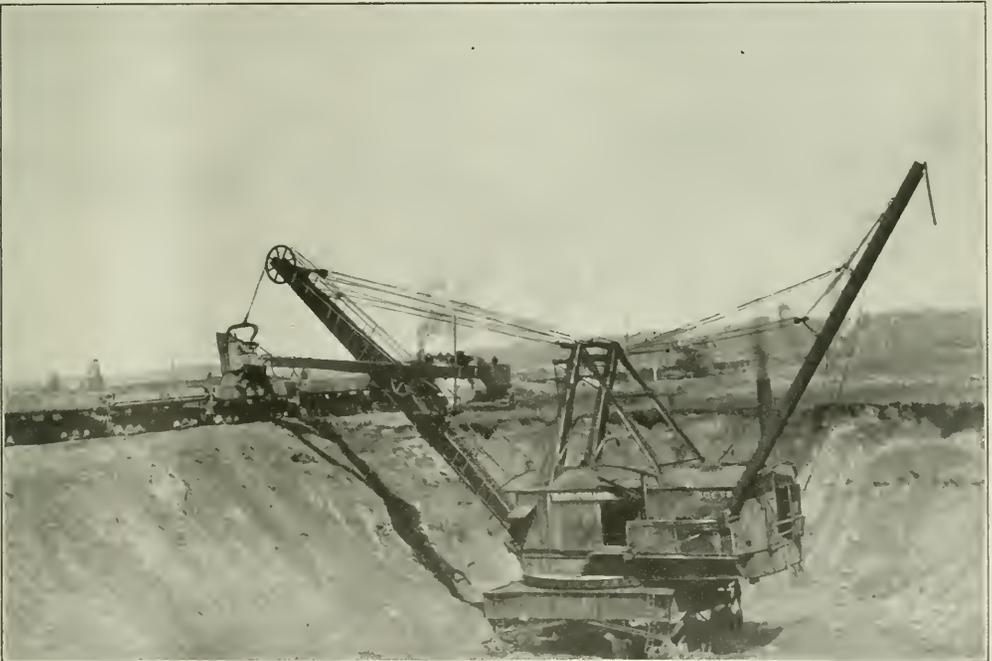
SPREADER BEING USED ON THE STRIPPING DUMP OF A MESABI RANGE OPEN-PIT MINE



MECHANICAL TRACK SHIFTER USED IN MOVING TRACKS ON STRIPPING DUMPS



STEAM SHOVEL LOADING OVERBURDEN INTO 20-YD. AIR-STEEL AIR-DUMP CARS



ONE OF THE 360-TON STEAM SHOVELS NOW USED ON THE MESABI IRON RANGE FOR REMOVING OVERBURDEN

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical
Industry Dealing With Pertinent
Subjects of Interest

The American Quicksilver Industry

The *Journal* published on May 17 an interesting letter from Murray Innes, of San Francisco, and another from Fletcher Hamilton, both relating to the necessity of fostering the mercury industry of the United States.

Mr. Innes' letter commends most highly the report of the U. S. Tariff Commission upon the mercury situation at home and abroad, but severely criticises the conclusions that F. L. Ransome has drawn from his investigations of the subject. Previous to reading Mr. Ransome's conclusions I had read the report of the Tariff Commission and such other data as have recently been published, and was regretfully forced to almost the same conclusion reached by Mr. Ransome. My conclusions were not published, for they too would have read like an "epitaph of the quicksilver industry in the United States."

As one indirectly interested in the mercury industry, and appreciating the status of those who have done their utmost to fulfill the requirements of the Government in an emergency, I preferred to believe that I was mistaken and that at an early date a more hopeful outlook for the mercury industry might develop. My personal feelings are fully expressed in the editorial of April 19 which Mr. Innes was good enough to quote, and, having those feelings, it is evident why one does not wish to believe that Mr. Ransome's conclusions are correct, irrefutable as they may appear to be.

If the mercury industry is to be saved in this country it will be through stronger arguments than those presented by Mr. Innes in the letter quoted, and it is with the hope of eliciting such stronger argument that this communication is submitted.

Is it possible to continue to produce in this country approximately its normal consumption of mercury without a protective tariff that will be an actual burden on the consumer? Is the statement correct that the average ore mined in the United States (during 1918) contained only five pounds of mercury per ton?

Mr. Ransome believes that the prospect of opening any new deposits of mercury are extremely small and that those deposits now capable of producing will yield less and less per ton as time passes. Is this correct, or do those who are familiar with production of mercury have reason to believe the contrary, and, if so, upon what is that belief based?

What hope can the producer of quicksilver give to the consumer that the protection asked for will not continually rise, that it may remain constant or diminish as the industry prospers? There is no doubt that the European supplies are controlled in London and that within certain limits one house controls the price. It must be noted in passing, however, that this condition has maintained for many years. This house could long ago have closed every mercury mine in the United States and then made prices to suit itself, or it could have done so, if I am correct in my understanding of

the European situation; but it has not taken such action. The reason may be that it does not possess physical control of the output, but more probably is because it does not consider such a policy good business. If this firm has not monopolized the business in the past, is there good reason to expect that it will do so in the future?

The quicksilver miners, numerically small, to be entirely successful in their contention for adequate protection must have some support, or at least but slight opposition from the consumers, numerically large. If the miner can convince the consumer that free trade means high prices at no distant date, we will have support from a most important section of the community, and the battle will be more than half won.

There are several interests to consider in this discussion. First, and perhaps the most important consideration, is that of the preparedness of the Nation, the League of Nations to the contrary notwithstanding. What should be the policy of the Government in order to avoid the possible consequences of all foreign supplies being suddenly cut off? Should the Government buy and store enough mercury in times of peace to carry it through two or three years of intensive military preparation? Should it try to conserve all present known deposits to meet such an emergency? Should the mercury industry be encouraged with the hope of developing additional supplies, even at the risk of using up all of which we now know? May we not reasonably expect that, with more detailed geological investigations, new deposits will be found?

The second consideration is that of the normal consumer, of whom there are thousands. What procedure will be to his best interest? Will it be best to take down all tariff bars, admit the metal freely, and cut off the home supply, or will it be better for the consumer to pay a high tax and be sure that there is a home supply to be depended upon?

Third, those who have invested capital for the production of the metal must be considered. They are not many, as compared with the consumers, but their work and expenditures have been in good faith, they have helped win our war, and should not now be left to shift for themselves. There can be but one answer to this question, but the form the aid should take is open to discussion. The experience that is gained in the handling of the war-minerals relief will at least acquaint the Government with full information about the cost of mining operations when undertaken on a relatively small scale.

And, fourth, there is the mining industry in general, and the policy to be adopted respecting war minerals in particular. Mercury is one of those metals, and the need for uniform policy respecting them is plainly apparent. Whatever that policy may be, it will effect the mining industry of the country to a marked degree.

New York, June 16, 1919.

F. F. SHARPLESS.

Trouble With Rock-Breaker Pitmans

Even if true, I think the troubles with rock-breaker pitmans described in the Mar. 29 issue of the *Journal*, are a little exaggerated so far as small and medium-sized plants are concerned. It is not advisable to have the pitman water cooled. To do so would require some kind of water jacket, and this would make the pitman more cumbersome. The jacket would be likely to crack and leak. Two lines of hose would be necessary, one to bring the cool water, the other to take the heated water away, and the hose would of necessity be long, in order to absorb all the stroke vibration, and leaks would surely occur. The change may be desirable where water is scarce, although overflow water can surely be used in some other place in the mill. If the rock breaker is situated, as in most cases, on the top of the mill, the pressure may not be sufficient, but a small rotary pump like that used on machine tools could be geared on the crusher shaft. From the engineering standpoint water cooling can be done easily enough, but few would use the water jacket, and many in a short time would discard it after having given it a trial.

In nearly all the swing-jaw types of crushers the pitman bearing extends the full length of the eccentric—the width of the jaw. This is ample bearing surface, but the babbitt must be of the right kind. I have used "Magnolia" with good success on 10 by 15-in. crushers running 16 to 20 hours daily. All the oil pockets are filled with hairy wool waste, packed tight enough so as to be always in contact with the shaft. Lost motion can no more be permitted in the pitman bearing than in a connecting rod, as it causes pounding, more friction, and, of course, more heat.

The toggle must point down toward the pitman, as, if placed slanting off from the pitman, the strain will be on the bearing caps, and this will cause the studs to break quickly. It will also cause undue heating of the bearings, caps, and shaft. The remedy is to raise the block carrying the toggle seat above the toggle seat of the pitman. It may be necessary to change the toggle to keep the jaws to breaking size. Never let the toggle ends and the toggle seats wear down too far. Both get so out of shape (rock and dust helping) that the tension of the spring must be increased to hold them home.

All dust and grit must be kept out of the lubricating oil and grease. A good way is to cover the bearings with a 5-gal. can or a cyanide can. The crusher depends to a large extent on the filtered oil already used on the engines. Castor machine oil has in many cases helped the running of crusher bearings. It is advisable not to fill the oil box of the pitman with waste alone. A little wool waste will do to absorb and hold oil; then, on the top of the waste, place a piece of felt the shape of the oil box, and hold tight by driving a strip of wood. This will act as an oil filter that can be relied upon. The oil grooves in the bearing must be of a shape that will permit oil circulation. One groove usually is not sufficient.

Reversing the motion on a hot-running pitman will help, but it makes but an insignificant change with most crushers, whereas to the bearing it may make a great change, particularly in connection with worn bearings, because one edge has usually worn so sharp that it scrapes nearly all the lubricant off the shaft. Running in the other direction, it faces the beveled edge of the

babbitt. Both sides of the bearing must be beveled to ease off and give the lubricant every chance to follow the shaft.

The crusher must be run at a reasonable speed. Over-speeding increases the capacity, but unless of exceptionally heavy construction, it soon breaks the foundation bolts or loosens up the framework. A bent, grooved, or worn shaft also invites trouble.

When an idle pulley is used on a rock-breaker shaft it must have a renewable bushing and an automatic grease cup of ample size. The diameter of the idle pulley must be $\frac{1}{2}$ to 1 in. smaller than the diameter of the driving pulley. The belt tension is lessened and the friction on the bearings greatly relieved when the belt is shifted on the loose pulley. It is of course highly desirable to avoid the loose pulley wherever possible.

Johnnie, Nev., Apr. 10, 1919.

C. LABBE.

A New Factor in Flotation Litigation

To anyone who has followed flotation litigation during recent years it must be rather a surprise to learn that there are some features of the process that have not been brought out in the course of the many hearings before the various courts. That some points still remain open for elucidation and discussion is evident, as the *Mining and Scientific Press* of Mar. 22 comments editorially concerning J. D. Wolf's patent.

Apparently this patent, No. 787,814, dated Apr. 18, 1905, the application for which is dated May 22, 1903, is likely to be of importance. As neither of the litigants made a particular point of it in the Hyde case, it seems to have received no consideration from the profession in general. In the action of Mineral Separation, Ltd., vs. Butte & Superior the patent apparently is accorded technical attention for the first time. The defendant's expert, Dr. Sadtler, after detailing the working of the apparatus as described by Wolf, concluded his testimony as follows:

"Now, I feel satisfied that we cannot practice this procedure of first practicing agitation with that form of apparatus without producing an aerated froth which holds the mineral, as stated, quite completely, and then, if we follow that by a flotation as described here in these claims, of the mineral-bearing oil, an air-bubble mixture over the top of the spitzkasten, that it is impossible to have anything else than the removal of the mineral-bearing froth."

I suppose it is unwise for one to make predictions or to commit himself as to what bearing certain patents or applications have upon the legal aspect of flotation. Apparently, however, this Wolf patent must be of some importance. It seems that an actual recovery by an oil froth can be made by carrying out the directions of the patent. Coupling this with the fact that Wolf's patent appears to antedate the patents under litigation, it is evident that flotation operators are confronted by a new source of what may be trouble or salvation.

It is unfortunate that this patent has been kept dark for so long, if the facts are as they seem to be. The more light we can get on this situation, the better it will be for every one having any interest in flotation metallurgy. There is an opportunity here for investigators to give attention to the Wolf patent and discuss it in the technical press, just as the other patents and processes have been discussed. H. A. MEGRAW.

New York, May 29, 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Zinc Tariff Gets Hearing

Paul A. Ewart, representing the zinc-mining industry of the Joplin district, appeared before the Committee on Ways and Means in support of the bill providing a tariff of 2c. per lb. on the metallic contents of zinc ore. He stated, however, that all that the producers want is a tariff that will equal the difference between costs here and in Mexico. Though the principal competition is expected from Mexico, Mr. Ewart told the committee that he fears the dumping of German zinc.

Otto Ruhl, representing the Webb City Chamber of Commerce, the Joplin Chamber of Commerce, and the Webb City Mine Sanitary and Safety Association, engaged in the following colloquy during his appearance before the committee:

Mr. Kitchin: Is there any evidence that the zinc producers have, of a combination among the smelters to fix the price?

Mr. Ruhl: There has been such an accusation, but we have not the evidence on that particular question here.

Mr. Kitchin: The general opinion among you zinc producers is that they fix the price among themselves?

Mr. Ruhl: There is some sort of an opinion like that expressed among a certain element of our men.

Mr. Kitchin: What do you think about it?

Mr. Ruhl: I am open-minded, and I am willing to be convinced; but I do not think we have the evidence to do so yet.

Mr. Kitchin: You do not want to cast any reflections because they are your only purchasers and you do not want to embarrass yourself with your purchasers?

Mr. Ruhl: If we find there is such a combination we have legal relief, and I understand we will probably exercise that legal relief if we can do so.

The Chairman: You do not know now that there is any combination?

Mr. Ruhl: No, we do not know it.

Farmers Object to Potash Bill

Farmers and importers are vigorously opposing the proposals to establish a potash-licensing system, or to place a tariff on imported salts. Ben C. Marsh, secretary of the Farmers' National Council, told the Ways and Means Committee that the principle of the Fordney bill is vicious and that the farmers of the country want the bill killed. It is estimated that one-third of the agricultural products of the United States require potash, and that the yield next year will be 30 per cent less if potash is not available at a price the farmers will pay. The decrease in production will be increasingly greater as the reserve of potash in the soil is exhausted, it was stated. Representatives of the agricultural interests of the country were unanimous in their belief that there is no important reason why the United States should tax itself heavily to create a domestic potash industry.

It is inconceivable, one witness pointed out, that this country would be at war with France and Germany at the same time. H. A. Huston, secretary of the German Kali Works, an American corporation, a subsidiary

of the potash syndicate of Germany, said among other things:

The American producers are rather sharply divided into two classes. One of these cannot produce potash at a price that the consumer will ever consent to pay; the other class can produce at a price that can compete with any foreign source. One is beyond help, the other does not need it to make reasonable profits on honest capitalization.

A sound national policy would seem to require that those sources from which potash can be produced only at a high cost should be held in reserve as an insurance against another period of shortage, as are the oil-bearing shales. It is not a sound national policy to pay a premium to exhaust these resources and at the same time increase the cost of producing food and clothing.

Federal Aid for Mining Schools

Senator Smoot has introduced a bill providing for the application of part of the proceeds of the sales of public lands to the endowment of schools or departments of mines and mining in each state. The amount to be expended is to be \$25,000 per year in each state. The purposes for which the money is to be spent are given in the bill as follows:

Instructions, research, and experiment (including the employment of instructors and experts, the purchasing of apparatus, supplies, books, and the equipping of laboratories) in mining, mining machinery (with the application of electricity thereto), mining engineering, ore-treatment, metallurgy, assaying, and chemistry and geology, so far as these sciences relate to minerals and mining, with a view to teaching a practical and scientific knowledge of the best and safest methods of mining and carrying on the business of mining and of producing gold, silver, coal, and other minerals, oils, gas, and medicinal waters, and also the concentrating, smelting, refining, and other preparation of the same for marketing so far as the same may be necessary and appropriate to the mineral resources of the state or territory in which said school or department of instruction in mines and mining shall be located; and especially for the study and prevention of explosions, fires, and other dangers incident to the carrying on of mining and the mining industry, in order to secure the most intelligent conservation, use, and development of the mining and mineral resources of the country, to make the lives of miners more safe, property in mines more secure, and to promote the general welfare of miners and operators of mines.

Shippers Get Respite as to Bills of Lading

In the long-pending matter of bills of lading, the Interstate Commerce Commission, on June 26, extended by one month the date on which the printed forms of bills of lading now in use should be discontinued. The date is thus advanced from Aug. 8, as set in the order of Apr. 14, 1919, to Sept. 8, 1919. Otherwise the original order remains in full force. This action was taken because it was realized that shippers having printed stocks of such bills on hand would suffer some loss if forced to waste them unused; also the date originally set allowed insufficient time to have new bills printed.

N. Y. Section American Institute of Mining and Metallurgical Engineers

Meeting Addressed by Horace V. Winchell, Who Reviewed Conditions on the Mesabi Range and Recent Advances in Ore Concentration

THE regular meeting of New York Section of the American Institute of Mining and Metallurgical Engineers was held on June 26, 1919, at the Machinery Club, New York City. The usual dinner, followed by the program and entertainment, was attended by seventy-five members and guests. William Young Westervelt was chairman of the evening. Announcement was made of the meeting of the Institute in Chicago, Sept. 22 to 26, 1919, and members were urged to attend. An appeal was also made to the members of the Institute to make every effort to give employment to returning soldiers, not only from patriotic motives, but also for the reason that such men have acquired discipline and a high sense of duty and are usually worth more to employers than men without the Army training.

The president of the Institute, Horace V. Winchell, submitted a resolution expressive of the high esteem in which J. E. Johnson, Jr., who died recently, was held by the members of the Institute. The resolution was adopted unanimously. Mr. Winchell then addressed the meeting, and pointed out the momentous possibilities of peace, and the place that mining and metallurgical engineers would occupy during the impending industrial development. He commented particularly on the iron-ore resources of the Mesabi Range, the annual production of which is 40,400,000 long tons, and reviewed in detail the possibilities of a new mining and metallurgical enterprise which has been brought through the experimental stages to a commercial possibility by Walter G. Swart and Dwight E. Woodbridge.

These metallurgists have devised a method for the treatment of certain extensive deposits of taconite containing 25 to 35 per cent iron in the form of magnetite which promises to be of great commercial importance. The process is the outgrowth of tests conducted by W. G. Swart in an experimental mill built in Duluth in 1916. The ore is crushed to 1/2-in. size and passed to magnetic cobbing machines, which eliminate 50 per cent of the material, the remainder being delivered to a closed-circuit ball mill. A Davis magnetic log washer receives the ball-mill product and recovers a clean, fine concentrate, representing 30 to 40 per cent of the original ore. The ratio of concentration is approximately three to one. The concentrate is mixed with pulverized fuel, filtered, and sintered on Dwight-Lloyd sintering machines. The sinter is of bessemer grade, and contains 61.18 per cent iron, 0.025 per cent phosphorus, and 11.72 per cent silica.

Mr. Winchell called attention to the great production of the Mesabi Range, which now amounts to 500,000,000 tons of its best ore. He stated that fifteen years ago, about two-thirds of the ore mined was bessemer grade, and contained approximately 0.038 per cent phosphorus, whereas last year only about one-third of the tonnage was bessemer grade, and the phosphorus had risen to 0.045 per cent. At the current rate of production, the supply of commercial ore under present practices will be exhausted in about thirty years, and if the production should increase 10 per cent a year, the exhaustion of the Minnesota deposits might take place

in twenty years. The new methods described promised to make large deposits of lower-grade ore available, thereby greatly extending the life of the district, as well as the supply of useful material.

Major C. E. Stuart addressed the meeting on the subject of recruiting for the U. S. Army and pointed out the advantages of the Army as a training school for men who would subsequently go into industry. He called attention to the radical changes in Army life during the last few years, and the new recruiting slogan: "The Army is a builder of men." Major Stuart explained the effect of the educational advantages now offered by the Army, and the wholesale development of "can-do" men under the new system. He stated that the \$30 per month to the soldier is equivalent to \$125 per month in civil life, and that a young man earning \$125 or less per month would do better in the Army, because he would receive a liberal education, which he could not otherwise afford. Major Stuart convinced the members present of the value of the idea.

Major Arthur S. Dwight was greeted with genuine enthusiasm. In a direct and simple way he told the members of his war experiences, concluding his interesting narrative by the presentation of moving pictures of war-zone activities.

June Mining Dividends

Dividend payments by mining companies in June, 1919, show a big decrease from the amount for the same month last year, owing to continued additions to the list of those companies which have passed their dividends, and those which have decreased their payments. Companies which failed to pay the dividends which would have been due at this time were the following: International Nickel (common), Ahmeek,

U. S. Mining and Metallurgical Companies			
	Situation	Per Share	Total
Am. Sm. and Ref., com.	U. S.-Mex.	\$1.00	\$699,980
Am. Sm. and Ref., pfd.	U. S.-Mex.	1.75	875,000
Argonaut, g.	Calif.	.05	10,000
Bingham Mines, g.	Utah	.25	37,500
Caledonia, l. s.	Ida.	.01	26,050
Calumet & Ariz., c.	Ariz.	.50	321,260
Chino, c.	N. M.	.75	652,483
Copper Range, c.	Mich.	.50	197,500
Cresson Cons., g.	Col.	.10	122,000
Fairview Round Mountain, g.	Cal.	.02	19,948
Federal Min. & Sm., pfd.	U. S.	1.00	120,000
Golden Cycle, g.	Col.	.03	45,000
Hecla, l. s.	Ida.	.15	150,000
Homestake, g.	S. D.	.50	125,580
Kennecott, c.	Mich.	.50	1,393,530
Nevada Con., c.	Nev.	.37 1/2	749,797
North Star, g. a.	Nev.	.40	100,000
Oroville Dredge, g.	Cal.	12	82,385
Quincy, c.	Mich.	1.00	110,000
Ray Con., c.	Ariz.	.50	788,589
St. Joseph Lead, c.	Mo.	.25	352,367
Tintic Standard, l. c.	Utah	.08	93,400
United Eastern, g.	Ariz.	.07	95,410
United Verde, c.	Ariz.	1.50	450,000
Utah Copper, c.	Utah	1.50	2,436,735
Canadian and South American Companies			
	Situation	Per Share	Total
Cerro de Pasco, c.	So. Am.	\$1.00	\$898,224
Hedley, g.	B. C.	.10	24,000
Hollinger, g.	Ont.	.05	246,000
Mexico Mines of El Oro, g.	Mex.	.96	174,960
Kerr Lake, s.	Ont.	.25	150,000
Min. Corpn. of Can., s.	Ont.	.12 1/2	200,000

Allouez, Isle Royale, and Osceola. Calumet & Arizona reduced its payment from \$1 to 50c. per share; Copper Range, from \$1 to 50c.; Federal Mining & Smelting, from \$1.75 to \$1; and St. Joseph Lead, from 35c. to 25c. per share.

Whereas, in June, 1918, 40 United States mining and metallurgical companies, making public returns, paid dividends amounting to \$24,662,838, only 24 companies are on the list for June of this year, their

payments having amounted to \$9,963,616, a decrease of more than 55 per cent.

Canadian, Mexican, and South American companies also show a decrease in their payments, the amount in June, 1919, being \$1,693,190, compared with \$2,653,442 in 1918.

By error, Hollinger Gold Mines was included in the dividend table of May payments, published in the *Journal* of June 7. The date of its payment was June, and it appears in the present list.

The only holding company to pay in June, 1919, was the Yukon Alaska Trust, which made its usual quarterly payment of \$1 per share.

The totals for the first six months are as follows, the figures for the corresponding period of last year being given in parentheses: United States mining and metallurgical companies, \$50,039,792 (\$89,763,010); holding companies, \$900,005 (\$1,066,866); Canadian, Mexican, Central and South American companies, \$8,060,281 (\$9,719,686).

Lake Superior Metal Mine Safety Conference at Duluth

Meeting of Representatives From Every Mining Range in the Upper Peninsula of Michigan and Wisconsin and Minnesota

THE Lake Superior Metal Mine Safety Conference was held at Duluth on June 19-20. Among the many papers, the following were presented: "Proper Safety Organization for Metal Mining Companies," by George Martinson; "Common Open-Pit Accidents and Their Prevention," by H. E. Mitchell; "Americanization of Mine Employees," by George H. Crosby; "The Safety Engineer and Accident Statistics," by A. H. Fay; "Open Stopes," delivered for M. E. Richards by J. J. Griffiths; "Underground Disaster Warnings," by B. O. Pickard; "Some of the Different Methods of Interesting Our Mine Employees in Accident Prevention," by B. D. Shove; "The Problem in the Work of Accident Prevention," by William Conibear; "Work of the Safety Division of the Bureau of Mines," by D. J. Parker, and an address on general safety problems by F. E. Morris.

The committees in charge were as follows: Program, George Martinson, William Conibear, and Stephen Quayle; meeting plans and hotel accommodations, A. A. Krogdahl and George Lohneis; reception and luncheon committee, A. A. Krogdahl, George Lohneis, B. D. Shove, and E. A. Sporley.

After the luncheon on June 20, C. E. Julihn spoke on "Neighborliness as an Industrial Factor."

A resolution was unanimously passed recommending that the U. S. Bureau of Mines should consider making these conferences annual affairs in the district, as it was felt that such conferences should be prompted by the Bureau of Mines rather than by an organization of safety engineers in the district.

The testimony taken by the Committee on Ways and Means of the House of Representatives on potash, magnesite, and tungsten will be of interest to a large proportion of those engaged in mining. A copy of any one of these hearings may be obtained gratis on application to Paul Wooton, 307 Union Trust Building, Washington, D. C., the *Journal's* special correspondent.

BY THE WAY

Emerald and Molybdenite

Molybdenite has a greenish streak at times, according to Dana. In this connection it is interesting to note that William J. Spain, of New York, who operates the Spain molybdenite mine at Dacre, Ontario, is also the local treasurer for Ireland's victory campaign fund. "The Irish have declared a republic," run the advertisement in New York street cars soliciting contributions for the fund. More evidence of the versatility of mining men.

Unpatented

"H. W. Hardinge has spent two weeks at his camp in Spencer, Me.," writes a friend. "Fishing was very good, and Mr. Hardinge caught one that was too large to be weighed on any scale in Maine. However, being of an inventive turn of mind, he hung the fish on a tree and weighed it on its own scales. Furthermore, the camp being eighteen miles from the nearest town and difficult to find, he hung the small fish on trees to act as guides, the scales showing the weigh."

Thus we see that one can be comical as well as conical.

Joking at a Funeral

War-mineral producers who suffered loss in their effort to aid the Government have our deep sympathy. To this is added our admiration in the case of the manganese operator in Tennessee, who jestingly announced his loss to the War-Minerals Relief Commission as follows:

The sudden death of the manganese market upon the signing of the armistice, having plunged the _____ Manganese Co. into deepest mourning to the extent of about four thousand dollars, Mr. Wilbur A. Nelson, State Geologist of Tennessee, directs that we take this matter up with you, as being the one best qualified to offer consolation in our bereavement. If you will kindly suggest how we may best shape our supplications for relief from our distress we will consider ourselves under many obligations to you.

To this H. E. Meyer, chief clerk of the commission, replied in like vein:

I am in receipt of your letter of Apr. 17 and am very sorry to learn that the _____ Manganese Co. has, by the unexpected death of the manganese market, been required to take on the garb of mourning. I very fully appreciate your need for sympathy in your great bereavement. Having learned in advance from Dr. Wilbur A. Nelson of your loss, I took it upon myself to forward to you under date of Apr. 18 the regulations and questionnaire prepared by the War-Minerals Relief Commission, with the suggestion that you prepare your claim for relief from your dire distress.

The regulations and questionnaire are very simple and I am sure you will have no difficulty in shaping your supplications for relief. I will say that the questionnaire must be sworn to before a notary public or clerk of a court of record. June 2 is the date for the placing of claims with the commission for final rest; so therefore get busy with your undertaker, and have your claim properly embalmed and shipped for burial. Having so disposed of your claim this at least should give you some relief, pending the commission's autopsy of your case.

If the commission, now conducting hearings in Western cities, finds other producers as amiable, its task will at least be pleasant.

PERSONALS

C. F. Kelley is going to Butte in connection with the labor situation there.

H. G. Officer sailed for Chile on June 21, where his address will be Casilla 83-D, Santiago.

J. W. Russell, of Woodstock College, Woodstock, Ontario, has resigned his position to become manager of the Oxford Cobalt silver mine.

August Heckscher, president of the New Jersey Zinc Co., has been elected a director of the Crucible Steel Co. of America.

T. O. McGrath, auditor, Shattuck-Arizona Copper Co., appeared before the War-Minerals Relief Commission, at its recent sitting in Tucson.

Arthur W. Jenks is in New York on his return from Nanttu, Burma, where he was smeltery manager for the Burma Corporation.

F. M. Van Tuyl, who has recently joined the staff of the Malm-Wolf Co. as consulting geologist, is examining oil properties in Wyoming, where he expects to be engaged until Aug. 1.

E. F. Simms, vice-president of the Sinclair Gulf Corporation, will be president of the Simms Petroleum Co., with extensive acreages in the Texas oil fields.

Fred Carroll has discontinued his duties as State Commissioner of Mines in Colorado, and resumed his former position as general manager of the Atlas Mining Co. near Ouray.

Horace F. Lunt has been appointed State Commissioner of Mines of Colorado, succeeding Fred Carroll. Mr. Lunt served during the war as a captain in the U. S. Army.

A. Tancig, mechanical superintendent of the mining operations of the Shenango Furnace Co., has returned from a business mission in Buffalo, N. Y.

Richard Hamilton has been re-elected president of the Western Australian Chamber of Mines. Mr. Hamilton has been president for twenty-two consecutive years.

James Flannigan, superintendent, Higgins mine, has returned to his home in Bisbee, after making a tour of examination of the oil fields of central Texas.

G. Chesterfield Evans, a member of the metallurgical staff of the Oriental Consolidated Mining Co., Unsan, Korea, has left Australia, where he has been spending his vacation, to return to Korea.

W. H. MacMahon, formerly safety inspector of the Northern Ore Mines District of the Republic Iron & Steel Co., has accepted a position as employment manager for the American Hoist & Derrick Co., of St. Paul, Minn.

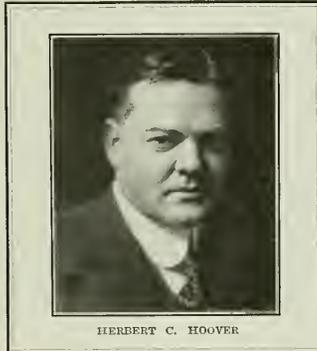
F. D. Adams, dean of the Faculty of Applied Science, McGill University,

Montreal, who went abroad last year as deputy director of educational services of the Canadian military forces, has returned to Montreal.

Richard Tarantous, who first served in the Engineers Corps on the border and later with the tank service in the battle in the Argonne, was recently discharged from the service. His address is 1,050 Clay Ave., New York.

H. S. Mulliken, for some years engaged in active metallurgical work in Mexico, with the A. S. & R. Co., and afterward with the Peñoles Mining Co., and Cia. de Minerales y Metales, will have his headquarters in the States after Sept. 1, continuing to act as consulting metallurgist for the last two named companies, in addition to other professional work.

Herbert C. Hoover, in addition to many other honors awarded him during his tenure of office as Food Director of the United States, and subsequently as Director General of Allied Relief, was included in the honor roll of Oxford University, receiving the degree of Doctor of Civil Law at the exer-



HERBERT C. HOOVER

cises held on June 25. Only one other American, General John J. Pershing, was so honored. Many of the war's greatest diplomatic, economic and military leaders also received the degree, the list including the Prince of Wales, Marshal Joffre, Marshal Haig, Admiral Beatty, Premier Orlando of Italy, and Premier Venizelos of Greece. Mr. Hoover has resigned as chairman of the Food Administration Grain Corporation, but remains as a director.

Arthur W. Burgren has been appointed superintendent of the Dolores Mines of the A. S. & R. Co., at Matehuala, San Luis Potosi, Mexico.

Rex R. Seeber, formerly manager of the Winona Copper mine, in Michigan, is now situated at Dalhousie, New Brunswick, where he is in charge of extensive lumber interests.

E. N. Patty, assistant to Milnor Roberts, dean of the college of mines, University of Washington, started on June 22 on a trip through various parts of the State of Washington.

J. Leonard Replogle, chairman of the board of the Wharton Steel Co., Whar-

ton, N. J., has been elected a director of the Sinclair Oil & Refining Corporation.

R. A. McGovern, general manager of the Caloric Co., a subsidiary of the Mexican Petroleum Co., has arrived in New York from Rio de Janeiro, Brazil. Mr. McGovern expects to leave on a tour of Europe about September.

Charles F. Willis, consulting supervisor, Department Industrial Relations, Phelps Dodge Corporation, has returned to his home in Warren, Ariz., after making a tour of the copper mining camps of the state.

G. W. Grey, superintendent of mines, for the Rio Tinto Co., Ltd., with headquarters at Rio Tinto, Huelva, Spain, is making a tour of the various mining camps in Arizona, including Bisbee, Ajo, Globe, Miami, Clifton, Morenci, and Jerome, studying modern mining methods employed in the various operations of the state.

Amasa Stone Mather, head of Pickands-Mather & Co., with a party of associates, made an inspection tour of the company's Mesabi Range holdings June 25-26. In the party were Henry Coulby and William H. McLoughlin, of Pickands-Mather & Co.; George Downs, of the Lackawanna Steel Co., and C. H. Munger, W. P. Chinn, and W. A. Rose, of Duluth, local officials of Pickands-Mather & Co.

OBITUARY

William G. Sharp, president of the United States Smelting, Refining and Mining Co., since its organization, in 1906, died suddenly on July 1, at his home in Wenham, Mass. He was born in Utah and was graduated from Rensselaer Polytechnic Institute in 1879.

William Thum, superintendent of the United States Metals Refining Co.'s East Chicago plant, died at his home in Hammond, Ind., on June 28. Mr. Thum was specially interested in the electro-metallurgical treatment of copper, nickel, silver, lead, bismuth, and zinc. A more extended notice of his career will be published in the *Journal* in the near future.

SOCIETIES

The Engineers' Club of Northern Minnesota on June 21 entertained 200 members of the American Society of Civil Engineers, adjourned from the regular annual convention at Minneapolis. The guests arrived on a special train and were taken through the Hull-Rust-Mahoning mines, at Hibbing, and later by automobile across the range from Hibbing to Eveleth.

American Mining Congress, Arizona Chapter, held the bi-monthly meeting of the directors on June 27 and 28, in San Francisco. The following at-

tended: Robert E. Tally, assistant manager, United Verde Copper Co., Jerome; B. Britton Gottsberger, ex-general manager, Miami Copper Co., Miami; W. B. Gohring, superintendent of mines, Calumet & Arizona Mining Co., Bisbee; George Kingdon, general manager, United Verde Extension Mining Co., Jerome; Norman Carmichael, general manager, Arizona Copper Co., Clifton; L. S. Cates, general manager, Ray Consolidated Copper Co., Ray; J. A. Burgess, general manager, United Eastern Mining Co., Oatman; J. Kruttschnitt, Jr., manager, A. S. & R. Co., Tucson; W. C. Browning, general manager, Magna Copper Co., Superior; W. G. McBride, general manager, Old Dominion Co., Globe; Captain Joseph P. Hodgson, manager, Morenci branch, Phelps Dodge Corporation, Morenci; G. H. Dowell, general manager, Copper Queen Branch, P. D. C., at Bisbee.

INDUSTRIAL NEWS

Walter A. Zelnicker Supply Co., of St. Louis, has added 2,000 sq.ft. to its present office space at 325 Locust St., St. Louis, Mo.

The Celite Products Co., New York, announces the appointment of Edward F. Davis as sales engineer in northern New Jersey on the application of Sil-o-Cel insulation and Filter-Cel for filtration.

Stephens - Adamson Manufacturing Co., Aurora Ill., has announced its new representation in the San Francisco district. The firm of Bannon, Bodinson, MacIntyre, Inc., 317 Market St., San Francisco, will have charge of the engineering sales work in this territory.

Cavein Rock Fluorspar Co., Evansville, Ind., filed articles of incorporation for the mining, treating and selling fluorspar for use in the tempering of steel, with a capital of \$60,000. Directors are William E. Barnes, William P. Walsh, and P. F. Persons.

H. D. Staley and G. A. Fisher, doing business under the name of Western Steel & Engineering Co., 35 Montgomery St., San Francisco, have been appointed California representatives for the United Filters Corporation. They are also representing "Beaver" brand drill steel and "Duroloid" grinding balls.

Leeds & Northrup Co., Philadelphia, Pa., has opened a pyrometer sales and service department at 1304 Monadnock Block, Chicago. A complete standardization equipment will be maintained, and certification of thermocouples and of pyrometer equipments will be furnished in terms of standards certified by the United States Bureau of Standards. Particular attention will be given to maintaining equipment after installation. The office will be in charge of Henry Brewer.

D. Tyne O'Day & Sons, Rio de Janeiro, Brazil, announces the opening of

offices at 149 Broadway, New York, to carry on a business in Brazilian products as follows: Manganese ore, ferromanganese, pyrolusite, zirconium, monozite, and similar materials. The company, having its own salesmen and buyers throughout Brazil, is prepared to market American manufactured products. The New York office is under the management of Herbert S. Davis.

Hendrie & Bolthoff Manufacturing and Supply Co., Denver, Col., have been recently appointed exclusive distributors in the Rocky Mountain region for the Shelby cold-drawn seamless steel tubing made by the National Tube Co. The wide range of uses for which it is peculiarly adapted includes heater, condenser and evaporator tubes, bushings, washers, axles, automobile parts, ball-bearing sleeves, boring bars and an extended list of manufactured articles. The June stock list of sizes on hand in Denver is available for distribution. This list also gives information on outside diameters, thickness of material, decimal equivalents, weight per foot and list price per foot.

TRADE CATALOGS

"Pedigreed Gears." R. D. Nuttall Co., Tractor Department, 2,133 Conway Building, Chicago. Catalog, 6 x 8 1/2; 16 pp.; illustrated. Descriptive of the Nuttall tractor gears, which are designed to meet the severe service required in tractor work. A discussion is included on gear troubles and inefficiency resulting in escape of power in transmission, as well as effect of uneven wear of bearings and vibration. It is claimed that with cut heat-treated gears and anti-friction bearings, the power loss is reduced to 3 per cent for each gear set, which amounts to 9 per cent for three sets, as compared to a loss of 10 per cent per set for rough-toothed gears.

Nordstrom Lubricated Plug Valve. The Merrill Co., formerly Merrill Metallurgical Co., San Francisco, Cal.; catalog, 6 1/2 x 10; 22 pp.; illustrated. Descriptive of the Nordstrom valve, particularly designed for the handling of cyanide solutions and slimes. It has been in use in mining camps of Mexico for over three years, particularly in Pachuca and El Oro. The basic principle is the combination in a plug valve of lubricant conduits and a lubricant chamber at the base of the plug so positioned that when pressure is applied to the lubrication screw this pressure operates to lift the plug from its seat and simultaneously to distribute lubricant over the bearing surfaces. It possesses a full 100 per cent opening in the plug.

Austin Roek Crushing Equipment. Austin Manufacturing Co., general offices, 910 South Michigan Ave., Chicago. Catalog 28; 9 x 12; 48 pp.; illustrated. Describes the company's gyra-

tory crusher, which has an automatic oiling system, rigid eccentric bearing, countershaft supported on each side of driving pinion, retains full eccentric bearing surface when head is raised, and is thoroughly protected from dust and grit. The portable crusher is also described. The Austin standard screens with dust jackets and the municipal revolving type; elevators of the pipe frame or municipal, belt and traction chain types; bins, of the portable telescope and stationary types, and dump cars are described. Detailed drawings of complete Austin crushing plants installed at various properties are also included, as well as a number of tables of engineering data.

NEW PATENTS

U. S. patent specifications may be obtained from the *Engineering and Mining Journal* at 25c each.

Drill Sharpener. Jesse Ditson, Littleton, Col., assignor to the J. George Leyner Engineering Works Co., Littleton, Col. (U. S. No. 1,304,459; May 20, 1919.)

Electrodes—Production of Electrodes. William Kingman Page, Chicago, Ill., assignor to Chile Exploration Co., New York, N. Y. (U. S. No. 1,302,959; May 6, 1919.)

Electrolysis, Process of. Herbert I. Allen, Portland, Me., assignor to Electrochemical Co., Portland, Me. (U. S. No. 1,303,226; May 13, 1919.)

Electrolytic Slimes, Treatment of. William C. Ferguson, Garden City, N. Y., assignor to Nichols Copper Co., New York, N. Y. (U. S. Nos. 1,305,787, 1,305,788; June 3, 1919.)

Filtering Apparatus. Michael H. Kuryla, San Francisco, Cal., assignor to Merrill Metallurgical Co., San Francisco, Cal. (U. S. No. 1,302,812; May 6, 1919.)

Furnaces—Construction of Roof of Openhearth and Reverberatory Furnaces. George Campbell Carson, San Francisco, Cal. (U. S. No. 1,302,307; Apr. 29, 1919.)

Hoisting—Safety Device for Mines. James A. Nolan, Bowerston, Ohio, assignor to the Mining Safety Device Co., Bowerston, Ohio. (U. S. No. 1,301,732; Apr. 22, 1919.)

Filtering—Process of Maintaining Filters in Filtering Condition. Michael H. Kuryla, San Francisco, Cal., assignor to Merrill Metallurgical Co., San Francisco, Cal. (U. S. No. 1,302,813; May 6, 1919.)

Drills—Cylinder and Guide Construction for Hammer Drills. Lewis C. Bayles and Fred M. Slater, Easton, Pa., assignors to Ingersoll-Rand Co., Jersey City, N. J. (U. S. No. 1,304,442; May 20, 1919.)

Flotation—Differential Flotation Concentration of Sulphide Ores and Raw Ore Products. Charles Cuthbert Freeman, Broken Hill, New South Wales, Australia. (U. S. No. 1,301,551; Apr. 22, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief
of Interest to Engineers
and Operators

SAN FRANCISCO, CAL.—June 26

Potash Production from the Mohave desert will have a decided impetus if all those who have received permits from the Government start operations. Ten permits have been issued for Searle's Lake, four for Mesquite Valley, and five for Layo County.

Strikers at Grass Valley Mines were joined on June 21 by the engineers and pump men, who walked out after the expiration of their 24-hour notice to the operators. C. A. Brockington, superintendent of the Allison Ranch mine, has made it known that his company will accede to the new schedule for the few men he employs, but only in the departments affected by the strike. The rest of the force are employed under the contract and tributary system. Deputy State Labor Commissioner John D. Blair arrived on June 21, with instructions to use every possible means to effect a settlement. A proposal by the operators to abolish the bonus system, establish a free market, and grant a percentage wage increase was rejected.

Consolidated Virginia Mining Co., on the Comstock lode, made a record shipment to the Mexican mill in the week ended June 14, amounting to 425 tons, valued at \$11,223. Ophir shipped 223 tons, valued at \$5,013. The average of the Consolidated Virginia ore was \$26.43 per ton; Ophir \$22.48. In the week ended June 21 the total ore shipped and crushed was 492 tons of a total value of \$13,336. Consolidated Virginia shipped 249 tons, averaging \$29.44 per ton, and Ophir 223 tons, averaging \$24.29. The mill was run 96 per cent of the time in the first week and 81 in the second week. Prospecting and exploration in Union, Mexican and Sierra Nevada are progressing favorably, and indications are good for development of commercial ore in sufficient amounts for shipment.

GOLD HILL, ORE.—June 27

War-Minerals Relief Committee will hold hearings at Medford, Ore., about Aug. 5 to receive further evidence supporting claims filed in the Oregon and northern California. Claims filed are to be for net losses. Operators must show that sufficient ore existed to yield profit had market been able to absorb ore.

Gold-Mining Activity has not been resumed in southwestern Oregon as readily as had been hoped for, owing to the continued scarcity and high cost of labor and supplies. Many mine owners who during the war had sold much old mill and mine equipment at great profit now find it impossible to obtain machinery at any price to replace the old. Little development work is in progress. Few copper and mercury deposits are being worked. Chrome and manganese mining is, of course, wholly suspended. The general revival of the lumber industry and building of the Federal Highway and other roads is held responsible for the shortage of mine labor.

The Oregon Bureau of Mines, which suspended all field work and publications during the war, has again resumed its activity, and with the liberal appropriation recently made by the Legislature purposes to extend its investigations. The auto truck engineering bureau of the bureau is operating in the Jacksonville district, west of Gold Hill. Equipment consists of an auto truck, upon which is mounted a complete sampling, crushing and assaying outfit, the power machinery of which is operated by the truck motor. This party, consisting of five men, is making detailed examination during this summer of partly developed mines in the region, most of which are now idle. The work of investigating oil and gas possibilities in eastern Oregon is being done jointly with the U. S. Geological Survey. The state bureau has secured a firm of consulting oil geologists to conduct investigations in western Oregon. Insufficient work has been done hitherto to obtain the necessary geologic information upon which to prospect for oil and gas.

ABERDEEN, WASH.—June 21

Two Carloads of Casing and one carload of machinery for Standard Oil Co.'s projected well near McClips, Wash., at the end of the branch line of the Northern Pacific, 30 miles north of Aberdeen, arrived at McClips the middle of June and are being transported to the site of the oil derrick over wagon roads, construction of which has just been completed. Offices and cook house are finished, as is the laying of mud sills for derrick and engine room, and indications point to an early start of actual drilling.



ROAD BUILDING BY STANDARD OIL CO., NEAR MCCLIPS, WASH., LAST STRETCH IN SEC. 8-20-12, JUNE 5, 1919.

Photo by Girard & Frank, Aberdeen, Wash.

Shell Oil Co.'s Geologists arrived at Aberdeen this week. This is taken in some quarters to indicate intention on the part of that corporation to enter the Grays Harbor oil exploration field, but no statements to that effect have been authoritatively made. No activities, in fact, of the number of companies, mostly newly organized, now in the field safely may be taken as affording sound indication of actual development intentions. Nothing has transpired clearly to prove that any exploration of oil prospects is planned other than that undertaken by the Standard Oil Co., upon some stage of whose work, in the opinion of most local observers, other concerns are waiting before starting development prospects themselves.

WALLACE, IDAHO—June 26

Managers of Coeur d'Alene Mines will make no concessions to the International Union of Mine, Mill, and Smelter Workers, successor to the Western Federation of Miners, nor will they do anything that could be construed as a recognition of the organization. This in substance is the answer given to Robert M. McWade, Conciliation Commissioner, representing the Department of Labor, who has been in Wallace for the last two weeks. Mr. McWade invited the managers to meet him in a body and discuss the situation, the result of the conference being as stated. He does not appear to regard the matter as finally settled, however, for in adjoining the conference, he stated that it was necessary for him to leave for a few weeks and that he desired to meet the managers again upon his return.

BUTTE, MONT.—June 26

Options providing for a 60-day examination of the property of the old Bluebird mining company, embracing 21 claims, toting together with adjoining property, are being sought in Butte, presumably by an outside company. The Bluebird has large bodies of silver-zinc-lead ore, and 20 years ago was a producer of silver ore. A large mill erected on the ground failed in its treatment of the ore in consequence of its high zinc content.

Initial Payment of \$110,000 for a tract of ground lying on the west side of the Butte district and known as the Bernard placer and the West Yellow Jacket claim, has just been made in a deal involving a total payment of \$330,000. This territory is more than a mile long and from 300 to 400 ft. in width, lying at right angles across the strike of the large fissure system of the Anaconda company, embracing the Syndicate vein on the north and the Stewart on the south, two of the largest producing figures in the district. Payment was made through Joseph C. Pyle, a prominent mining engineer and geologist, connected with the W. A. Clark interests.

Organization of Montana Mining Association, with headquarters at Helena, during the last week is the first step of Montana owners of mining property to act in concert in bringing the merit of their claims properly before Eastern capital; also to act together in the suppression of wildcat mining flotations. Former State Senator C. S. Murray of Broadwater County, was named chairman, with Lieutenant Governor W. W. McDowell vice-chairman, and L. S. Ropes temporary secretary-treasurer. Addresses were made at the organization session by Governor S. V. Stewart and Mr. McDowell. Twenty years ago the state boasted a mining association but it soon fell into the discard. The silver boom is responsible for its revival.

SALT LAKE CITY, UTAH—June 26

The Park City Strike is at an end and the men are going back to work under the conditions prevailing at the time of its beginning in May. Normally there are employed in this camp between 700 and 800 men, and production has been averaging 8,000 to 9,000 tons per month. It is estimated to be 300 to 450 men at work. The number for the Judge Mining & Smelting and Daly West is estimated at 75 to 100; for the Silver King Coalition at 85 to 90; for the Ontario Silver, at 40; for the Silver King Consolidated, at 20. Other properties opening up include the Three Kings, Nalldriver, Iowa Copper, and Park-Utah. It will probably take two to three weeks before work forces are all, as these have been scattered to some extent. However, the more permanent and more dependable men have remained, and others are coming from outside as they hear that the mines are opening up.

A Survey of Metal Production in Utah in 1918, according to advance figures by the U. S. Geological Survey, shows Salt Lake County to lead, with 13,744,115 short tons of ore, from which was produced 100,477 fine ounces gold, 3,022,638 fine ounces silver, 213,236,973 lb. copper, 88,681,872 lb. lead, and 11,169,540 lb. recoverable zinc, the total value of which was \$65,987,444. Juab County was first in production of silver, second in lead, and second in total value. The figures are: Juab, 1,115 short tons treated, 30,408 oz. gold, 894,806 oz. silver, 5,896,223 lb. copper, 25,823,853 lb. lead, 218,061 lb. recoverable zinc; total value of output \$8,953,104. Summit County, with Park City the center of activity, was third in silver and lead produced, and in value of output. Ore treated amounted to 116,797 tons, from which was produced: Gold, 3487 oz.; silver, 7,061,292 oz.; copper, 544,322 lb.; lead, 16,361,250 lb.; recoverable zinc, 103,849 lb. The total value of these metals was \$3,435,033. There were 19 producing companies.

Report of Treatment of Low-Grade Ore by volatilization, by the U. S. Bureau of Mines at the University of Utah.

for work done during May, shows new Cottrell treaters and large rotary kiln just installed to have worked satisfactorily. During the month three large trucks at the Park City district were treated; one a very complex silver-lead-zinc-iron sulphide ore, the content of lead and zinc averaging about 15%; the second type representing oxidized ores of lead practically free of zinc; and the third type partially oxidized lead ore containing a little zinc. Large tonnage of material is present on dumps in the district. It was found possible to extract practically all of the lead from each of the samples and the greater part of the zinc from the oxidized ores. The complex sulphide ore has not responded to the volatilization treatment as readily as the other ores and had to be pre-roasted to drive out the greater amount of sulphur before it was subjected to the chloridizing roast. As this is typical ore, representing large tonnages, considerable time is being given to the problem. It has been possible to drive off practically all of the lead, but the silver extraction up to the present has not been satisfactory.

Assessed Valuation.—The Utah Mines under the new state law is operating for the first time this year is in round numbers \$100,000,000, as compared with \$46,000,000 last year. Metalliferous mines are now taxed on a basis of three times the net proceeds and, in addition, according to their improvements—including milling plants, whether situated at the property in question or not, such as smelters and flour plants, of the Utah Copper, formerly separately taxed by the county—instead of at their net proceeds plus an occupation tax, as in the case of non-metalliferous mines, represented chiefly by coal mines, are taxed according to a cash valuation fixed by the state board of equalization. As will be seen, the new law is being applied by the mining industry in this state to have the law in regard to mine taxation read as "not to exceed" three times the net proceeds in this form. This form was approved by the State Senate and had the sanction of the Governor, but failed to pass the House. Mining companies opposing the "occupation" suit as unconstitutional had withdrawn suit instituted and paid the tax, with the understanding that the law would read at "not to exceed three times the net proceeds." The Governor's veto and the failure of the House to pass the law in this form, was released from any obligation by the mining interests.

DENVER, COL.—June 26

An Independent Co-operative Ore-Treatment Plant, to be erected in Denver, is favored by various metal-mine operators of Colorado. No actual plans have yet been made for the erection of such a plant, and it remains to be seen whether anything will come of the proposition. The opinion is expressed that the concern will be made up of small producers if anything comes of it.

The State Mines Development Association was organized some time ago in Denver, with the object of governing the operations of a company to be formed that would be active in the development of prospects to the point where they might be termed mines, thus eliminating the promoter and wild-catting. It was planned to organize a board of representative business and mining men in each of the ten mining districts. The association does not seem to have extended its activities to any of the mining districts in Colorado.

CLIFTON, ARIZ.—June 27

Shannon Copper Co.'s Holdings recently purchased by the Arizona Copper Co., Ltd., of Clifton, Ariz., include 17 claims once acquired from the latter company, a well-equipped road to the mines, a large smelter below Clifton, the smeltery, concentrator, offices, and considerable realty. The furnaces are to be scrapped and the railroad will be sold, although possibly maintained for future use. The Arizona company has been narrowing the scope of its operations for some time, and has closed down its workings at Metcalf and Coronado as well as its No. 4 concentrator at Clifton, which has handled the ores from the sections named. The Metcalf district is therefore idle, save for a little work by lessees.

BEROME, ARIZ.—June 27

Steam Shovel at Verde Mine, are working toward the upper "hot stopes" on benches that correspond to the 150 and 300 levels. These shovels are expected to cut down through the entire burnt zone of the mine, removing what has been a source of irritation that is a danger. The cost of extraction of this ore will be relatively small. Embraced within the operations will be the bench formerly occupied by the

United Verde smeltery, and the company's main office will have to be removed to a place prepared on the 300-level bench. The company's present operations consist mainly of exploration work on its deepest levels. A coal-crushing plant is also being installed preparatory to doing away with oil firing of reverberatories.

GLOBE, ARIZ.—June 26

Inspiration Consolidated Copper Co. is equal partner with Anaconda Copper Mining Co. in the purchase for about \$1,600,000, of 160 acres of producing oil land in the Bakersfield district of California. Title has been passed to an Arizona corporation formed for the purpose. The purchase was for the purpose of protecting the fuel supply of the two companies, which are closely associated. For months past Inspiration has been securing most of its power from the reverberatories at the International Smeltery, as Roosevelt hydro-electric works, with a low reservoir level, would not be relied upon. It appears that Inspiration had made need of this Roosevelt title, the default emphasized the need for maintenance of the company's own power plant for possible use in the full operation of the mines and of the 20,000-ton mill.

BISBEE, ARIZ.—June 27

The Southwestern Oil Co., recently formed to explore some of the oil districts of Texas is attracting considerable notice at this time among the mining fraternity of Arizona, principally because its incorporators and principal stockholders are prominent mining men in the state. It holds all of the stock of the company is held by mining men in various Arizona copper camps. The new manager is H. E. Barkwood, formerly of Bisbee, Ariz., who had charge of the Phelps Dodge churndrilling operations on Sacramento Hill. Two deep wells are to be started immediately by the company on its holdings, which lies several miles northwest of Ranger, Tex., in a district which has recently brought in a heavy producer known as the Perkins well.

TYRONE, N. M.—June 27

The Stopping of Copper Production at the Burro Mountain branch of the Phelps Dodge Corporation at Tyrone, N. M., as recently announced, and the turning of attention to development and repairs indicates the company's policy. Tyrone cannot produce copper at a profit at the present market, which is present cost of labor and supplies, it is officially stated; moreover, there is no incentive to produce copper now. The employment situation in Tyrone is little affected, as practically all miners who have been producing ore for the mill have been placed on development work, which will be pushed. Testing is being done in the big mill, which will probably result in remodeling.

AUSTIN, TEX.—June 28

Two Pipe Lines to carry oil from West Columbia and Ranger to coast will be completed soon. Pipe line of Humble Oil & Refining Co. from West Columbia to Webster tank-farm is nearly finished. Completion of the second line of the Texas Co., from Ranger to Fort Arthur, has been interfered with by weather.

The Texas Co. has recently increased its capitalization from \$69,275,000 to \$85,000,000 by an amendment to its charter filed in Austin on June 18. This increase was approved at a meeting of the board of directors held in Houston last December, and, it is stated by officials of the company, represents increase in the company's business.

The Railroad Commission has formed a temporary organization and adopted temporary rules and regulations for enforcing the oil and gas conservation law, which became effective June 18. Prior to its enforcement is the duty of the Railroad Commission. The law prohibits waste of natural gas, crude oil, or petroleum, defining the terms as follows: (a) "waste" in commercial quantities . . . except from gas pockets at high points in strata recognized as oil strata; (b) "drowning" with water waste as follows: (1) burning of waste; (d) waste-ful utilization of such gas; (e) burning flambeau lights; and (g) burning of gas for illuminating purposes between certain hours. In all, thirty-

seven rules are laid down pertaining to the conduct of companies engaged in the business of producing or drilling for the products named.

DULUTH, MINN.—June 27

The Railroad Management responsible for shipments of iron ore from Minnesota ranges continues to develop new means for hampering the shipper, the latest being a proposal to make the operator pay for and maintain special tracks leading into his mine and contracts of binding nature, which will perpetuate this system after the return of the railroads to private ownership have been submitted. Many operators have over the year the excessive charge of \$75 per car, which was put in effect by the Railroad Administration during the last shipping season, by doing the work with their own locomotives and crews, and it is rumored that the objections of the railroad unions to this system have been so strenuous as probably to necessitate a track-rental charge so prohibitive as to insure the return to the spotting charge system.

The Oliver Iron Mining Co. is making preparations for the building of a model village at Alice to replace the scattered houses and locations which will have to be moved when operations begin on the removal of the ore now underlying the north end of Hibbing. The village will consist of 40 acres in the village of Alice has been purchased, and work is now going forward on the plotting, grading, and other preliminaries necessary for building the houses, which it is announced will be started as soon as the ground is ready. A feature of the new location will be a fine electric trolley system, which, if the plans possible and which, it is claimed, will be the most complete in Minnesota. It will cover an entire block, be three stories high, and be used for hauling, drying, refrigerating machinery, ventilating machinery, anesthetizing, sterilizing and gynecological rooms, X-ray, and an obitric section covering the entire third floor.

ISHPEMING, MICH.—June 28

The Michigan State Tax Commission has increased the valuations of many of the mines in both the iron and the copper districts. The Calumet and Hecla Mining Co. is now on the assessment rolls for \$1,000,000 more than last year, and some of the largest iron producers have been advanced as much as \$3,000,000. The mines of the Gogebic Range are now assessed at about \$50,000,000, the largest increases having been made in the case of the Newport Mining Co., the Oliver Iron Mining Co., and the new pit properties near Wakefield. The mines on the Marquette Range were advanced, but some reductions were also made, so the increase is not as great as for some of the other ranges. It was many years ago that the tax commission reassessed all of the properties, claiming to place them on a cash-value basis, and it was not expected that any changes would take place this year. The policy of the state to tax all ore reserves has had the effect of slowing up development work, the companies not caring to open ore deposits before they are needed. The Cleveland-Cliffs Iron Co. is the only concern which is doing any great amount of diamond drilling in the Michigan field at present. The company is now carrying several drills on the Mesabi Range. Ten to twelve drills are being worked regularly by the company on the Marquette Range, but no information is being given as to what \$50,000,000 is known that the Cleveland-Cliffs desires to find another mine in the Ishpeming field, as three of the properties now operating there will be closed down in a matter of two or four years. Ore is not going forward any faster than it was a week ago, there being few shovels attacking the stockpiles. Some properties are now making development of the ore that is now coming to surface, and the outlook for next winter is far from being encouraging. There is certain to be shut down a number of the ore mines unless the movement of ore is much more brisk than it is now.

HOUGHTON, MICH.—June 28

The Situation in the Michigan Copper District is summarized as follows: Seven mines are producing copper as close to normal as their working forces will permit. They are: Quincy, Mohawk, Wolverine, and Champion of the Escanaba, Mountaintop, and Champion mines of the Copper Range company. Eight mines are producing at approximately half of normal. They are: Calumet, Hecla, Ishpeming, Wakefield, Central, Almeck, Osceola Consolidated, Superior, and Mass Consolidated. Fifteen active organizations have their properties closed down: Lake Copper, White Pine, La Salle, Franklin,

New Baltic, New Arcadian, Hancock Consolidated, Winona, White Pine, Cass Copper, Wyandt, South Lake, North Lake, Cherokee and Indiana. Five exploration properties are continuing their development with energy: Seneca, Mayflower-Old Colony, Naumkeag, and Michigan. With reference to the properties that have suspended, it should be noted that mines like the Hancock, Franklin, La Salle, and White Pine are keeping their pumps operating, and could be reopened and become factors in copper output, in a small way, on short notice. Michigan is included in the list of exploration properties. The mine is a regular producer, but has a most important future possibility in an exploratory sense.

More new ground was opened in lower levels of the mines of the copper district during June than in any month for two years. The most noteworthy fact in connection therewith is that the general physical condition is better than average. This applies most importantly to the lower levels of the older mines, which are equally productive to the newer mines or those working along new lines.

Mines included in the classification of high-normal output have not cut down the total number of men working with drills underground. They have, therefore, a larger number employed in sinking shafts and opening new laterals. This underground preparation for the future places them in position to increase output of copper rock to normal whenever the metal market warrants such action and without the necessity for doubling their underground working forces. Greatest interest centers in the developments at the Seneca and the Michigan properties. The Seneca showing in the Kearsarge amygdaloid is up to reasonable expectations. That was made as certain as anything in copper mining might be made, by reason of the developments in adjoining properties, Ahmeek and Mohawk, and then again by reason of the drill showings when underground tests were conducted.

BIRMINGHAM, ALA.—June 27

Inquiries for Pig Iron are steadily becoming more numerous, a few for 1920 delivery being noted. Most companies, however, are refusing to sell beyond the third quarter of 1919, looking for an advance in prices. Two or three are out of the market for deliveries in the third quarter at present prices, and, owing to the belief that higher prices are to come, no inquiries for 1920 delivery are being considered. The Birmingham district is again shipping iron north, and were it not for the extremely high ocean freight rates the district could secure a large export trade. The Tennessee Coal, Iron & Ry. Co. is preparing to blow in its Alice furnace in the city proper at once; likewise in the near future another furnace at Bessemer, Ala. The feeling in

the district is that a decided change for the better has set in.

The demand for steel wire products for future delivery has become so heavy that plants are preparing for long and steady operation. Dealers are said to be taking advantage of the prevailing low prices. The plant of the American Steel & Wire Co. at Fairfield, Ala., has been in steady operation for some time, and, with the exception of repairing to be done in some departments, no shutdown is looked for. The Gulf States Steel Co. will close its Gadsden plant for about three weeks during July in order to put it in the best of condition. This company also expects to start its blast furnace in July. Some repairs now being rushed to completion.

Unionization of mill and furnace workers as well as of those in ore and coal mines and byproduct plants is progressing rapidly, with the aid of experienced organizers. The latter declare the workers are eagerly accepting the propaganda of the American Federation of Labor. Mass meetings in the old Ironstone district. One is scheduled for the latter part of June at Ensley, Ala., where the big steel mill of the Tennessee Coal, Iron & Ry. Co. is situated. The local business officials intend to make any statement as to the attitude which would be taken by the companies in regard to the efforts to organize. A shortage of labor in the mining divisions along Red Mountain, first noticed in the middle of June, has increased somewhat during this the last week of June. Some labor is being transported from Bessemer to northern points, but this will not wholly account for the shortage.

VICTORIA, B. C.—June 27

Diamond Drilling is being used to a larger extent in British Columbia in mine development than heretofore. The provincial government is drilling on the Snow-storm group of copper claims in Highland Valley, near Merritt, B. C. The work was started last January, and five borings have been completed. The sixth is now down and the plan is to drill at least 10,000 ft. for the purpose of proving up the orebody. The surface showings indicate an extensive zone, with good values in copper.

The Granby Consolidated Mining, Smelting, and Power Co. closed its Phoenix mines and Grand Forks smelter on June 10. Trains on the Phoenix branch of the Great Northern Ry. made their last trip on June 13, and now the rails are being removed from the track. For some time the company has been concentrating its efforts at its northern property, at Anvox, and reducing them at Phoenix and Grand Forks, and it was the intention of the owners to

close the latter properties at the end of the year. The strike of the coal miners at Fernie, and consequent inability to get coke from there, hastened the closing by six months. The grade of ore at the Phoenix mines has averaged about only 1% of copper and about 60c. in gold and silver for some time. During the last 20 years, 12,814,862 tons of ore has been taken from the Phoenix mines and smelted at Grand Forks, producing 636,291 oz. gold, 4,330,345 oz. silver and 271,073,000 lb. of copper. All the miners and smelter men have been offered work at the Granby company's northern property. During the month of July, the company's Anvox mines produced 1,267,658 lb. of copper.

In the Portland Canal District, W. R. Tonkin and W. W. Warren, representing United States capital, and John Peterson, of Stewart, B. C., have bonded the North Star, the Van Guard, the Last Chance, and the second Thought mines at Alice Arm, Portland Canal district. The total consideration is \$550,000. W. Somerville has bonded the Homestake, Xelking, and the Muskies and the Taylor Mining Co., a subsidiary of the Taylor Engineering Co., which was incorporated recently to take over the Dolly Varden mine—has taken a working option in the Ruby mine, opposite the Dolly Varden, and has started to operate the properties. The Temiskaming Mining Co. of Cobalt, Ontario, is negotiating for the purchase of the Moose group.

TORONTO, ONTARIO—June 28

Conferences Between Striking Miners and mine managers of Kirkland Lake have been held without leading to any settlement. The majority of the mining company officials do not expect that any adjustment of the dispute can be effected for some time, and have made their plans for remaining inactive for an indefinite period. One effect of the strike has been to encourage the development of the outline districts, where a number of the strikers have found employment in doing assessment work on mining claims. Others have gone out as prospectors or obtained work on undeveloped prospects. The Porcupine miners this week presented a new wage scale to the operators calling for an increase of 50c. per day all round and asking for an answer by June 28. The minimum asked for is below that demanded by the Kirkland Lake and Cobalt miners, and the attitude of the men is generally conciliatory. They ask for a reasonable and just discussion of local labor problems, and a peaceful settlement. A factor that is expected soon to cause a subsidence of the strike fever is the large surplus of labor in the Sudbury district, owing to the curtailment of the nickel output, and the reduction of wages in the mining districts of the Western states, which it is anticipated will cause an influx of mine workers into northern Ontario.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ARIZONA

Cochise County

NIGHT HAWK LEASING (Bisbee)—Has purchased new hoisting machinery for property, which will be installed promptly, preparatory to extending shaft from 600 to 800 ft.

Gila County

MIAMI M. & M. (Miami)—Recently closed deal for purchase of milling plant formerly owned by Arizona Butte corporation.

Pima County

LITTLE AJO (Ajo)—Some copper mineralization disclosed by diamond-drill hole at depth of 1,150 ft.

MYERS GROUP (Ajo)—Property adjoining New Cornelia on southeast, may soon be diamond drilled. Investigation of ground by representatives of E. J. Longyear Co. for data in estimating drilling costs, has been made.

PAYMASTER MINE (Twin Buttes)—Preparations being made to open old property again and operate under name of Paymaster Silver & Lead Co.

Pinal County

SILVER BELT (Mayer)—Eight-inch vein cut at 275 ft., carrying 400 oz. silver, 40% lead, within 12 ft. of orebody carrying pay ore. Strike is on new ground.

HALF-MOON (Ray)—Property, 12 miles from Florence at Red Hill, being developed by Ray men, headed by Charles Goodman.

Yavapai County

GREEN MONSTER (Jerome)—Secretary and Power Co. resigned, succeeded by Perklin. Company developing Silver Tip claim.

COLORADO

Boulder County

BOULDER COUNTY TUNNEL (Cardinal)—Development resumed, and force engaged in clearing out tunnel preparatory to active operations. Tunnel is crosscut for 2600 ft. then drift for about 2500 ft. on Boulder County vein. Chicago capitalists interested in new work.

YELLOW PINE (Crisman)—Twenty sets of lessees at work under superintend-

ence of J. W. Pherson. Winze from 6th to 9th level being unwatered, and will probably drain water from property. Installation of larger compressor plant under consideration.

Clear Creek County

BLACK EAGLE (Idaho Springs)—Reopened, and force of six men engaged on development under management of Harry Short.

CROWN POINT (Idaho Springs)—Lessees have opened 30-in. vein of high-grade gold ore west of main shaft.

EDGAR NO. 2 (Idaho Springs)—Lessee Al. Freedman has opened 4 x 4 ft. vein of milling ore in east heading from Big Five tunnel level. Heading being advanced and raise being extended east of old ore-shoot for exploration purposes. Six-inch streak of high-grade smelting ore opened 60 ft. east of raise. Miami tunnel level being cleaned out and new track being laid preparatory to resuming development of ground above this level.

LORD BYRON (Idaho Springs)—Mine in Spring Gulch will be taken over by P.

O. Dwyer, of Davenport, Iowa. Planned to develop property to depth of about 900 ft. through Stanley Road adit level. Crosscut will be driven about 200 ft. to the Byron vein, and thence drift will be advanced on vein for distance of about 2000 ft. to point under Byron shaft. Raise will then be extended about 500 ft. to connect with bottom of shaft.

STANDARD (Idaho Springs)—Lessees have opened small streak of high-grade ore on 400 level of this Fall River property. Ore being shipped in sacks by express to Pueblo smeltery under valuation of \$10 per lb.

SAN JUAN COUNTY

GOLD BIRD (Silverton)—Development resumed under direction of W. N. Kloster, owner. High-grade gold and silver streak opened.

PARADISE (Silverton)—Crosscut now 200 ft. long and will be advanced 75 ft. to junction of several promising veins. J. W. Esley superintendent.

SILVER LAKE (Silverton)—Secured by John B. Giono and associates under lease from American Smelting & Refining Co. Development will be resumed soon.

SAN MIGUEL COUNTY

SHIPMENTS OF CONCENTRATES from Telluride during May were as follows: Smuggler Union, 80 cars; Tomboy, 52; total, 132. Twenty cars from Smuggler shipped to Durango, and remainder to Pueblo smelteries.

CALIFORNIA

Eldorado County

STILLWATER GOLD QUARTZ (Omo)—Two hundred feet driven on vein and 6 ft. of quartz exposed.

Fresno County

CHROME PRODUCERS OF FRESNO COUNTY have organized to aid Government in speedy adjustment of claims.

Inyo County

SLATE RANGE MINERALS (P. O. Bakersfield)—Erecting 50-ton mill, combining gravity concentration and flotation, to handle ore averaging \$15-\$20. Three years' supply blocked out. Eight-mile electric power line installed. Expect to be in operation about July 15. Ore chiefly lead carbonate, with oxides sulphates and sulphides. High grade shipped to U. S. smelter, Midvale, Utah Property in Slate Range Mountains, about eight miles northeast of Trona, Cal. Number employed 20-40. Production in 1918, 1,331,440 lb. lead, 1,783.85 oz. gold, 64,388.89 oz. silver, and 90,124 lb. copper. Gross receipts 1918 were \$142,821.87. Morris B. Parker, superintendent.

Nevada County

IDAH0 MARYLAND (Grass Valley)—Has purchased Eureka claim and is negotiating for purchase of Brunswick group.

Sierra County

EXAMINATION OF ALHAMBRA PROPERTIES in Jim Crow Canyon finished by H. S. Raymond and F. O. Richardson. Sovereign mine now being examined, these properties under option to Gold Exploration Co., of Salt Lake City; also the Comet, latter carrying vein of arsenical sulphides not amenable to ordinary mill processes.

TABLE ROCK MINING CO. has found body of gold-bearing pipe clay overlying gravel in 3,000-ft. tunnel at Howland Flat, near Sierra City. J. H. Hartley in charge.

GIBRALTAR (Downieville)—Two feet per day being made in tunnel by Kieffer brothers.

Siskiyou County

BLUE LEDGE (Hutton)—Shipping three cars weekly of 12 per cent copper ore to Tacoma smeltery, with several thousand tons good ore on dump. Will double shipment while roads are good. Thirty-five-mile haul to shipping point, costing \$11 per ton.

Tuolumne County

DREISAM (Tuolumne) Shaft being unwatered by Ripon Mining Co.

IDAH0

Shoshone County

NABOB (Bealer)—Mill of 150 tons' capacity nearing completion. Expected to be running in July. Large amount of lead-silver-zinc ore available. Controlled by Stewart Mining Co.

AJAX (Burke)—Development resumed after suspension of three months. Work transferred from Con Paul tunnel to Moonlight shaft. Down 200 ft. and drifting west toward common end line with Hercules. Considerable ore continues in drift.

Vein supposed to be identical with Hercules. Company controlled by capitalists of Lynn, Mass.

GOLD FLOTATION (Mullan)—Gold Flotation Development Co., which has lease and bond on old Singiser mine in Lehmi County, Idaho, announces mill will be installed within 30 days, and will include crushing plant, tables and flotation cells. Former company discontinued work in 1906, after doing large amount of development, and property is equipped with stamp mill and cyanide plant. Ledge said to be 50 ft. wide, with 3-ft. pay streak. Satisfactory tests made with flotation. Officers and directors: W. H. Havlin, Baltimore, Md., president; Harold Williams, of Mullan, vice-president; H. G. Loop, of Seattle, secretary-treasurer; John Brizel, of Wilmington, Del., and O. W. Lewis, of Wallace.

GIANT LEDGE (Murray)—Large lead-silver ore shoot on 200 and 400 levels. Property originally located and developed for gold.

BULLION (Wallace)—Operations suspended during war. Now has five men drifting into body of 4% copper ore disclosed in shaft above and by diamond drill.

LUCKY SWEDE (Wallace)—Work started in crosscut to promising copper ledge, which will be cut at 1,000-ft. depth. Should reach vein during summer.



NEW MILL UNDER CONSTRUCTION BY SLATE RANGE MINERALS CO., INYO COUNTY, CAL. CUT SHOWS FLOTATION MACHINE ON SKIDS

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Copper production for May was as follows: Ahmeek, 1,117,984 lb.; Alouez, 190,000; C. & H., 3,596,900; Centennial, 92,732; Isle Royale, 790,209; Osceola, 812,497; Superior, 102,386; and White Pine, 94,111.

MICHIGAN COPPER (Rockland)—Copper output now running 25 lb. to ton, but May output showed 23 lb. to ton. 149,000 lb. being total refined output from 6,230 tons. Company plans to increase force on development work. No construction work now under way. Underground openings going forward on three lodes, the Butler, Ogima, and Evergreen. These all toward location of proposed shaft, east of present shaft.

Gogebic Range

NEWPORT (Ironwood)—Has built four more cottages for miners at North Park location. Employees may buy these or other houses from company, paying on installment plan. In last year homes for salaried men and miners have been built.

PAEST (Ironwood)—Haulage-power generating set consisting of tandem-generator Corliss engine and 400-kw. d.-c. generator

has been sold and removed from power house. Current for haulage now supplied by rotary circuit in pump house on 23rd level, which receives power from turbine generators in main power house. Company trying out Captain Hear's mucking machine in 8 by 15-ft. crosscut on 24th level of H shaft. Newport mine has two and ordered another of these machines. Is using them chiefly in ore. Machine driven by air motors, has a dipper, and swings in horizontal circle, but will operate in 8 by 8-ft. drift.

MONTREAL (Montreal, Wis.)—Exploration of property by diamond drills continuing. Most of holes are some distance north of foot wall in horizons where other mines have recently found ore. This property on Gogebic Range in Wisconsin.

Menominee Range

CARPENTER (Crystal Falls)—Four miners killed on June 20. Bodies recovered.

MINNESOTA

Mesabi Range

AJAX (Biwabik)—Operators announce discovery of vein of high-grade manganese ore 6 ft. wide.

HOBART (Gilbert)—Completion of new spur will permit resumption of shipments July 1. Hanna Ore Mining Co. operators.

ALEXANDRIA (Hibbing)—Big underground property, of Hanna Ore Mining Co. starts shipment of stockpile.

CYPRUS (Hibbing)—Property, opened by R. M. Sellwood in 1903, makes final shipment. Open-pit scrap, total shipments 1,800,000 tons.

WEBB (Hibbing)—Resumes operation of underground portion of mine with full crew day shift only. Shenango Furnace Co. operators.

DEAN (Kinney)—Tod-Stambaugh Co. completes churn-drilling campaign. Drilling equipment transferred to Dunwoody, at Chisholm, operated by same company. Dean increases shipments from 80 to 120 cars daily, with announcement of further probable increases.

PIL0T (Mountain Iron)—New open-pit property of Hanna Ore Mining Co. made initial shipment of concentrate. Drainage shaft completed at depth of 103 ft. Complete electrical equipment.

MONTANA

Jefferson County

LEGAL TENDER (Clancy)—Orders placed with hardware and mining machinery department of Anaconda Copper Mining Co. for electric hoist and compressor plant.

Silver Bow County

ANACONDA (Butte)—Shortage of water has compelled Washoe smeltery to shut off treatment of independent copper ores which require concentration. Sinking under way at Orphan Girl and Original shafts. Drifting in ore continues on 800 level of Emma mine. Good showing reported at Tropic. Treatment of zinc concentrates from Butte & Superior and Timber Butte Milling Co. resumed. Shaft of Gambinus, recently acquired, has been abandoned and head frame removed. Production continues slightly under 60% normal.

ANSELMO MINING (Butte)—Shipments resumed, smelter returns on first six cars showing net value up to \$3,000 per car. Succeeding cars running around \$1,500 net value chiefly in gold, silver, and zinc. Property now opened to 800 level through Trifle shaft, and drifting in progress.

BARNES-KING (Butte)—Options being taken on several claims in northern and northwestern part of district. Some preliminary prospecting being done on Little Annie and George properties.

CRYSTAL (Butte)—Drifting on 500 level of North Goldsmith ledge shows ore of medium grade continuing 5 ft. wide.

DAVIS-DAILY (Butte)—Steam shovel double former capacity at work removing Colorado mine dump. May returns from development ore show net of over \$28,000 despite added cost of removing dump. High-grade zone continues. Silver-zinc shipments from Hibbernia approximating carload daily. Sinking of Colorado shaft under way and will be started soon at Hibbernia.

ELM ORLU (Butte)—Two high-grade bodies of silver-zinc ore 15 ft. 2,000 level of Rainbow fissure, one 15 ft. wide, and other 20, lying on foot and hanging walls. Sinking in progress. Production of zinc ore being increased.

NORTH BUTTE (Butte)—Good ore disclosure reported on 600 level of Speculator. Development progressing, but ore production still curtailed to 25% normal. Sarsfield shaft crosscuts still in country rock.

NEVADA

Washoe County

STANDARD METALS (Reno)—Company operating Peavine mine, near Reno, installing new mill with K. & K. flotation machines, Wilfley tables, Calkow tanks. Expected to be in operation within 30 days. Ore chiefly silver, with some copper.

OREGON

Jackson County

RAINIER MERCURY CO. of Tacoma, Wash., operating Utah groups of 38 claimants north of Gold Hill during last two years, with monthly output of 65 flasks of mercury, has been reorganized. New corporation, known as War Eagle Mining Co., organized at Medford, Ore., with local men at head, is operating mines with present equipment, making developments, and purposes to erect large-capacity furnace for reducing lower-grade ore.

Josephine County

DAILY & CASEY (Selma)—Two prospectors have struck high-grade gold quartz on claims on Briggs Creek near Selma, Ore. The mine is a high-grade quartz also chrome producer, inaccessible until Government roads were built. Find in Illinois River district.

TEXAS

Brazoria County

WEST COLUMBIA FIELD production for week ended June 19 averaged 34,435 bbl. daily. Producers as follows: Humble Oil & Refining Co., 10,000 bbl.; Gulf Production, 8,300 bbl.; Texas, 8,300 bbl.; Crown Oil, 6,800 bbl.; Sun, 600 bbl.; Hanicker Oil, 35 bbl.

TEXAS CO. (Brazoria)—Good pump brought in at 2,300 ft. on Masterson & Altan ranch, 16 miles south of Brazoria. Will continue drilling.

Galveston County

HUMBLE OIL & REFINING (Texas City)—Will build 1,200-ft. dock for loading oil from north Texas fields for shipment to Atlantic seaboard refineries. Loading of channel-dredged will be 2 1/2 ft. deep, to accommodate largest tank steamers. Will be connected with company's 8-in. pipe line from oil fields.

Gonzales County

LARGE ACREAGE NEAR WALDER leased recently, and more ground being taken up; several thousand acres altogether now under lease. Test wells will be sunk soon.

Kleberg County

CONSIDERABLE DRILLING near Kingsville to be done soon. Texas-Kentucky Co. building derrick on land six miles southeast of Kingsville. International Petroleum Co. opened office at Kingsville. Kleberg County Oil & Gas Co., just organized, capital stock \$100,000, owns leases on 4,020 acres from six to twelve miles southeast of Kingsville. Some gas seepages found.

Lampasas County

HOWELL WELL NO. 1, on White ranch, shows oil at 1,030 ft. Nelms-Marvin well No. 2, southwest of Lampasas, now drilling in dark gray limestone at 775 ft.

Montgomery County

BLACK HAWK PETROLEUM CO. has Water No. 2 well down to 4,315 ft., and going deeper.

Orange County

DRILLING BY CHICAGO SYNDICATE will be started soon in Orange County. Large acreage leased. George A. Foreman local manager.

Wichita County

WICHITA FALLS DISTRICT production now about 100,000 bbl. per day, according to producers and pipe line officials. Total capacity of pipe lines in district less than 85,000 bbl. a day. Several lines building. Big companies building more tanks. Federal officials asked to assist in facilitating movement of tank cars to decrease storage.

UTAH

Box Elder County

VIPONT MINING (P. O. Oakley, Idaho)—Proposed to construct modern mill to treat low-grade silver ores, of which there is stated to be good tonnage. Property

worked intermittently since '60s, but only high-grade mined. Attempts at concentrating low-grade by old method unsuccessful. Main tunnel in 1,000 ft., giving depth of 200 ft. Reported force of 50 men working is adding rapidly to low-grade ore on dumps.

Juab County

TINTIC SHIPMENTS week ended June 21 amounted to 110 cars.

CHEF CONSOLIDATED (Eureka)—Three new pumps put in operation, making possible lift up to 1,250 gal. water per min.

COPPER LEAF (Eureka)—Shaft at this Tintic property down to 1,200 level, and 100 ft. more of sinking probably to be undertaken. Two shifts working in shaft, and drifting being done on 1,000 level.

EUREKA BULLION (Eureka)—Strike holding out. Raise from 800 level up about 10 ft. and showing 6 ft. of ore. Ore mined also from crosscut in main drift a short distance from raise. Conditions promising. Further sinking to be done, as large bodies are found at depth in this section.

LEHI-TINTIC (Eureka)—Assessment 2c. at this level to provide funds for new working shaft. Has power connections, and sinking will begin as soon as necessary equipment acquired.

TINTIC PAYMASTER (Eureka)—Consolidating interest of claims with Eureka King effected, stockholders in latter to receive two shares in new company for one of Eureka King. Understood not less than \$50,000 worth of development work promised under agreement.

DESERET MOUNTAIN (Tintic Junction)—Probable work will be resumed soon. Opened to depth of 300 ft. Difficulty in getting ore to railroad. Property in west Tintic district.

IMPERIAL LEAD (Tintic Junction)—Some development work being done. Made shipments last year.

Salt Lake County

MICHIGAN-UTAH (Alta)—Shipped six cars week ended June 21. Reported no miners still scarce, and that with sufficient force could market 300 or 400 tons weekly.

SELLS (Alta)—Spur 850 ft. long being built to connect with Little Cottonwood Transportation. Shipped 450 wet tons during week ended June 21. Increase shipments when spur is in operation.

SOUTH HECLA (Alta)—Shipped about 1,000 tons week ended June 21, over Little Cottonwood Transportation Co.'s road.

MONTANA-BINGHAM (Bingham)—Work resumed under old company account after four-months' shutdown; some leases shipped during this period. Several assessments levied, and last assessment of 2c. a share levied in February, 1919. 2,000,000 shares capitalization and 47,000 shares delinquent. This and reductions in salaries and overhead expenses placed company on better foundation. Mayflower drift being worked on level 2,400 ft. from surface on dip of vein and 1,600 ft. below Keystone tunnel of Fortuna.

WOODLAWN MINING (Salt Lake City)—Property at mouth of Cottonwoods has made trial shipments by truck. Stated to have enough ore blocked out for regular shipments.

Sanmiti County

NAILDRIWER (Park Citk)—Work resumed.

SILVER KING COALITION (Park City)—Work resumed under old conditions since calling of strike. A. J. Drey for some time with Cardiff and in early days superintendent of Coalition, is mine manager.

Tooele County

HONORINE MINE (Stockton)—Ore opened in Hercules vein on 600 level by lessees, who are preparing to ship.

Utah County

PACIFIC (American Fork)—High-grade silver ore reported opened in new ground.

WISCONSIN

Zinc-Lead District

KISTLER & STEPHENS (Platteville)—Results of recent drilling on Alderson tract four miles south of Platteville indicate reopening. Property dismantled and abandoned three years ago.

ZINC HILL (Platteville)—Company's "Little Dick" mill, at Cuba City, placed in operation in July. "Big Dick" will be opened upon completion of shaft now being sunk.

WILSON (Platteville)—Milling plant at Potosi completely destroyed by fire on June 6. Property idle for two years.

CANADA

British Columbia

(CONSOLIDATED) M. & S. COMPANY has purchased five groups of claims in Sibola county, 20 miles from Sibola Mountain and 100 miles southwest of Grand Trunk Pacific Railway.

ARTHUR E. HEBURN, of Vancouver, has taken bond on seven claims in Summit camp, Tulameen district. Claims are silver-lead and include Sutter No. 7, Nickel Plate, Huckleberry, Huckleberry Fraction, Sunlight, Sunbeam, and Jumbo.

SKEENA M. & M. has working bond on Victory and Coronado groups, Hudson Bay Mountain, northern British Columbia. Properties silver-lead-zinc. To install 50-ton concentrator and other operating equipment.

NUGGET GOLD (Victoria)—Development tunnel extended 350 ft. and advancing at rate of 200 ft. monthly. When sufficient ore is blocked out Mother Lode mill will be operated. E. C. Property on Sheep Creek, near Salmo, B. C.

Manitoba

SILVER DISCOVERY is reported near Mile 235 on Hudson Bay Ry. in The Pas district of northern Manitoba. Find made by Louis Coteau prospector, and samples exhibited at The Pas.

Ontario

COBALT PROVINCIAL planning to increase capacity of mill to 80 tons at cost of \$10,000.

BUFFALO (Cobalt)—Annual report for year ended Apr. 30 showed production of 625,000 oz., a decrease of 140,000 as compared with previous year. Net income for year, \$171,238, which brought surplus to \$636,139. Ore reserves estimated at \$288,700.

FOSTER (Cobalt)—New high-grade vein two inches wide discovered.

MOHAWK (Cobalt)—Work started. Property situated on west side of Mud Lake.

CASTLE (Gowganda)—Shaft down 380 ft., with results stated to be satisfactory.

KIRKLAND LAKE (Kirkland Lake)—Frank L. Crysler, president, states mine bins filled with 500 tons of ore and surface dump contains 8,000 tons, with stopes at 300 level also full and smaller quantities at lower stopes. A 15-ft. ore-face shows at 600 level, averaging \$5 per ton, and close by is parallel 3-ft. body carrying \$28 ore. Underground workings kept pumped out.

YOUNG-DUNCAN (Kirkland Lake)—Property east of Tough-Oakes shows possible extension of same vein system.

MATACHEWAN (Matachewan)—Shaft down 140 ft. and still in ore. Orebody dipping at 70 deg. and expected to leave shaft at depth of about 160 ft. Shaft will be continued to 200 ft. and crosscut started. Stated that assays show average gold content of good milling grade.

DOMESTIC EXTENSION (Porcupine)—Annual meeting showed \$51,841 cash on hand. Property under option to Dome, and president stated development of same vein. Large body of ore averaging \$5.22 already developed.

INSPIRATION (Porcupine)—Diamond drilling begun.

MEXICO

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper production for May was 1,322,720 lb.

Sonora

SANTA LUCIA (Nacoazar)—Syndicate headed by D. J. O'Rourke, of Potter, Jarrett & O'Rourke Construction Co., has perfected 60-day option upon Santa Lucia mine. Careful investigation of property now being made. Ore contains silver, copper and lead.

BELGIAN CONGO

UNION MINIERE DU HAUT KATANGA (Elisabethtown)—May production of copper was 2,094,370 lb. April, 4,295,970 lb.

BURMA

BAWDWIN MINES (Bawdwin)—Lead production for May, 1,976 tons gross, from 5,988 tons of lead-bearing material (including 1,000 tons of secondary refined lead production 1,587 tons; refined silver production approximately 180,371 oz.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

June	Sterling Exchange	Silver		June-July	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
26	4.5800	1.09½	53½	30	4.5900	1.08½	53
27	4.5900	1.08½	53½	1	4.5800	1.07½	53
28	4.5938	1.08½	53½	2	4.5538	1.07½	53

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

Daily Prices of Metals in New York

June-July	Copper		Tin	Lead		Zinc
	Electrolytic	Spot		N. Y.	St. L.	
26	18.35	68	5.35@5.40	5.15	6.95@7.00	
27	18.50	68	5.35@5.40	5.15	6.95@7.00	
28	18.60	68	5.35@5.40	5.15	6.95@7.00	
30	18.70@18.85	68	5.35@5.40	5.15	7.00	
1	19.00@19.10	68	5.35@5.40	5.15	7.00	
2	19.10	68	5.35@5.40	5.15	7.00	

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

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

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

June-July	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
26	86½	88½	90	239½	235½	22½	22½	38½	38½
27	87½	88½	91	238	235½	22½	22½	38½	39
28	...	...	...	...	...	...	...	...	...
30	87	88½	91	238½	236	22½	22½	38½	39½
1	86½	88½	91	240	236½	22½	22½	39	39½
2	89	90	92	240	238½	22½	22½	39½	40

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—July 2, 1919

The main features this week were a further advance in copper, which crossed 19c. in its upward movement, and the resumption of free trading in tin on a fairly active scale.

Pacific freights remain unchanged at \$14 from San Francisco to Hongkong and Kobe. Transatlantic freights remain unchanged.

The price for three-months tin, at London, on June 25, was given incorrectly in the "Journal" of June 28. The correct price was £238.

Copper—The conditions we reported last week continued, i.e., the market remained wholly in the hands of the producers, who made the consummation of relatively small business the basis for advancing prices further, and immediately obtained what they asked. On Thursday the market was firmly es-

tablished at 18½c., delivered, and before the end of Friday no copper was to be had for less than 18½c., delivered.

On Saturday the market was firmly established at 18½c., delivered. During these days a pretty good business was done. A noteworthy feature was the buying by brass-makers. With Monday, producers advanced their prices to 19c., delivered, and on Tuesday a further advance to 19½c. was made. A rather fair business was done on Monday, but on Tuesday and Wednesday transactions were light.

The total of domestic business done during this week was only moderate, but the sentiment among the buyers is such that producers are able to advance prices and get them on relatively small business. No attention is paid to the statistical position, but a good deal is focussed on the labor situation.

The Japanese were again considerable buyers of copper this week, making pur-

chases through the Export Association. Nobody knows just what is at the bottom of the Japanese demand.

Copper Sheets—The base price of copper sheets is 28½c. per lb. Market strong. Copper wire is quoted at 22c. in carload lots, f.o.b. mill. Market strong.

Tin and Lead

Tin—Business amounting to several hundred tons was transacted during the week, mainly in the reselling of surplus material. Producers did not sell much. There was substantially no change in prices from those which prevailed at the close of the previous week. The market is still more or less in a daze and has not yet found itself, many consumers who are potential sellers apparently not yet having made up their minds what to do. At the close high-grade tin, including Straits, Banka, and American electrolytic, was quoted at 70c., and tin of 99 per cent grade was at 68c. July-August shipments from the Straits and July shipments from Banka were quoted at 50½c., c.i.f. Lamb & Flag, July shipment, 51½c. Lamb & Flag, 99 per cent grade, July shipment, 51½c.

Lead—A rather large business was transacted during the week, especially on Friday. Following that the market became rather dull. The prices were cut a little in order to effect business. There was gossip about bonded lead being sold at 4½c., which would give a price of 5c., or only a trifle more for domestic consumption. A small quantity was bought on that basis, but this was apparently lead smelted in this country from foreign ore, the supply of which is not large. Mexican producers were able to sell rather freely, at relatively good prices, to France and Japan, and so long as they have a fair foreign outlet they will not be disposed to think of entering their product for domestic consumption.

inc

Zinc—A rather large business was done during the week, much of which was apparently of speculative character. The market having touched 7c., some interests were evidently minded to realize, and sales were made as low as 6.95c. However, the market exhibited a good deal of resiliency, and quickly returned to a firm basis of 7c. The advance in spelter in London, which today touched \$40 for futures, is reflected here for spelter could theoretically be sold for shipment to England via Galveston, on terms netting 7@7.05c., f.o.b., works in Oklahoma. However, the

sharp fluctuations in sterling exchange make all calculations uncertain.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 32@33c. per lb. Market quiet.

Antimony—Unchanged at 8½@8½c. for spot. Scarcely any offerings of futures are made.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at \$1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, \$1.75 per lb.

Nickel—Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Shortage in supplies here continues, but there was no further advance in price this week. Californian is quoted at \$95, and Mexican at \$92. San Francisco telegraphs \$92, firm.

Silver and Platinum

Silver—The London price has shown a downward tendency. Owing to the weakness of China exchange, there having been a decline both in Shanghai and Hongkong, the offerings on the London market have been larger. Shipments of gold to China may have occasioned the decrease in demand for silver in that quarter.

Mexican dollars at New York: June 26, 84½; June 27, 83½; June 28, 83½; June 30, 82½; July 1, 82½; July 2, 82½.

Platinum—In very strong demand, but as yet no further advance in price. We quote refined ingot at \$105@107½. A lot of crude platinum sold this week fetched \$105.50, which would indicate a price of \$107.50 for refined ingot. There were several bidders for this lot.

Philipp Bros., metal and ore dealers, of New York, inform us that Derby & Co., Ltd., of England, have consigned to them a parcel of platinum per the dirigible "R-34."

Zinc and Lead Ore Markets

Joplin, Mo., June 26—Zinc blende, per ton, high, \$47.50; basis 60 per cent zinc, premium, \$46; Prime Western, \$45; sludge and flotation, \$42.50@40; calamine, basis 40 per cent zinc, \$28@25. Average settling prices: Blende, \$42.71; calamine, \$26.36; all zinc ores, \$42.27.

Lead, high, \$63.30; basis 80 per cent lead, \$60; average settling price, all grades of lead, \$60.83 per ton.

Shipments the week: Blende, 8,467; calamine, 236; lead, 1,303 tons. Value, all ores the week, \$447,150.

Shipments six months: Blende, 271,161; calamine, 7,240; lead, 38,289 tons. Value, all ores six months, \$13,234,910.

Sellers are producing so lightly this week that no offer under \$45 basis would be accepted. Buyers finally met this demand, and a considerable tonnage was contracted on the higher price level. Owing to miners and teamsters leaving for the harvest, estimates are

offered of a reduction of 20 to 40 per cent in the production this week. Perhaps 25 per cent is a conservative estimate. Few mills are idle, but none are milling over 75 per cent of capacity.

Platteville, Wis., June 28—Blende, basis 60 per cent zinc, \$45 base for premium grade, and \$42.50 base for high-lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$60 base for top grade and \$59 base for second grade. Shipments reported for the week are 1,905 tons blende, 284 tons galena, and 396 tons sulphur ore. For the year to date the totals are 50,224 tons blende, 2,611 tons lead, and 7,144 tons sulphur ore. Shipments for the first six months of 1919 compared with the corresponding period of 1918 show decreases for all ores as follows: Blende, 16,210 tons; galena, 983 tons; sulphur ore, 19,457 tons. During the week 2,937 tons blende was shipped to separating plants.

Other Ores and Minerals

Chrome Ore—This ore is offered abroad, but high freight rates prevent the consummation of business. It is thought that Canada may become a larger producer of chrome ore.

Manganese Ore—Charles Hardy reports that the first shipment of Caucasian ore has been made, but American buyers being skeptical of it, the material was diverted to Liverpool, where it was due to arrive on or about July 3.

Molybdenum Ore—Unchanged at 75@85c. per lb., but this quotation is merely nominal, there being scarcely any inquiry for the ore.

Tungsten Ore—Considerable business was reported this week, Chinese ore selling at \$7.25@7.50. Shipments from China were sold at \$6.75. High-grade ore is still held at \$10 and upward, but no business was reported.

Nitrates—The market is quoted at \$3@3.25 for carload lots, with some spot supply reported available in this country. It is said there have been practically few or no transactions done with Chilean producers recently, importers in this country awaiting easier prices.

Pyrites—Spanish pyrites is quoted at 19c. per unit for furnace ore, c.i.f., New York or other Atlantic port. Market slow and unsettled.

Iron Trade Review

New York, July 2,

June pig-iron output, according to *The Iron Age*, shows definitely the turn in the industry. For the thirty days the total was 2,114,863 gross tons, or 70,495 tons a day, against 2,108,056 tons in May, or 68,002 tons a day. Seventeen furnaces blew in and twelve blew out last month, a gain of five, and estimated capacity active on July 1 was 71,700 tons a day for 200 furnaces, as compared with 68,600 tons a day for 195 furnaces on June 1.

The gain in output last month was the first check to a steady decline in the

daily average from the high point reached in September, 1918, at 113,942 tons. From 372 furnaces in blast Sept. 1, last year, the shrinkage was 177 in nine months to 195 on June 1.

Pittsburgh—July 1

The steel market has continued to gain steadily. The advent of the mid-summer period does not appear to have any effect whatever upon the activity, and the common opinion now is that the improvement will not be interrupted by the season or anything else. The prospective signing of the peace treaty doubtless had a favorable effect, but results from the actual signing are yet to be seen, and these will probably be observed during the next few weeks in favorable action by directors, executives, and general investors upon various construction projects that have been held in abeyance until the consummation of this important event.

Steel-mill operations, which dropped from 65 per cent to 54 per cent from April to May, as monthly averages, and probably to about 50 per cent at the middle of May, were approximately 65 per cent of capacity last week, and are showing further increasing tendency, though this week the holiday interferes somewhat. Many mills are operating at a general average of 75 per cent, and some are doing better than that, and many departments are running full. The general average is pulled down by the light operation of rail, plate and structural mills.

Even in conservative quarters the prediction is now ventured that the steel industry will be operating substantially at capacity next September, as a result of continuance of the improvement in steel demand that has been so constant for the last six or seven weeks. Such predictions, however, do not necessarily mean that the full ingot capacity will be engaged. The percentages named above are computed on ingot capacity, which is taken at 49,000,000 tons a year, against about 35,000,000 tons in 1914, showing a 40 per cent increase. There has not been a commensurate increase in finishing capacity for any important product except plates, and the majority of finishing departments could run full without using all the raw steel that could be made. Prior to the war, the supply of ingots would run short before all finishing departments attained full rates.

The general character of demand can be described in fewer words by mentioning the slack commodities than those that show full activity. The least demand is for rails, and plates, structural shapes, and butt-weld pipe follow in sequence. Even tin-plate demand has increased and is producing operations near to capacity. Delivery promises on lap-weld pipe, because of continued heavy demand for oil-country goods, are lengthening. Demand for shapes is steadily improving. Fabricated-steel lettings doubled from April to May, to 49 per cent of the shop capacity, and June is expected to show a marked additional improvement.

Predictions of prospective advances in steel prices, recently floating about promiscuously, are now much less common, probably through the Steel Corporation quietly allowing it to become known that it has definitely adopted the policy that there should be no steel price advances this year. It is understood the Steel Corporation has let it be known it would refuse to be stamped, even should the independents all advance prices, and with such warning the independents are unlikely to make any attempts.

Pig Iron—The market has become quiet, but at the same time it shows a stronger undertone, the active furnaces being well sold up for a few months by reason of the recent activity, and the idle furnaces are unlikely to consider blowing in until there is fresh evidence of demand. The Valley market is now firm at Mar. 21 prices, and concessions by other furnaces for Pittsburgh delivery have become uncommon. We quote Valley prices at \$27.95 for bessemer, \$25.75 for basic, \$26.75 for foundry, and \$25.75 for forge, with \$1.40 freight to Pittsburgh. W. P. Snyder & Co. report computation of average prices involved in sales by Valley furnaces during June at \$27.95 for bessemer and \$25.75 for basic, the averages being the same as for the two months preceding, and being the regularly recognized quotations. Valley foundry was quotable at \$26.75 throughout the month.

Steel—Billets, slabs, and rods continue quiet. Sheet bars are in active demand, chiefly because sheet and tin mills send specifications weekly to their regular sources of supply without price negotiation, the market being firm. We continue to quote: Billets, \$38.50; slabs, \$41; sheet bars, \$42; rods, \$52.

Ferromanganese—Domestic producers made sales of a few thousand tons of 80 per cent ferromanganese when they reduced prices to \$110, apparently fearing that English producers would cut their price of \$125, delivered, or \$121, c.i.f., and take prospective business. Some makers state they have returned to their former \$125 quotation, but desirable orders could probably be placed at the same price as recently. We quote domestic ferromanganese at \$110 @ \$125, delivered, and English at \$125, delivered, with spiegeleisen practically nominal at about \$30 @ \$33 for 18 per cent delivered.

Coke—Nearly all the contracting for second half has now been done, furnace coke going generally at 61 to 1, against basic pig iron at Valley furnaces, and foundry at \$5 @ \$5.50, depending on brand. As usual, spot coke is stiffer, on account of the impending holiday, furnace having brought \$4.25 even last Saturday. Next week the usual reaction will probably occur. Illustrating the situation, one producer of a favorite brand is today holding spot at \$4.25, but would sell over July at \$4. Prompt foundry may be quoted at \$4.50 @ \$5 as formerly, per net ton atovens.

MONTHLY AVERAGE PRICES OF METALS

	Silver					
	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.885	85.716	101.125	37.742	42.792	48.027
Mar.	77.861	88.082	101.125	36.410	43.624	47.181
April	73.573	85.346	101.125	36.963	41.658	46.860
May	74.745	99.505	107.135	37.960	48.985	50.124
June	76.971	99.500	110.430	39.045	48.875	53.896
July	79.010	96.625	109.000	40.110	46.810	51.810
Aug.	85.407	100.292	110.000	43.418	49.077	53.000
Sept.	100.740	101.125	110.000	50.920	49.500	53.000
Oct.	87.832	101.125	110.000	44.324	49.300	53.000
Nov.	85.891	101.125	110.000	43.584	48.969	53.000
Dec.	85.960	101.125	110.000	43.032	48.492	53.000
Year	81.417	96.773	110.000	40.851	47.516	51.000

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

	Copper					
	New York		London		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	14.836	110.000	75.123	125.000	82.071
April	23.500	15.246	110.000	77.300	125.000	82.200
May	23.500	15.864	110.000	77.767	125.000	81.227
June	23.500	17.610	110.000	84.623	125.000	83.900
July	25.904	.....	119.913	.....	134.913	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	.....	(a)	118.447	.....	133.167	.....
Year	24.628	.....	115.550	.....	130.507	.....

(a) No Market.

	Tin					
	New York		London		Electrolytic	
	1918	1919	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557	.....
February	92.000	66.801	311.525	223.962	.....
March	66.934	318.875	226.843	.....
April	(a)	72.500	329.905	225.275	.....
May	(a)	72.500	304.217	223.398	.....
June	(a)	71.240	331.927	228.263	.....
July	(a)	.....	360.347	.....	.....
August	(a)	.....	380.900	.....	.....
September	(a)	.....	343.905	.....	.....
October	(a)	.....	338.543	.....	.....
November	(a)	.....	267.736	.....	.....
December	(a)	.....	.....	.....	.....
Year	330.138	.....	.....

(a) No average computed.

	Lead					
	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.037	27.227
February	6.973	5.037	6.899	4.784	29.026	28.675
March	7.201	5.228	7.091	4.992	29.000	27.952
April	6.772	4.860	6.701	4.722	29.000	28.888
May	6.818	5.018	6.704	4.773	29.000	28.852
June	7.611	5.340	7.251	5.070	29.000	22.544
July	8.033	.....	7.750	.....	29.000	.....
August	8.050	.....	7.750	.....	29.000	.....
September	8.050	.....	7.750	.....	29.000	.....
October	8.050	.....	7.750	.....	29.000	.....
November	8.050	.....	7.750	.....	29.000	.....
December	6.864	.....	6.324	.....	40.000	.....
Year	7.413	.....	7.222	.....	30.100	.....

	Zinc					
	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	7.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.800	7.286	6.150	54.000	35.500
April	7.300	6.463	6.715	6.114	54.000	36.118
May	7.914	6.429	7.114	6.079	54.000	35.477
June	8.02	6.901	7.000	6.551	54.000	36.703
July	8.088	.....	8.338	.....	54.000	.....
August	8.088	.....	8.338	.....	54.000	.....
September	8.144	.....	9.092	.....	54.000	.....
October	8.80	.....	8.451	.....	54.000	.....
November	8.691	.....	8.144	.....	54.000	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.990	.....	54.180	.....

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

	Pig Iron, Pittsburgh					
	Bessemer			Basic		No. 2 Foundry
	1918	1919	1918	1919	1918	1919
January	37.25	33.60	33.95	33.40	33.30	32.40
February	37.25	33.60	33.95	33.40	33.30	32.40
March	37.25	33.60	33.95	33.40	33.30	32.40
April	36.15	29.35	32.65	27.15	34.10	28.15
May	36.20	29.35	33.00	27.15	34.10	28.15
June	36.20	29.35	33.00	27.15	34.10	28.15
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	33.40	.....	34.40	.....
November	36.60	.....	33.40	.....	34.40	.....
December	36.60	.....	33.40	.....	34.40	.....
Year	36.67	.....	33.70	.....	33.44	.....

As reported by W. P. Snyder & Co.

	STOCK QUOTATIONS		
	N. Y. Exch.†	July 1	
Alaska Gold M.	31	Adventure	111
Alaska Juneau	2	Albion	180
Am. Sm. & Ref. Co.	84 1/2	Albion	180
Am. & Ref. pf.	16 1/2	Albion	180
Am. Sm. Sec., pf. A	62	Albion	180
Am. Zinc	30 1/2	Albion	180
Am. Zinc, pf.	60 1/2	Albion	180
Am. Zinc, pf. B	30 1/2	Albion	180
Am. Zinc, pf. C	30 1/2	Albion	180
Am. Zinc, pf. D	30 1/2	Albion	180
Am. Zinc, pf. E	30 1/2	Albion	180
Am. Zinc, pf. F	30 1/2	Albion	180
Am. Zinc, pf. G	30 1/2	Albion	180
Am. Zinc, pf. H	30 1/2	Albion	180
Am. Zinc, pf. I	30 1/2	Albion	180
Am. Zinc, pf. J	30 1/2	Albion	180
Am. Zinc, pf. K	30 1/2	Albion	180
Am. Zinc, pf. L	30 1/2	Albion	180
Am. Zinc, pf. M	30 1/2	Albion	180
Am. Zinc, pf. N	30 1/2	Albion	180
Am. Zinc, pf. O	30 1/2	Albion	180
Am. Zinc, pf. P	30 1/2	Albion	180
Am. Zinc, pf. Q	30 1/2	Albion	180
Am. Zinc, pf. R	30 1/2	Albion	180
Am. Zinc, pf. S	30 1/2	Albion	180
Am. Zinc, pf. T	30 1/2	Albion	180
Am. Zinc, pf. U	30 1/2	Albion	180
Am. Zinc, pf. V	30 1/2	Albion	180
Am. Zinc, pf. W	30 1/2	Albion	180
Am. Zinc, pf. X	30 1/2	Albion	180
Am. Zinc, pf. Y	30 1/2	Albion	180
Am. Zinc, pf. Z	30 1/2	Albion	180
Am. Zinc, pf. AA	30 1/2	Albion	180
Am. Zinc, pf. AB	30 1/2	Albion	180
Am. Zinc, pf. AC	30 1/2	Albion	180
Am. Zinc, pf. AD	30 1/2	Albion	180
Am. Zinc, pf. AE	30 1/2	Albion	180
Am. Zinc, pf. AF	30 1/2	Albion	180
Am. Zinc, pf. AG	30 1/2	Albion	180
Am. Zinc, pf. AH	30 1/2	Albion	180
Am. Zinc, pf. AI	30 1/2	Albion	180
Am. Zinc, pf. AJ	30 1/2	Albion	180
Am. Zinc, pf. AK	30 1/2	Albion	180
Am. Zinc, pf. AL	30 1/2	Albion	180
Am. Zinc, pf. AM	30 1/2	Albion	180
Am. Zinc, pf. AN	30 1/2	Albion	180
Am. Zinc, pf. AO	30 1/2	Albion	180
Am. Zinc, pf. AP	30 1/2	Albion	180
Am. Zinc, pf. AQ	30 1/2	Albion	180
Am. Zinc, pf. AR	30 1/2	Albion	180
Am. Zinc, pf. AS	30 1/2	Albion	180
Am. Zinc, pf. AT	30 1/2	Albion	180
Am. Zinc, pf. AU	30 1/2	Albion	180
Am. Zinc, pf. AV	30 1/2	Albion	180
Am. Zinc, pf. AW	30 1/2	Albion	180
Am. Zinc, pf. AX	30 1/2	Albion	180
Am. Zinc, pf. AY	30 1/2	Albion	180
Am. Zinc, pf. AZ	30 1/2	Albion	180
Am. Zinc, pf. BA	30 1/2	Albion	180
Am. Zinc, pf. BB	30 1/2	Albion	180
Am. Zinc, pf. BC	30 1/2	Albion	180
Am. Zinc, pf. BD	30 1/2	Albion	180
Am. Zinc, pf. BE	30 1/2	Albion	180
Am. Zinc, pf. BF	30 1/2	Albion	180
Am. Zinc, pf. BG	30 1/2	Albion	180
Am. Zinc, pf. BH	30 1/2	Albion	180
Am. Zinc, pf. BI	30 1/2	Albion	180
Am. Zinc, pf. BJ	30 1/2	Albion	180
Am. Zinc, pf. BK	30 1/2	Albion	180
Am. Zinc, pf. BL	30 1/2	Albion	180
Am. Zinc, pf. BM	30 1/2	Albion	180
Am. Zinc, pf. BN	30 1/2	Albion	180
Am. Zinc, pf. BO	30 1/2	Albion	180
Am. Zinc, pf. BP	30 1/2	Albion	180
Am. Zinc, pf. BQ	30 1/2	Albion	180
Am. Zinc, pf. BR	30 1/2	Albion	180
Am. Zinc, pf. BS	30 1/2	Albion	180
Am. Zinc, pf. BT	30 1/2	Albion	180
Am. Zinc, pf. BU	30 1/2	Albion	

THE MINING INDEX

Listing Special Articles of Interest
and Value to the Miner
and Metallurgist

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for \$1, 33 for \$5, and 100 for \$15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

COPPER

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102—LEACHING—First Year of Leaching by the New Cornelia Copper Co. Henry A. Tobelman and James A. Potter; also discussion. (Bull. A. I. M. E., Feb. and Apr., 1919; 54 pp.; illus.) 40c.

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104—PERU—Estado Actual y Porvenir de la Industria Minera en los Departamentos del Sur. Carlos Basadre y G. (Bol. del Cuerpo de Ingenieros de Minas del Peru, No. 93, 1918; 64 pp., illus.)

105—POWER—Economy of Certain Arizona Steam-Electric Power Plants Using Oil Fuel. C. R. Weymouth. (Advance copy, A. S. M. E., June 16, 1919; 23 pp.) Refers to plants of Inspiration, New Cornelia, and Arizona Power companies.

106—QUEENSLAND—Resources of the Cloncurry Copper Field, North Queensland. S. Harris. (Reprinted from Chem. Eng. and Min. Rev., Nov. Dec., 1918, and Jan., 1919; 123 pp., illus.)

107—SOUTHWEST—Notes on Certain Ore Deposits of the Southwest. (Bull. A. I. M. E., Feb., 1919; 3 pp.) Discussion of paper by W. Tovic, previously indexed.

GOLD AND SILVER—GEOLOGY

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GOLD DREDGING, PLACER MINING, ETC.

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(See also "PETROLEUM AND NATURAL GAS")

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Mexico and Proposed Propaganda

IN RECENT news reports it is said that attempts are to be made to purchase the support of American newspapers for spreading Mexican propaganda in connection with a defence of Mexican policy toward American oil operators issued by General Candido Aguilar, son-in-law of President Carranza. It is a poor governmental policy which will not stand on its own legs and which requires the crutches of "propaganda" to enable it to limp along. Why is it that the real merit of a policy is not its best support? If the policy is fair, and if there exists confidence that it will be carried out substantially as it is stated, no propaganda should be required. The fact that propaganda should be thought necessary under the circumstances in itself arouses suspicion that there are defects either in the policy or in the way in which it is to be effectuated.

American oil operators and mining men ask few things from Mexico. Security of life and property, protection of titles, and the assurance that company operations can go on without onerous and unfair restrictions are necessary to promote continuity of work and to make the enterprises sufficiently remunerative to attract outside capital. In respect to taxes, all that is demanded is a square deal.

Non-fulfillment of these important conditions cannot be covered up by propaganda, however expensive or extensive that may be. Fulfillment of them will make unnecessary such a detestable method of evading direct issues. We want friendly and cordial relations with Mexico. American mining men have done their part, and require of Mexico only that she stabilizes conditions in a broad and equitable spirit.

There are important natural resources in Mexico. Their development will provide work and opportunity for the Mexican population as well as increasing the prosperity of that country as a whole. Without the assistance of foreign capital and the leadership of experienced technical men a long time must supervene before Mexico can come into its own. There is a mutuality of interest here which is the part of governmental acumen to recognize. Without an equitable division of the proceeds of enterprise there is little incentive for foreign capital to enter any country. A state of continual disorder and brigandage is also equally vexatious and embarrassing to the government as well as to private enterprise.

Great courage has been shown by American mining men and oil operators in continuing operations in the face of danger and under trying experiences. How long are such conditions to continue? The answer to this question can be made in part by Mexico doing her share and, in part, by our own State Department insisting that Americans and American interests are accorded the treatment that foreigners should receive in any civilized country.

The Latest Transatlantic Flight

THE first dirigible to cross the Atlantic, the giant British R-34, arrived safely at Roosevelt Field, Long Island, Sunday, July 6, 1919, bearing a message from the King of England to the President of the United States. The craft was in the air 108 hours and 12 minutes, and covered a distance of 3,599 miles. It carried a crew of thirty officers and men. Major G. H. Scott, commander; Major Cook, navigator, and Lieutenant Harris, meteorological officer, gathered data relating to problems of aerial navigation, which further enrich the fund of knowledge already accumulated.

The distinguishing feature of this successful exploit is that the R-34 is the first lighter-than-air machine to cross the Atlantic. All previous attempts were with heavier-than-air types. The special advantages of each type, and which design will be adopted finally for commercial purposes, are for the future to determine. However, all recent attempts to cross the Atlantic in plane and dirigible add to the sum total of human knowledge of the art, and bring nearer the era of practicability of transoceanic flight.

This recent achievement of the engineer should prove a great boon to mankind, as it offers to all the world the advantages of an intimacy heretofore unknown. The British are to be congratulated on this latest historic achievement.

Re-employment at Calumet & Hecla

LAST May the Calumet & Hecla Mining Co. announced simultaneously an increased reduction of its operations and a changed form of curtailment. For some time previous to the announcement the men had been employed on three-fourths time at a reduction from war wages, but the plan was not sufficient to accomplish the necessary reduction of output and expense, so that a 50 per cent curtailment was ordered, and the men retained were allowed to work full time.

There was ample reason for the change. There was little or no market for copper, the active and profitable war demand for the metal lapsed with the signing of the armistice, and the accumulation of stocks, which were produced in many instances at costs higher than the selling price of that date, continued to grow. Up to that time, the companies had maintained their production, not because it was to their advantage to do so, but to aid constructively in the solving of a difficult labor situation.

There can be little doubt as to the magnanimity of this policy. Obviously, the greatest return for the company during that period could have been obtained by a drastic curtailment immediately following the declaration of the armistice. The plan followed, however, is indicative of the far-seeing vision of the Calumet & Hecla management, and it is such policies as these that

greatly aid in the stabilization of industry and the prevention of labor unrest.

The announcement made on July 7 by the Calumet & Hecla and subsidiary mines to the effect that all underground men are to be re-employed is indeed welcome news, not only in the local field but to the copper industry at large. The additional labor may produce no immediate effect in the amount of copper produced, and aside from the present possible anticipation of an immediate increase in the price and sales of the metal, there is now assurance that underground development work is to continue apace. Production during the war years proceeded at high speed, and in many cases little attempt was made toward the development of future supplies of copper. With the cessation of a pressing demand for the metal and the accumulation of stocks, the copper industry may be considered to be facing a breathing spell, and the news that this interim is to be used for the development of future resources is of significant interest.

Development in

Dressing Tin Ores

IT WOULD seem, in view of the long time during which tin ores have been successfully treated in Cornwall, that there could be little room for improvement either in appliances or in the method of using them. The exceeding fine state of subdivision of the cassiterite has made it obligatory upon the tin-mining industry to perfect methods for the separation of the cassiterite from the slimes. This has been the real problem, as the coarser particles of the mineral admit of ready and clean separation from the gangue.

Modern research does not accept prevailing practice unless experimental verification has shown justification for it. Undertaken in this spirit, there is much that can be done in determining the best procedure to be followed in any one case, and there are few instances where improvement cannot be made. In a series of papers presented before the Institution of Mining and Metallurgy, Professor S. J. Truscott has given the results of investigations made by him in collaboration with J. H. Goodchild, K. S. Low, and H. L. Burnie upon the treatment of slimes on Cornish frames. It is reasonable to assume that the limitations of this simple device had been determined long ago, but Mr. Truscott and his collaborators have shown that radical improvements are possible and that better results can be achieved.

The nature of the surface of the frame, its length and inclination, as well as washing, rate of feed, consistency and duration of feed, have been subjected to exhaustive investigation. The value of re-grinding not only the middling product but also the sand product, which has been allowed to go to waste, has been demonstrated. Tailing losses have been due not so much to excessive comminution as to the excessive state of subdivision of the cassiterite. If higher recoveries are to be made, the re-grinding of the sand has been shown to be essential.

The rapid enrichment of the slime by the use of the simple frame, improved as shown by the experiments, removes the danger of greater tailing losses on account of the finer grinding. Higher recoveries necessarily imply a corresponding increase in the proportion of liberated grains. In this respect the tin ores present a problem of greater difficulty than is met in other ores

where the mineral grains are of larger size and the fine grinding is of lesser degree. The results of the investigation as a whole are of importance to the tin industry, as well as marking an advance in improving some of the simpler methods of treating slime, and commendation is due Mr. Truscott and his collaborators for their thorough work.

The Situation In Butte

BUTTE is again afflicted with labor troubles. The desire to strike is apparently like an intermittent fever, which comes and goes with the changing condition of the patient. No longer ago than February mining was practically suspended in the district for a short time, following a wage reduction at the Great Falls and Anaconda smelters. Now again a strike is pending, some of the men having already gone out.

On Sunday last, the downtown pay office of the Anaconda company was dynamited, supposedly by a fanatic. Whatever the justice of their cause, violence will do the workmen little good. Nothing can be gained thereby that cannot be had by peaceful conference. Whether the deed of an individual or not, a criminal act will inevitably be charged against unions in general by the public. The organization in Butte will do well to help rid the district of such radicals.

A Brighter Future For Zinc

TO MAINTAIN an industry—for example, the zinc industry—the demand for the product must be maintained under price conditions that permit the producer to make a fair profit. Maintaining demand for a product means convincing the consumers that they need the product, and can use it to their advantage. If customary uses for the metal are insufficient to sustain the demand, new uses must be found, and consumers must be educated to appreciate the advantages of these new uses.

A campaign to educate consumers to new uses for zinc should be founded on scientific study, research, experiment, and demonstration, followed by advertising. This is one of the constructive ideas expressed by Pope Yeatman in his address before the American Zinc Institute of St. Louis on June 9, published on page 19 in the last issue of the *Journal*. Mr. Yeatman points out the development of the spirit of helpful co-operation among zinc producers and a better understanding between miners and smelters.

The conversion of a blind feeling of antagonism into a mutual desire to serve has never failed to produce good results. Perhaps here is a lesson for other ill-advised opposing interests in industry.

Colombia To Get \$25,000,000

THE Foreign Relations Committee has reported, or is about to report, a new treaty giving to Colombia \$25,000,000, but making no apology for the assistance given Panama 16 years ago. There is a strong probability that this treaty will be ratified and its terms carried out. The payment of this sum has been recommended by two Presidents of the United States, and probably it would have been made long ago had it not been for the strenuous opposition of Theodore Roose-

velt. Ex-President Roosevelt remembered well the reasons for the failure of Colombia to ratify an earlier treaty and felt strongly that the United States had not only acted legally but justly, and he naturally opposed what would appear to be a reflection on his administration.

The question of who was right or who was wrong will probably not be discussed at length on this occasion. Sentiment seems to be in favor of the payment being made, and we trust that the money will be accepted in as good a spirit as it is tendered. If the funds are used, as has been intended, for internal improvements, and if they will heal a wound that many Colombians have felt was unjustly inflicted, we need not regret the manner of closing the incident.

Perhaps a more intimate acquaintance between Colombia and the United States may develop from this settlement. There is reason for such acquaintance to grow. Colombia needs much that we can supply in the way of manufactured articles, and she has natural resources with which to pay for what we can send her. Her chocolate, beans, and coffee are of the finest quality, but what is of more interest to the miner is that her mineral resources are extensive and of considerable importance.

Looking back over the statistics of mineral production it will be seen that there was a time not so long ago when Colombia had more gold credited to her than had the United States. Her rivers and streams have produced a large quantity of platinum. Her silver production has been large, and she is now practically the only producer of emeralds in the world. On account of inadequate means of transportation, and lack of fuel development, the base metals of Colombia have attracted little attention.

For the immediate future gold, silver, and platinum mining offer more attractive opportunities than other metals, and we believe that Colombia will not go unanswered if she applies to the miners of the United States for assistance in the development of these precious metals.

From time to time in the past we have published descriptions of mining districts in Colombia, and our readers will find in the files of the *Journal* an immense amount of information respecting this fascinating country. Though we have published much, there are many attractive areas of which nothing or but little has been written, areas that are well worth the serious attention of the mining industry, and we believe, as the years go by, and our miners come to know Colombia better, that they will find it an extremely interesting and profitable country in which to operate.

Too Much Legislation

ON PAGE 49 in this issue our Denver correspondent discusses the Engineers' License Bill, recently passed by the Legislature of Colorado. This bill requires that all engineers practicing in the State of Colorado must take out a license before they can legally undertake any engineering work. As our correspondent points out, the conditions under which a mining or other engineer is employed are markedly different from those of the physician. Consulting mining engineers may be called by their clients to undertake examinations and investigations in any part of the United States or in foreign countries. In the course of a year a mining engineer might visit a dozen states

and several foreign countries. Can anyone imagine a more exasperating condition than for such an engineer to be compelled to take out a license in every state which he may enter in the course of his activities?

Most mining engineers engaged in consulting practice have their offices in large cities where they can be conveniently reached by their clients. If other states follow Colorado in the enactment of such legislation, an engineer with a large practice would be compelled to take out licenses in those states where his business centers. We hope that no other state will be so short-sighted as to emulate the example set by Colorado. The motive back of this law is clearly an attempt to monopolize local engineering practice, for the aggregate revenue to be derived from the operation of such a law will be pitifully small compared with the loss in prestige of the state enforcing it. Colorado mining interests require and should receive protection from unwise legislation of this kind.

The Geologist and Prospecting

THE location of mineral deposits at grass roots must grow more infrequent from year to year, especially in those areas that have become the home or hunting ground of intelligent men. Much virgin territory remains, and it will be many generations before the most distant has been prospected. But it is not upon these distant localities that our industries must depend. Manufacturing industries do not quickly follow to the source of raw supplies. Supplies must be brought to industrial centers, and the nearer those supplies are to the industrial centers already built the more valuable do they become. Naturally, supplies close at hand will be the first to be exhausted, and gradually the manufacturer draws from known sources farther and farther away, until the expense of transportation becomes so great as to threaten the industry. It is at this stage that the prospector loses his importance, and the economic geologist has an opportunity to exhibit his skill. With all visible ore exhausted, it is no longer a question of following stringers and indications to other veins or bodies of mineral, searching with small deposits as a guide to larger ones, but is a matter requiring an intimate knowledge of ore deposits and the formations in which they occur.

The surface of the earth, that portion of it which a prospector may examine with care, is a very limited portion of the whole. The surface of the earth as known to the geologist, or that portion respecting which he has considerable knowledge, may extend from daylight to several miles in depth, certainly far beyond human means of penetrating with shafts or boreholes.

It is in the study of these buried formations and the minerals that they contain that the geologist becomes especially useful to industry. The geologist is not infallible, he is not working with an exact science, or not with one whose factors are all known. The most that he can do is to guide, to reduce the amount of useless risk and increase the amount of profitable work.

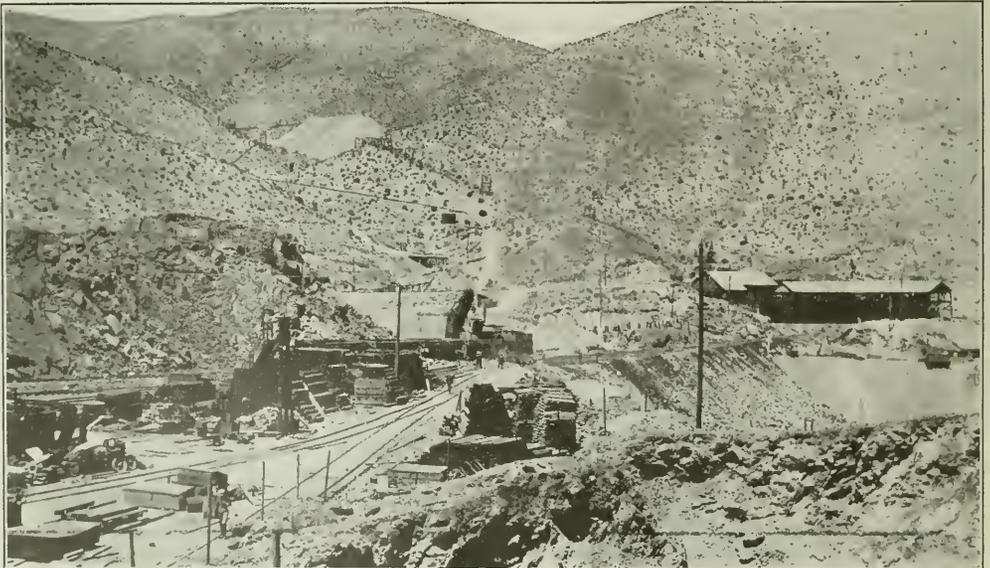
Not only in oil but in the mining of almost every mineral of economic importance geological knowledge may be used to advantage. Our mining schools of the future will probably spend as much time in teaching how to use geological knowledge as they spend in teaching pure science, and as we now have mining, metallurgical, and chemical engineers, our colleges will soon be graduating geological engineers.



STRIPPING OPERATIONS OF COPPER QUEEN CONSOLIDATED MINING COMPANY AT BISBEE, ARIZONA. STEAM SHOVEL LOADING INTO 20-YD. AUTOMATIC AIR-DUMP CARS

Mining Operations in Arizona

VIEW OF COPPER QUEEN COMPANY'S OPERATIONS AT BISBEE, ARIZONA



Electric Blasting Equipment

Dependability and Conditions Under Which Electric Detonating Caps Can Best Be Used—
Methods of Testing—Advantages in the Use
Of the Ohm-Meter

BY L. D. ROWELL

Captain of Engineers, Washington, D. C.

THE experience of the Army in the recent European War brought out certain weaknesses and faults in the equipment used in electric blasting, and led to the development of apparatus which, it is hoped, will find a permanent place in the commercial field. It is not the purpose of this article to discuss the method of setting off blasts in general, but to present certain features of the problem as it affects general practice in the use of electricity for the detonation of explosives.

The standard electric caps manufactured in this country are thoroughly dependable if handled with intelligence, and, when one considers their construction, their uniformity is remarkable. The "bridge" of an electric cap is a piece of high-resistance alloy not over $\frac{1}{4}$ -in. long, and so fine that it can hardly be seen with the naked eye. The resistance of this bridge is about one ohm. It is soldered to the ends of the copper wires which are sealed into the cap and serve to connect it in the circuit. To fire the cap, the bridge must be heated by a current of electricity to the temperature necessary to start detonation of the fulminate, which is materially less than that required to fuse the wire of the bridge. A current of 0.4 amp. will fire some caps, and 0.5 amp. may be depended upon to fire any single cap. The time required to produce detonation, however, varies from 0.05 sec. to 0.2 sec., even with caps of the same resistance, and may vary considerably more. This fact is of the utmost importance in electric blasting, as will be shown later.

The variation in time required for detonation at low current strengths is not due to avoidable variations in manufacture. It is probably dependent on the amount of solder at the joints where the bridge wire is soldered to the leading-in wires, to the character of the joint, and to the closeness of contact between the bridge wire and the fulminate paste which surrounds it. There is no way of testing for variations of this kind, other than by exploding the cap, and the whole structure is so minute that no inspection could possibly detect it. It does not detract in the slightest from the dependability of the cap, provided the condition is clearly understood and proper precautions are taken to insure the necessary current in firing. Unless the caps have been injured by storage in too hot a temperature, failures may always be charged to a faulty circuit or too low current strengths when firing.

The effect of time variation at low currents is seen only when two or more caps are connected in series. If a current of one-half ampere be used, and two caps be connected in series, it is probable that one of the caps will fire and open the circuit before the other has reached the firing temperature, and if a circuit of 20 or 30 caps be connected up, a current of one-half ampere may fire only a few caps for this reason, even though the same current, if continued, would have fired all of them. The conclusion that the unexploded caps are faulty is entirely

wrong, and is based on a lack of knowledge of the true conditions.

The difficulty presented by this time variation can be overcome only by using a current so high that the slowest cap in the circuit will be raised to the firing temperature before the quickest cap explodes and opens the circuit. A time interval elapses between the raising of the bridge wire to the firing temperature and the explosion, probably due to the transfer of the necessary heat from the wire to the fulminate. While this is taking place in the "quickest" cap, the current must be high enough so that the bridge of the "slowest" cap reaches firing temperature. The explosion of the first cap, and consequent interruption of current, will then not interfere with the firing of the second, as the heat transfer, which takes place in a few hundredths of a second, can proceed after the current has been interrupted.

So far as I know, no accurate determination has ever been made of the magnitude of the current required to ignite a number of caps. Experiments by Captain Ralph W. Crocker, Chemical Warfare Service, at the Pittsburgh Laboratories of the Bureau of Mines, show an increase of 20 per cent in the current necessary to fire two caps in series, one of which was 10 per cent high in resistance and one 10 per cent low. An increase of 8 per cent in current over that for single caps was found necessary where two caps of the same resistance were connected in series.

From results secured in the testing of blasting machines, I believe one ampere may be accepted as a safe current to insure the detonation of all caps in series. As the heating varies as the square of the current, this represents four times the heating rate required for single caps. The bridge wire fuses before explosion of the cap at a current of about 2.5 amps., and this value forms the basis of the specifications adopted by the Corps of Engineers, U. S. Army, for electric exploders.

TESTING BLASTING MACHINES

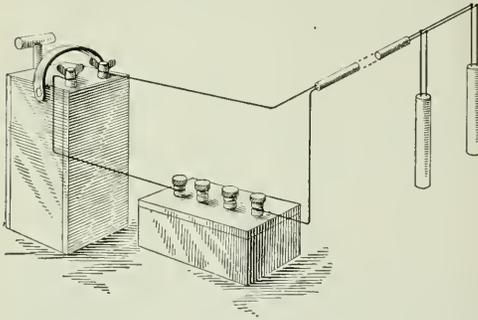
The considerations mentioned are of the utmost importance in the testing of electric blasting machines. It is customary to test the machines by the use of a rheostat (which takes the place of a stated number of caps in the circuit), with a single cap connected in series with it. Such a test, however, may give erroneous results, for the reasons already stated; that is, the current necessary to fire a series of caps is always higher than that which will always fire a single cap. To remedy this, and provide the necessary factor of safety, the resistance of the rheostat is made two or three times that of the caps which it replaces, but this may not give the desired results, as will be shown.

The type of blasting machine in most common use delivers an initial current which is determined by the windings of the machine, and is independent of the number of caps in the circuit. Now, if such a machine

is designed to deliver an initial current of one-half ampere or slightly higher, it will pass a splendid rheostat test, but it will not fire a series of caps with any degree of certainty. The effect of added resistance in the circuit is to produce a more rapid falling off of current, so that a machine designed to deliver an initial current of five amperes may fail on the same rheostat test, and still be a dependable machine, up to its rating, though the first machine is not dependable at any rating. Making the rheostat resistance double that of the caps in the contingency suggested has not provided the necessary factor of safety. It can also be shown that, with the five-ampere machine, doubling the resistance and using a single cap may not provide a true indication of the machine's capacity.

RHEOSTAT TEST

The best rheostat test is to connect two caps in parallel, as shown in the figure. If they both fire, the test shows that sufficient current is delivered to insure the firing of all the caps in a series circuit. The factor of safety in such a test conforms to actual working conditions, and though a difference in the resistance of the two caps may permit the explosion of both caps on less than one ampere, my experience warrants the belief that this is a reliable test for capacity. In making this test, be careful to place the caps so that one can-



METHOD OF TESTING BLASTING MACHINE

not detonate the other. The rheostat in this case should be equivalent to the actual resistance of the caps which it replaces in the circuit.

The average resistance of a Du Pont cap with 10-ft. leads is 1.3 ohms, and if 1.5 ohms per cap is used in the rheostat it allows for the resistance of the cap and connections, when properly made. Duplex firing wire has a resistance of one-half ohm per 100 ft., or 300 ft. is equivalent to one cap. Allowance for this should be made in calculating the number of caps in the circuit. Thus, 25 caps connected up through 1200 ft. of duplex firing wire would be equivalent to 29 caps. The Du Pont rheostats have a resistance of about 3.2 ohms per cap; when used as described above, with two caps in parallel, their rating may be increased in the ratio of 2 to 1. Thus a machine which fires two caps in parallel through the 25-cap step of a Du Pont rheostat would have a capacity of 50 caps.

The blasting machines in common use are frequently referred to as magnetos, or magneto exploders. This is a misnomer, and the term should not be used, inasmuch as it conveys a wrong impression as to the nature of the machine. These machines are electric generators

of the series type; that is, the field windings are in series with the cap circuit. When such a machine is operated with no connected circuit, severe insulation strains are produced, and in the larger capacities this becomes a vital defect. The shunt machines, however, in which the field windings are connected in parallel with the cap circuit, do not have this objectionable feature, and they may be designed for larger capacities than is practical in the series machine. The Du Pont No. 6 is an example of this type.

By the use of small, enclosed-frame machines, with impregnated windings, exploders having considerably greater capacities than those in present use have been built and tested. Machines having the size and weight of a 30-cap exploder have a capacity of 120 to 150 caps, and a machine having a capacity of 500 caps weighs not over 35 lb. and is entirely practical. These machines represent a development in advance of any of the earlier machines, and indicate the possibilities in this field.

Testing of the electric-cap circuit is usually of the crudest sort, consisting of a test for continuity made with a "circuit detector," which is some form of galvanometer, with a self-contained silver chloride cell. This type of cell is used because its potential is so low that it does not give enough current to explode the cap, and also because of its supposed permanency. This latter quality, however, is questionable, and there is nothing more undependable than a cheap circuit detector equipped with a silver chloride cell.

The best instrument of this type is a well made, pivoted galvanometer, with a graduated scale. With a good cell, and careful usage, such an instrument serves the purpose of tests for continuity of the circuit, and gives a rough indication of the number of caps. Instruments of the annunciator type, which merely show whether the circuit is open or closed, are not recommended.

For military operations, and for commercial work where it is important that there shall be no failures in the explosion, especially in cases where the cap circuit is connected up for some time before being detonated, it is highly desirable to make more thorough tests than those above indicated. For this work an extremely rugged, portable ohm-meter has been developed, by means of which the resistance of the circuit can be instantly measured, with an accuracy sufficient to detect the shorting-out of a single cap. With it, tests for opens, short-circuits and grounds can be made readily. As it uses an ordinary flash-light cell, which is easily renewable, it is not subject to the uncertainty of instruments using silver chloride cells. Protection against currents high enough to explode the caps is secured by a resistance combination, and the sensitiveness of the instrument is such that the actual current used is less than that of the ordinary circuit detector, being limited to 2 per cent of that required to explode the cap. With such an instrument, the condition of the cap circuit may be fully determined at any time, and the development of trouble at once detected.

Exports of Graphite from Madagascar during the first nine months of 1918 amounted to 15,914 metric tons, according to a recent consular report. The figure for the corresponding period of 1917 is not at hand, but, during the whole of that year, exports amounted to 27,838 metric tons.

Blast-Furnace Explosions

A Disastrous Accident Occurred When the Blowing Engine Was Shut Down, Probably Due To Leaky Jacket Permitting Contact of Water and Hot Coke, and Consequent Generation of Water Gas

By B. B. HOOD

Assistant to Superintendent, Chrome Plant, United States Metals Refining Co.

IN SHUTTING down a copper blast furnace precautions must be taken to avoid accidents. These precautions should, among other things, guard against the gas generated in the furnace getting back into confined spaces, where it might explode and cause damage. Several years ago at the Chrome, N. J., plant of the United States Metals Refining Co. a serious explosion took place, an account of which may be of value in helping someone to protect his plant against a similar calamity.

operations the valve at the end of the blast pipe was closed and the two valves on the branch pipes were open.

The blowing machinery consisted of a No. 9 Roots blower, directly connected to a reciprocating steam engine. An auxiliary motor-driven No. 6 Roots blower of much smaller capacity was also connected to the air pipe. The power house building is 52 by 126 ft. in size, of brick construction, and houses, besides the two blowers mentioned, a converter-blowing engine and two high-pressure air compressors. All of these engines



WRECK OF ENGINE ROOM CAUSED BY EXPLOSION OF GAS IN AIR-BLAST PIPE

The equipment consisted of two blast furnaces, 44 by 186 in. An air pipe, 32 in. in diameter and about 300 ft. long, connected the two furnaces with the blowing machinery. This air pipe, as it entered the smeltery building, branched to each furnace and was fitted at the end with a gate valve. The two branch pipes to the furnaces were each fitted with valves, one being a butterfly and the other a gate valve. Under normal

were furnished with steam from a boiler plant 150 ft. distant.

The blast-furnace blowing engine was to be shut down in order to repair the crosshead and connecting rod, which would take about ten minutes. The motor-driven blower was not running, nor was it started up. The smeltery was notified that it was desirable to shut this engine down, and the management put the furnaces in

first-class condition and reported back to the engine room force that everything was arranged for the short shutdown. The blower was then stopped. The furnaces still contained their usual charges, and precaution was taken to remove about one-third of the tuyere blocks on each furnace. The two valves on the branch air lines were not closed. This operation had been performed many times before, both with the branch line valves closed and with the valves open.

another piece went through a 12-in. brick wall. All of the window sashes and frames and door frames were completely wrecked. The roof of the building was made of tile, and large parts of it had to be replaced, as the tile seems to have been lifted up from the purlins and then dropped back into place again. Flying pieces of metal broke the main steam lines, and the building rapidly filled with steam. The men groped their way out, some of them hardly knowing how they arrived outside of the building. Aside from a few bruises and the general scare, the men were none the worse for their experience.

The engine driving the large Roots blower was thrown out of line to some extent, but otherwise not damaged. The valve mechanism of the converter-blowing engine was partly wrecked, but the two high-pressure air compressors escaped with little injury. The 32-in. air line had a "T" connection just outside of the engine room, one end of which was covered by a blank flange $\frac{1}{16}$ in. in thickness. This was blown off, striking a steel tank 4 ft. in diameter and 10 ft. high and knocking it over. One of the 3-in. bolts was hurled a distance of about 100 ft. through an erecting shop and through a window of a machine shop, barely missing a machinist's head, and burying itself in the opposite wall. The gate valve at the smeltery end of the 32-in. blast pipe consisted of a slide $\frac{1}{4}$ in. thick, and was not even bent. In fact, those in the smeltery hardly realized that an explosion had taken place.

As stated before, the practice of shutting down the blowing engine for a short period was not a new one, and why an explosion took place at this particular time is not absolutely certain, but the following is what probably happened:

One of the jackets of one of the furnaces leaked rather badly. The water, upon meeting the hot coke, undoubtedly generated water gas in sufficiently large quantities to force its way back into the blast pipe. This took place until the pipe was practically filled completely back to the engine room, and then, for some reason or other, it was ignited, causing the slight puff which had rattled the safety valves near the blowers. The mixture in the pipe, however, was too rich to explode, but a flame gradually burned its way back along the pipe until it neared the power-house end of the gas column, where undoubtedly air was mixed with the gas, forming an explosive compound. This was ignited, causing the explosion close to the boilers themselves. There was absolutely nothing in the power house to ignite the gases.

The smelting plant was in operation again in three weeks, during which time a No. 11 Roots blower weighing about 67 tons was taken from a similar plant near Salt Lake, Utah, shipped east by express and installed. No other blower of similar capacity could be obtained in less than two or three months' time. New air-pipe connections were made, the blower engine was relined, the foundations were enlarged to suit the larger blower, and the two blast furnaces were practically rebuilt, as they were in need of extensive repairs. The repairing of the damage done by this explosion might properly be listed among the historical quick repairs.

The total cost of the explosion is not represented entirely by the repair costs; the lost production which might have been made in that time must be considered.

To protect the plant against explosions of this nature in the future there have been installed upon the main blast pipe seven ventilating doors (Fig. 1). These are

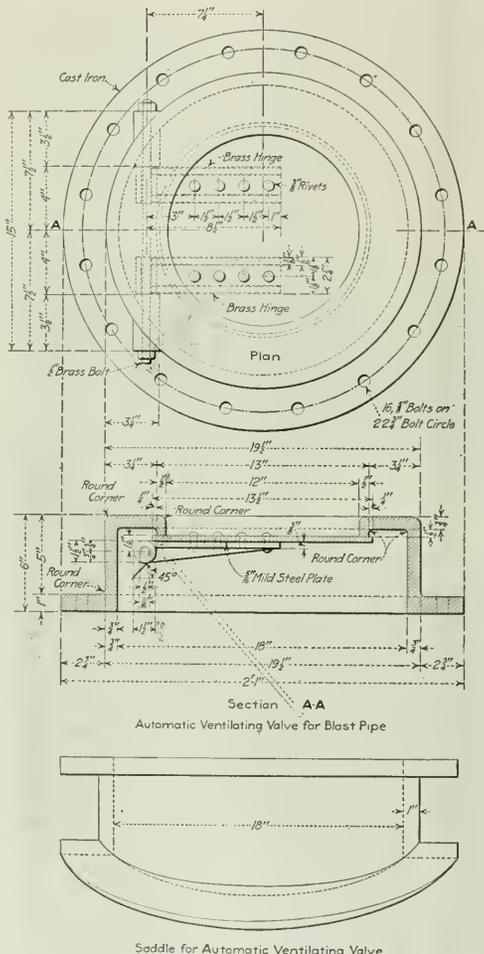


FIG. 1. DETAILS OF VENTILATING DOOR

Approximately four minutes after shutting the engine down a slight explosion took place, which rattled the safety valve mechanism in the power plant. About a minute after that a terrific explosion followed. There were five men in the building at the time of the explosion, and that no one was killed is a miracle. The two Roots blowers were completely wrecked, as indicated by the photograph, and pieces of them weighing from 200 to 300 lb. were scattered from one end of the building to the other. One piece went through the roof;

nothing more than check valves 12 in. in diameter, and are situated along the top of the blast pipe. They automatically open to the atmosphere when the pressure inside of the pipe is taken off. The air volume is such that they automatically close themselves when the blowing engine is started up. The purpose in installing these valves is to allow the gas, when produced, to find its way out to the atmosphere before collecting in large enough quantities to do damage. Care is also exercised to see that valves on the branch blast pipe lines at the furnaces are closed when the blast is taken off.

Engineers' License Bill

Act Passed by Colorado Legislature Providing for Licensing of Engineers Takes Majority Of Engineers by Surprise

DENVER CORRESPONDENCE

ENGINEERS who intend to engage in professional work in Colorado will be interested in the Engineers' License Bill. When Senate Bill 339, introduced by Senator Knaus and Mr. Finley, providing for a State Board of Engineer Examiners and the licensing of engineers in the State of Colorado, became a law, fully 90 per cent of the practicing engineers of the state were surprised. Most of them had never heard of the bill. A few who were in touch with activities in the Legislature knew that such a bill had been offered, but they regarded it as freak legislation and assumed that it would in all probability expire without receiving serious consideration. However, before the majority of the engineers who were to be affected by the measure had become familiar with it, the bill was passed.

Supporters of the bill claim that the licensing of engineers is a desirable reform measure to protect the public against incompetent advice, and at the same time to reduce competition among engineers. These supporters of the measure, representing a small percentage of the practicing engineers of the state, regard the licensing of engineers as similar to the licensing of physicians. This view indicates that they fail to appreciate that the services rendered by physicians and engineers are far from parallel in most respects.

Whenever a man engages the services of a physician with whom he is unacquainted, it is because an emergency exists and human life may be endangered by delay. It is proper that the law should provide for such cases, as well as it can, by insisting that a practicing physician give evidence of certain ability. On the other hand, when a man desires engineering advice, no such emergency exists as in a case requiring the immediate services of a physician or surgeon. A client rarely engages an engineer with whom he is unacquainted, or who has not been satisfactorily introduced and recommended. Engineers are not selected hastily from the lists in business and telephone directories. Competent practicing engineers receive their appointments through the recommendation of satisfied clients; they fear no competition from incompetent or inexperienced members of the profession, nor is the public safety ever endangered through their work.

There are serious and well-founded objections to the bill from the point of view of all engineers who reside outside the state. Under the law, all consulting engineers, including those engaged in the investigation of

mining and metallurgical projects and those who may be directly or indirectly instrumental in bringing outside capital into the State of Colorado for its industrial development, may be subjected to the irritation and delay incident to making application for a license and passing an examination before they may proceed.

Regardless of the high personal qualifications which individual members of the Board of Engineer Examiners may have, such a board will be utterly incompetent to pass upon the ability of a certain engineer to render certain specific service to his client. As a rule, the client will have no interest whatever in the opinion of the examining board, because confidence in his engineer may have been firmly established by previous service or satisfactory recommendation. In instances of this character, which represent a large percentage of all those coming under the law, the examining board will serve no useful purpose, but the operation of the law will make Colorado unpopular with engineers and hamper development with red tape.

The law provides that the Examining Board shall admit to examination any candidate who pays a fee of \$10 and submits evidence, verified by oath and satisfactory to the board, that he is a citizen of the United States and is more than 25 years of age; that he is of good moral character; and that he has been actively engaged in the practice of engineering for at least six years, in the employ or under the supervision, direction, and tuition of one or more practicing engineers.

Each complete year as a student in an engineering school of recognized reputation, or employed in the military service of the United States or its Allies during the war, shall be credited as one year of practice. The candidate must show that, during two years of his period of six years of active practice, he has been in active, responsible charge of engineering work requiring the exercise of initiative, judgment, and independent decision. The Board of Examiners shall verify the statements of the applicant, so far as practicable, and shall mail to each licensed engineer and to each employer or reference given by the applicant a copy of the statement pertaining to his experience. In not less than 60 nor more than 120 days, the application for license shall be either approved or denied, and final action taken thereon.

The law provides the manner in which the examination of candidates shall be held. Upon the evidence of the official record that an applicant has successfully passed the examination, the Board of Examiners shall issue to him a license to practice engineering, upon the payment of an additional fee of \$5. This fee, added to the examination fee of \$10, makes the total cost of a license amount to \$15. This license may be renewed from year to year by paying an annual fee of \$5.

The following extract from the law is of interest: "Any person who, not being then lawfully authorized to practice engineering within this state, according to the provisions of this act, shall attempt to practice or shall so practice for hire, and any person who shall, in connection with his name, use any designation tending to imply that he is a licensed engineer, within the meaning of this act, and any person who shall violate any other provision of this act, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not more than \$500 or by imprisonment for not more than six months, or both.

Refining Flake Graphite for Crucible Use^{*}

The U. S. Bureau of Mines Investigates the Possibilities of Producing a Satisfactory Grade of Crucible Graphite From Alabama Flake Graphite—Intermountain Station Contributes Research Results

BY FREDERICK G. MOSES

FERGUSON¹ describes the requirements for crucible graphite as follows: "Graphite for the making of crucibles must be of great purity. Its content of graphite carbon should exceed 85 per cent and preferably should be as high as 90, and it must be practically free from mica, pyrite, and iron oxide. A small amount of quartz is not injurious. Graphite for making crucibles should also be coarse enough for the interlocking fragments to be bound by the clay with which it is mixed. It should contain a large percentage of flake about 1 m. in diameter and should all remain on a 100-mesh screen."

The concentrates produced in the Alabama district differ widely in their physical characteristics and graphitic content. Notwithstanding this fact, however, the physical properties of the different minerals composing the concentrates cannot, of course, vary greatly, and hence a scheme worked out for any one of the types can be applied, with only slight variations and adjustments, to the others. For this reason, and because of the numerous schemes tried in the limited time available for the investigations, it was impossible to do all of the work on all of them. It was decided, therefore, to select several of the most representative for investigation, and to determine the extent that the results obtained on the concentrates could be generalized and applied to all.

EXISTING REFINING METHODS

The present method of finishing the crude concentrate consists of, first, drying the concentrate from the previous process, grinding the dried material in a buhr mill, and "bolting" or screening the ground product to remove the impurities that have been crushed during the grinding operation. The theory of the process is that the graphite, being tougher, smoother, and thinner than the impurities that occur with it, will be rubbed and polished between the buhrstones, with a minimum reduction in size. The impurities, owing to their more brittle characteristics and more massive structure, will be ground between the stones to such an extent that they can be removed by screening over a suitable cloth.

It is readily understood that the theory of this process is simple, and in fact, within certain narrow limits and under favorable circumstances, the method will give good results. As a general rule, however, two difficulties are encountered that interfere with the commercial success of the operation. The first of these is the large proportion of the coarse and valuable flake that is often destroyed during the grinding. The second is lack of uniformity in the finished product. It is evident that the primary object of the present investigation is to determine the most efficient manner of ob-

taining the desired results and eliminating the troubles in the process mentioned above.

The first experiments were made to determine the possibility of separating the graphite and gangue material by differences in specific gravity and shape of the various particles. The apparatus first tried depends on the difference in specific gravity and the difference in shape of the various minerals to accomplish separation. This type of apparatus is already being used to a limited extent in Alabama, and is there known as an aspirator. The aspirator is fundamentally an air classifier. The name is appropriate, for the reason that the separation depends on the settling rate of the different minerals in a current of air.

The apparatus constructed for the experiments was closely similar to devices now used in the Alabama field. The material to be treated is fed from a hopper to a roller, from which it drops into the large end of a long, sloping, horizontally placed box. The roll feeder is arranged so as to feed the material in an even curtain across the whole opening. Leading from the small end of the box is a suction pipe equipped with a suction fan. The box is 13.5 in. wide by 12.5 in. high at the feed end, and 43.5 in. long. The suction pipe is 31 in. long and 4 in. in diameter.

Across the opening of the box and parallel to the ground line are four vanes or sand deflectors, placed at such an angle from the vertical that any material fed from the roller when the air current is not on will be deflected to the outside of the box.

The principle of operation of the aspirator is as follows: The graphite, being lighter in weight and of a flat shape, will, of course, be deflected further from the vertical by a horizontal current of air than the heavier and more massive sand particles. For this reason, the graphite will be carried further into the box than the heavier and more massive sand material, which will fall on the vanes and be thrown to the outside of the box.

The results obtained indicate that although some of the impurities can be removed with the aspirator, thereby materially raising the grade of the original material, the application of this type of machine will never be general.

It has been known for a long period that the coarse sand particles cause the greatest destruction of the large flake in the buhr mill. When the concentrates carry a large proportion of sand particles of such nature that the type of treatment described will raise the grade of the crude product to 70 per cent or better, there can be no question that the aspirator can be used to great advantage before treating the concentrates in the buhr mill. It is to be understood, however, that unless there is a comparatively large proportion of such impurities in the crude concentrate, the aspirator cannot be used to best advantage. The apparatus should certainly not be incorporated in a finishing mill except after thorough and comprehensive tests to determine

^{*}Abstracted from War-Minerals Investigation Series Bulletin 8, Bureau of Mines, Washington, D. C.

¹Ferguson, H. G., "Mineral Resources U. S., 1917," U. S. Geological Survey, 1918, p. 97.

the results that can be obtained by its use, and then only on the advice of a competent engineer conversant with the conditions that must be met by the installation.

TESTS WITH PNEUMATIC JIG

The pneumatic jig differs in construction from the aspirator, although the principles involved in the operation of each are similar. This equipment has been manufactured on a commercial scale for several years, and its use would be advantageous when feasible, as a more simple and standard layout could be arranged than where improvised equipment like that described was used. Both types would be simple to operate, the aspirator, however, being capable of more sensitive adjustment.

The jig used in the experimental graphite work was a small laboratory apparatus, built by the manufacturers of the standard machine, for laboratory experiments. It consists of a small metal box, the bottom of which is made of a screen 3.25 by 2.5 in. Air pressure of 2 to 4 oz., furnished by a pressure blower or compressor, is admitted to the bottom of the box under the screen through a small rapidly rotating valve. The rapid pulsation of the air, due to its passage through the valve, causes the material on the screen to remain in continuous agitation and suspension. Consequently, the coarse and heavy impurities collect at the bottom of the material on the screen, the lighter graphitic material being stratified above the sand. The jig is so arranged that the operation is continuous, the heavy sand impurities being constantly collected and discharged from one side, whereas the lighter graphite is separated above the sand and discharged from the top of the column and on the other side.

AIR JIG PRODUCES CLEAN TAILING

The field of application of the air jig is practically the same as that of the aspirator. The results indicate that the air jig can be made to produce a cleaner tailing than the aspirator, but that the aspirator will give a higher grade of finished product. This condition will not, however, interfere with the usefulness of the jig, provided the material removed from the crude concentrate by it is the coarse-sand particles that cause the high loss of coarse flake in the buhr mill. Inspection of the various products of the jig will indicate that it does remove the coarse-sand particles.

Many of the remarks regarding the use of the aspirator will apply also to the air jig. There is no question that under certain circumstances the jig can be made to do valuable work in the preparation of crude graphite for crucible making, but the character of the crude concentrates themselves, and the other factors that enter into the commercial finishing of concentrates, must be considered before the jig is recommended for use in preliminary treatment. If the jig is used, and used only to do that for which it is particularly adapted—the removal of coarse-sand impurities—its success can be assured.

Probably the most striking characteristics of graphite flakes are their toughness and the shape of the individual particles. In these two respects the flakes differ greatly from the impurities usually associated with the graphite in the crude concentrates. It was hoped, therefore, that these properties could, in some manner, be utilized in separating the graphite from the associated impurities. In considering the matter, it was decided

that although the coarse-sand impurities were much harder than the graphite flakes, they were, at the same time, so much more brittle than the carbon that the concentrate could be ground in some manner so as to materially reduce the size of these hard, brittle particles without causing a material reduction in the size of the graphite particles themselves. A careful survey of the different classes of grinding machinery indicated that this operation could be carried out with the greatest chance of success in a mill of the ball or pebble type.

The difference in the specific gravity of the two classes of substance was also a reason for believing that this method of selective grinding could be done. It was thought that, under correct conditions of dilution, the heavier, sandy material would tend to classify in the bottom of the charge among the grinding balls, where it would be ground more than the graphite, which, because of its lighter weight, would tend to segregate higher in the charge and out of the grinding zone. Such a separation corresponds closely to that in a hydraulic classifier. The results obtained from experiments proved that in most particulars the assumptions were fundamentally correct.

SEPARATION OF SAND AND CARBON

After a treatment such as suggested, which would produce a product with the sandy constituents ground to a finer size than the flake graphite present, two means of separating the sand and carbon would be available. One of the methods, as might be expected, would be a screening operation. In fact, it was found that after such grinding it was possible to raise the grade of the original material 25 per cent or more by simply passing the ground concentrate over a 100-mesh screen.

In summarizing the results obtained by the pebble-mill grinding, it may be said that the apparatus, when operated under the conditions that have been determined to be the most satisfactory, will raise the grade of the + 100-mesh material in a crude concentrate to such a degree that the following buhr-mill grinding can be carried on to give the maximum results possible with it. At the same time, the results indicate that the pebble mill cannot be used to produce a finished grade of product. In other words, the pebble-mill grinding should be used only as a step in the process, and that step only preparatory to treatment in the buhr mill.

The choice of method of removing the impurities that are ground in the pebble mill will depend on the character of the concentrates that are being treated and on other conditions that will be encountered in the commercial finishing plant. The results obtained in the experiments here described indicate clearly that the field of the pebble-mill grinding is wide and that the process can be made to produce favorable results even under the most adverse and difficult of operating conditions.

TESTS WITH ELECTROSTATIC SEPARATOR

The great difference between the electroconductivity of graphite and that of the principal impurities associated with it in the crude concentrates early suggested that a method of separation based on electroconductivity might be developed. Such a method has already been tried to a certain extent in the Alabama field, but the results in general have been unsatisfactory. This failure has been due to two difficulties. The first of these was

that most of the concentrates produced in the district contained a large amount of iron oxide, which, obviously, could not be removed with an electrostatic machine. Of course, crucible stock containing a large quantity of iron oxide could not be sold. The other reason for the failure of the process was principally that mechanical faults developed in the electrostatic separator when attempts were made to treat a product containing such large quantities of light, electroactive material.

However, in one section of the field producing concentrates high in mica but low in iron, the process worked well on a commercial scale, and is now being used. Such material is particularly adapted for electrostatic treatment; hence the process gives satisfactory results, although certain changes in the separator, as originally designed, were made to overcome inherent mechanical defects. This condition was only local, however, and electrostatic separation was never successfully used in the remainder of the district.

Improvements in the concentration mill made it possible to produce a concentrate carrying so much less iron that it was thought that the iron would no longer be a determining factor, and that, consequently, the electrostatic process should offer much more chance for success than previously. Thus, in order to use this method of separation, it seemed necessary only to construct a machine that would eliminate the mechanical difficulties previously encountered in the operation of this type of apparatus.

ELECTROSTATIC TESTS OFTEN UNSATISFACTORY

With this end in view, a series of experiments was made with a large machine of the type at present on the market, to determine definitely the reason for its previous failure. However, with this machine the separation was not satisfactory. The poles of the machine are so arranged that the graphite particles receive a certain charge and are thrown into the field of the pole carrying the opposite charge. When the graphite particles come under the influence of the charge of the latter pole, the charge first obtained is neutralized and the particles are thrown in the direction of the first pole. In this manner the material progresses through the apparatus in a zigzag path, first in one direction and then in the opposite, with the result that no separation of the graphite from the non-electroactive particles is obtained. The sand and other impurities, being unaffected by the charges acting on the graphite, fall directly through the machine. It can be seen, therefore, that the graphite will be separated from the impurities while passing the first pole; but on passing the oppositely charged pole will be thrown in the opposite direction and into the sand from which it has just been separated. Eventually the mixture is discharged practically unchanged from its original state.

The experiments demonstrated that to overcome the faults mentioned it would be necessary so to design a machine that when a graphite particle had received a charge of a certain sign, it would carry this charge unneutralized, and not be forced in the opposite direction and lose its tendency to separate. Many experiments were made with this end in view, and two types of apparatus were constructed. It was found possible to build a machine of such a nature that only one set of poles would tend to give a charge to the graphite, which would be repelled directly into the concentrate hopper and given no chance to be neutralized and thrown back

into the impurities from which it had been separated.

Fig. 1 shows the principal details of the separator as finally constructed, and indicates the manner of its operation. The material to be treated is placed in the hopper at the top of the apparatus and fed from it by a roller in the bottom. The graphite first strikes one of the inclined planes that carries a weak negative charge. While the graphite is on this plane it therefore receives also a weak negative charge. As the plane and the graphite both have the same charge, the graphite will be repelled and will jump from the negative vane into the field induced by the positive vanes. On coming into this opposite field, the graphite gives up its weak negative charge and receives, instead, a much stronger positive one, which, in turn, causes it to be repelled violently from the positive plate and through the openings shown between the electrodes. After having passed to the back of the plates, the graphite is free to fall directly into the concentrate hopper at the bottom of the separator.

The sand and mica, being much poorer conductors of electricity, receive such a weak charge from the negative plate on which they first fall that they are not repelled into the strong positive field, but simply slide from one negative plate to the next, and so on down through the machine, until finally discharged into the

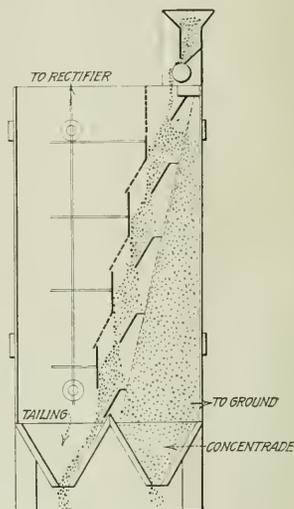


FIG. 1. ELECTROSTATIC GRAPHITE SEPARATOR

tailings hopper at the bottom of the apparatus and in front of the concentrates hopper.

SUMMARY OF RESULTS WITH ELECTROSTATIC SEPARATOR

The results obtained with the electrostatic separator prove conclusively that electrostatic separation can be successfully used in the finishing of graphite. They also indicate that the separators now on the market must be changed in certain respects to make it possible to obtain satisfactory results by their use. The results also seem to prove that the apparatus has a wider application than is possible with any of the other devices tested, with the possible exception of the buhr mill.

The electrostatic process seems also to be economical.

The cost of power is low and the loss of coarse and valuable flake is small. At the same time, it is to be expected that, although the device will invariably improve the grade of the concentrates treated, it will not yield a finished product containing 90 per cent carbon, which is considered necessary for crucible manufacture. However, the improvement in grade of the concentrates tested was so great as to indicate that electrostatic separation will, with few exceptions, produce a feed for the buhr mill that will be ideal for that apparatus to finish to the crucible requirements without a prohibitive loss of coarse flake. The removal of the coarse sand was almost complete.

The results already recorded show that, although the

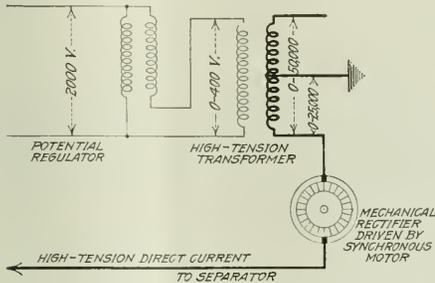


FIG. 2. WIRING DIAGRAM OF ELECTRICAL EQUIPMENT USED FOR ELECTROSTATIC GRAPHITE SEPARATOR

electrostatic separator will improve the grade of the concentrates, the degree of improvement will vary. Seemingly, the degree of variation depends on the physical condition of the concentrates themselves previous to treatment. In other words, the results to be obtained with this separator, as with those of any other type of equipment, will depend on the concentrates themselves, and consequently there can be no doubt that conditions will sometimes be met under which this type of treatment would not be as satisfactory as some other that might be developed for the removal of the coarse sand. However, the process has a more general application than is possessed by any of the other methods thus far described.

FLOTATION AS A FINISHING PROCESS

Flotation as a process of concentrating the graphite content of ores has been used for some time and with a fair degree of success. For this reason, and because graphite has a much greater tendency to float than the impurities that are usually found associated with it, the idea of re-floating the concentrate to remove the impurities before buhr-mill treatment was suggested.

There are two primary reasons for thinking that flotation could be used in this connection. The first is the law of concentration that the grade of the concentrates produced by a concentration process will vary directly with the richness of the feed being treated. As it is possible to produce a 45 per cent graphite concentrate from ore carrying only 3 per cent graphite, it is reasonable to believe that, under the proper conditions, it should be feasible to make a concentrate carrying, say, 70 per cent or more graphite from a feed carrying 40 per cent or more of graphite.

The results obtained make it evident that simple re-flotation, without a preliminary treatment, will mate-

rially raise the grade of the product, and give a high recovery of the carbon content of the feed. However, as would be expected, the results do not indicate that simple re-flotation would be satisfactory in commercial practice.

As regards re-flotation following treatment in buhr or pebble mills, the results are such as to justify its adoption in a commercial installation. Both the mechanical and the pneumatic types of flotation machines were used in the tests, and, as far as could be noted, neither machine could claim an advantage. Several oil mixtures were used. A mixture of 2 lb. of No. 17 oil and 0.75 lb. of No. 5 oil, both made by the General Naval Stores Co., was found satisfactory in every case.

THE BUHR MILL: ITS PLACE IN GRAPHITE FINISHING

During the comparatively long period that the buhr mill has been employed to finish graphite, methods of overcoming inherent difficulties in its use have become evident. One requirement is that the concentrate be of comparatively high grade before grinding in the buhr mill. With such material, no difficulty is encountered in consistently producing a crucible stock assaying 90 per cent graphite, provided the other conditions are correct. That the excessive destruction of coarse flake incident to buhr-mill grinding may be eliminated, it is necessary to remove only the coarse, gritty particles, or, at least, those coarse enough to require a large amount of grinding in the buhr mill. Stated simply, when the buhr mill is operated principally as a grinding machine on low-grade material, the grade of the product resulting cannot be depended upon, and an excessively large proportion of the flake will be ground to dust. When, on the other hand, the machine is operated only as a polishing or buffing machine, it will give satisfactory results.

The limitations of the mill were realized early in the progress of the work, and the experiments were conducted accordingly. Most of the products resulting from the various treatments contained less than the required 90 per cent of carbon, and, therefore, could be used by the crucible makers only after a treatment in the buhr mill, to bring them to the necessary grade.

GENERAL SUMMARY AND DISCUSSION OF RESULTS

As a result of the investigations made to determine the most satisfactory methods of refining crude graphite concentrates, several important facts were developed. Probably the most important of these is that each concentrate to be treated is a problem in itself, and, therefore, no complete plan of treatment applicable to all kinds of concentrate can be prescribed. Such a limitation is due to the differences between the characteristics of the crude graphite flakes and of their associated impurities. The most important characteristics that will effect the type of treatment scheme to be applied are the hardness, toughness, diameter, and thickness of the flakes and their contents of interfoliated impurities. The different physical properties affect the amount and intensity of the grinding necessary to remove the impurities without the destruction of too large a proportional amount of the large and more valuable flakes.

Another important factor in determining a satisfactory finishing process is the kind of impurities that must be removed. When these impurities exist free from the flakes of carbon, they can be removed, to a great degree, with a small loss of coarse carbon. When these impurities are soft and of small size, they can

be removed after a slight and non-destructive grinding operation, which will, in all probability, cause a comparatively small loss of valuable flake.

On the other hand, coarse, hard impurities are much more difficult to handle in a satisfactory manner. This type of material offers the greatest problem to the operator of the finishing mill. The results obtained in the experiments indicate that the efficiency of the finishing process will depend on the success obtained in the removal of this type of impurities at the earlier stages of the finishing operations.

The investigations have also brought out the fact that the buhr mill is a necessary apparatus in all processes for graphite finishing. It separates the flakes into their constituent laminations, and prepares them for the removal of the interbedded or interfoliated impurities.

The aspirator and the pneumatic jig were found to have an application under certain circumstances. It was seen, however, that such apparatus can be considered only for preliminary treatment previous to the regular finishing process, and should be used only for the removal of coarse, hard, free impurities that are sometimes encountered.

The experiments proved fairly conclusively that the use of either the electrostatic separator or the pebble mill, followed by flotation, will be applicable to all types of concentrates produced in the Alabama fields. The material produced by either of these types of apparatus can be ground in the buhr mill with satisfactory results.

The different processes of finishing graphite may be classified under two general heads—wet and dry. The decision as to which of the two should be used is dependent on the characteristics of the concentrates themselves. It is important that neither be adopted except after the necessary experiments and on the advice of an engineer thoroughly conversant with the problems to be encountered in the treatment of the particular concentrate, and with the economic conditions that will exist in the operating plant.

It can be said that, with rare exceptions, a satisfactory crucible stock can be produced from all of the concentrates that are at present made from the Alabama ores, and that the recovery of +100-mesh flake at the majority of finishing plants now operating can probably be improved. It should be possible to keep the recovery of material coarser than 100 mesh at 70 per cent of the total carbon in the original concentrates, and in many cases this can be increased to 80 per cent or more. These figures are sufficiently high to make profitable a loss.

The results obtained in finishing the graphite concentrates are dependent largely on the character of the crude flake contained in the ores. Moreover, mills that are producing a potential crucible stock in their concentrating plants can also produce a satisfactory crucible stock at a profit from a finishing plant that is correctly designed and intelligently operated. The operator who is unfortunate in having to mine small, low-grade flake requiring a large amount of intensive grinding and associated with a large quantity of coarse siliceous or micaceous impurities will have difficulty in producing the required grade of crucible stock at a profit. In common with all mining ventures, successful operation depends more on the character of the raw material occurring in the ground than on the treatment given the ore after it has been mined.

Chemical Industries Exposition

Companies Which Will Exhibit—Meetings of the American Institute of Mining and Metallurgical Engineers, American Electrochemical Society and Other Organizations

AS PREVIOUSLY announced in the *Journal* the national exposition of the chemical industries will be held during the week of Sept. 22 in Chicago, during which time a number of societies will also hold meetings. The American Institute of Mining and Metallurgical Engineers will occupy the first part of the week. The American Electrochemical Society will hold its meeting on Sept. 25, 26, and 27. The following companies are among those which will have exhibits at the annual exposition:

Abbe, Paul O.	Hercules Powder Co.
Alnsworth, Wm. & Sons	Harold China & Pottery Co.
Allen Electrolytic Cell Corporation	Huff Electrostatic Separator Co.
American Chemical Society	Industrial Electric Furnace Co.
American Chemical & Manufacturing Co.	<i>Journal of Industrial & Engineering Chemistry</i>
American Cyanamid Co.	Lead Lined Iron Pipe Co.
American Electrochemical Society	Little, Arthur D. Inc.
Anaconda Copper Mining Co.	MacBeth Evans Glass Co.
Armstrong Cork Co.	Magnetic Manufacturing Co.
Austin Co.	McGraw Hill Co. Inc.
Bailey Meter Co.	Merck & Co.
Barrett Co., The	Metals Disintegrating Co.
Bausch & Lomb Optical Co.	Mineral Point Zinc Co.
Brown Portable Conveying Machinery Co.	Nash Engineering Co.
Canadian Electrode Co.	New Jersey Zinc Co.
Carborundum Co., The	Norton Co.
Celite Products Co.	Olivet Continuous Filter Co.
Central Scientific Co.	Ontario Bureau of Mines
Carnotte Reduction Co.	Permutit Co.
<i>Chemical & Metallurgical Engineering</i>	Pennsylvania Salt Manufacturing Co.
Chemical Catalogue Co. Inc.	Raymond Bros. Impact Pulv. Co.
Cleveland-Cliffs Iron Co.	Research Corporation
Coors Chemical Porcelain Co.	Rössler & Hasslachner Chem.
Corning Glass Works	Rossendale-Reddaway Belting & Hose Co.
Crane Co.	Schutte & Koerting Co.
De Laval Separator Co.	Sperry Co., D. B.
Deans Fire Clay Co.	Sturtevant Mill Co.
Dings Magnetic Separator Co.	Sullivan Machinery Co.
Dow Chemical Co.	Taylor Instrument Companies
Duriron Castings Co.	Texas Gulf Sulphur Co.
Eimer & Amend	United Filters Corporation
Electric Furnace Co.	United Lead Co.
Electrolytic Engineering Corporation	United Lined Tube & Valve Co.
Foote Mineral Co.	U. S. Cast Iron Pipe & Foundry Co.
Fuller Lehigh Co.	U. S. Bureau of Mines
General Chemical Co.	Union Sulphur Co.
General Electric Co.	Virginia Smelting Co.
General Filtration Co. Inc.	Wedge Mechanical Furnace Co.
Groch Centrifugal Flotation Co.	Westinghouse Elec. & Manufacturing Co.
Goulds Manufacturing Co.	
Hardinge Conical Mill Co.	

Prices of Milling Supplies in New York

The following table shows the fluctuation in prices of milling supplies during the last two years from July, 1917, to June, 1919.

Supplies	1917-1919 PRICES OF MILLING SUPPLIES IN NEW YORK				
	July, 1917	Dec., 1917	July, 1918	Dec., 1918	June, 1919
Leather belting, heavy, discount, %	35	35	35	.....	25
Rubber air hose, 1-in., first grade per ft.	\$0.55	\$0.60	\$0.60	\$0.60	\$0.50
Cotton waste, white, per lb.	.13	.11	.11	.11	.11
Packing, rubber and duck for low-pressure steam, per lb.	.15	.13	.13	.13	.13
Packing, asbestos for high-pressure steam, per lb.	.....	.77	.99	.99	.95
Packing, rubber and duck for piston packing, per lb.	.....	.88	1.10	1.10	1.00
Pure steam-distilled pine oil, per gal., in bbl.	.501	.501	.56	.65	.70
Pure destructively distilled pine oil, per gal., in bbl.	.40	.40	.49	.65	.63
Pine tar oil, per gal., in bbl.	.26	.28	.35	.38	.45
Crude turpentine, per gal., in bbl.	.37	.37	.40	.45	.61
Hardwood creosote, f.o.b. Cadillac, Mich., per gal., in bbl.	.191	.191	.23	.23	.23
Sodium cyanide, per lb.	.30	.37	.39	.30	.30
Zinc dust, 350 mesh, per lb.	.16	.18	.16	.16	.10

PHOTOGRAPHS FROM THE FIELD



DISASTROUS FIRE AT PROPERTY OF SUNNYSIDE MINING AND MILLING COMPANY, EUREKA, COLORADO. The fire, which occurred on Apr. 21, originated in the third story of one of the bunk houses. The following buildings were completely destroyed: Boarding house, two bunk houses, moving-picture hall, commissary, and compressor plant. The following buildings were saved: Tramway terminal, crushing plant, machine shop, blacksmith shop, and transformer plant. There was no damage to the tramway which connects with the 600-ton mill three and one-half miles distant.

Sinking and Concreting Mine Shaft 936 Feet Deep*

Lining and Walls of Four-Compartment Shaft No. 5 of Miami Copper Company Concreted Simultaneously With Excavation Operations—Blasting Impossible Below 200-Foot Depth

BY RICHARD L. RUSSELL
Superintendent, The Foundation Company, Miami, Ariz.

SEVERAL novel details in underground construction were developed and applied in the sinking and concreting of shaft No. 5 of the Miami Copper Co., at Miami, Ariz. This shaft has four compartments and is 936 ft. deep, and the concrete lining was carried on at the same time as, and without interference with, the sinking, 700 ft. of the shaft lining having been placed and two large stations having been excavated and concreted by the time the shaft had reached its final depth. The section, shown in Fig. 1, is 13 ft. by 16 ft. 4 in. clear and required an excavated section 15 by 19 ft.

The entire shaft lies in what is locally known as Gila conglomerate, a formation which is typical hardpan rather than a true conglomerate. Although the material is very hard, no blasting was done after water was encountered at a depth of about 200 ft., it being found practically impossible to remove the powder fumes from the fissures in the water-laden hardpan. Light jackhammers with "bull points" from 2 to 3 ft. long were used to break the ground. This method, besides permitting the walls to be trimmed neatly, with far less overbreak than would result from blasting, permitted a progress of 100 ft. per month.

The shaft was sunk on the side and near the top of a small, steep hill, the top of which was graded down by the contractor to the elevation of the collar of the shaft. The plant layout is shown in Fig. 2. The shaft being near the present operating plant of the Miami Copper Co., the air, water, and electricity were delivered by that company at the collar of the shaft.

The contractor began erecting the headframe and other working structures Dec. 11, 1917, and hand excavated for the top 25 ft. of shaft without blasting, to avoid disturbing the ground adjacent to the collar. As the hoist could not be delivered until the end of January, 1918, the contractor obtained, late in December, permission to drift in from a tunnel of the Miami Copper Co. which passed within 20 ft. of the southerly corner of the shaft at a depth of 118 ft. This permitted the tramping of muck by hand a distance of about 300 ft. through the tunnel to a dump in the gulch at the tunnel entrance.

After the line of the shaft was reached, a raise was driven for the purpose of meeting the excavation from the surface. This raise was 2½ by 6 ft., of which 2½ by 2 ft. was a manway with ladders and the remaining space was occupied by a cribbed chute. At the tunnel level the drift was widened and the full shaft section excavated to make a working chamber large enough to accommodate a switch, which permitted the sidetracking of an empty car while another car was being loaded. The full section of the shaft was then broken down through this chute by the use of 40 per cent dynamite.

The drift was started Dec. 26, 1917, and completed Jan. 1, 1918; the raise was started Jan. 2, 1918, and

completed at 6 a.m. Jan. 8, 1919—a rate of 5 ft. per eight-hour shift. The full section of shaft was excavated to the level of the tunnel Feb. 20, 1919, and 60 ft. of shaft had been concreted in the same period, as follows:

As soon as the excavation had reached a depth of 35 ft., the forms for the 25-ft. collar were started on 12 by 12-in. bearing timbers placed in 18-in. hitches cut in the hardpan walls. No back forms were used, and the whole 25 ft. was poured continuously. As no water was encountered, no timbering was necessary.

While the collar was being concreted, the excavation had progressed to a depth of 55 ft. Hitches were again cut in the walls, and the three 12 by 12-in. bearing timbers were lowered into them. On these bearing timbers was placed a timber frame, the exact size of the con-

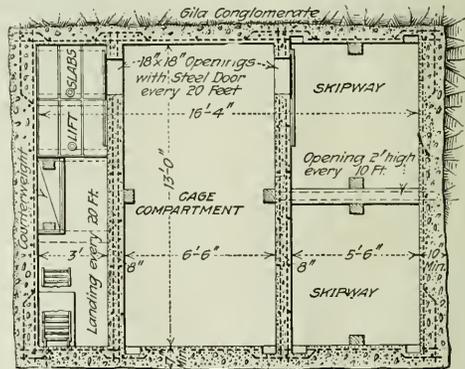


FIG. 1. CROSS-SECTION OF SHAFT, SHOWING CONCRETE LINING

creted section, which served both as a bottom form and a sill on which the form panels could be set. The vertical reinforcing rods were then hooked to the verticals which had been left projecting from the bottom of the previous concrete, and the horizontal reinforcing was wired to the verticals. A 5-ft. section of forms was then placed, and concrete was poured, this process continuing until the concrete was carried up to the bottom of the collar section. It was found that the ground would safely permit the opening up of a depth of fully 25 ft. of shaft without lateral support, and the concrete was carried down in 20-ft. sections by the above process for the first 200 ft. of the shaft.

As soon as the raise from the tunnel level was finished and the breaking-down process was well under way, a small air hoist was installed at the tunnel level, and the two skip compartments were sunk and timbered as a pilot shaft, the muck being hoisted to the tunnel level and also tramped through the tunnel. Thus excavation was being carried on simultaneously at two levels

*From *Engineering News-Record*, June 26, 1919.

without interference, while waiting for the double hoist to be delivered.

By the time the whole shaft had been excavated down to the tunnel level a two-compartment pilot shaft 100 ft. deep was ready, one compartment serving as a chute through which to draw off the muck from breaking down the full section of the shaft and the other a hoisting compartment to the tunnel level through which the muck was still trammed.

Water was encountered at this depth (218 ft. below the surface) and while the full shaft section was being excavated to this depth the double-drum hoist was delivered and installed and a special crosshead was devised to comply with the requirements of the Arizona mining laws and at the same time permit the bucket to be dumped into the receiving bin in the headframe without excessively increasing the height of the latter.

As it was neither possible nor desirable to keep the bucket guides extended nearer the bottom than 15 to 30 ft. while sinking was in progress, this crosshead had to be such that it could be stopped at any desired point in the shaft as well as at the headframe and allow the bucket or skip to continue on, for filling or changing at the bottom or dumping when reaching the headframe.

It was found that the water caused the hardpan to slough very treacherously soon after a wall was exposed. Full timbering was therefore carried on with the excavation from the 250-ft. depth; 8 by 8-in. plates, posts and dividers and 2-in. lagging were used. Corner joints were framed as shown in Fig. 4 to secure an increased bearing surface. As the shaft was concreted, all timber and lagging were removed and re-used, some timbers being used as many as four times. This not only resulted in a large material saving but also saved a high framing expense, as carpenters were paid \$7.25 per shift at that time.

The section concreted in one operation was increased to 100 ft.; that is, the 12 by 12-in. bearing timbers were lowered 100 ft. and set in hitches and the 100-ft. section was concreted upward in 5-ft. courses.

The water was bailed into buckets and hoisted, five buckets per hour, or 600 gal., which, together with the water shoveled and hoisted with the muck, was sufficient to keep the bottom free. A timber bulkhead 6 in. thick was kept not over 50 ft. above the men working in the bottom over all of the shaft except the two skip compartments. While the reinforcing and forms were being set in one of the skip compartments all the

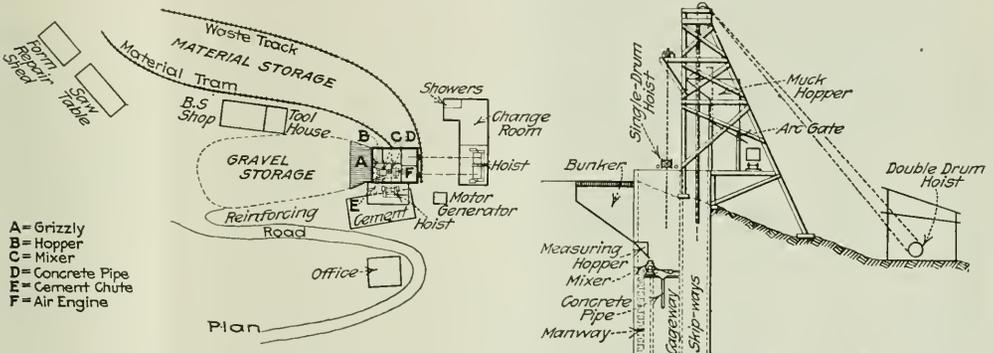


FIG. 2. PLAN AND SECTION OF CONSTRUCTION-PLANT LAYOUT FOR SINKING AND CONCRETING MINE SHAFT

This was accomplished by the arrangement shown in Fig. 3.

A lug D was securely clamped to the cable about 6 ft. above the shackle loop. This lug engaged the dogs B and thus attached the crosshead securely to the cable. When the crosshead reached the top of the headframe, the top lander pulled the lever E and slid the frame A over against the guides and gave the lowering signal. The bumper C then hit the frame A, the dogs B released the lug D, and the crosshead was left resting on the frame A while the bucket was dumped, after which the latter was raised high enough to take the crosshead off the frame A. The frame was then slid back and the bucket with the crosshead attached was ready for lowering. At the bottom of the shaft, or at any other point where free use of the bucket was desired, stop blocks E were bolted to the guides and performed the same function as the frame A at the headframe. This crosshead gave perfect satisfaction.

From the 218-ft. depth to the bottom the full section of shaft was excavated by the use of bull points; three men using jackhammers, working them into the material, loosened all that four muckers could load into the buckets.

hoisting from the bottom was done in the other compartments, and after the forms were set one of the skip compartments was bulkheaded at the level of the top of the forms, as were the cage and manway compartments, one skipway only being left open for hoisting.

Upon the completion by the contractor of the contract for lining with concrete the old shaft No. 3 of the Miami Copper Co., a mile distant from the new shaft No. 5, about Apr. 1, 1918, the single-drum hoist from shaft No. 3 was installed at shaft No. 5, as shown in Fig. 2, working from extension timbers from the same headframe and operating in the cage compartment.

This hoist handled all reinforcing, forms, concrete pipes, and timbers to the form and concrete gangs, and as there was always a bulkhead in this compartment over the men in the bottom, the danger of working at two different levels was greatly lessened. This hoist was also used in pulling and resetting the rather heavy wooden forms in all compartments. It proved nearly as fast as a derrick and obviated the use of the slow and expensive block-and-tackle method.

Separate bunkers for sand and gravel were excavated immediately adjacent to the collar of the shaft at the

manway end, and the sand and rock from the crushing plant, which was installed in the creek bed, were dumped through grizzlies into these hoppers. Through openings left in the shaft collar, with arc gates, the sand and stone passed into measuring hoppers inside the manway and cage compartments. These hoppers were of the proper dimension for a one-bag batch, and from them the material was chuted to a batch mixer in the shaft

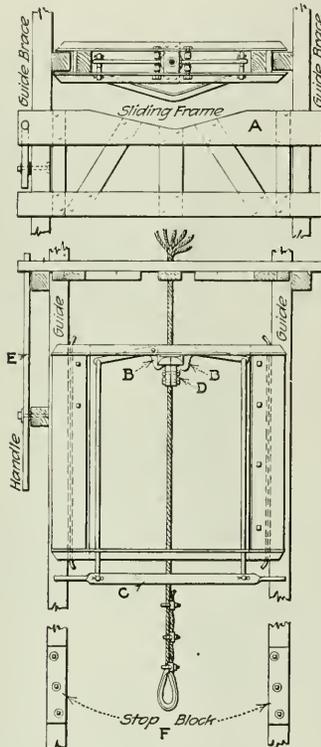


FIG. 3. CROSSHEAD AND SAFETY DEVICES

cageway compartment 20 ft. below the surface. The cement was slid in bags down a chute from the door of the cement shed through an opening in the south side of the cageway compartment directly to the mixing plant.

The mixer, of 8-cu.ft. capacity, was belt-driven from a small air hoist set at the same level. This plant occupied the southerly half of the cage compartment and manway compartment, the wall between the two being omitted temporarily for its accommodation, the whole plant occupying an area only 7 ft. by 9½ ft., as clearance for buckets, and material handled by the small hoist in the cage compartment had to be maintained at all times.

The 1 : 2 : 4 mixture of concrete was dumped from the mixer through a 6-in. iron pipe with screwed couplings and with the fall broken at junction boxes every 300 ft. and at the swiveled chute which carried the concrete to the forms around the shaft. This pipe was supported by timber clamps resting on 6 by 8-in. timbers carried in recesses left in the concrete when poured,

and on the shaft timbers where the concrete had not yet been placed.

In the manway compartment the permanent iron ladders were put in position as the concrete lining was placed. In advance of that, the permanent ladders were placed on temporary wooden landings. Concrete-lined stations were constructed at 235, 490, 576, 643, 729, 770, 835, and 920 ft. below the surface. The 490- and 576-, also the 770- and 835-ft. stations were the top and bottom of future ore pockets. The ore pocket between the 643- and 729-ft. stations is now being constructed.

To facilitate the construction of these pockets, 4 by 4-ft. cribbed chutes were excavated before the shaft was concreted just outside of the concrete walls of the northwestern skipway, with a gate and a chute leading into the skipway at the bottom of each pocketway. When the ore pockets are constructed the muck will be shoveled into these chutes and drawn off at the bottom, and the cribbing removed as the excavation proceeds, thus effecting a considerable economy in the cost of excavation.

For the hoisting in the cageway compartment, cable guides were installed, carried on reels on the head-frame and unreeled as the shaft was deepened, and even at the full depth of 936 ft. these did not oscillate enough to cause difficulty.

To avoid trouble with the permanent guides from the use of expansion bolt fastenings, and to obviate the irregular spacing of bolt holes in the guides if anchor bolts were set in the concrete as it was poured, a novel guide fastener was designed. It was built in the concrete as poured, but still allowed drilling of the bolt holes by templet after the shaft was completed and permitted a leeway for any reasonable irregularity in location while pouring. These fasteners are shown in Fig. 5.

A chart was kept showing the progress made each day by each shift on each part of the work. A large-scale elevation of the whole shaft, stations, tunnels and ore pockets was made, and a certain portion was allotted to excavation, timbering, form work, reinforcing, concreting, and other construction processes. To each shift boss was assigned a certain color, and the portion of the chart representing the position and the amount

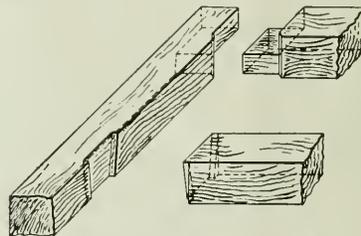


FIG. 4. DETAIL OF TIMBER FRAMING

of work done was colored for the shift doing the work. The date was then written through the color. Quantities for this purpose were determined both by actual measurement and by the foreman's reports. For instance, the number of buckets of muck hoisted was a close check on the advance in sinking for that shift. The foremen were never formally notified that this chart was being kept, but within two days from the time it was instituted they all seemed familiar with it and watched it closely.

The chart not only furnished information as to progress at all times and gave a comparison of the work accomplished by each shift, but it also served as a record which showed at a glance which shift boss had excavated any part of the work. If faulty workmanship had been discovered it would have been simple to trace it.

Probably the greatest value of the chart, however, lay in the competition it aroused among the shift bosses, who realized that their work was being closely followed and that they were getting due credit.

In spite of the fact that the hardpan through which the shaft was driven is so firm that all former shaft

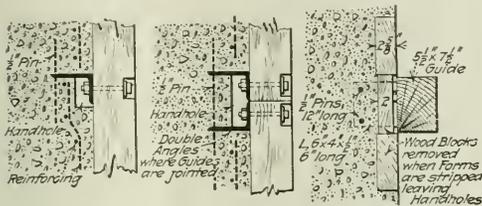


FIG. 5. DETAIL OF NOVEL GUIDE FASTENING

sinking in the district had been done by blasting, it sloughed badly upon exposure to the air, and this without warning. Ground which had been sounded and found solid but a few minutes before would suddenly fall, with no warning, so that the sinking combined the difficulties of both hard-rock work and soft, treacherous ground. In spite of this fact, there have been no serious accidents to either construction or the employees during the entire work, which means that though every precaution has been taken to safeguard the men and the work, good luck has also favored the job.

The Foundation Co., of New York City, did this work by contract, under the supervision of its Pacific Coast department, with Bayly Hipkins, vice-president and Pacific Coast manager, and A. S. Lilley, assistant manager; and under the direct charge of the writer as superintendent, James H. LeFeaver as assistant superintendent and John Sheehy as night superintendent.

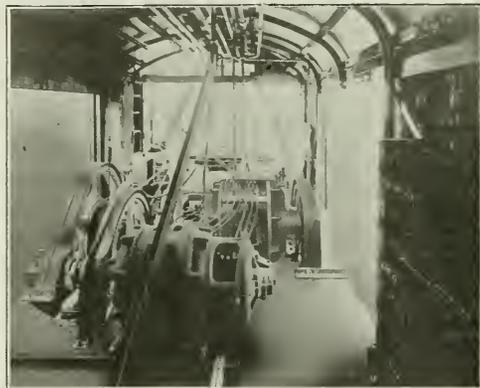
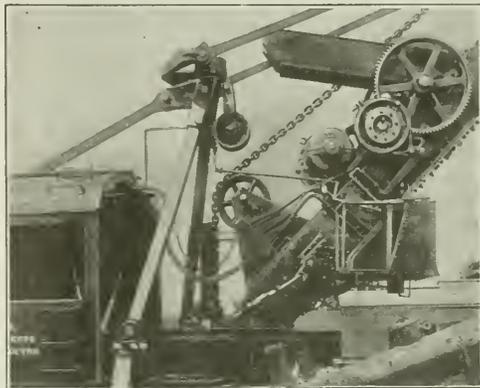
Copper Range Co.

The Copper Range Co., reporting operations during 1918 at the Baltic, Trimountain, and Champion mines, states that 792,151 tons of rock was stamped and 26,623,940 lb. of refined copper produced, and that these figures represent 33.61 lb. of copper per ton of ore stamped. The total cost per lb. of copper produced was 14.46c., and the average price received was 24.76c. Total expenses amounted to \$3,849,216.38. Net earnings were \$2,895,615.28 and dividends \$2,336,394. It should be noted that the above figures include only one-half of the Champion's operations, the property being owned jointly with the St. Mary's Mineral Land Co.

At the Baltic mine, No. 3 shaft was sunk 178 ft., and 11,901 ft. of drifting was done, together with 164 ft. of sub-drifting, 965 ft. of crosscutting and 663 ft. of raising. At the Champion mine, No. 2 shaft was sunk 95 ft. and 3146 ft. of drifting was done, together with 35 ft. of crosscutting, 202 ft. of sub-drifting and 1022 of raising. At the Trimountain mine, No. 2 shaft was sunk 159 ft. and No. 4 shaft, 154 ft. Drifting at the mine totaled 4913 ft.; sub-drifting, 1362 ft.; crosscutting, 289 ft. and raising, 841 feet.

• Motor-Driven Shovels and Draglines

In stripping overburden or performing work of a similar nature where the use of steam shovels or draglines is desirable, it will often be found that the utilization of electrically driven equipment is an economy, especially where the electric power is available and can be secured at reasonable rates. Some of the advantages obtained by the use of the electrically driven shovel and dragline are that fewer operators are required; fuel is not an essential; no water supply or boiler is needed, and no smoke, no sparks and no objectionable



MECHANISM ON ELECTRICALLY DRIVEN SHOVEL
Top—Motor installation on shovel boom. Bottom—Driving mechanism in interior of shovel.

noises are present, and more material can be handled if the proper arrangements are made for car supply.

A complete line of electrically operated shovel and dragline equipment which meets the severe service encountered in such work, and embraces simplicity in design, has been placed on the market by the Westinghouse company. In general, the situation of the shovels makes alternating-current equipment preferable, although both alternating and direct-current equipment can be furnished. The accompanying cuts show motor installations on a shovel boom and the driving mechanism in the interior of a shovel, where motors are used to operate the hoisting drum and to swing the boom.

Petroleum in April and March

Production and Consumption of Domestic Crude Petroleum—Stocks on Hand—Imports and Exports—
Total Consumption of Domestic and Imported

A COMPARATIVE summary of the quantity of crude petroleum produced and marketed, imported, consumed and exported in April and March, 1919, and in April, 1918, prepared by C. C. Osbon, under the supervision of E. Russell Lloyd, of the U. S. Geological Survey, is given herewith. The statements with regard to fields east of the Rocky Mountains are based upon reports filed by about two hundred pipe-line, marketing, and refining companies, only such refineries being included as receive crude oil by private pipe lines or tank cars directly from the wells. Statistics relating to California and to imports and exports were compiled from secondary sources. This statement indicates the general trend of conditions in the crude-petroleum industry of this country.

The quantity of crude petroleum run from wells and producers' field storage tanks and delivered to pipe lines, marketing companies, refineries, and other consumers in the United States in April, 1919, amounted to approximately 29,310,000 bbl., a decrease of 1,102,000 bbl., or nearly 4 per cent, compared with March, 1919, but an increase of 461,000 bbl., or nearly 1½ per cent, compared with April, 1918. The average daily rate in April, 1919, was 977,000 bbl., a quantity less by 4,032 bbl. (a little over 0.4 per cent) than the average daily rate in the preceding month, but greater by 15,367 bbl., or about 1½ per cent, than the average daily rate in the corresponding month of 1918.

Approximately 98 per cent of the oil included in the following table was actually brought to the surface in the United States in the months specified, the remaining 2 per cent consisting of runs or tank-car shipments from field storage. Data concerning the quantity of oil run into field storage are not available.

TABLE I. PRODUCTION OF DOMESTIC CRUDE PETROLEUM
(Barrels of 42 Gal. Each)

Field	April, 1919	March, 1919	April, 1918
Appalachian.....	2,542,000	2,453,000	2,178,000
Lima-Indiana.....	293,000	282,000	294,000
Illinois.....	1,008,000	1,166,000	1,145,000
Mid-Continent.....	14,048,000	14,629,000	14,182,000
Gulf Coast.....	1,843,000	1,890,000	1,745,000
Rocky Mountain.....	1,259,000	1,166,000	955,000
California.....	8,317,000	8,824,000	8,350,000
Totals.....	29,310,000	30,412,000	28,849,000

PETROLEUM CONSUMPTION

It is estimated that 27,726,000 bbl. of domestic crude petroleum was delivered in April, 1919, to refineries and other consumers of crude oil and used for the manufacture of petroleum products and for fuel, or exported. This quantity is less by 486,000 bbl., or nearly 2 per cent, than the quantity so delivered or consumed in March, 1919, and by 2,441,000 bbl., or about 8 per cent, than the consumption in April, 1918. However, the average daily rate of consumption was 924,200 bbl., an increase of 14,135 bbl., or about 1½ per cent, compared with the daily rate in March, 1919, but a decrease of 81,367 bbl., or about 8 per cent, compared with the rate in April, 1918.

The following table, computed from marketed production and stocks, includes approximately 99 per cent of the total quantity of domestic crude oil consumed or exported in the months referred to, the remainder

representing oil used by producers in drilling and pumping.

TABLE II. CONSUMPTION OF DOMESTIC CRUDE PETROLEUM
(Barrels of 42 Gal. Each)

Field	April, 1919	March, 1919	April, 1918
Appalachian.....	2,359,000	2,359,000	2,204,000
Lima-Indiana.....	124,000	251,000	289,000
Illinois.....	797,000	580,000	1,368,000
Mid-Continent.....	13,664,000	13,553,000	14,352,000
Gulf Coast.....	1,272,000	1,251,000	2,215,000
Rocky Mountain.....	1,305,000	1,209,000	842,000
California.....	8,260,000	9,009,000	8,897,000
Totals.....	27,726,000	28,212,000	30,167,000

STOCKS OF PETROLEUM

The surface reserve of domestic crude petroleum held on April 30, 1919, by pipe lines and marketing companies and by refineries that receive it directly from the wells, was approximately 132,694,000 bbl., a gratifying increase of 1,584,000 bbl., or a little more than 1 per cent, compared with the quantity on hand March 31, 1919, but a decrease of 12,104,000 bbl., or about 8 per cent, compared with the quantity in storage on April 30, 1918.

From about 95 to 98 per cent of the domestic crude oil above ground in the United States in the months specified is included in the following table, the remainder representing unmarketed oil run by producers to private tanks and held as field storage.

TABLE III. STOCKS OF DOMESTIC CRUDE PETROLEUM AT
END OF MONTH
(Barrels of 42 Gal. Each)

Field	Increase or Decrease		April, 1918	Increase or Decrease April, 1919 Apr., 1918
	April, 1919	March, 1919		
Appalachian.....	4,246,000	4,063,000	+ 183,000	3,966,000 + 280,000
Lima-Indiana.....	1,429,000	1,260,000	+ 169,000	1,594,000 — 165,000
Illinois (a).....	3,823,000	3,612,000	+ 211,000	3,066,000 + 757,000
Mid-Continent.....	79,567,000	79,183,000	+ 384,000	96,334,000 — 16,767,000
Gulf Coast.....	10,131,000	9,505,000	+ 626,000	11,445,000 + 1,314,000
Rocky Mountain.....	955,000	1,001,000	— 46,000	754,000 + 201,000
California (b).....	32,543,000	32,486,000	+ 57,000	30,395,000 + 2,148,000
Totals.....	132,694,000	131,110,000	+ 1,584,000	144,798,000 — 12,104,000

(a) Includes some Lima-Indiana oil stored in Illinois. (b) Includes stocks of residuum and unfinished refinery products.

Statistics for the California field in 1918 were compiled from figures published by the Standard Oil Co. (California), the Independent Oil Producers' Agency, and the Pacific Coast Petroleum War Service Committee, but for 1919 the figures are those of the Standard Oil Company only.

PETROLEUM IMPORTS AND EXPORTS.

The United States leads the other countries of the world in the production of crude petroleum, but the quantity obtained from domestic sources is inadequate to meet the demand, and a large volume is imported, chiefly from Mexico. Although the export trade of the petroleum industry in the United States consists chiefly of refined products, a substantial volume of crude oil is being exported for the manufacture of petroleum products in Canada, Cuba, and other foreign countries.

The following table was compiled from the records of the Bureau of Foreign and Domestic Commerce:

TABLE IV. IMPORTS AND EXPORTS OF CRUDE PETROLEUM
(Barrels of 42 Gal. Each)

Imports	April, 1919	March, 1919	April, 1918
Mexico.....	3,970,195	3,492,800	2,846,037
Other countries.....	14,000	981	205
Totals.....	3,984,195	3,493,781	2,846,242
Exports			
Canada.....	275,000	178,228	377,233
Cuba.....	1,429	39,384	5,912
Mexico.....	241	628	681
Other countries.....	1,240	144	875
Totals.....	277,919	218,394	384,701
Excess of imports over exports.....	3,706,276	3,275,387	2,461,541

Data are not available to show the quantity of Mexican crude oil held in storage in the United States. If, however, the consumption of Mexican oil keeps pace with importation, the following table indicates the total quantity of petroleum exported and delivered to refineries and other consumers in this country:

TABLE V. TOTAL CONSUMPTION OF DOMESTIC AND IMPORTED CRUDE PETROLEUM (Barrels of 42 Gal. Each)

Kind	April, 1919		March, 1919		April, 1918	
	Total	Daily Average	Total	Daily Average	Total	Daily Average
Domestic	27,726,000	924,200	28,212,000	910,065	30,167,000	1,005,567
Imported	3,984,195	132,807	3,493,781	112,702	2,846,242	94,875
Totals	31,710,195	1,057,007	31,705,781	1,022,767	33,013,242	1,100,441

The foregoing data are subject to revision in subsequent statistical reports of the U. S. Geological Survey relating to crude petroleum.

North Star Mines Co.

The 1918 Report Shows Diminishing Operating Profits Due to Increased Costs—Champion Mine Produces Small Profit

THE North Star Mines Co. has had a long and successful record, but, like most gold-mining companies, it experienced marked operating disadvantages during the period of the war, on account of conditions beyond its control. The following information is taken from the company's last annual report and is presented in more detail than is customary, to illustrate the difficult conditions under which the company operated:

During 1918 the gross production of the North Star mine was \$775,688.18; the expenses for current operation amounted to \$716,778.14, and for development to \$9225.70, or a total outlay for operation and development of \$726,003.84, leaving an operating profit of \$49,684.34. The gross production of the Champion mines was \$271,108.40, and the expenses for current operation amounted to \$235,363.18 and for development to \$27,759.64, or a total outlay for operation and development of \$263,124.82, leaving an operating profit of \$7983.58. The total production of the company's mines was therefore \$1,046,796.58, with total operating and development expenses of \$989,128.66, leaving an operating profit of \$57,667.92. Interest and dividends on invested funds amounted to \$36,331.43, increasing the total net earnings of the year, before deduction of allowance for depletion and depreciation, to the sum of \$93,999.35. The amount allowed for depletion and depreciation, on the same basis as in previous years, was \$315,734.83, resulting in a deficit on the year's operations of \$221,735.48. Of the dividends declared during the year, amounting to \$100,000, the sum of \$50,000 was derived from undistributed earnings of the year 1913, and, the surplus of previous years being exhausted, \$50,000 was paid as a distribution of capital assets.

The conditions under which the business of gold mining was conducted during 1918 were so unfavorable and abnormal that the outcome affords no criterion of the results obtainable with ordinary factors of operation. The scarcity and inefficiency of labor and the high cost of materials used, combined with a lower yield per ton crushed, resulted in a situation at the North Star mines during the latter part of the year under which the cost of producing an ounce of gold exceeded the standard price at which it could be sold. Since the beginning of 1919 conditions have improved. The supply of labor is now fairly adequate; there is a declining tendency in the cost of certain supplies; and, although the process toward lower prices generally is likely to be a slow one, a gradual return to more normal conditions may be looked for.

The year's output from the North Star mine came chiefly from stopes on the 3400, 4000, 4400, 4700 and 5000 levels. A

total of 130,445 tons of rock was delivered to the sorting plant, of which 30,895 tons was discarded as waste, leaving 99,550 tons of ore crushed, with an average yield of \$7.79 per ton crushed, at an average cost of \$7.20 per ton for operating and \$0.09 per ton for development expenses, making an aggregate cost of \$7.29 per ton crushed (\$5.59 per ton mined), and leaving a realized profit of 50c. per ton crushed.

The yield per ton crushed in 1918 was \$3.64 less than in 1917. This decrease was partly due to unfavorable operating conditions, the scarcity of labor making it necessary to mine the ore most readily available, without proper sorting, in order to keep the mill supplied, and partly to the fact that the North Star vein, so far as developed below the 4000 level, seems to be of poorer and less uniform quality than in the upper levels. The total cost per ton of operation and development in 1918 was \$7.29, as compared with \$7.19 in 1917. The average outlay per ton for development during the five preceding years was 65c. If an equivalent amount had been spent for development in 1918, the total cost per ton of operation and development would have been \$7.85, as compared with \$7.19 in 1917, \$5.43 in 1914, and \$5.20 in 1913.

MAJOR PROPORTION OF YIELD WON BY AMALGAMATION

Of the total production of the year, 82.03% was obtained in the mill by amalgamation; and 17.97% was recovered by cyanidation. It is estimated that the valuable material lost in the tailings amounted to about 33c. per ton crushed.

The development work done in 1918, restricted as above stated, amounted to 701 ft. of drifts, with results of no particular significance as to the opening of additional resources.

During the year, \$27,681.21 was expended on improvement account, almost entirely in the erection of a plant for disposal of the tailings from the cyanide treatment, as required by the United States Debris Commission.

A reestimate has been made of the ore reserves, with a reduction of about 100,000 in the number of tons counted as positively developed. The ore supply now available is estimated as sufficient to keep the mill supplied for two or three years. The prospects for developing additional resources, both on and above the 4000 level, and at the bottom of the mine, on the 6300 level, are favorable.

The Champion mines were operated throughout the year, with a production, as above stated, of \$271,108.40, the yield of 41,300 tons crushed, or \$6.56 per ton, resulting in a small profit over all expenses of operation and development. Nearly all of the ore came from 2400 to 2700 levels of the Providence mine.

Development work at the Champion mines amounted to 2109 ft. (drifts 1579 ft., raises 43 ft., and winzes 487 ft.). With the exception of the Providence 2700 orebody, the development work revealed practically nothing of value, and the outlook for the future is not encouraging. As long, however, as the production is sufficient to cover expenses, some further prospecting is justified.

The result of the Champion venture has been extremely disappointing. From 1911 to the end of 1918 a total of 228,810 tons has been milled, with an average yield per ton of \$5.44, and the cost of operation and development per ton has been \$8.04. The production obtained has been only about six tons of ore per foot of development; an exceedingly low ratio when compared with 20 to 25 tons per foot at the North Star.

Flotation Agents at Anaconda are delivered to flotation sections of the copper concentrator by means of a constant-speed disk-type feeder, with detachable cups, operating in a feeder tank or rectangular cross section. The amount of agent used is determined by measuring the volume removed from the feeder tank over a period of from one to four hours, depending upon the rapidity of flow from the tank. The specific gravity of the agent being known, the number of pounds of agent used is easily determined by use of curves or tables. The adjustment of agent to flow of pulp through the flotation section is made by varying the number and size of the cups attached to the disk.

Calumet & Hecla Mining Co.

During the year ended Dec. 31, 1918, the Calumet & Hecla Mining Co. produced 67,968,357 lb. of copper. The production costs and earnings statement, as given in the annual report, is tabulated as follows:

PRODUCTION COSTS OF CALUMET & HECLA MINING CO. FOR YEAR ENDED DEC. 31, 1918

	Pounds	Per Lb.	
Mining and mine taxes	58,722,969@	15 01c.	\$8,816,924 28
Reclamation	9,245,388@	7 20c.	665,600 39
Totals	67,968,357@	13 95c.	\$9,482,524 67
Smelting, refining, Eastern offices and corporation taxes		Per Lb.	\$1,201,831 71
Depreciation and depletion		5 34c.	3,626,314 07
Production cost of	67,968,357@	21 05c.	\$14,310,670 45
On hand Jan. 1, 1918	17,967,381@	12 60c.	2,263,786 84
Total	85,935,738@	19 29c.	\$16,574,457 29
Delivered in year:			
On hand Dec. 31, 1918	78,367,248@	19 29c.	15,114,714 63
	7,568,490@	19 29c.	\$1,459,742 66

EARNINGS STATEMENT

	Pounds	Per Lb.	
Received for copper delivered	78,367,248 00@	24 28c.	\$19,027,052 27
Costs of copper delivered:			
Production cost, as above, at 19 29c.	\$15,114,714 63		
Selling and delivery costs at 0.50c.	392,582 58	19 79c.	15,507,297 21
Gain on copper delivered		4 49c.	\$3,519,755 06
Miscellaneous receipts	\$2,679,791 23		
Miscellaneous charges	1,250,350 22		1,429,441 01
Total net income			\$4,949,196 07
Dividends paid	\$5,500,000 00		
Reserve (estimated) for 1918	600,000 00		6,100,000 00
Federal taxes			
Balance			\$1,150,803 93

Tons of rock treated aggregated 2,876,392, at a mine cost (excluding construction) of \$3.07 per ton. The rock yielded 58,722,969 lb. refined copper, or 20.42 lb. per ton of ore mined. Of this production 1,547,603 tons came from the Conglomerate lode, at a mine cost of \$4.09 per ton, and yielded 43,329,816 lb. copper, or 28 lb. per ton, and 1,328,789 lb. came from the Osceola lode, at a mine cost of \$1.88 per ton, and yielded 15,393,153 lb. copper, or 11.58 lb. per ton.

Mine development on the Conglomerate lode included 33 ft. of shaft sinking, 7,149 ft. of drifting, and 3,659 ft. of crosscuts and foot-wall raises. On the Osceola lode, 10,192 ft. of drifting was performed.

Operation of the regrinding plants is illustrated by the following figures of tonnage treated and results obtained:

TONNAGE AND TREATMENT DATA

	From Mine	From Old Sands
Tons treated	530,657	715,007
Assay headings, per cent. copper	0 599	0 868
Assay tailings, per cent. copper	0 414	0 568
Pounds refined copper	2,243,022	4,776,302
Pounds refined copper per ton treated	4 23	6 68
Cost per pound, excluding smelting and selling, cents	6 75	4 33

The leaching plant operated satisfactorily throughout the year, with the following results:

Tons treated	1,005,015
Assay headings, per cent. copper	0 555
Assay tailings, per cent. copper	0 126
Pounds refined copper	8,035,156
Pounds refined copper per ton treated	8 00
Cost per pound copper, excluding smelting and selling, cents	7 71

The results of operations of the reclamation plant for the year are as follows:

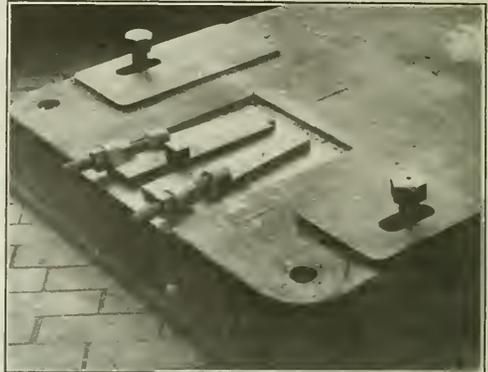
	Year, 1918	Since Starting
Tons tailings treated	715,007	2,173,009
Assay headings, per cent. copper	0 868	0 928
Assay tailings, per cent. copper	0 244	0 364
Pounds refined copper	9,245,388	25,316,296
Pounds refined copper per ton treated	12 93	11 65
Cost per pound copper, excluding smelting and selling, cents	7 20	5 99

Dividends paid by the company to the end of the year 1918 (including No. 186), amount to \$150,750,000. Divi-

dends received from subsidiary companies to the end of the period reviewed were as follows: Ahmeek, \$5,533,640; Allouez, \$1,127,500; Centennial, \$166,000; Isie Royale, \$411,734.50; Osceola, \$3,629,002; and Superior, \$100,200; total, \$10,968,076.50.

An Adjustable Motor Anchorage

An adjustable motor anchorage which is used for the purpose of conforming motors to their bedplates is illustrated herewith. It is suitable for use on motors of 50 hp. or over and recently has been placed on the market by the Adjustable Anchorage Co., of Detroit, Mich. The device is simple, reliable and positive, and its application to motors equipped with magnetic clutches is of particular advantage, although it is useful



ADJUSTABLE ANCHORAGE FOR MOTORS

on motor driving belts. Heretofore motors have not infrequently been doweled in place. Any change in the situation of a motor so positioned is difficult, slow, and often entails injury or destruction to the concrete foundation. By means of this new device slight changes in the position of the motor may be readily and quickly effected, the only tool necessary being a suitable wrench.

Injury to Blasting Employees

BY A. L. H. STREET

Attorney at law, 820 Security Building, Minneapolis, Minn.

In an action to recover damages for death of a mine laborer in the Joplin district, due to an explosion of dynamite used by him in breaking boulders, it is held by the Missouri Supreme Court that a mine operator may be regarded as having been guilty of actionable negligence in permitting an inexperienced man to use dynamite under such circumstances, without proper instruction, not only as to the dangers involved in the work, but also as to how he should do his work to avoid such danger. (*Batesel vs. American Zinc, Lead & Smelting Co.*, 207 *Southwestern Reporter*, 742.)

It is also decided that whether an employee is to be regarded as having been guilty of contributory negligence or as having assumed the risk of injury in such a case depends upon whether the peril encountered by him was so obvious that a reasonably prudent man would not, under the same circumstances, have undertaken the work, considering the injured man's experience or lack of it in such work.

Technical Training*

Special Knowledge Required by the Young Man Who Hopes Successfully To Meet the New Problems Which Have Grown Out of Recent Changes in Commercial and Industrial Activities

BY M. L. REQUA

TO THOSE young men who contemplate a career in the petroleum industry—or, for that matter, in mining of any sort or in the diversity of industries that have to do with engineering in all its multiplicity of forms—thorough technical education is today of greater value than at any time in the past. Tomorrow it will be still more valuable, and its value will increase as the years pass.

The reason is simple, if we will but stop to consider and analyze the events of the last century. A hundred years ago our mineral wealth was practically untouched; the great West was an unknown wilderness; the revolutionizing inventions based upon steam and electricity were undreamed of. We were in large part a pastoral and mercantile people, untrained in the sciences which now form so vital a factor in our daily life. The great fabricating plants of all kinds that now dot the landscape from Maine to California were then unthought of; the family spinning-wheel supplied the wants now cared for by the factory crammed with intricate machinery. The home-made tallow dip afforded the light now supplied by electricity, gas, and petroleum; and the horse transported from place to place the freight we now move by railroad and motor. The infinite and complex activities founded upon power have necessitated special knowledge, and that knowledge is now in large part being supplied by our colleges and universities through engineering courses.

Science, after all, is but the record of experiments, successful and unsuccessful, which have been coordinated, catalogued, and filed away for future reference. It is the index, the record, of the activities of the practical man whose pioneer efforts in the field, the factory, and the laboratory are made available as a guide to posterity. And because of the complexity of modern engineering in all its branches, its constantly widening scope and growing literature, it is becoming more and more important that the young man upon the threshold of his career shall be familiar with past failures and successes; to the end that he shall not waste his time in attempting experiments long ago undertaken by others, the records of which are available for the asking.

None of us, I am sure, would think of submitting himself to untrained hands if in need of a surgeon, nor would he knowingly commit his cause to one untrained in the law. The case of the youth about to enter the oil industry is to a great degree parallel—no one would think of giving him the job of drilling the well, producing the oil and transporting, refining and marketing it, unless he had first undergone a preliminary course of education, had served his apprenticeship. This apprenticeship may be served entirely in the field, but if it is served first in the classroom and thereafter in the field the result will, of course, be more satisfactory. And, given two boys equally endowed, the one possessing the technical education should not only far more quickly

complete his practical apprenticeship, but he would in after years be more completely the master of his chosen subject.

And, again, the reason is not far to seek: he has mastered not only the theory but the practice of his business; he knows not only what to do, but—and what is perhaps equally important—why he does it. I know, of course, that there are great men who have risen to premier rank in their several professions without a college degree, but I think it may safely be said of them that they would have the sooner arrived, and would have saved themselves endless and laborious effort, if they had in the first place completed a technical course of training. The information slowly gathered in fragments here and there over the long years of practical apprenticeship could be far better mastered in four years of intensive training in college, where it is acquired in an orderly, co-ordinated, and complete way.

We must not fall into the error of believing that a college degree is a certificate of ability. Far from it. The world is well supplied with men possessing sheepskins whose services would be dear at any price. Without the requisite foundation of character, all the diplomas on earth will fail to make their possessor a man of value. Common sense, that greatest of all fundamentals, is often notable by its absence among highly educated theorists.

We are basing our discussion broadly upon the question as to whether or not a technical education is desirable for a young man about to embark in the oil business. In production, certainly, some geology as well as civil and mechanical engineering is of value. In transportation, mechanical engineering is almost a necessity: and in the refinery a course in chemistry is a prerequisite for any man who hopes to master the refining of petroleum in all of its branches and stand among the leaders of modern refining practices. I believe, too, that a salesman who knows something of the chemistry of oils, and who has served apprenticeship in a refinery, will, other things being equal, lead the way rather than follow the lead of others.

All industrial activities should be constantly progressing. Inertia is fatal. And he who would lead or be near the head of the procession must of necessity have technical education as the foundation of his activities. He may not acquire it in college; it may come through the slow process of years of practical experience, but it is none the less necessary; and if four years will serve to acquire the fundamental knowledge that it would otherwise have taken fifteen or twenty years to gather, is it not the part of wisdom to adopt the former course?

There are many young men who have already started out in their work without having had the opportunity to secure the necessary technical foundation. I believe that those who can would do well to spend a year or more at some technical school, and with that groundwork build the balance of the structure by home study.

*Reprinted from Sinclair's Magazine, June, 1919.

It does not follow that, simply because work has been commenced before the college course has been undertaken, the time has gone by. I know several men who have abandoned work for the classroom and who have afterward returned to their business career far better equipped for the struggle.

The future has still in store many great discoveries in perhaps all lines of engineering endeavor. Certainly the end of invention has not yet been reached; there is much yet in store for the student who would venture upon pioneer expeditions into the realm of science. Learned mathematicians of the past demonstrated conclusively that the flying machine was an impossibility; and yet today we do fly. Petroleum may yet be made into edible fats; the heavy-gravity oils may be metamorphosed into 80 per cent gasoline; the impossible, so-called, may in years to come be found to be, after all, absurdly simple.

It is a wonderfully brave man—or an ass—who confidently outlines the limits of possible future advancement in the realms of science. I think that about all we can say with assurance is that the future holds possibilities as yet unfathomed.

TECHNICAL TRAINING NOW ESSENTIAL

Within the life of two generations conditions have been revolutionized. It was not particularly necessary for our grandfathers to be technically trained. Power, as supplied by steam, petroleum and hydro-electricity, was virtually unknown; and the myriad inventions that today depend upon power were unredeemed of. Our children have other days to face, wherein the activities of the time will rest largely upon technical skill. He who would be a part of those activities must know some phase of them, and know it well. A mere smattering of knowledge no longer suffices.

The man who is sought after today is the man who knows his subject thoroughly and who brings to the task not alone adequate training but common sense, honesty, and integrity, loyalty, and untiring energy. For such as these, opportunity beckons with insistent gesture. That it rewards only those who hold college degrees would be, of course, an absurd statement; but, all things being equal, the man with the technical training has an advantage that will be found difficult to overcome by those not so fortunate.

Edward A. Caswell Dead

Dean of Lead Industry, and for Years the Country's
Leading Lead Statistician, Expires Suddenly
At West Chester, Pa.

EDWARD ALEXIS CASWELL died suddenly on June 25 at West Chester, Pa. In his death the metal industry lost one of its best-known and most-respected figures. For nearly half a century he had been prominently identified with the lead business of the United States, as a broker and statistician, and for many years there was no one better known in those capacities.

Mr. Caswell was graduated from Yale in 1866, and immediately afterward went to Europe, where he remained for six years, studying, traveling, and seeking restoration to health. During a part of that time he was correspondent to newspapers in this country. Returning to the United States in 1873, he engaged in business as a metal broker in New York, and continued in

that business up to the time of his death. In December, 1912, owing to his advanced years, Mr. Caswell incorporated the business under the name of Caswell & Starke, Inc., and during recent years he had not been very active at the firm's office.

Mr. Caswell was born in New York in 1844. His father was Nathan Caswell, a descendant of Peregrine White, and his mother was Mary Lincoln (Bowman) Caswell. He was married to Emma Fairbanks in Geneva, Switzerland, in 1872. His wife died in New York City in 1883, leaving two children, a son and a daughter.

From Mr. Caswell's early participation in metal-industry affairs up to about the beginning of this century he was one of the recognized pig-lead statisticians in the United States. In earlier years he was, in fact, the only one; and the possession of any statistical working knowledge about the industry was due to him. In the course of time, however, as statistical work was taken up by others, Mr. Caswell gradually dropped it as being no longer a necessary effort on his part.

Mr. Caswell was a member of the Century Association and the Yale Club. In addition to his business, he wrote occasional musical and art criticisms for the New York daily papers. He was one of the charter members of the New York Metal Exchange.

Mr. Caswell was highly esteemed by all who came in contact with him, and the number of his staunch friends is legion. The men who were most closely associated with him in business unite in saying that he never did anything dishonorable, nor did he ever seek an unfair advantage. He was a true and loyal friend of all. With his passing away, the lead business of the United States may be truly said to have lost its dean.

Expiration of Flotation Patents

According to the *Boston News Bureau* of June 23, 1919, the following statement recently appeared in print on behalf of the Butte & Superior company in its legal controversy with Minerals Separation, Ltd:

"The Butte & Superior Mining Co. states it is prepared to continue the use of permissible quantities of oil until the expiration of the (Minerals Separation) patent in November, 1923, (after which time the use of the process with any quantity of oil will be free and open to the public), or to adopt one of the more economical methods now coming into use."

The article continues to the effect that counsel of Minerals Separation was asked for a statement concerning the patent expiration referred to, and the following reply was received:

"The fact is that the patent which was adjudicated by the Supreme Court in the Hyde case and in the Butte & Superior case ends its seventeen-year term on Nov. 6, 1923, and the public will then be free to the use of the invention disclosed and claimed in that patent. There are, however, many other flotation patents owned by the Minerals Separation North American Corporation which have considerably longer periods to run, such, for example, as the basic patent covering the use of soluble frothing agents, which expires in June, 1927; the aromatic-hydroxy-compounds patent, which expires in 1931 (both of which patents have been declared valid by the Circuit Court of Appeals of the Third Circuit), and the essential-oils patent (which necessarily includes pine oil), which expires in 1930."

Recent Metallurgical Progress*

Flotation Has Revolutionized Concentration—Zinc Metallurgy Has Advanced, Though But Little, in Smelting—In Copper, Reverberatory Practice and Ammonia Leaching Are Chiefly To Be Noted

BY HUGH K. PICARD

President of the Institution of Mining and Metallurgy

IN REGARD to metallurgical advance during the last few years, it will probably be conceded that the practice of flotation has brought about greater progress in metallurgy than any other single invention. At the inception of the froth flotation process in 1905, oils, such as oleic acid (then deemed to be insoluble), were used. As careful analysis showed the mineral so frothed to be intimately associated with the insoluble oil employed, the impression was gained that this had uniformly coated the particles which had been floated, and that the air-bubbles had become attached to such oiled particles. As the amount of oils used was relatively minute, say two pounds to the ton of ore, though the aggregate surface of the particles oiled is enormous, calculation showed it to be questionable whether an oil could be distributed *qua* "oil" in such extreme tenuity and still retain its original physical properties.

PROCESS BECOMES KNOWN AS FROTH FLOTATION

With the discovery, about four years later, that other and wholly soluble frothing agents were found equally as and sometimes even more efficacious, the conception that oil was primarily essential to frothing was necessarily modified, and the process became more widely known as that of froth flotation. With later discoveries as to the partial solubility of essential oils, of the beneficial effect of certain insoluble oils in "stabilizing" the froths and of sub-aëration procedure, the elimination of any need for pulp-heating, or in many cases for acidification, together with the use of alkaline circuits, and like expedients, modern flotation has made remarkable advances.

Broadly speaking, the essential conditions for effective flotation appear to be that the material to be floated must be capable of flocculation, whereas that not to be floated must be brought as nearly as possible to the reverse state. This is achieved by the addition to the ore pulp of reagents which by absorption or adsorption at the surfaces of the various particles increase such differentiation. Acids, alkalis, and certain alkaline salts act in the direction of wetting the gangue by water more profoundly, producing a deflocculation effect and the adsorption or absorption of a minute amount of an immiscible oil at the mineral surface renders this still less capable of being wetted by water, and thus stabilizes a mineral-coated bubble in water.

The water-soluble portion of an oil, or a water-soluble substance such as cresol or amyl alcohol, reduces the tension of water, and thus permits the latter to form an extended froth surface for occupation by the less water-wetted floatable mineral. Certain oils may thus play a dual part in flotation. Variations in ore constitution—both physical and chemical, in the nature of the water, in choice or limitation in reagent, and in local conditions generally—are so wide that each one

will present a flotation problem of its own, requiring individual study. Where the factors are so varied flotation must in large degree remain an art, as well as a growing science. This condition, however, governs applied science generally, and metallurgical processes form no exception to the rule.

I understand that contributions to the more scientific aspects of flotation may be expected soon, which will, no doubt, go far to elucidate the fundamental principles on which the process is based.

Since the outbreak of war, flotation methods have been widely, indeed almost universally, adopted. During this period, the greatly extended use of this process in the United States is the most notable feature, and it is hardly too much to say that concentration practice has been revolutionized. In addition to the increased recoveries of mineral due to the ability to deal effectively with slimes, its adoption has led to a general simplification of concentration procedure, with a corresponding reduction of working costs.

In modern installations, such as that of the Inspiration Consolidated Copper Co., Miami, Ariz., where the plant was specially designed for flotation, the current practice is to limit the units to the smallest number possible. At this mill, the ore, first crushed by disk crushers, is passed to tube mills, working in closed circuits. The pulp is then immediately sent to flotation units, with the consequent elimination of all intermediary steps in the concentration. The re-treatment of any middling products and the enrichment of the primary concentrates are also effected by flotation, resulting in a simple flow sheet.

Froth flotation has developed the use of settlers and vacuum filters, which are now indispensable units in concentration plants adopting this process. The settlers are in some instances employed for the re-utilization of plant water and in others for the thickening of concentrates prior to vacuum filtration. Their usual size is from 30 to 50 ft. in diameter, but in some instances settlers of over 200 ft. in diameter are in use. The shallow "tray" settler is also employed where the physical character of the ore permits. The trays consist of units 3 to 4 ft. in depth superimposed on a common shaft to economize space and secure increased capacity.

Similar progress has marked the evolution of the flotation units themselves. In the M. S. type, for example, the driving gears have in some instances run continuously for over three years. These units are self-regulating, the supply of reagents being automatic, so that in practice it is not uncommon to find one man per shift operating units dealing with between 3,000 and 4,000 tons of ore per twenty-four hours.

Everywhere the tendency is toward the elimination of hand labor. Thus, besides ores, the concentrates and tailings are handled by settlers and belt conveyors, and the grouping of all units is designed with the object

*Excerpted from the presidential address delivered at the annual general meeting of the Institution of Mining and Metallurgy, in London, May 8, 1919.

of reducing to a minimum labor, space, and construction cost. The result has been a reduction in treatment cost which, in many instances, has rendered obsolete the best of the older gravity-concentration systems.

FIGURES SHOW ADVANTAGES OF FLOTATION

Comparative figures as to the advantages of flotation may be of interest. The total tonnage of ore treated by water concentration at the Anaconda plant from February, 1902, to December, 1915, was approximately 36,000,000 tons, carrying 1,250,000 tons of copper, of which the actual recovery was approximately 900,000 tons. In 1916 flotation was installed, from the results of which it is estimated that had it been used during the earlier period 175,000 additional tons of copper would have been saved, capable of realizing, less cost of treatment, a further profit of nearly £8,000,000. In 1913, when water or gravity concentration had attained perhaps its high-water mark of efficiency, the five largest porphyry copper mines in the United States produced approximately 162,000 tons of copper, but discarded 83,000 tons in tailings, the average recovery of copper at these mines being about 66 per cent. Had flotation been employed, it is now demonstrable that their increased recovery for that year alone would have exceeded £3,500,000.

In its turn, however, flotation has introduced new smelting problems, mainly due to the fineness of the material to be handled. The International smeltery, at Miami, which now represents the latest copper-smelting practice in America, has been specially designed to deal with this type of concentrate. Hand labor here has also been practically superseded by mechanical appliances; specially designed cars handle the concentrates and facilitate their loading and unloading, prior to their passage to the roasting plant. The roasters are fired either by oil or coal dust, the latter having now proved the more economical. The Cottrell process here becomes a necessary adjunct, preventing dust losses with practical completeness. Again, progress in one department of metallurgy has imposed conditions which have led to improvement in another; thus, the cost of smelting the fine concentrates, originally so difficult to handle, is now reduced to between 5s. and 6s. per ton of charge.

Though the theoretical principles underlying flotation are still unsolved, progress in this direction is being made, and it is one of the most remarkable features of this process that its use has been so greatly extended, although its full scientific basis is yet unestablished. Callow, whose contribution to the technics of the art deserves special mention, calculates that with four different oils, three oil percentages, two pulp densities, and two changes of temperature, the possible commutations are no less than 59,284. This gives some idea of the difficulty experienced in arriving at the effect of any given change of conditions, but in spite of this over 400 flotation plants have been installed in the North American Continent alone.

LITTLE IMPROVEMENT IN ZINC SMELTING

Passing to the metallurgy of zinc, there has not been marked improvement of first importance in smelting during recent years, though general advance in matters of detail may be recorded. The problem of the mechanical roasting of the ores cannot yet be considered as completely solved, especially for the more refractory

types, such as Broken Hill concentrates, which form so large a proportion of the world's supply of raw material. Though improvement has been effected in this direction, as exemplified by the Ridge and Spiret furnaces, it is significant that in the latest zinc works to be erected in this country the management has adopted the hand-rabbléd Delplace furnace as being the type best suited to its requirements. These works, situated at Avonmouth, are being constructed by the National Smelting Co., and are designed for an ultimate output of 50,000 tons of zinc per annum. When completed, with extensions of other existing works, they should go far toward establishing the industry in this country on a much sounder basis than existed before the war.

No effort is being spared to make the Avonmouth works thoroughly efficient and up to date. The general lay-out is well designed, and provision is made for future extensions. The pottery has a capacity of 45,000 retorts, and is arranged for convenient handling in and out. Two hydraulic pot presses are to be installed (one of which is already erected), which will supply the retorts for the sixteen retort furnaces now planned. These are of modern gas-fired type, the retorts being arranged in four rows, back to back. The air is preheated in regenerative chambers under the furnaces. These chambers are protected from injury due to slag from broken pots by the interposition of a layer of chrome-iron ore between the regenerators and the retort chamber. Five gas producers are provided for each pair of furnaces, two being in regular use for each furnace, the fifth being a spare one which can be turned on to either furnace, as may be required.

Though Delplace furnaces are being installed for roasting, the management is erecting one of special design, upon the results of which future additions will depend. The former are of large type, having six muffled hearths with eighteen sections, and should be capable of dealing with twenty tons of raw concentrates per day. Special care has been taken in the design to insure easy renewals of the hearths as required.

The acid plant, of platinum "contact" type, was originally built by the government, and has been used for the manufacture of sulphuric acid from Sicilian sulphur. With the necessary additions for cleaning the roaster gases from arsenic and other objectionable material, this plant will be available to deal with the sulphur dioxide evolved from the twenty roasting furnaces that it is purposed to install.

In view of the present high cost of both labor and material, and of the improved extraction now called for, much attention has lately been given to the question of treating retort residues for their metallic contents, both as to zinc still contained, and other metals such as lead and silver, if present. It has been proposed to blow such residues on Wetherill grates, but this yields a mixed product of zinc oxide and lead sulphate and affords only a partial elimination of the silver. Other objections are the inferior quality of the product (due to a certain amount of fine grit being carried over with the fumes), and if silver be present the blown fume acquires a pinkish tint, rendering it unsuitable for paint purposes. Further, the silver, both in the fume and the ultimate residues, is lost.

In the absence of silver, a market exists for the zinc oxide-lead sulphate product, if free from grit and carrying about 20 per cent of lead. Such a mixture makes a paint of covering power superior to pure zinc-white,

besides being cheaper. For ores of a less complex character, "blowing" the residues offers fair possibilities, and it has even been proposed to modify the usual distilling practice in the direction of recovering only the more easily distilled part of the zinc, calling for the employment of a smaller amount of reducing coal and leaving a richer zinc residue for blowing. Such a procedure would increase the capacity of the distilling furnace and result in longer life of retorts, as it would not be necessary to submit them to the high final temperature required to drive off the last units of zinc.

ELECTROLYTIC ZINC PROCESS WILL BE ESTABLISHED

Wet processes for zinc extraction, with the subsequent recovery of the metal by electrolysis, have now become firmly established. Ashcroft's pioneer work in this direction will be remembered. The conditions necessary for success, notably roasting at a low temperature to avoid the formation of insoluble ferrite, and the subsequent perfect purification of the solution, are now well understood, the latter condition being demanded by the necessity for keeping the deposited zinc in a passive state to prevent re-solution. As a necessary consequence, electrolytic zinc will always be highly pure compared even with the redistilled zinc producible from retorted metal.

Much discussion has taken place as to the possibility of the electrolytic process displacing the older method; but it seems probable that for some years both processes will survive, and that local conditions with regard to the nature of ore, power cost and facilities, and other factors of production will determine which method shall be adopted for any particular case. It may be said for the electrolytic process that it certainly permits the utilization of low-grade and complex zinc ores which cannot be made available to the retort process. As an example, the Consolidated Mining and Smelting Co. is treating ores by this method at Trail, which assay as low as 20 per cent zinc and carry 14 per cent lead. Further, combination dry-and-wet processes are likely to develop in which the zinc oxide (and lead if present) are concentrated as a "fume" for subsequent treatment by solution of the zinc, followed by electrolysis. Such methods have the advantage of yielding a zinc solution which requires the minimum of purification, at the same time leaving other metallic contents in a form recoverable by smelting.

At Anaconda, Laist has proceeded in a reverse direction, by first extracting roasted flotation concentrates with acid, electrolyzing the purified solution, and treating the residues by volatilization in a reverberatory furnace, the contained zinc being recovered as oxide. According to recently published information, Laist no longer recovers the zinc by volatilization, confining this operation to the saving of the lead, the zinc passing into the slag. How far this is due to more perfect original extraction of the zinc in solution in the previous operation is not stated.

AMERICAN METALLURGISTS CHIEF CONTRIBUTORS

These developments are due in large degree to the work of American metallurgists, who have at their disposal large supplies of ores of varying character, which offer scope and opportunity for special methods of treatment. But in this country, also, zinc has been regularly produced by electrolysis from ores, though on a smaller scale. Given, however, equal opportunity, we

may certainly claim to possess the necessary technical knowledge to compete with foreign producers.

The war brought about a large demand not only for the highly pure electrolytic zinc of 99.95 per cent grade, but also for metal of 99.9 per cent purity, obtainable by the redistillation of ordinary brands, and even of hard spelter, which contains from 90 to 92 per cent zinc, the remainder being mainly iron. The preferred method in this country was devised by Fricker, who distills the metal in vertical-closed crucibles provided with connecting pipes leading into a brick condensing chamber common to a number of pots, generally eight. The lead and other impurities are prevented from passing over with the zinc vapor by covering the surface of the molten metal with a floating filter of crushed coke or similar porous material. By this process large quantities of refined metal have been produced for cartridge brass and other purposes.

How far the demand for high-grade zinc will persist for ordinary commercial uses is uncertain. For most alloys containing a substantial percentage of zinc, as also for galvanizing, ordinary brands of spelter are sufficiently pure. Hence, consumers are not likely to pay the higher price demanded for "purity" metal.¹ The latter will therefore have to compete with G.O.B., and producers may perhaps be forced to accept a price only greater in proportion to the higher unitage of the purer product.

Before leaving the subject of zinc metallurgy, reference may be made to the manufacture of zinc oxide in this country. Before the war practically the whole of our requirements were met from Continental and American sources. Indeed, our secondary products were, in some cases, bought by German firms, exported to the Continent for treatment, and the zinc oxide product again sold to us. War conditions have since brought about the establishment of a home zinc-oxide industry; and, as in other cases, we now produce this material of a quality equal in all respects to that hitherto imported. Works capable of producing fifty tons or more per week are running regularly, and, given reasonable protection against unfair competition, there seems to be no reason why all of our requirements should not hereafter be met from home sources.

The oxide is manufactured by distillation of hard spelter and scrap, with subsequent burning of the volatilized metal to oxide, which is collected in a baghouse plant in the usual way. Technical details as to pipe, arrangements, fan capacities, and other operating factors have been worked out, and the conditions necessary for the production of the highest quality product have been established. No doubt there will still be competition from American oxide, produced directly from ore, owing to the lower cost of the raw material employed. This oxide, though of inferior color, is suitable for many purposes, such as rubber filling; moreover, it possesses the advantage of high density. Oxide production from ores and residues, though not yet established in this country, is being investigated, and there is reason to expect that this may eventually prove successful.

In South Wales zinc dust ("zinc blue") has recently been manufactured direct from metallic scrap, and a product obtained which is far superior to that derived as a byproduct from the retort process. The latter

¹The galvanizer would prefer pure zinc if obtainable at a reasonable price, as a more durable product results from its use.

usually contains about 85 per cent of active zinc, whereas the former carries not less than 95 per cent. The demand for high-grade zinc dust in the dyeing industry is large, and owing to its superior reducing value it should have a good outlet in gold precipitation.

The prepared fume is screened in a flour miller's bolting machine. Owing to its granular character, no difficulty is experienced in screening. The product, though excessively fine, is uniform in size of particle and free from dust; under the microscope each grain is seen as a brilliant metallic sphere. A word may be said as to the perfection of the bolting machine for screening fine powders. This has been developed to meet the stringent requirements of the corn-milling industry, and, if better known, would no doubt find application in screening dry crushed ore.

A wider general knowledge of the practice of industries other than our own would, I believe, lead to the discovery of many appliances which could be adapted to our special needs. For example, the filter press was well known to the potter before its value was recognized in ore treatment. He has from our point of view the worst possible type of clayey material to filter, and, in addition, contamination by iron rust must be avoided. Hence he adopts a press with wooden frames. We could perhaps reciprocate by introducing to him the vacuum filter and pulp thickeners.

COPPER METALLURGY HAS PROGRESSED

For developments in the metallurgy of copper we naturally look to the United States. Thanks to the publicity given to progress in the States, and to excellent technical publications, we have been made familiar with recent advances, and it thus becomes unnecessary to refer to them in detail. Among such, reverberatory practice (due to the ever-increasing amount of flotation concentrates to be smelted) may be mentioned. In this connection the increased throat area, with correspondingly larger burners for oil or coal-dust firing, resulting in largely increased output per furnace, should be noted. The El Paso 130-ft. furnaces, burning oil, have reached a daily capacity of over 960 tons, with a consumption of 0.61 bbl. of oil per ton. Leaching of oxidized copper ores by ammonia, so often suggested, has come within the domain of practical metallurgy. For example, it is reported that the Calumet & Hecla Mining Co., in a plant treating 2,000 tons of tailings per day, is recovering copper at a total cost of 6.25c. per lb., with a loss of only 1 lb. of ammonia per ton of ore. Further developments have also taken place in acid-leaching plants, in connection with which A. W. Halin's process deserves mention. He passes the acid solution through a number of ore charges until the solution becomes neutral. It is then delivered to a tank containing fresh ore, whereby the ferric iron is precipitated, whence, after acidification, the solution passes to the electrolyzing plant for precipitating the copper. The treatment of ore in heaps by leaching, following Rio Tinto practice, is also being extended in America.

The metallurgy of gold, in so far as it relates to the recovery of the metal from its ores, shows general improvement, but nothing of first-rate importance except perhaps Crow's method of precipitating cyanide solution under reduced pressure. He shows that the air dissolved in the solution has, owing to the different coefficients of absorption, a composition of 35 per cent of oxygen and 65 per cent of nitrogen, and consequently

is a more active oxidizing agent than air of normal composition. He points out that in weak cyanide solutions, consequently with a minimum of hydrogen being generated, the oxidizing action of the dissolved oxygen largely neutralizes the reducing action and may even overcome it. In normal practice this is met by adding lump cyanide at the head of the precipitation box, with consequent increased consumption of both cyanide and zinc. By the adoption of the vacuum process this practice is unnecessary and extraction may be effected with weaker solutions, resulting in savings in all departments, including the production of a purer bullion. The Portland Gold Mining Co. reports a saving of \$30,000 a year in zinc and cyanide in a plant treating 2,000 tons of ore per day. It is interesting to note that G. T. Hansen claims similar advantages by heating the solutions to 170 deg. F. before precipitation.

FLOTATION OF GOLD ORES HAS RESTRICTED FIELD

Concentration of gold ores by flotation is making progress, but the field for this process is somewhat restricted, owing to the general high efficiency of the older methods. At Cobalt, flotation has replaced gravity concentration, though at the Nipissing mines this process has been rejected, not on account of its inefficiency, but because of the difficulties in subsequent treatment of the concentrates. On complex gold-silver concentrates involving further treatment, the advantages of flotation compared with ordinary concentration followed by cyanide are not so manifest. The value of flotation as a means of increasing the world's output of gold lies, rather, in improved recovery of base metals, such as copper, with which gold is so commonly associated.

In the metallurgy of lead, also, recent advances seem to be in detail rather than in fundamental improvements. In the stress of recent years there has been small opportunity of developing new processes in industries that are well established on recognized lines, such efforts being rather devoted to specialties called for by the art. Mention, however, may be made of progress in hydro-metallurgy, as applied to oxidized lead ores. This has been limited to brine treatment, with or without the addition of sulphuric acid to carbonate and sulphate ores. This process has been tested in America, as well as in North Wales, where a small plant was working until the difficulties of obtaining supplies caused a temporary cessation of operations. In this case the material to be treated consisted of an extensive dump of blende and lead sulphate slimes.

Vanner concentration yields a mixed product of no value until further separated. This is effected by agitating the concentrates with hot saturated brine at 70 deg. C., whereby the lead sulphate is completely dissolved, with, of course, the equivalent formation of sodium sulphate. The presence of this salt in growing proportions interferes with the solubility of the lead sulphate, and it must therefore be removed by the addition of the equivalent amount of calcium chloride. The lead solution is filtered from the blende-calcium sulphate residues, and precipitated with slaked lime, re-forming a portion of calcium chloride. About 50 per cent of the chloride is regenerated, the rest of the chlorine being precipitated with the lead as oxy-chloride. The blende-calcium sulphate residues are then re-treated on a vanner, which effects perfect separation of the easily removed flocculent sulphate, leaving a

salable blende concentrate. The chief objection to the process lies in the chloride present in the lead precipitate, involving volatilization loss in smelting, but this may be overcome by precipitating the lead by electrolysis, using soluble iron anodes. This process is limited in its usefulness by the relatively small quantity of material available and by its inapplicability to silver or gold contents. It may, however, develop in the direction of the treatment of low-grade sulphide ores, after a sulphating or chloridizing roast at a temperature low enough to prevent the volatilization of the lead chloride.

In the province of general metallurgy the increasing use of the Cottrell process deserves special mention. As an example of painstaking research in developing a practical process from a long-known but unused scientific fact, it has few equals. We have to go back to 1870 to the work of Dr. Tyndall for the first disclosure of the phenomenon on which the process is based. This was further examined by Frankland, Lord Rayleigh, and Oliver Lodge; but for the useful application of the principles involved we had to wait for Dr. Cottrell. He first applied the method to depositing sulphuric acid mist produced in the contact process, and it is still being used for this purpose. It is satisfactory to report that the merits of the invention have been recognized in this country, the first plant to be erected here in 1917 being at one of the government acid plants. It is also in use here for the precipitation of fumes from metallurgical works, following established practice in America; and its further extension in this country seems certain. The advantages of the process are far-reaching. Not only are valuable products recovered, but agriculture in the neighborhood of the operations is saved from serious damage. We are glad to congratulate Dr. Cottrell on receiving the Perkin Medal as a recognition of his valuable services to industry.

Labor Troubles at Butte

Shorter Workday and Wage Increases Sought by All Crafts at Mines—Anaconda Pay Office Dynamited
— C. F. Kelley in Butte—Local Merchants Called Profiteers

BUTTE CORRESPONDENCE

LABOR controversies are occupying the center of the stage in the Butte district. All crafts engaged at the mines either have made demands, or will do so soon, asking for a shorter workday and material wage increases, which demands at this time, it is expected, will be rejected by the operators, in view of the high mining costs and market conditions.

C. F. Kelley, president of the Anaconda Copper Mining Co., arrived in Butte tonight (July 7) to take personal charge of the labor situation, and conferences with local mine officials will be held on July 8 to set dates for meeting with representatives of unions. Mooney sympathizers and the I. W. W., by a system of personal picketing, up today had succeeded in inducing about 35 per cent of the working force of miners in the district to stop work, although many of these have quit in line with the program to enforce demands for higher wages and a shorter workday. The miners themselves as yet have presented no formal demands, despite the fact that all other crafts have done so.

The downtown pay office of the Anaconda company, which is remote from the mines, was dynamited Sunday. This is regarded as the work of a fanatic. Little damage was done.

The metal crafts, comprising all classes of mechanics employed at the mines, demand \$8 per day for journeymen and \$7 for helpers, with a 5½-day week, with overtime at double pay for Saturdays and Sundays. These crafts now are receiving \$6 for journeymen and \$5.75 for helpers. Carpenters ask for similar increases. Smelter men's demands are based on what is purported to be a Government report showing that the cost of living has doubled since 1914, and a wage increase which would measure correspondingly is asked. This would not necessarily mean doubling the present pay of smelter workers, as their wages have been increased materially since 1914. The smelter men's organization embraces most of the crafts employed at the reduction works. Demands of the miners had not been received up to the time this is written.

The unions also had asked the companies to take steps to lower living costs by establishing company stores operated at cost. The complaint is widespread against alleged profiteering of Butte merchants, and the unions declare that it is impossible to live in Butte under the present expenses, even under what the new scale demanded would give them.

One factor in favor of the operators is that the greatest number of miners are on what is known as a contract basis. That is, they are paid for what they do, and their remuneration is running from \$6 to \$12 daily. These men are not in favor of striking, particularly as they either are married or have dependents. The I. W. W. and radicals long ago were weeded out of the properties to a great extent, with the single men giving way to the married or those with dependents, thus leaving the more conservative of the miners.

There is apparently a disposition on the part of the unions to wait and see what the Anaconda company is disposed to do before deciding upon radical action, as word has gone forth that the company is not opposed to suspending mining operations altogether for a period, in view of the huge copper surplus.

Despite unofficial word that the operators were not inclined to grant wage increases, a feeling of optimism is dominant, and the sentiment obtains that wage increases will be had, particularly as the copper market is showing signs of recuperation to an extent which will show a profit under present conditions.

A Department of Public Works

New Bill Introduced in Both Houses To Reorganize Interior Department—Will Bring All Engineering Activities of Government Into One Department

FAR-REACHING changes in the executive machinery of the Federal Government are proposed in bills introduced in each house of Congress on June 25. The Federal Department of the Interior will become the Department of Public Works, if the legislation proposed is enacted. The main idea is to assemble all engineering activities of the Government in one department.

Such bureaus of the Interior Department as are non-engineering in character are, under the terms of the

bill, to be placed under the jurisdiction of appropriate departments, and engineering bureaus from other departments are to be included in the Department of Public Works. The bill proposes that the Patent Office be removed from the Interior Department and placed under the Department of Commerce. The Bureau of Pensions is assigned to the Department of the Treasury. The Bureau of Education and the Bureau of Indian Affairs are transferred to the Department of Labor, with the proviso that the engineering and construction work and the land and mineral surveys now performed under the direction of the Bureau of Indian Affairs are to be prosecuted under the Department of Public Works.

On the other hand, the Department of Public Works is slated to absorb the Supervising Architect's Office of the Treasury Department, the Construction Division, River and Harbor Improvements, Mississippi River Commission, and California Debris Commission of the War Department, the Bureau of Standards and the Coast and Geodetic Survey of the Department of Commerce, the Bureau of Public Roads, and the Forest Service of the Department of Agriculture.

The bill provides that the Secretary of Public Works "shall by training and experience be qualified to administer the affairs of the department and to evaluate the technical principles and operations involved in the work thereof." The measure accepts from the foregoing provision the Cabinet officer who is at the head of the department at the time of the passage of the bill.

Four assistant secretaries, each to be paid \$7,500 per annum, are provided and their duties outlined. One assistant secretary is to have administrative jurisdiction over all matters of engineering design and construction. Another is to have charge of architectural design and construction. The third is to have jurisdiction over all scientific work and surveys, and the fourth is to be in immediate charge of all land and legal matters. The assistant secretaries are charged with the duty of co-ordinating all activities of the department.

An important feature of the bill is the proviso that engineer officers of the U. S. Army detailed on non-military work are to be assigned by the Secretary of War to like duties under the new department, for not over two years. This enables the Secretary of Public Works to make gradual transfer of improvements and instrumentalities to civil administration without detriment to public interest. Members of the Corps of Engineers may, under the direction of Secretary of Public Works, be detailed by the Secretary of War to temporary duty in the new department for such instruction, training, and experience as desired.

The bill was introduced in the upper house by Senator Wesley L. Jones, of Washington, and in the lower by Representative Frank C. Reavis, of Nebraska.

June Pig-Iron Production

Pig-iron production during June was 2,114,863 gross tons, or an average of 70,495 tons per day, as compared with 2,108,056 tons in May, a thirty-one-day month, according to *Iron Age*. Ferroalloy production amounted to 14,254 gross tons, of which about 70 per cent was ferromanganese. The estimated capacity of the 200 furnaces active July 1 is 71,700 gross tons a day, as compared with 195 furnaces, rated at 68,600 tons, active June 1.

Cornerstone Laid for Assay Office In New York

Carter Glass and W. G. McAdoo Have Chief Parts in
Ceremony at Site of New Building
In Wall Street

THE cornerstone of the new eight-story building that is to house the United States Assay Office in New York was laid on July 1 with fitting celebration. The ceremony, taking place at noon in the heart of the financial district, was witnessed by many thousands who filled the adjoining streets.

Vernon M. Bovie, superintendent of the Assay Office, was in charge of the ceremonies, and after a brief opening address resigned his position as chairman to Mr. McAdoo, who in a short speech introduced the Secretary of the Treasury. Mr. Glass, speaking briefly, confined his remarks chiefly to the position which the United States occupies in the world and set forth the steps by which it has been brought to its present high place.

Following the addresses, Mr. Glass and Mr. McAdoo participated in the actual work of laying the cornerstone, and with a silver trowel designed and cast in the local Assay Office spread at the base of the huge marble block the mortar which will hold it in place.

Calumet & Hecla Increases Forces

HOUGHTON CORRESPONDENCE

The Calumet & Hecla and subsidiary companies announced on July 7 that all underground workmen would be re-employed. This means that 3,000 men will return to work in the mines. Copper output will not be increased beyond 50 per cent of normal, but the amount of underground development work will be augmented. This event presages the turn in the copper-metal situation as viewed by the leading Michigan copper producers.

West Virginia Well Down 7,579 Feet

WASHINGTON CORRESPONDENCE

Evidence sustaining the temperature hypothesis of a cooling globe has been obtained by the U. S. Geological Survey in the large number of thermometer readings made during the sinking of a well near Valley Falls, W. Va., to a depth of 7,579 ft. The temperature near the surface was 52 deg., whereas at a depth of 7,500 ft it was approximately 170 deg. A slight reduction in the steepness of the gradient is noticed below 6,500 ft.

The well was designed for a test of the Clinton sand on the prominent geological arch, which is deeply cut by a river at the point where the well was put down. It was remarkable for the fact that it was dry and no casing was used below 2,000 ft. Caving started near the bottom of the well, however, and the drillers were forced to give up their attempt to reach a depth of 8,000 ft. The log of the well is being studied by the State Geologist of West Virginia.

The well was bored by the same company which put down a Goff well near Clarksburg, in northern West Virginia. That well, at the time of its drilling, about nine months ago, was the deepest well in the world. The record prior to that time had been held by a boring at Czuchow, in Silesia, which was 7,349 ft. deep.

Embedded in the stone was a copper box containing the customary documents, coins and other mementos. An inscription on the block read: "William G. McAdoo, Secretary of the Treasury; Raymond T. Baker, Director of the Mint; York & Sawyer, architects; James A. Wetmore, supervising architect; MCMXXVIII."

The new Assay Office, when completed, will contain the largest vaults of their kind. They will be able, it is estimated, to hold \$20,000,000,000 in gold. There is at present in the local Assay Office more than \$900,000,000 in gold and more than \$100,000,000 in silver. Five of the building's eight stories will be below the level of the street and three of them above.

Chronology of Mining, June, 1919

June 2—Period set for filing claims with War-Minerals Relief Commission closed, 1,287 claims having been filed.—U. S. Supreme Court decision handed down in Minerals Separation, Ltd., vs. Butte & Superior.—Pan-American Commercial Conference opened at Washington.

June 5—Powder explosion in Baltimore tunnel of Delaware & Hudson Coal Co. killed 83 and injured 50.

June 9—Arizona Employers' Liability Law held constitutional by U. S. Supreme Court in case against Arizona Copper Co.—American Zinc Institute opened first annual convention at St. Louis, Mo.

June 13—Strike of underground employees declared at mines in Grass Valley district, California.—War Trade Board announced scientific books and periodicals printed in Germany may be imported.

June 16—War Trade Board announced licenses will be issued for tin imports.

June 18—American Institute of Chemical Engineers opened semi-annual meeting in Boston.

June 19—Lake Superior Metal Mine Safety Conference opened in Duluth.

June 24—Strike at Park City, Utah, ended.

June 25—Bill introduced in both houses to create a Department of Public Works.

June 26—Interstate Commerce Commission permitted shippers to use old bills of lading until Sept. 8, 1919.

June 27—Arizona Chapter American Mining Congress opened bi-monthly meeting in San Francisco.

June 28—Strike of miners at Grass Valley, Cal., ended.—War Department offered platinum surplus for sale.

June 30—Transference announced of War Trade Board's personnel, powers, duties, and records to Department of State.

BY THE WAY

Junk

The connection between the secondary metals industry and criminal courts is not immediately apparent. However, according to an investigation made for the Juvenile Protective Association of Chicago, much of the delinquency of minors (not miners) in that city is to be attributed to the lure of the junk dealer. Statisticians will no doubt find it an interesting addition to the data already accumulated to estimate what portion of the secondary metals annually saved is "recovered" with the

aid of the Fagins of the junk business. The householder who is blithesomely packing up for a month at the seaside should include the investigating committee's bulletin in his summer reading. When he returns he will then be prepared to answer the query, "Where are the lead pipes of yesteryear?"

Objection Sustained

"Ere, partner, gos' long naow an' 'ave tha doctor take a geek at thee afor' thee gaws down in the bal," said Cap'n Dick. "Better that thee's 'ol an' soun' than to 'ave some o' these 'ere physical difficulties 'amperin' tly work. These 'ere days, m'son, ut don't do. Back 'long ve, in tha days o' 'ammer an' drill, Jan Penglase, 'e an' Dick Trevarrow wuz double-jackin' to Dolcoath mine. Many years befor' Jan 'ad los' 'is lef' h'eye, but few nawed about un, an' them as did figger'd as 'ow 'e 'ad a 'andsom glass one. Any'ow Dick never nawed till one day 'e wuz 'oldin drill an' Jan wuz strikin'. So 'appened w'en Jan lef' tha 'ouse in a 'urry that mornin' 'e came away leavin' this 'ere glass h'eye be'ind. They wuz takin' five, an' Dick looks h'up an' sees this 'ere h'empty socket. 'So 'elp me, Jan,' says Dick, 'Wot's tha matter with tha h'eye?' 'Oh, dam-me,' says Jan. 'I lef' un 'ome; she's one o' these 'ere glass chaps. Never figger'd for to do that.' 'Veli, gos' along with thee, Jan Trembath, I'm through,' said Dick; 'W'y, dam-me, man 'as 'ard nuff time strikin' with two h'eyes, let alone 'avin' one o' they glass beggars.' So thee can see, m'son, some men is powerful particular as to 'oo they works with an' these days a chap mus' be physically perfect."

The Chromatic Rainbow Process

Tourists and perhaps metallurgists passing through Salt Lake City will find it worth while to visit the plant of the General Reduction & Chemical Co. there. The public has been invited, in fact, by the company to witness demonstrations in the new science of converting crude ore into finished paint. Its advertisement runs thus:

The crude ore is crushed and by the application of various chemicals is reduced to pure pigments, such as prussian blue, white, chrome, red and arsenate of lead, and every desired shading or color. In fact, there are no colors we cannot produce. Besides this, we not only recover and set aside valuable byproducts, such as silver, zinc, iron and sulphur, or any other metal the ore may contain, but we save all chemicals, and use them over and over again.

Mine owners are urged to bring in samples and have them treated free of charge.

"It seems unfortunate that a company producing paints like these did not advertise in colors," says George D. Van Arsdale. "Of course, it is a little difficult to understand from the advertisement where the colors are to come from, as it is stated that all metals are recovered as byproducts and all chemicals used over and over again. This is no doubt a mere matter of detail, and probably the pure pigments are only intermediate stages in the production of the final products.

"As a name for this interesting process there is so little choice between chromatic and rainbow that it would seem best to call it the chromatic rainbow process. With the suggestion of the pot of gold which we all know is at the foot of every rainbow, investment in the method should be much increased."

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War Department Selling Platinum

The War Department is offering its present surplus of platinum for sale at a minimum of \$105 per oz., and iridium at a minimum of \$200 per oz., prices and orders subject to cancellation without notice. The sales will be made from the New York Assay Office and will be handled by the committee on sale of materials, New York District Ordnance Office, 1107 Broadway, New York. The minimum offer which will be considered by the committee will be for a quantity of 10 oz., and the maximum amount that will be disposed of to a single purchaser will be 1,000 oz., unless the Director of Sales deems it advisable to grant special permission for a sale of larger quantities.

The platinum will be delivered in the form of grains or sponge, and, as the New York Assay Office has limited facilities to prepare the product for delivery by either mail or express, the deliveries will be made wherever possible to the purchaser in person, cash being required in advance.

West Indian Surveys Division Formed

Arrangements have been made whereby the U. S. Geological Survey will direct certain extensive topographical surveys in several of the West Indian countries. It is probable that this will be followed by a similar arrangement for geological studies. The work will be done by members of the Survey staff, but the money for their salaries and for the other expenses incurred will be furnished by the governments for which the work is being performed. The arrangement offers to Survey staff members an opportunity for interesting and useful foreign service.

To handle this work the division of West Indian Surveys has been created, with Lieutenant Colonel Glenn S. Smith as the topographic engineer in charge. Though the members of the Survey's staff assigned to the West Indian division are technically furloughed without pay, they will continue to make their usual reports to the chief geographer and collect technical data for the use of the Survey.

Congress has appropriated \$1,461,353.50 for the use of the Geological Survey during the present fiscal year. The total of the funds placed at the disposal of the Bureau of Mines is \$1,201,897. Of the Survey's appropriation, \$110,000 is to be used in gathering mineral statistics. This is an increase of 10 per cent over the amount available for the fiscal year just ended. The Bureau of Mines appropriation for investigating health conditions in mines and for a study of waste in mining is \$125,000. The item in the bill which provides for three new mining experiment stations was eliminated, as was the section providing for Federal explosives regulations.

The Geological Survey will have \$425,000 available for its topographic surveys. Of that amount \$100,000 is to come from the War Department's appropriation, it is understood.

Engineering Training and Economics

After extensive discussion occupying two days, representatives of engineering schools and societies, at a meeting in Washington presided over by the Commissioner of Education, Dr. Glenn L. Swiggett, adopted resolutions recommending that economic phases of engineering subjects should be emphasized, wherever possible, in engineering instruction. This may be done, it was stated, by emphasizing the problems of values and costs in the regular technical work and by introducing or extending courses in general economics, cost accounting, business organization, and business law into the engineering curricula. These courses should be designed particularly to meet the needs of the engineering student.

It was also recommended that the engineering phases of economic subjects should be emphasized wherever possible in commercial instruction, and all institutions with departments in engineering and economics or commerce were urged to consider some plan to develop a course in preparation for careers wherein practical training in modern languages, in the essentials of engineering and business theory and practice have been found helpful and necessary.

Tin Import Ruling Changed

The War Trade Board section of the Department of State will issue licenses permitting the importation, on or after Sept. 1, 1919, of pig tin and all metal alloys containing tin, including oxides, from points other than points of origin and without reference to the date of shipment.

On June 30 the transference was announced of the War Trade Board's personnel, duties, powers, and records to the Department of State, as of July 1.

A Becker Fellowship

An effort is being made to establish a fellowship in memory of Dr. G. F. Becker. Edward B. Mathews, chairman of the division of geology and geography of the National Research Council, has been active in promoting the movement. It is expected that John Hays Hammond will serve as chairman of a committee which will "confer with others similarly interested and report specific recommendations."

Czecho-Slovak Mission Here

A Czecho-Slovak technical mission is in the United States to study development of mineral resources and water-power. The commission also will make studies of flood control and irrigation. The membership of the commission is as follows: Joseph Spaek, member of No. 1 Assembly; Stanislav Spaek, of Ministry of Public Works; Charles Anger, of Ministry of Public Works; Vaclav Masek, of Ministry of Agriculture; Frank Binovec, member of No. 1 Assembly; and Lieutenant Frank Mick, of the Ministry of Foreign Relations.

Extinguishing a Burning Gas Well

CALIFORNIA CORRESPONDENCE

On the evening of June 2, 1919, well No. 4 of the Standard Oil Co. of California, in Elk Hills, Sec. 36, T. 30 S., R. 23 W., M. D. B. & M., came in as a heavy gusher, and caught fire. The 10-in. casing had been cemented at 2,520 ft., and the well was being bailed to test the water shut-off. Gas broke in, shooting the bailer up into the derrick. The drillers were able to close the head valve and reach a point of safety. The pressure became so great that the valve was torn from the casing. Undoubtedly the friction of tearing the



VIEW OF A BURNING GAS WELL

the junk pile by several men. Other men followed with streams of water, playing it on the screen, on the ground, and on the men. The men were equipped with heavy woolen clothing and asbestos shoes. A drag cable was carried up behind the screen, and, working in short periods, the men were able to remove all the hot metal.

While this was going on, a battery of five boilers had been set up, about two hundred yards away from the well. These boilers, together with ten drilling boilers at other wells, supplied the steam. From different directions, three steam lines were laid as near to the well as possible without protection. Sections of pipe were made up long enough to reach the remaining distance to the well. Under the protection of the fire screen, these sections were carried to the collar of the well, and connection was made to the lines leading from the boilers. Steam was turned into these lines simultaneously. The first two attempts to smother the well were failures, because of insufficient steam. After slight changes were made in the method of applying the steam, the third attempt was successful.

The following day the ground had cooled sufficiently to permit an examination of the casing, which was found to be intact at the bottom of the first joint. A control valve has been put on the well. The gas flowed freely through a 4-in. opening under a pressure of 210 lb. per sq.in. The accompanying photograph shows the burning well before the attempt was made to extinguish it.

Explosives in Trans-Mississippi States in 1918

A total of 9,866,534 kegs of black blasting powder, 206,516,077 lb. high explosives, and 46,045,233 lb. permissible explosives was manufactured in the United States in 1918, and the following quantities were used in states west of the Mississippi, according to a recent bulletin of the U. S. Bureau of Mines:

	Black Blasting Powder, Kegs	High Explosives Other Than Permissible, Pounds	Permissible Explosives, Pounds
Alaska.....	178	2,213,600	41,200
Arizona.....	8,833	13,124,525	15,600
Arkansas.....	105,768	8,264,461	103,400
California.....	43,538	8,517,684	1,600
Colorado.....	92,975	4,902,915	903,550
Idaho.....	5,857	2,874,630	4,550
Michigan.....	20,907	24,994,152	23,600
Minnesota.....	179,045	9,941,860	168,904
Missouri.....	219,571	9,120,244	51,100
Montana.....	112,033	8,216,874	51,100
Nevada.....	11,507	4,733,025	505
New Mexico.....	7,913	2,576,310	775,250
Oklahoma.....	196,083	8,955,327	1,102,770
Oregon.....	22,902	2,816,684	1,150
Texas.....	44,380	1,206,020	28,200
Utah.....	27,211	3,610,556	4,430,820
Washington.....	49,647	5,934,194	427,800
Wyoming.....	128,178	416,850	590,500

New Outrage in Mexico Probed by State Department

The State Department at Washington has inquired of the Carranza government concerning the measures it is taking to protect foreigners from the attacks of bandits as well as of soldiers of the existing regime. This action has been hastened by recent reports that an American citizen, John W. Correll, was murdered on June 16 at Colonia, twenty-seven miles north of Tampico, while attempting to protect his wife. Complaints of other outrages have also been received since repeated assurances were given by various officials of the present Mexican government that the lives and property of foreigners would be safeguarded in Mexico.

casing caused the gas to ignite. No one was injured. The capacity of the well was estimated at 30,000,000 cu.ft. per day.

The company decided to smother the well with steam. The accompanying photograph indicates that considerable junk, such as rotary drilling outfit, drill stem, crown blocks, and piping, was close to the well. Naturally, all this metal was red hot and, unless removed before smothering the well, would ignite the gas again. A fire screen of corrugated iron, about 8 ft. high and 25 ft. long, was constructed and carried to the edge of

PERSONALS

E. E. Carpenter, recently in San Francisco, will return soon to Tonopah.

Harry J. Wolf recently made an examination of mining property near Salisbury, North Carolina.

Robert E. Tally, assistant manager, United Verde Copper Co., is spending a short vacation in California.

A. C. Bedford has returned from France and England, where he went in the interests of the Y. M. C. A.

Theodore J. Hoover has been appointed to take charge of the mining department of Stanford University.

Henry Oliver, president of the Oliver Iron & Steel Co., will be a director of the recently incorporated Simms Petroleum Co.

A. G. McGregor, of the firm of Rip-path & McGregor, is making plans for the erection of a \$25,000 residence in Warren, Ariz.

Kirby Thomas has returned to New York from Colorado, where he has been engaged in making examinations in the San Juan district.

J. Volney Lewis will spend several weeks on professional work in the Las Animas district of New Mexico. His address will be Hillsboro.

H. E. Minor, formerly geologist for the Gulf Production Co., is now on the staff of the Sinclair Gulf Oil Co., with headquarters in Houston.

J. E. Curry, secretary, Arizona Chapter, American Mining Congress, of Bisbee, is spending a month on the California coast with his family.

Hoval A. Smith has returned from a ten-day trip into the Moctezuma mining district of Sonora, Mexico, where he is interested in silver properties.

Sidney L. Shonts, mining engineer of Wallace, Idaho, is engaged in investigating claims of chrome producers in eastern Oregon for the Government.

Lorin Kemp is spending several months in the United States, after which he will return to South America. He is on the staff of the Chile Exploration Co.

Scott Turner has recently been appointed consulting engineer to the Mining Corporation of Canada, Ltd., 1511-20 Bank of Hamilton building, Toronto, Ontario.

E. W. Wagy, petroleum engineer of the Bureau of Mines, stationed in San Francisco, is in Illinois studying production methods in use by oil operators in that district.

George T. Smith, president of the Joseph Dixon Crucible Co., together with the directors, lately made the annual inspection of the properties of the American Graphite Co.

Captain J. C. Ray, a California mining engineer, late of the 544th U. S. Engineers, has been appointed manager of the Bellevue Mining Co.'s properties in the Rice Lake district, Manitoba.

H. Kenyon Burch, consulting engineer, Phelps Dodge Corporation, has returned to his headquarters in Bisbee, Ariz., after a visit of inspection to the company's plant at Nacozari, Sonora.

C. E. Julihn, superintendent of the Lake Superior station of the U. S. Bureau of Mines, and his assistant, G. E. Ingersoll, are on the Mesabi Range, working in the interests of the Bureau.

D. E. A. Charlton, Managing Editor of the *Journal*, has returned to New York after a month's trip through the Minnesota and Michigan iron and copper districts.

George J. Young, Assistant Editor-in-Chief of the *Journal* since January, 1918, has left for San Francisco, to assume the position of Western Editor of the *Journal*, with headquarters at the Rialto Building.



GEORGE J. YOUNG

Fred Crabtree, consulting metallurgist with the Bureau of Mines, is in charge of the recently organized cooperative department of mining engineering of the Carnegie Institute of Technology.

B. C. Yates, superintendent of the Homestake Co., at Lead, S. D., is spending his vacation visiting points of interest in Colorado. He is accompanied by his family, and is making the trip by automobile.

Captain E. R. Graham has returned from service in France and has taken up his residence in Lead, S. D. Previous to his entering the army Mr. Graham was superintendent of the Mogul Mining Co.

W. Fleet Robertson, provincial mineralogist of British Columbia, has been appointed acting deputy minister of mines of that province, during the absence of R. T. Tolmie, who has been granted sick leave.

Richard Bollas, of the engineering staff, Copper Queen mine, Bisbee, has resigned, to take over the management of the Smith-Cananea Mining Co., whose property is situated in Cananea, Sonora. It will be worked for silver.

J. Wallace Bostick is now chief geologist of the National Oil Co., of Philadelphia, and has recently made two locations for this company in Duval County, southwest Texas. Mr. Bostick was assistant geologist in the oil division of the Southern Pacific Ry.

J. A. O. Preus, State Auditor, and F. A. Wildes, State Mine Inspector, of Minnesota, have returned from Cleveland, Ohio, where they were in conference with officials of the Fort Henry Mining Co., operators of the Woodbridge mine, situated at Buhl, Minn.

Charles T. Willis, head of the industrial relations department, Phelps Dodge Corporation, has returned to his home in Warren, Ariz., after an extended visit to the company's copper camps at Tyrone, N. M., and Morenci, Ariz., and its coal camp at Dawson, N. M.

Joseph Hyde Pratt, State Geologist of North Carolina, has secured his discharge from the Army and has returned to his former duties. As Colonel of the 105th Engineers, a combatant regiment which served for eleven months with the British in Flanders, Dr. Pratt did distinguished service.

John W. Mercer, who has been the American Red Cross commissioner for Switzerland, expects to return to New York by the end of the summer, as his work is then expected to be completed. All mail should be sent to his New York address, 15 Broad St., from which it will be forwarded if there is still time.

John F. Shaforth, former Senator from Colorado, presided at the session of the War-Minerals Relief Commission at the University of Arizona, June 21 and 23. H. E. Meyer, of Washington, secretary, former president of the A. I. M. E., and Paul S. Black, council for the Bureau of Mines, were also present. The commission heard the war claims of a number of southern Arizona mining men.

OBITUARY

Elwyn Waller, for many years professor of analytical chemistry at the Columbia School of Mines, died at Morristown, N. J., recently. He was seventy-three years old, and was graduated from Harvard, becoming assistant instructor at Columbia in 1871 and professor in 1885, continuing there until 1893. Professor Waller was mineralogist at the Santo Domingo Exposition in 1871. He was a member of many engineering societies.

Charles K. Lipman, who since 1905 had been prominently identified with the Guggenheim interests, died on July 2 at his home, No. 205 West 89th St.,

New York. He was vice-president of the following concerns: Chile Copper Co., Braden Copper Co., Yukon Gold Co., and the Yukon-Alaska Trust Co., and was a director in many allied and subsidiary concerns. Mr. Lipman was born in California fifty-two years ago, and all of his business career had been in mining projects. He came to this city thirteen years ago. Mr. Lipman leaves his wife and one brother, Frederick L. Lipman, who is vice-president of the Wells Fargo-Denver Bank, of San Francisco.

SOCIETIES

The Chemical Foundation, Inc., has published a 60 p. report describing its aims and purposes and the reasons for its organization, as told by A. Mitchell Palmer, U. S. Attorney General and former Alien Property Custodian in his report to Congress, and by Francis P. Garvan, Alien Property Custodian, in a recent public address.

American Society for Testing Materials had the opening session of the 22d annual meeting on June 25 at Atlantic City, N. J. The election of the following officers has been announced: President, J. A. Capp; vice-president, C. B. Young; executive committee, Ernest Ashton, H. F. Moore, C. R. W. Ryes, and Admiral D. W. Taylor, U. S. N. The membership now is 2,500. Revisions have been proposed in four tentative standards, including those for openhearth steel girders, high T-rails, and engine-bolt iron. Five tentative standards, including that for malleable castings, have been recommended for adoption. Recommendations for the use of the Saybolt viscosimeter were adopted. The committee on preservative coatings reported results of tests had not been sufficiently conclusive to warrant recommending any particular method of preparing iron and steel for painting.

INDUSTRIAL NEWS

Gauld Supply Co., Incorporated, has taken over the business of the Gauld Co., Portland, Ore. The directors of the new company are William P. F. Ayer, president; Thomas Nickerson, vice-president; G. A. Ricker, treasurer; Theodore W. Little and Carl T. Keller, all of whom are prominently connected with the Walworth Manufacturing Co.

Eastern Foundry & Machine Co., Inc., announces the placing in operation of its new plant at Ambler, Pa. This company furnishes bronze castings, bushings, cord bars, bearings, or specification work. General sales offices, 706 Liberty Building, Philadelphia. B. J. Morrison, general sales manager. R. W. Dale, assistant general sales manager.

Electric Hoist Manufacturers' Association held the regular monthly meeting on June 27 at 9 East 40th St., New York. A pamphlet prepared by the engineering committee is available by applying to the secretary, W. C. Briggs, 30 Church St., New York. A new pamphlet on track, supports, current conductors, and other subjects will be issued soon.

War Department, office of ordnance district chief, Equitable Building, St. Louis, Mo., offers for sale a quantity of black iron pipe, second hand, random lengths. Also quantities of new galvanized iron pipe and fittings and caulking lead. Complete description and conditions of sale are furnished by the St. Louis Salvage Board, Committee on Sale of Materials, Lieutenant Cleve A. McMullen, Ordnance Department, U. S. A., secretary.

Hamilton & Hansell, Inc., New York City, announces the selling of the following electric furnaces: One 1,000-lb. Rennerfelt furnace, 400 k.v.a., to the Steel Alloys Co. of America, to be erected at its plant in Bayway, Elizabeth, for the reduction of tungstic acid to metallic tungsten. One 1,000-lb. Rennerfelt furnace, 200 k.v.a., to the British-American Nickel Co., Ottawa, Canada, to be erected at its Deschene plant in Quebec, for melting nickel.

Federal Trade Commission formally charges the Non-Derrick Drilling Machine Co., Inc., Pittsburgh, ostensibly organized for the manufacture of an apparatus for the drilling of oil, gas, and water wells, with false and misleading advertising and misrepresentations to the public in the interstate sale of stock. The company was incorporated in June, 1917, the complaint sets forth, and has not yet engaged in actual manufacture. The concern is cited to make answer before the commission in Washington on Aug. 11.

TRADE CATALOGS

Fume Recovery. Dust Collecting. Pneumatic Conveying. The Dust Recovering and Conveying Co., Cleveland, Ohio. Illustrated pamphlet describing the operation of handling gases from driers and arsenic dust with Perfecto filters, automatic cutouts, and condensers.

"Bulldog" Jaw Crushers. Traylor Engineering & Manufacturing Co. Bulletin JX-1; 6½ x 9½; 26 pp.; illustrated. Descriptive of the Traylor "Bulldog" jaw crusher, designed to have a stronger and more reliable main frame than could be made with either cast steel or cast semi-steel, because of the difficulties in making a perfect steel casting of the complicated sections necessary and having them properly annealed. Other parts, viz., pittman, toggles, and oiling system, are included.

Lilly Gravity Electric Hoist Controller. Duro Metal Products Company,

361 East Ohio St., Chicago. Catalog B1, 7½ x 10½; 8 pp., illustrated. Descriptive of the Lilly controller, the principles of which are based on the laws of gravitation and electricity and designed to control and regulate the operation of steam, air, and electric hoists. It is claimed to possess instantaneous action, positive results, to sound an alarm when excess speed is attempted, and will stop the hoist if the engineer fails to respond. The operation is briefly: The force of gravity is prevented from actuating the controller by an electro-magnet acting through a series of levers so that only a small current is necessary to hold it in balance. When an emergency arises, and current is broken by the controller, the levers are instantly taken from the engineer. It is stated that closed-circuit system insures against possibility of failure by a broken or loose wire.

NEW PATENTS

U. S. patent specifications may be obtained from the *Engineering and Mining Journal* at 25c each.

Fuel—Fluid-Pressure Apparatus for Burning Powdered Fuel. Patrick A. Leonard, Michael F. Maloney, and Ernest Fandrich, Schenectady, N. Y. (U. S. No. 1,305,726; June 3, 1919.)

Gasoline—Recovery of Gasoline from Natural Gas, etc. Edmund S. Merriam, Marietta, Ohio. (U. S. No. 1,304,587; May 27, 1919.)

Lead—Extraction of Lead (Electric Smelting). Edward Salomon Berglund, Trollhättan, Sweden, assignor to Sven Huldt, Stockholm, Sweden. (U. S. No. 1,306,942; June 17, 1919.)

Lead—Process for the Electrolytic Deposition of Lead. Dell F. Harbaugh, Chicago, Ill. (U. S. No. 1,306,479; June 10, 1919.)

Magnesite—Manufacture of Bricks and Furnace Linings from Dead-Burned Magnesite. Samuel Gerard McAnally, Hull, Quebec, Canada. (U. S. No. 1,305,475; June 3, 1919.)

Molybdenum—Extraction of Molybdenum. Tormod Reinert Förland, Hauge, Norway. (U. S. No. 1,305,350; June 3, 1919.)

Pyrolusite—Method of Treating Pyrolusite. Carl Valdemar Jorgensen, Copenhagen, Denmark. (U. S. No. 1,303,911; May 20, 1919.)

Separator—Hydraulic Separator for Crushed Ores. Henry R. Wahl, Chicago, Ill. (U. S. No. 1,306,361; June 10, 1919.)

Separator—Magnetic Ore Separator. Lewis G. Rowand, Brooklyn, N. Y., assignor to the New Jersey Zinc Co., New York, N. Y. (U. S. Nos. 1,303,396; 1,303,397, and 1,303,398; May 13, 1919.)

Separator—Ore-Separating Machine. Joseph William Miller, Miami, Okla. (U. S. No. 1,306,270; June 10, 1919.)

Sintering—Treating Fine Ores. Daniel Shields McAfee, New York, N. Y., assignor to the Dorr Co. (U. S. No. 1,305,817; June 3, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

SAN FRANCISCO, CAL.—July 3

New Oil Wells started during the first half of the year 1919 totaled 367, as compared with 406 and 577 for the same period in 1918 and 1917. The number for last week was 16, which is considerably above the average so far. Nine were in Kern County, three in Ventura and three in Los Angeles neighborhood. There were 18 wells ready for test of shutoff, 20 being deepened or redrilled, and four abandoned. A notable development during the week was the striking of oil in the Myers well of the Union Oil Co., about four miles east of the Coyote Hills field, and three miles south of the Whittier field.

The Government Oil Land Suit against L. E. McMurry, charged with illegal and fraudulent entry of 160 acres in Kern County, has been decided in favor of the defendant by Judge Robert S. Bean, of the Portland, Ore., sitting in the U. S. District Court at Los Angeles. McMurry located the land in 1909 and secured eight individuals and companies to file mineral claims on it. The locators, after securing a contract for development. The contract was transferred by J. M. McLeod, the contractor, to his attorney, who re-transferred it to McMurry. The Government charged that McMurry sold portions of the land for large sums and contended that the land and the proceeds of the sales were secured by fraud. The court held that in making the location and subsequent contracts in relation thereto, the fair consensus of opinion from the evidence was that McMurry was acting for and in behalf of his principals, with no intention at that time of fraudulently acquiring the land or proceeds therefrom for himself.

GRASS VALLEY, CAL.—July 3

Marysville Nevada Water Co. has selected a site a mile and a half below Eullard's Bar, on the north fork of the Yuba River, and twenty miles west of Grass Valley, as proposed for a restraining dam. This is intended for hydraulic tailings to come from renewed operations at a number of old camps in Sierra and Nevada counties. A nominal charge for the work will be made. The overflow is to be used for power generation.

The Strike at Grass Valley, after continuing for fifteen days, ended suddenly on the evening of June 28, when the Mine Workers' Protective League voted almost unanimously to accept the operators' revised proposal. The new wage scale calls for a 10 per cent advance over the old rate, wherever emplaced, and with the provision that the extra amount will be paid in a lump sum to each man on the payroll at the end of a certain length of time. Provisions are also made for the men to leave the employ of the company, when necessary, without loss of pay, and half pay will be allowed for time lost during the strike. All mines and North Star mines operating with greatly reduced forces. The lower levels of these mines have flooded, but the men were able to work higher up. The Pennsylvania drains into the Empire. Milling cannot be resumed for some time. The Western Federation of Miners had no voice in the strike, although it has a chapter at Grass Valley. No violence was reported. About 1,000 men are enrolled in the Mine Workers' Protective League.

SALEM, ORE.—July 3

A Board to License Oregon Engineers has been appointed by Governor McClell of Oregon, in conformity with the act passed by the last Legislature requiring the licensing of all professional engineers. Under the new law all engineers will be required to register. The board consists of two civil engineers, two mechanical engineers, two hydraulic engineers, and one electrical engineer.

WALLACE, IDAHO—July 3

The Question of a Strike in the mines of the Coeur d'Alene district, has been deferred until after July 15. It was decided at meetings of the local branches of the International Union of Mine, Mill and Smelt-

er Workers, when the question was submitted to a vote of the membership. Union leaders state that the request of the conciliation commissioner, Robert M. McWade, to postpone the strike, is all that prevented it carrying by a large majority.

Consolidated Interstate-Cullahan Mining Co. is preparing to resume operations early in August, after a suspension of about four months. A few weeks ago the management stated that when zinc reached 7c, per lb., the company could earn a fair profit, even with the prevailing high cost of mining, and that if the market seemed stabilized around that figure, the company would feel justified in resuming production on a normal basis. Though the chief product of the mine is zinc, the company also produces considerable lead. The mill recovery of lead has never been satisfactory, and for months before the shutdown the manager, C. W. Newton, had been conducting experiments with the view to reducing the lead losses in flotation. As a result, in the last month of operation the lead produced was almost double what it had been formerly, the character of the ore being the same. When the mine closed down plans were at once prepared to add a lead flotation section to the mill which is nearing completion and is expected to double the company's lead production. New classifiers and a ball mill are also being added to the mill equipment. Another change is being made in handling the crude ore. Heretofore ore coming from the mine was conveyed direct to the mill by tramway, where it passes over sorting belts to permit removal of waste rock and shipping ore. A sorting plant is now being built at the mine, where the waste will be removed before the ore reaches the tramway, and another shaft is being provided to bring the mill, where the first-class ore will be removed for shipment crude.

BISBEE, ARIZ.—July 3

Hoval A. Smith, well known as a mining engineer in the Southwest, recently returned from a ten-day trip into the Moctezuma mining district of Sonora, Mexico. Mr. Smith stated that confidence was in a decline over northern Mexico, and that although there were many problems to be worked out, and some time will be needed to bring things back to normal so far as the mining industry is concerned, there today are not as serious as some believe. The resources of Sonora are great. Mr. Smith said, and the transportation problems are not, as a general thing, serious handicaps, and with silver at \$1.07, there is no question that the country will be developed rapidly in the near future. Mr. Smith was formerly chief engineer for the Calumet & Arizona Mining Co., and was one of the promoters of the Warren company and Warren ranch at Bisbee, as well as of the Globe Consolidated Mining Co., of Globe.

SALT LAKE CITY, UTAH—July 3

Working Forces at Park City Mines are being increased gradually to normal conditions. The state-owned mine at Park City has not yet been resumed at the Judge electrolytic zinc plant, owing to an accumulation of spelter. The state-owned zinc plant was producing a high grade of spelter, and the problems of operation had been satisfactorily solved. It is expected that the plant will resume operation as soon as the weather improves, when it will be a greater demand for spelter.

Changes in the Workmen's Compensation Law, made at the last session of the Utah Legislature, whereby, among other things, the rate of compensation has been increased, because of the strike, has been given as the cause of increased insurance rates charged by stock companies operating in the state. A lower rate is charged by the state insurance fund, but this in some quarters is considered inadequate. To meet state competition the companies will adopt merit-rating and experience-rating plans intended to give an employer credit for installing safety devices and otherwise providing working conditions that will reduce the liability to accident to a minimum. Ex-

perience rating will apply only to companies having an annual premium of \$500 or more. A company with a good showing as to accidents for twenty-one months just ended will be given allowance in the next year's premium. It is said the merit and experience ratings may bring premiums in individual cases down to almost the same as, or possibly a lower rate than, that charged by the state fund. The advance made was fixed in New York at a meeting of companies affiliated with the National Workmen's Compensation Bureau, and all companies operating in Utah except one will be bound by the rate fixed. The new rate is 26.5 per cent on \$100 in excess of the old rate. Compensation is now at the rate of 60 per cent of the average weekly wage, instead of 55 per cent, as formerly; and the maximum weekly payment in most instances is \$16 instead of \$12. The minimum in all cases is \$7 per week. The maximum aggregate payment in all is \$5,000, except in case of total disability. For total disability the compensation is 60 per cent for 45 weeks, and 45 per cent until death, with a maximum of \$16 per week and a minimum of \$7 per week. Additional compensation up to a maximum of \$500 is allowed for hospital and nursing expense, and up to \$150 for funeral expense.

DENVER, COL.—July 4

The Industrial Commission of Colorado announces that advances in rates necessitated by amendments to the law adopted by the last Legislature will not effect mining insurance now in force under the State Fund, or insurance renewable in July, and that renewals to Dec. 31, as well as new insurance, will be written in the fund at the present rate, until July 31, after which the rate will probably be advanced 15 per cent. The new law provides for an increase in the weekly benefit from \$8 to \$10, cuts down the waiting period from fourteen to ten days, increases the death payment from \$2,500 to \$3,000, and provides \$200 for hospital fees, instead of \$100. The State Fund will declare a dividend on mining risks of 15 per cent of premiums paid for the first half of 1919.

In Molybdenum Production Colorado ranks first, according to a fifteenth biennial report of the State Bureau of Mines, covering 1917 and 1918, which was compiled by Fred Carroll, until recently the State Commissioner of Mines. The equivalent of 665 tons of concentrates averaging 90 per cent molybdenum sulphide, valued at \$1,436,400, is the estimated production of the state for 1918. The world production in 1915 was slightly under 250 tons. Colorado's output is derived from the properties of the Climax Molybdenum Co., at Climax, in Summit County, and of the Primus Chemical Co., at Camp Urad, in Clear Creek County. It is estimated that molybdenum can be produced at these mines for 50¢ per lb. The State Construction was started on these properties in 1917 and milling by flotation in 1918. The mines of the state also produced in 1918 a total of 1,071,763 lbs. of copper (7,204,352 in 1917); 6,423,919 lb. of copper (8,122,004 lb. in 1917); 64,282,841 lb. of lead (67,990,012 lb. in 1917); and 88,411,745 lb. of zinc (120,315,750 lb. in 1917). It is further according to the report, there are five smelters operating in Colorado, with a daily furnace capacity of 4,000 tons of which more than 1,000 tons are utilized, although a large tonnage of ore is imported from other states.

GLENROCK, WYO.—July 3

The Midwest Refining Co., at Casper, Wyo., has expended over \$2,000,000 in the last year in new construction and additions to its refinery, and now has a daily capacity of 55,000 bbl. The company has started work on erection of a refinery at Laramie, Wyo. The Riverton Wyoming refinery, at Riverton, has started operations, and most of the oil will be taken from the Dallas field. In the Lauce field, the Buck Creek company brought in well No. 1. The oil sand was tapped at 3,650 ft. in

the same field the Lusk Royalty company has five wells drilling, but as yet these have not given sufficient depth to prove the presence of oil. The Ohio company is drilling for the Lance Creek Royalty and has reached a depth of 3,600 ft. Oil was encountered at 2,200 ft. It was decided to go deeper or a larger production. At present 230 wells are being drilled in the different oil fields of Wyoming. The 1919 season of oil production in Wyoming passed the Carbon Black bill, which prohibits the manufacture of carbon black from natural gas in Wyoming within ten miles of an oil well. The measure takes effect Oct. 1, 1919, and is protested by producers of this material.

EDGEMONT, S. D.—July 3

In the Mule Creek Oil Field, west of Edgmont, in Wyoming, the Ohio Oil Co. has brought in its second well. Though it has a capacity of only 100 bbl. it is encouraging, in that it marks the boundary of this oil area and greatly extends the productive area. This new well is four miles from the pioneer well on the Norbeck and Nicholson lease and opens a large track for oil drilling. North of the Mule Creek area, Norbeck and Nicholson are drilling on a structure known as the Cottonwood Dome.

HOUSTON, TEX.—July 2

Invincible Oil Corporation, of New York, incorporated under the laws of Virginia, with capitals of \$1,000,000, has secured contract from Invincible Oil Co. for all its holdings. Consideration involved is said to be \$5,000,000. Through a merger with the Gladstone Oil Refining Co. of Oklahoma, and the Louisiana Oil & Refining Co., of Shreveport, the Invincible corporation has acquired 83,643 acres of land, held by fee and leases, in the Ranger and Blue Ridge fields in Oklahoma, and in the Walters and Cement fields in Oklahoma, with estimated production now of 3,500 bbl. to 5,000 bbl. daily. Other holdings are in Stephens field in the Fumble district and in Alabama. The corporation has one refinery of 300 bbl. capacity in operation, together with 70 miles of gathering lines, and 200,000 bbl. storage capacity; also 160 steel tank cars for transportation to dewater export station, at New Orleans, where storage capacity of 100,000 bbl. is provided. Estimated production of 3,000 bbl. capacity nearing completion at Fort Worth.

MOUNTAIN HOME, ARK.—July 3

Mining Operations in the north Arkansas zinc and lead field are nearly at a standstill. Less work is being done than at any time during the last five years, and at the same time there is no new ore developed. Most of this is zinc carbonate averaging 40 per cent zinc, which is bringing from \$22 to \$28 on the present market, which is the operators' average. A large amount of development and prospecting is in progress.

DULUTH, MINN.—July 3

The Minnesota State Supreme Court has upheld the finding of the district court at Erskine, whereby Patrick Hammel established his claim to half interest in the mining lands held by the estate of the late Thomas Feigh. The lands involved include two operating properties on the Cuyuna Range, the Hillcrest and the Feigh, and the Hammel share of royalties at the time suit was begun amounted to \$135,700, to which must now be added the 1917 and 1918 earnings of the properties. It was held by Hammel that under an arrangement between himself and Feigh he was to do the detail work of locating the properties while Feigh retained the ownership and that the properties were placed in Feigh's name to protect his investment. The agreement was that all profits should be divided half and half, and that the property had developed in a new trial in which H. B. Blackwood, of Duluth, who controlled the lands involved at the time Hammel and Feigh were negotiating for them, now claims one-half of Hammel's interest under an agreement he claims to have had with Hammel.

HOUGHTON, MICH.—July 5

Calumet & Hecla's loss by fire of the Hancock & Pewabic engine houses, with the hoisting plants contained, did not interfere with production. The plant served four shafts on the conglomerate, namely Nos. 7, 8 and 10, the last two being a double shaft, all in the South Hecla branch of the main Calumet & Hecla mine. Within twelve hours after the fire, one of the shafts was connected with an auxiliary hoist, and within twenty-four hours all shafts were producing rock and hoisting at normal rate. These four shafts, which are included in the program for greater development, with depth that is planned for the Calumet & Hecla conglomerate lode, are among the deep mining shafts of the Lake Superior

district. No. 7 is below the 81st level. No. 8 was permanently discontinued at the 63d level, and Nos. 9 and 10 were 142 ft. below the 82d level, a depth of 8,132.7 ft., on Jan. 1.

Because of the excessive cost of maintaining Nos. 6 and 7 Hecla and Nos. 9 and 10 South Hecla, it was determined some months ago to discontinue sinking at these points. To reach the ground lower down in this end of the mine, a haulage level (at the elevation of the 80th level) connecting this territory with the Red Jacket shaft, is being driven in the amygdaloid lode 150 ft. under the conglomerate. This haulage level, when completed, will be 7,800 ft. long, 3,700 ft. having been driven already. Shafts will be sunk from the haulage level, from which the conglomerate will be mined. Power tramming will be used to get this product over to the Red Jacket shaft, where it will be sent to surface.



SNOW TUNNEL BETWEEN SANDON AND CODY, B. C., ON ROAD TO NOBLE FIVE MINE DURING LAST SEASON

BIRMINGHAM, ALA.—July 3

At the Woodward Iron Co.'s plants there is considerable construction and repair work in progress, notably at the company's No. 1 mine, on Red Mountain. The company has two furnaces in operation out of three at Woodward, Ala.; the third now being repaired. It is expected this furnace will be blown in soon. Sinking has begun at the company's Songo mines. Electrically operated elevators and other time-saving devices are to be used here to eliminate expensive haulage.

All classes of industry in the district seem to have speeded up. Coke production is being increased to meet orders now being received. With iron up 10 per cent and production increasing, several large companies are out of the market at present prices for third-quarter delivery. Cast-iron pipe shops, machine shops, and foundries with plenty of orders on hand or expected are gradually working back to normal operating schedule. The Republic Iron & Steel Co., the Sloss-Sheffield Steel & Iron Co., and the Alabama Co. are expected to blow in a furnace in the next few weeks. On the whole, July opened with the brightest promise of a good month of production and sales in the iron and steel industry this district has experienced for some time.

No statement as yet has been received from the various companies as to their attitude toward the movement to unionize the steel and iron workers in the district. The organizers are credited with the statement that no strike is in prospect, but only the right to organize and do collective bargaining with employers is sought.

Suit has been brought by Wiley Nunn against the Woodward Iron Co. for \$3,000 for injuries to a minor son formerly employed in the company's mines. Suit has been brought by Will Gray against the Tennessee Coal, Iron & R.R. Co. to collect \$3,000 damages, for injuries received in the company's employ.

BOSTON, MASS.—July 7

Shannon Copper Co. states officially that an agreement has been entered into with the Arizona Copper Co., of Phoenix, Ariz., to sell the latter the Clifton and Metcalf, Ariz., properties of the Shannon company for approximately \$600,000. It is possible that operations at the Shannon and Veager may be resumed, but the directors have not definitely decided upon any policy for the future.

VICTORIA, B. C.—July 3

The Free CODY Mine, which has recently been formed at Prince Rupert, B. C. It has announced its purpose to be "the employment of a permanent secretary in premises containing the operations of the company together with information about them and other mining literature. It has petitioned the provincial government to establish an assay office at Prince Rupert, one-half the cost of assays made to be paid by the individual and the other half by the government. Weston Coyney, Prince Rupert, is secretary. Membership in the Free League costs \$5 a year.

The Noble Five Mine, situated between Sandon and Cody, in the Sloacan mining division, British Columbia, is installing a 100-ton concentrator that, it is expected, will be ready for operation this autumn. The company now has a considerable force engaged in the development of the mine. A photograph on this page was taken early this year by Paul Lincoln, manager of the Noble Five, on the Old Cody Road running between Prince Rupert and Codan and the snowshed shown took place, some of the company's employees were busy repairing the road. They had little notice of their danger, and sent them to the local level. The slide was one of the greatest in the history of the district, and, as the view indicates, it was necessary to tunnel to open to the mine late in spring.

The Committee Investigating Smelting Rates charged by the Consolidated Mining and Smelting Co. for treating custom ores at Trail has gone a report into the information it received in length of twenty-two pages. Its conclusions have been summarized as follows: "A new smelting rates schedule which, applied to average ores received at Trail smeltery during the seven months ending April 30 last, is being prepared. It will effect an average saving to shippers of \$3 per ton. Most of this benefit will accrue to producers of silver-lead-zinc ores, who were hit hardest by Schedule B. Miners of oxidized ores, or low-silver, low-zinc ores will benefit very slightly, if at all.

"Prior to the introduction of Schedule B and for some time afterward, the lead-smelting operations of the company were conducted at a loss. Though other causes of this loss existed, it was attributable chiefly to the nature of the general ore supply, the increased prices of metals, particularly that of silver, and the use of large shipments of ores and mill products high in zinc content, which, if sold at previously prevailing metal prices, would have been far less profitable.

"The schedule was devised as a fair means of securing improvement of quality in the general ore supply through elimination of some of the zinc, or placing the burden of cost arising from its presence in undue amount in the furnace charge, upon those who fail to help bring about the desired end. The result of operation under the schedule, during recent months, is manifested by marked improvement in the general ore supply, and in the substantial increasing recovery of silver and lead, and by decreased cost. No undue margin from increased treatment rates has been derived by the smelter, and in the opinion of the committee 'the end has justified the means.'

"Finally, the general improvement of conditions warrants the committee's expectation of the important concessions in favor of the shippers, upon whom, nevertheless, there still rests the duty of helping themselves. The committee recommends the appointment of a permanent committee on smelter rates."

TORONTO, ONT.—July 5

Many Districts of Northern Ontario have been devastated by extensive bush fires, which at one time threatened to cause much loss in the mining camps. Some of the recent heavy rains the danger has been averted with comparatively small loss. The Boston Creek district and Ironouls Falls suffered the most damage. The plants of the Patricia mine and the Cotton property at Boston Creek are reported to have been destroyed, and the Miller Independent though the mine camps were escaped. At the Porcupine camp, the West Dome and Davidson mines were in great danger and were saved only after a protracted fight with the flames. The plants in the mine neighborhood the Hollinger and other properties were saved by a timely fall of rain.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ARIZONA

Cochise County

PHILIPS DODGE (Bisbee)—Copper production for June from all branches 8,415,335 lb. (May 8,355,900), U. S. properties producing 6,253,335, Mexican 1,735,000, and custom ore 427,000.

Maricopa County

LEFD ROYER (Phoenix)—Company plans to build own power line to connect with line of Arizona Light & Power Co., being built from Fossil Creek plant to Phoenix.

Pinal County

SOUTH RAY COPPER (Kelvin)—Unwatering completed to 500 level. Old timbering needs repairs before sampling can be completed. Crosscutting into walls shows copper orebodies not located by former owners. No. 2 shaft will be unwatered in July. W. E. Duvoil in charge.

RAY BROKEN HILLS (Ray)—Tunnel will be driven another 200 ft. Flow of water now approximately 100 gal. per min.

POLAND COPPER (Ray)—Lateral development on 2^d level being continued, and shaft will be sunk additional 200 ft. About fifteen men now employed.

U. S. VANADITE (Kelvin)—More men working in lower tunnel, from which crosscuts are being driven north and south. Drifting on diabase-limestone contact in lower tunnel shows 5 ft. of well-mineralized vein.

Santa Cruz County

BLUE NOSE (Cogozales)—John Hoy, of Harshaw, has sold Blue Nose group to Lyman syndicate, of Jerome. Property formerly big producer of high-grade silver ore, but has been idle since 1881. New owners have installed compressor and hoist and begun sinking new shaft.

SHARDSHELL (Harshaw)—Twenty-five men now at work on property. New shaft being sunk at rate of 5 ft. a shift.

ARKANSAS

Marion County

LONNIE BOY (Rush)—Will start erection of small concentrator soon. Five thousand tons zinc ore developed.

MATTIE MAY (Rush)—Work on new mill be resumed at once.

MOONEY-HAIZER (Rush)—Mooney and Haizer, owners of ten-acre tract adjoining Philadelphia mine, are developing two zinc orebodies on tract.

CALIFORNIA

Amador County

ARGONAUT (Jackson)—Mill now running to capacity and work progressing on same scale as before fire.

Calaveras County

KEYSTONE (Railroad Flat)—Operations will be resumed under management of Joe King. Shaft now being unwatered.

SHEEPFRANCH (Sheepfranch)—Preliminary work by Golden Gate Exploration Co. practically complete, and expectations are that mill will be started early in July.

El Dorado County

MANZANITA (Kelsey)—Recently bought by E. V. Fessler. Has been sold to Morovitch-Dryden-Morganson Co., of Seattle.

Nevada County

H. H. NOBLE mineral rights within limits of Nevada City were bid in by David Wildin.

Placer County

MAMMOTH SPRING (Dutch Flat)—Work resumed after usual winter shut-down. Compressor installed to speed work.

GEORGIA HILL DEEP GRAVEL (Yankee Jim)—After consolidating small holdings Crofters has started development by running 1,000-ft. tunnel.

Shasta County

UNITED STATES (Kennett)—Only development work being carried on at Mammoth mine. Company's operations in Mexico continued without interruption in first half of 1919, according to official re-

port. Average tonnage produced and milled about 68,000 per month for first half year. Expected to increase to 80,000 tons in July. Company's coal mines operating full time, with reduced forces.

Sierra County

MARIPOSA (Alleghany)—Electric hoist installed in main tunnel. Ready to begin sinking 500-ft. shaft.

Siskiyou County

LANKY BOB (Salmon River District)—Purchased by J. Tenny, of Seattle, who is arranging to install compressor and drills.

Tuolumne County

ANGELS DEEP (Angels)—On completion of headframe, sinking and crosscutting will be resumed.

SONORA (Sonora)—Property bonded to Blake and Solinsky, of San Francisco. Work to start within thirty days.

COLORADO

Boulder County

VICTORIA MINES (Boulder)—W. S. Garland, of Brockton, Mass., president, and directors plan to increase force and purchase more machinery for development campaign. Mine showing large bodies of high-grade silver ore. Last carlot shipped weighed 27,658 lb., settled for at 102 oz. per ton.

Ouray County

VERNON MINING (Ironton)—Entire plant in Gray Copper Gulch, near Ironton, destroyed by fire on July 26. No insurance. Will be rebuilt. Manager, A. G. de Golyer, Ironton. President, W. L. Fleming, 50 Broad St., New York. Plant shut down recently, with two watchmen in charge. Probable cause of fire spontaneous combustion. Plant included 150-ton concentrator with Marcy mill and flotation equipment, hunk house, hoisting house, shaft and compressor house. Plans for work this year may be carried out through driving new crosscut lower down gulch.

San Juan County

SUNNYSIDE M. & M. (Eureka)—To begin rebuilding hunk house, compressor house and other necessary buildings, preparatory to resuming active work. Will erect steel frame buildings. Will deepen Washington shaft to connect with Terry tunnel at Midway and erect buildings at Midway.

Summit County

SILVER DISCOVERY made by Charles Godfrey and partners on exposed bedrock of Meeka placer east of Breckenridge. Ground leased from owner, M. G. Evans, Denver.

TONOPAH PLACERS (Breckenridge)—Operating three dredges full time, one each in Blue River, upper Swan Valley, and in French Gulch.

WASHINGTON (Breckenridge)—Placer in Illinois Gulch first to start washing gravel this season in Breckenridge district. Under lease to James T. Burney, J. H. Bills in charge.

Teller County

CRESSON (Cripple Creek)—Dechene and Kearns have reached objective in shaft on Maggie, striking flat three-foot vein at 40-ft. Breeding ore bins.

FREE COINAGE CONSOLIDATED (Cripple Creek)—Wilson vein cut by diamond drill at depth of 550 ft. from Pinto mine workings adjoining Wilson on west. Bennett and Gunn, lessees. Now crosscutting to vein from 800 level of Lee shaft, of Isabella Mines Co. adjoining Wilson on north.

IDAHO

Shoshone County

RICHMOND (Adair, Mont.)—Winze from lower tunnel down 200 ft. and crosscut being run to vein, which should soon be reached. Ore oxidized copper above, but crosscut is finding stringers of sulphide ore.

SHERMAN (Burke)—Final payment made for property formerly known as Union, total amount being \$150,000. Union owned chiefly by estates of late John A. Finch and A. B. Campbell. Sherman Lead

Company, purchasers, controlled by Days. Deep tunnel being run expected to develop large lead-silver orebody. Ore found in two tunnels above. In addition to exploring Sherman this lower tunnel is expected to be permanent outlet for Tamarack & Custer adjoining, also controlled by Days.

CARBONATE HILL (Mullan)—Crosscut from shaft at 400 level finding some ore, but main vein thought not yet reached. Expect to prospect ground with diamond drill. Good showing of lead and zinc ore above.

NATIONAL (Mullan)—Company shipped sixteen carloads of concentrates in June, averaging 15 per cent copper and 40 oz. silver. This is one car more than May shipments, making record month. Important development work being done on 600 and 800 levels, above working tunnel, which is expected to show ore of better grade.

KANSAS

Aprilia District

EARLY BIRD (Baxter Springs)—Installing additional No. 4, 5 and 7 roller elevator pulleys, belting, shafting. Plant at Treece, Kan. Cleve Bird, superintendent.

UNION METAL MINES (Waco, Mo.)—Erecting new mill. Will need equipment. P. B. Butler, general manager.

MICHIGAN

Copper District

SENECA (Calumet)—Actual drifting on lode began July 1. Shaft below 1,800 ft. Additional surveys of possible mill sites made on Lake Superior shore on area held under option.

QUINCY (Hancock)—New hoist for No. 2 plant beginning to arrive. Drum will be 30 x 30 ft. Capacity for depth will be greater than for any other one-rope hoist, easily carrying for continuous hoist of 14,000 ft. Present plant hauling from 8,200 ft.

ISLE ROYALE (Houghton)—Production limited to three shafts, Nos. 4, 5 and 7. June tonnage about 42,000. Five drill parties working in newer openings. North of No. 7 shaft, drifts over to No. 6 are holed through to seventh level. To south all drifts from surface down to sixth level have been driven for 1,200 ft. and then stopped, as that is point midway to location of proposed No. 8 shaft.

Gogebic Range

ASHLAND (Ironwood)—Mining operations ceased some time ago, all available ore having been removed, but exploratory work is being carried on with small force on lower levels.

NEWPORT (Ironwood)—Diamond drill operating on surface north of Woodbury shaft and east of old north vein workings. As at other properties considerable attention being paid to horizon 500 ft. to 800 ft. north of foot wall. Wrecking of "D" engine house about completed. Boiler house abandoned last year because ground was sinking and now several other buildings are affected. Entire surface plant is south of foot wall, where no settlement of ground would be expected.

Menominee Range

AT CRYSTAL FALLS McKinney Steel Co. shipping from Odgers and Dunn mines. All ore in stock at Odgers to be loaded. M. A. Hanna Co. shipping from Carpenter and Monongahela properties.

CARPENTER (Crystal Falls)—Four men reported killed in last issue were caught by a cave-in. Accident occurred just above bottom level, and over 1,000 tons of rock had to be removed before bodies could be recovered.

MUNRO (Iron Mountain)—Operation started for season. Open-pit property. Hoose Construction Co. has contract to do loading in pit.

PEWABIC (Iron Mountain)—Discontinuing of entire surface plant about completed. Steel headframe sent to Iron River; and now several other equipment sent to other ranges. For many years mine was steady producer of low-phosphorus ores.

IRON RIVER DISTRICT shipments increasing. Most mines operating. Tully inactive, but will ship.

SPLES (Iron River)—Mine closed down. Most ore in stock to be shipped.

MINUOE (Norway)—Shipping of ore begun. Mine now operated as open pit. Mining done by Hoose & Person Construction Co. under contract.

MINNESOTA
Mesabi Range

DRAPER (Calumet)—New open-pit property of John A. Savage Co. has made initial shipment to modern washing plant, recently completed.

ACNEW (Hibbing)—Wisconsin Steel Co. property has reopened and taken on 100 men. One of deepest pits on range and has produced 2,000,000 tons by steam shovel. Present depth necessitates milling and scrambling with cable hoist.

RUSSELL (Keewatin)—New prospect of Pickands Mather Co. adjoining Bennett mine of same company being drilled by E. J. Longyear Co.

LA RUE (Nashwauk)—Carlson Exploration Co. operating two drills on preliminary exploration of open-pit orebody for M. A. Hanna & Co.

Vermilion Range

MCDONALD (Winton)—New property operated by Chippewa Iron Co. developed to stage where it will probably ship 50,000 tons this season. Shaft bottomed at depth of 345 ft. and levels partly developed at 100, 200 and 309 ft. Royalty 60c. per ton for first five years thereafter 62½c. Minimum tonnage 20,000 for first year and increasing 10,000 per year until 60,000 tons per year becomes permanent minimum. President, E. J. former operators. Will use stamps, amalgamation, tube mills, calow tanks, Janney classifiers, and James concentrators. Present company is reorganization. Property in litigation for ten years. Title perfected in 1917. During 1918 this mine produced \$52,000 worth of tungsten ore.

MISSOURI
Joplin District

ALLEGHENY WESTERN (Waco)—Moving old Adams mill from Tuckahoe to Waco. Will need steam engine, boilers, rock drills, and tables. W. S. Marquis, general superintendent.

ORANGE (Webb City)—Enlarging all departments of plant. Will need crushers, rolls, hoist, compressor. H. H. Wallower, superintendent.

MONTANA
Park County

JARDINE GOLD (Jardine)—Operating 23 patented claims six miles from Gardiner, Mont. Has started Huntington test mill in ore after having been shut down during winter. Remodeling forty-stamp mill built in 1902 by former operators. Will use stamps, amalgamation, tube mills, calow tanks, Janney classifiers, and James concentrators. Present company is reorganization. Property in litigation for ten years. Title perfected in 1917. During 1918 this mine produced \$52,000 worth of tungsten ore.

Extensive development work done, including 21 deep test tunnels with large amount of raises and drifts, showing an extensive commercial vein system. Property has excellent hydro-electric plant, compressor, machine shop and other equipment.

Silver Bow County

ANACONDA (Butte)—Mining operations at 55 per cent capacity; development at about 75 per cent. Scarcity of water near Anaconda, Mont. has resulted in compelling curtailment of concentration of custom ores at Washoe mill. Production for June 1919, 150,000 lb. of copper, as compared with 135,000,000 in May and 137,500,000 in April.

BUTTE-BULLWACKER (Butte)—Mining and development will be resumed when it is assured labor troubles will not interrupt. Property being cleaned up.

BUTTE COPPER & ZINC (Butte)—Showing of high-grade silver-lead ore continues east of 1,000 level. Production being increased.

BUTTE-DULUTH (Butte)—Property being placed in condition for resumption of operations. Good ore showing disclosed in winze.

BUTTE & PLUTUS (Butte)—Sinking continues at Plutus shaft. Two feet of ore on 100 level of Mapleton claim.

BUTTE & RAMSDALL (Butte)—Cross-cutting and drifting on 200 level on fissures released from Davis-Daly. Ore showing strong, particularly in the Lizzie vein. Expected to resume shipments as soon as East Blue plant can be put in operation.

BUTTE & SUPERIOR (Butte)—Ore showing east on lower levels continues good, with large tonnage indicated. Production being increased in consequence of rising price of zinc and resumption of treatment of zinc concentrates by Anaconda company.

DAVIS-DALY (Butte)—Sinking of Colorado shaft from 2,500 to 2,700 level already progressed quarter way. Average of all smeltery shipments during May was 10.1 per cent copper and 8 oz. silver. Operating less than 50 per cent capacity. Net earnings for June approximately \$45,000.

EAST BUTTE (Butte)—Operations being maintained at 75 per cent of capacity, 30 per cent of Pittsmeat smeltery output being contributed by Davis-Daly ores.

NORTH BUTTE (Butte)—Production being slightly increased from 25 per cent of normal development program pushed at capacity. Ambitious exploration campaign mapped out. Promising ore development reported on 600 level of Speculator.

TULUMANE (Butte)—Station cutting on 1,000 level nearly completed. Estimated output will be reached with 700 ft. of cross-cut. Shaft now more than 50 ft. below the 1,000 level and will be sunk to 1,200.

NEVADA
Emerald Valley

COIKNFORTH MINE, in Bellehelen district, taken over by Pacific States M. & M. Co., which is capitalized at \$1,500,000, par value of stock \$1. President, T. T. Cornforth; vice-president and general manager, Warren A. Haggott; secretary-treasurer, Ben Gill. Other two directors Charles S. Sprague and J. E. Vainwright. Home office in Goldfield, with Charles S. Sprague resident agent. Executive committee comprises Cornforth, Haggott and Sprague.

GOLDFIELD DEVELOPMENT (Goldfield)—Planned to start stamps about July 1, when repairs and alterations are expected to be complete. Will start on Red Top ore.

NEW YORK
Jefferson County

BASIC PRODUCTS CORPORATION (Natural Bridge)—Preparing plans for inclined railway, ore hoist, and housing to be constructed at Natural Bridge, at estimated cost \$12,000 to \$15,000. New York office, 233 Broadway.

TEXAS
Brazoria County

GULF PRODUCTION (West Columbia)—Eyers No. 2 well came in June 25. Well is 2,800 ft. deep.

Eastland County

GUGGENHEIM INTERESTS have purchased holdings of Gates Oil Co. of Ardmore, Okla. Land consists of W. T. Barker lease, six miles northwest of Ranger, of 67 acres; 40 acres of Hilly tract and 223 acres of Hawkins tract, near Desdemona, all in Eastland County, and 2,200 acres in Oklahoma. Barker lease, midway between Perkins gusher and Danley well of Prairie Co. Well on tract now 3,320 ft. deep.

Grimes County

BIG BEND OIL & GAS (Navasota)—Entire property change hands. Development will drill soon. New officers: C. C. Camp, president; E. F. Blackshear, secretary; Ward Templeman, treasurer; B. F. Reeves, manager.

Liberty County

BIG FOUR OIL (Hull)—No. 4 Hannerick well came in June 26, flowing from 1,550 ft. but soon sand-ed, and has not been brought in again.

Orange County

SHIPBUILDERS' OIL & GAS (Orange)—Build a new rig over Rio Bravo well, a producer brought in six years ago, intending to rewash it in effort to make it flow again.

ORANGE OIL (Orange)—Has won race against time, after delay in starting to drill, thereby saving lease and \$1,000 forfeit.

Victoria County

GOLDEN EAGLE (Victoria)—Drilling on Golden Eagle No. 1 well, near Victoria, started June 22.

Wodd County

WIXON OIL & GAS (Eryau)—Organized locally; capitalization, \$75,000. Rig ordered, and drilling will be done about fifteen miles northeast of Bryan on Navasota River. Officers: J. E. Gator, president; S. E. Hallan, vice-president and general manager.

UTAH
Beaver County

UTAH SULPHUR (Morrissey)—Plant, consisting of two retorts, turning out 40-50 tons of sulphur daily, to be enlarged by addition of three new retorts, each three times as large as those now in use, making possible treatment of 1,050 tons of ore daily.

Utah County

TINTIC SHIPMENTS first half 1919 amounted to 8,830 cars, including four cars of bullion, as compared with 4,416 cars first half of 1918 and 5,363 cars the first half of 1917. Thirty shippers thus far compared with 40 last year. Tonnage around 181,000 tons, valued at \$5,700,000. Shipments, 489 cars, as compared with 686 cars in June last year. Shipments held down by labor shortage early in year and later by low price of metals and high costs.

CENTENNIAL-ELI BEKA (Eureka)—Damage to shaft timbers occurring when steel was being hoisted caused short close-down for repairs.

CENTRAL STANDARD (Eureka)—Equipment being shipped in readiness for starting work. Shaft to be sunk.

PAYMASTER (Eureka)—Contract let for sinking shaft from 200 level to depth of 150 ft.

TINTIC DRAIN TUNNEL (Eureka)—In 3,000 ft. in formation requiring no timbering. Will connect with Iron Blossom, and starting from there, probably unwater large mining area.

TINTIC MILLING (Silver City)—Car of bullion amounted to 32 tons shipped, expected to bring about \$90,000. Runs high in silver.

UNCLE SAM (Silver City)—To be opened at end of year on 1,800 level of Colorado Consolidated, showing in readily back tunnel. Will give depth of several thousand feet below old workings productive, in part.

Summit County

PARK CITY SHIPMENTS first half of 1919 amounted to 237,368 tons, valued at \$2,500,000, according to camp estimates and weekly shipments. This is compared with 57,000 tons first half of 1918. Production for June, 1918, was 1,750 tons, that for June, 1919, was 165 tons, owing to strike, only ore shipped coming from Naldriver.

SILVER KING CONSOLIDATED (Park City)—Work resumed on Spiro tunnel, now in 10,000 ft. and being driven to develop Thayne Canyon section and connect with California-Costock ground. Expected also to start work in old workings on opposite side of hill, where producing ground is open to 1,800 level.

Salt Lake County

SILVER SHIELD (Bingham)—Old workings retimbered and shaft in condition for work.

CARDIFF (Salt Lake City)—Shipped 350 to 450 tons week ended June 28. Ore silver-lead of good grade. Fifty-five men working. Drifting started on 800 level with view to opening new Kennecott.

CANADA
British Columbia

GRANBY CONSOLIDATED (Vancouver, B. C.)—Production for May was 1,848,800 lb. copper; 41,532 oz. silver; and 2,307 oz. gold. For April, 1,333,523 lb. copper; 29,826 oz. silver; and 1,955 oz. gold. For March, 667,142 lb. copper; 17,723 oz. silver; and 1,283 oz. gold.

Ontario

TEMISKAMING (Cobalt)—Oreshoot 2 in. vein carrying high-grade encountered at 575-ft. depth.

ALLIED GOLD MINES (Boston Creek)—Extension of Miller Independence vein cut by diamond drilling.

GREENE-KIRKLAND (Kirkland Lake)—Exploration program planned. Small mine plant will be installed.

KIRKLAND COMBINE (Kirkland Lake)—Work started on group of claims adjoining Sylvanias. Andrew Grierson, manager.

LAKE SHORE (Kirkland Lake)—Production during May for May was \$42,136, from the treatment of 1,750 tons of ore, being an average recovery of \$24.05 per ton.

ONTARIO-KIRKLAND (Kirkland Lake)—Officially stated by mill with capacity of 100 tons daily will be installed.

ASSOCIATED GOLDFIELDS (Larder Lake)—One thousand feet of diamond drilling done on Dr. Reddick property. Two diamond drills at work on Kerr-Addison group adjoining.

LUCKY CROSS (Swastika)—Taken over by New York interests and renamed Mari-gold.

HERRICK (West Shining Tree)—Contract let for 5,000 ft. of diamond drilling. Vein about 25 ft. wide traced for nearly 1,000 ft. Shaft down 50 ft.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

July	Sterling Exchange	Silver		July	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
3	4 5200	1.07½	53½	7	4.4900	1.07½	53½
4	4 5200	1.07½	53½	8	4.4800	1.07	53½
5	4 5000	1.07½	53½	9	4.4763	1.06	53½

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

Daily Prices of Metals in New York

July	Copper		Tin	Lead		Zinc
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.
3	19.10@19.30	68	5.30@5.40	5.15@5.17½	7.00@7.05	
4	.....	.....	.....	.....	.....
5	.....	.....	.....	.....	.....
7	19.60@19.85	68	5.35@5.40	5.17½@5.20	7.10@7.12½	
8	19.85	68	5.40	5.17½@5.20	7½	
9	19.85	68	5.40	5.17½@5.20	7½	

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

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

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c per 100 lb above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

July	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
3	91½	92½	92	241	238½	22½	22½	39½	40
4	91½	92½	95	243½	241½	22½	22½	38½	40
5	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	94	95	96	248½	245½	22½	22½	40	40½
8	95½	96½	97	247½	244½	23	23½	40½	40½
9	97½	98½	100	250	248	23½	23½	41½	42½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

New York—July 9, 1919

There was great activity in copper during the week, but zinc and lead, while both strong, were only moderately active.

Saturday, following July 4th, was kept generally as a holiday. Although some of the offices were open, substantially no business was transacted.

Transatlantic freight rates remained unchanged, but there is an easier tendency. Rate from San Francisco to Hongkong and Kobe continues at \$14.

The sharp decline in sterling exchange puts some recent export sales in quite a different light.

Copper

Copper—A large business was done on Thursday at advancing prices, which led producers to make a further raise when the market reopened on Monday,

on which day they began at 19½c. delivered, and ended with 20c. delivered. On Tuesday very large business was done at 20c. delivered, corresponding to 19.85c. net cash, New York. Business was done at the same price on Wednesday, and it was clear that speculative interests would be willing to pay even more if producers were disposed to sell to them. The demand from consumers on this day was much lighter than on the previous day.

The aggregate sales per week amounted to a fairly large total. Wire-drawers were the principal buyers, but there were some important transactions with brass-makers, especially on Tuesday. The demand for cakes was relatively light. A fair amount of export business was done, this including sales to England and also to Japan, which was still a buyer.

The recent Japanese buying, which has been regarded as mysterious, is

believed to have a substantial foundation. Japan has bought copper and lead not only in this market, but also in Australia, and has been inquiring in London. Speaking generally, the Orient is the most prosperous part of the world at the present time, and manufacturing costs in Japan are considered to give that country a great advantage over both Europe and America. Moreover, the Japanese activity in the metal markets has been based partly on munition requirements.

The labor situation in Butte is uncertain. Exorbitant demands on the companies have been made, which cannot be granted. Negotiations have been going on without any settlement being reached. Some of the men have failed to go to work, leaving the companies short-handed. Whatever be the outcome, the uneasiness will have a considerable effect upon production.

The sales of copper by American producers in June were very large, though not quite so large as in May. The Government copper has been practically liquidated, although under the terms of the agreement it was contemplated that fifteen months might be required to accomplish it.

Copper Sheets—The base price of copper sheets is 29c. per lb. Market fair, and improving. Copper wire is quoted at 23@23½c. in carload lots, f.o.b. mill. Market strong.

Tin

Tin—The market remained unchanged at 70c. for high-grade tin and 68c. for 99 per cent grade, the situation being practically in the hands of the two smelters, inasmuch as consumers possessing surplus stocks have evinced no anxiety to resell. The business by brokers has been mainly in tin for shipment. Straits for July shipment and English for July shipment were sold at 52c. and 51½c. respectively, in the early part of the week. In the latter part, sales were made at ½c. higher.

Lead

Lead—Some of the principal producers are in a very strong position, but others have not yet sold as much as they would like to, and their offerings hold the market back. This naturally produces a situation where special brands may command a premium, which is distinctly the case with chemical hard lead. In the Ohio valley and at other points in the Middle West lead fetches prices above either the New York or St. Louis parity. Lead manufacturers report continuance of good business, especially in white lead. In

its statistical position lead is no doubt stronger than either copper or zinc, but the market lags, nevertheless.

Zinc

Zinc—After the halt last week, the advance was resumed, but there did not seem to be any great enthusiasm about it. There was again some buying for export, but the situation in respect to sterling exchange makes it uncertain what sellers are going to realize on such business.

There was some fair business done in high-grade zinc at moderate premiums over the price for common zinc.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 35c. per lb. Market quiet.

Antimony—The market was strong at unchanged prices, viz., 83¢@81¢. for spot.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.10 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at \$1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, \$1.75 per lb.

Nickel—Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—New York price advanced to \$107, at which figure the market closed strong. San Francisco telegraphed \$95, firm.

Silver and Platinum

Silver—After advancing to 533d., declined in London under American sales at 53rd. Exchange on London continues to be dropping, with the future uncertain.

Mexican dollars at New York: July 3, 82½; July 4, holiday; July 5, 82½; July 7, 82½; July 8, 82½; July 9, 81½.

Platinum—In strong demand. We quote ingot at \$105@107.50.

Palladium—Rather easier. We quote \$118@120.

Zinc and Lead Ore Markets

Joplin, Mo., July 5—Zinc blende, per ton, high, \$48; basis 60 per cent zinc, premium, \$46; Prime Western, \$45; sludge and flotation, \$42.50@40; calamine, basis 40 per cent zinc, \$28@25. Average settling prices: Blende, \$43.04; calamine, \$26.32; all zinc ores, \$42.10.

Lead, high, \$62.90; basis 80 per cent lead, \$60; average settling price, all grades of lead, \$60.76 per ton.

Shipments the week: Blende, 7,240; calamine, 499; lead, 1,342 tons. Value, all ores the week, \$451,390.

Report is that not a movement is being made today by any of the mines in the district, so many miners declaring their intentions of not returning to work until Monday, at the close of work the evening of July 3, that no other course was open to producers, many of whom would have resumed today. Pumping operations save the situation

from an appearance of abandonment. With the prohibition enforcement coming the first of the week, and the observance of two days' holiday at the end, the production in output will probably approach 50 per cent.

Platteville, Wis., July 5—Blende, basis 60 per cent zinc, \$47 base for premium grade and \$44.50 base for high-lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$60 per ton. Shipments reported for the week are 1,947 tons blende, 233 tons galena, and 232 tons sulphur ore. For the year to date the totals are 52,171 tons blende, 2,844 tons galena, and 7,376 tons sulphur ore. During the week 3,396 tons blende was shipped to separating plants.

Other Ores

Chromite Ore—High-grade ore is reported offered at 50c. per unit f.o.b. California.

Molybdenum Ore—Quoted nominally at 75¢@85c.

Tungsten Ore—Chinese ore was sold at \$6.75@87 per unit. A lot of high-grade scheelite for export was sold at \$10. There is rather more inquiry for this tungsten ore.

Other Minerals

Pyrites—Spanish pyrites is quoted at 18c. per unit for furnace ore, c.i.f., New York or other Atlantic port, and 18½c. at Gulf ports. Market slow and unsettled; hand-to-mouth buying.

Nitrate—Price is quoted at \$3.10 to \$3.25, carload lots, for immediate shipment in this country. Little change developed during the week, although considerable business was reported done after the removal of Government control of price, owing to drop in quotations. Practically all supplies are now being obtained from Government allotments to importers, only a small quantity reported being brought in from South America.

Iron Trade Review

New York—July 9

June sales of pig iron in the case of some furnaces equaled the total for several preceding months, and now in a limited way there is pig iron buying for delivery in 1920, including some malleable in the Central West, says *The Iron Age*. But many foundries have yet to cover for the fourth quarter of this year. Enough furnaces are going in to make the market uneven in their efforts to get backlog orders. Some cuts are heard of each week, but are generally reported as lapses which did not break the market.

Some Southern furnaces that were weak sellers are asking \$1 a ton more, the recent heavy bookings of their Northern competitors having turned some inquiry southward. Eastern Pennsylvania still reports concessions on foundry iron, and standard low-phosphorus iron is available at \$35. Less than the full price was asked on a round lot of basic wanted by a large northern Ohio steel foundry.

A British inquiry for 20,000 tons of basic iron gives a fair prospect of business. Sweden and Holland and other countries, which see little early chance of getting pig iron from Germany, are now inquiring here.

Pittsburgh—July 8

The improvement in the iron and steel market is so steady that it is quite uneventful, with no clouds on the business horizon. In no particular quarter is there any burst of buying enthusiasm, but orders for steel products are flowing in more and more freely, and mills are enabled to operate at higher rates from week to week, the present rate of steel-ingot production being nearly if not quite 70 per cent of capacity. Steel-ingot capacity increased by 40 per cent from 1914 to the present time, and steel-finishing capacity, except in plates, increased much less. The result is that some finishing departments are able to operate at close to capacity, even though the ingot-production rate is not over about 70 per cent.

By far the busiest branch of the finished-steel trade is the lap-weld departments of the pipe mills, which are running at capacity, some of them being booked up for practically the remainder of the year, almost entirely by reason of the heavy demand for oil-country goods. This phase of activity is reflected in the plate market, which is extremely dull, except for the demand for plates for oil tanks. The automobile trade continues to be a heavy buyer of all the steel products it uses, orders for sheets and cold-drawn steel being especially conspicuous. Dwelling-house construction is increasing throughout the country, and particularly in the Pittsburgh district, where trades disputes, except that with the painters, are settled, and contractors are in position to bid on the large volume of work that has been waiting. In bridge and fabricated steel work generally there is not much activity, although conditions in this respect are improving.

Steel prices are much firmer and price cutting is exceptional. It still occurs in plates, and though not absent from the sheet trade it is no longer conspicuous. In pipe and wire products there is not the semblance of shading, and there is little if any in bars.

Some of the independent pipe and wire mills seem to wish to advance prices, but they know that the Steel Corporation is opposed, and it is doubtful whether any advances will be attempted. It is asserted that the mill position in these lines is such that advances could easily be held, but the effect in the future would be problematical.

Tin-plate production has increased rather sharply, the industry now operating at near to capacity, but this burst in activity is attributed chiefly to demands of the fruit and vegetable crops in California, which prove much larger than anticipated, and all the tin plate for California must be got out by the

Engineering and Mining Journal

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Number 3

So Go Back to Your Meat And Enjoy it.

IN A RECENT issue of the *New York Tribune* there appeared an advertisement from which we take the following extract:

"The war is over; and all restrictions on meat are off. Now you may eat all you want with a free conscience—beef, lamb, veal—three times a day if you wish. You have done splendidly; you have helped win the war by denying yourself meat, as you have in dozens of other ways. But you needn't hold off any more; it's over 'over there' forever. Most of the boys are back at work; Army meat demands are no longer a strain. England and other European countries do not have to depend solely upon us any more. Ever since the beginning of the war, the American livestock raiser has been raising so much more livestock that there is plenty to go 'round. So, go back to your meat and enjoy it."

There is a naïveté about this that compels an irresistible chuckle. It is signed by a number of livestock associations. Evidently they expected the public to take the whole matter quite seriously and immediately to place heavy orders for tender, juicy cuts, thick tenderloins, and roasts like those of the good old days. Can't you imagine the cattleman standing, hat in hand, and waffing the good people to the butcher shops? What a fine belief he has in all humanity!

Bolshevism will never take a hold on this country while we have such confiding and honest people as our cattlemen. Evidently there is an overplus of meat, and instead of letting the law of supply and demand take its course, our friends ignore it and trust to a stampede to follow on their sweeping permission to eat more beef and lamb. Perhaps they have associated so long with lambs that they have a strong belief in the lamb-like qualities of the great American public.

The copper producers may well take lessons from this. They cut their prices sharply when copper became a drug upon the market and just as quickly they curtailed production. Why did they not issue a manifesto to the public along similar lines? Live and learn is the order of the day.

A Mexican Policy Essential

THOUGH no official announcements have come from Washington respecting any new policy as to our relations with Mexico, an atmosphere of expectancy hangs over the Capital. Rumors are rife to the effect that the President has had several conferences with the State Department respecting this subject since his return to Washington. His personal calls on Mr. Daniels and Mr. Baker have been interpreted as having to do with Mexican affairs.

It is suggested that President Wilson will address Congress regarding Mexico somewhat on the lines of the

McKinley message which led to intervention in Cuba. We scarcely anticipate that the Executive will take precisely this view, as conditions in Mexico do not closely parallel those that caused intervention in Cuba. Moreover, it will be recalled that during President McKinley's administration the voice of the jingo statesmen was heard above that of the saner, wiser advocates of intervention.

Appeals to the President and the State Department have for several years been strong and insistent, but they have not been tinged with any coloring of jingoism. Our citizens have asked for intervention of some kind because their brothers, though obeying the laws of the land, have been maltreated or murdered. Property has been confiscated through decrees or some form of taxation, and millions of dollars' worth has been rendered valueless because its owners have been forced to abandon it.

Bad as this story of governmental mismanagement and obliquity has been, it is not all—it is not the worst. Our citizens have made their personal wrongs and sufferings known to us from time to time, but the wrongs to thousands of Mexican citizens have been rather overlooked on this side of the line.

The small group controlling Mexican affairs for the last few years has been the cause of death and suffering among its own people to a far greater extent than among foreigners. Thousands of natives have felt the incompetency or dishonesty of the present government for every score of foreigners that have felt it. The money that foreigners have lost, and about which we hear much, is not to be compared with the internal losses in property and life. It is these poor people who call feebly but insistently for our help. Theirs is not a jingo call. They call for no war in their country, no revolution against any government. They ask only for succor in their rags.

Two months ago the writer sat in a dirt-floored house of two rooms with an octogenarian of the Diaz type. He was a man of affluence and influence during the Diaz regime and was well known to two of our own presidents. There was no complaint that thousands of head of cattle had been driven from his ranch, or wantonly slaughtered for their hides—no complaint that he had been driven from his home and was now living on a precarious charity; but tears came to his eyes as he told of the little children who were dying from starvation at the old hacienda, their fathers dead or forced to join some band of robbers as the only visible means of existence.

It was announced on July 11 at the Methodist Centenary Exposition in Columbus, by Dr. R. N. Bridge, that \$8,000,000 would be made available for the benefit of Latin America and Mexico and that the first call on this fund was for saving the lives of 1,500,000 orphans in Mexico. This is an admirable charity and one that should be supported, but of more importance

is the eradication of the cause that produced these orphans and will produce thousands more if our statesmen can find no way of improving the conditions south of the Rio Grande.

We want no war with Mexico. Our boys have seen all the war that they care to see; but most emphatically we do need peace and order in our neighbor's country. The work ahead of our Government is the work of statesmen, not of warriors. Unfortunately, negotiations cannot be taken up with statesmen. They must be initiated with politicians and bandits, and because of this fact our statesmen may require—probably will require—the moral and physical support of the military arm of our Government.

With the United States temporarily controlling the civil government of Mexico, its courts, customs, schools and national industries, and with order guaranteed, there would be a marvelously rapid return to prosperity. Mexico is capable of a prosperity that would amply and quickly pay all of its obligations. If the real patriots of Mexico are given an opportunity to assist themselves, this work will be done without the application of outside force, and, as with Cuba, our physical support will not be required for long.

England and France are anxiously looking forward to the day when the United States shall say that order must be restored. Some of the constituents of every American Congressman are asking it. Silently, but no less earnestly, millions of Mexicans are praying for it. May our statesmen soon see the way to do that which it is their duty to do, and to do it in a manner that will produce the least possible bad feeling.

Friction there will be, but it will be with the incompetent, the dishonest, the oppressors of their fellow men; and we trust that this friction may be so intense as to see the hands of the rapers of their country so deeply that they will never again touch political intrigues.

Serious Condition of the Gold-Mining Industry of South Africa

THE unfortunate situation in which many American gold mines have been placed through the fortunes of war has been a matter of serious consideration by the owners of mining properties, and the gravity of this condition has not been relieved by the report of the commission appointed to investigate the situation and suggest remedies.

Practically no relief was suggested, and the American gold miner is left to work out his own salvation. Perhaps even more serious is the condition in South Africa, where nearly all of the ore is of low grade and where the margin of profit was narrow even before the war. The output of the South African mines in 1918 was \$176,000,000, compared with the total world's production of approximately \$377,300,000. A material reduction in the Transvaal output means a curtailment in the world's production, and if some remedial steps are not taken soon the output for 1919 will be seriously curtailed. The *New York Times* of July 5 quotes F. S. Malan, Acting Prime Minister, as reporting that on the Central Rand six mines out of sixteen were worked at a loss for three months ended February, 1919. Mr. Malan states:

"These six employ 2,271 Europeans, and the short-
age amounted to \$140,000, while the expenditure in wages and stores amounted to \$12,387,940 for the last year. Out of thirteen mines in the Near East Rand,

five had losses in the three months amounting to \$145,000. They employ 2,518 Europeans, and last year they expended \$13,953,520. Of nine mines on the West Rand, five worked at a loss which aggregated \$153,700. The profit of the other four was \$172,775, leaving a credit balance of \$6,175, which, of course, is insufficient to meet capital expenditure, interest on debentures, taxation, and other charges. The unprofitable five employ 1,156 Europeans, and they expended in wages and stores last year \$6,976,810.

"The grand totals show that forty-six mines on the Witwatersrand employ 22,035 Europeans. Thirty mines made profits aggregating \$8,173,775; sixteen showed deficits amounting to \$438,540 during three months, and the total expenditure on stores last year was over \$125,000,000. Of course the figure of working profit is not all distributable, as out of it has to come interest on debentures, loans, capital expenditure, government taxation, and to a certain extent miners' phthisis contributions. The eight richest mines, which are on the Far East Rand, show a working profit for the three months of \$5,905,240."

Sir Evelyn Waller, President of the Transvaal Chamber of Mines, in a letter to the Acting Prime Minister, complains of the failure of the government to take action to avert the impending crisis, despite repeated urgings and warnings. Even a request to recruit an experimental number of native laborers from north of latitude 22 degrees south—that is, in tropical Africa—with a view to offsetting in a measure the great shortage of labor resulting from the war, has not been acted upon, and Sir Evelyn says:

"The position foreshadowed by the chamber so many times is now at hand. So far as we can see, nothing can now prevent a number of important mines, employing a large number of Europeans and upon whose operations the prosperity of a considerable section of the Witwatersrand depends, from ceasing operations in the next few months."

Mr. Malan continues: "The menace of the grave problem which the unemployment and distress that this shutting down would involve moved the government in replying, through the Secretary of Mines and Industries, to urge, should the closing down become unavoidable, that this be done with the maximum possible interval between the dates selected for this action by the different mines. The government also considers that the appointment of a small commission to report on the reasons and necessity for the closing down of each mine before the date of cessation of operations would have a valuable effect and would tend to keep public opinion informed as to the causes which are operating in connection with the industry. Such a commission should, in the opinion of the government, be composed of a government representative and one or more representatives of the chamber and of the workers."

Hurley a Loss to the Mining Industry

WHEN E. N. Hurley quit the position as head of the Shipping Board, the mining industry of the western hemisphere lost one of its best friends. Such energy in construction work has seldom been exhibited as Mr. Hurley has shown in the building of an American merchant fleet. With many vessels built and the war over, he promptly concluded that the ships could be usefully employed in plying between North and South America, and it was expected that the same energy

would be exhibited in establishing trade routes, to such advantage to Latin America and ourselves that European ship-owners could not break in. South America has mines, and we need her minerals. North America builds the best mining machinery that is manufactured, and we need an energetic agent to bring about an exchange of these commodities.

Let us hope that Mr. Hurley's successor has the same energy and vision, and that ample opportunity will be offered the South and Central American producer to send his ore and metals to this country, and to receive from us the goods and machinery that he requires.

Protecting American Rights In Mexico

EARLY in the present year there was formed in New York a national association with the object of securing through the United States Government that protection in Mexico to which all American citizens and their property are entitled. The method of procedure which the executive committee of this association adopted cannot be criticised. Though it is quite natural that regret is expressed because little has been done toward bringing order out of chaos, the efforts of the organization are being directed toward securing authentic information respecting Mexican conditions and in placing this information before our Government officials and the public.

Most Americans have but scant appreciation of Mexico and present conditions in that republic. So little do they know, that there is no evidence of interest in or a desire to acquire more information. A general impression prevails that Americans who have gone to Mexico are adventurers and ne'er-do-wells who have left their native land to cast their lots in a country of precarious opportunities, and that, having done so, they have stepped beyond the pale of American protection. It is with the idea of educating the American public to the fact that this is not the case that the association mentioned has started its campaign of publicity; but beyond this, and of even greater importance, is its publication of the conditions under which the Mexican people are living today.

We have recognized as a duly-elected government a president and his supporters who have wrecked the industries of the country, increased taxation, reduced the number of schools, and continue to pile up the obligations of the country under a dictatorship of incapacity, if not dishonesty.

The first bulletin of the association was issued on July 1, and we cannot read it without feeling the keenest sympathy for those who are patiently waiting for better things, or dying of starvation, crushed under the heel of the latest liberator.

Our Bill Was Thirty Billions

LAST week Secretary Glass made public the latest calculation of our share of the war's expenses—a little over thirty billions of dollars. This is a staggering amount when thought of in dollars alone; yet it is not so colossal when we remember that nearly 30 per cent has already been met by taxes. Or shall we say that it is a colossal sum, and that our resources for meeting the obligation are colossal also?

As large as these figures are, they pale into insignif-

icance when compared with the costs that have been laid upon our Allies. Their burdens have been not only in money but in property and lives that cannot be brought back. The resources of our friends will probably enable them to pay their bills in the course of time, but it will be generations before the destruction of life and property will cease to be felt.

We can congratulate ourselves that our bill was only 300,000 casualties and thirty billions of dollars, a third of which sum was loaned to our Allies. And when it comes time to collect interest on this loan, and time to pay back the principal, let us remember that the money was spent for us every bit as much as for ourselves; that Frenchmen, British, Italians, and Belgians were dying for us while using the ammunition that our money bought. They were fighting our battles; they were saving our lives and our Republic.

The suggestion has been made that the United States cancel its European loans made on account of the war. The suggestion is not fantastic, and it would not be altogether bad business. We owe a moral obligation to our Allies, an obligation that we will recognize less and less as the years pass by. We cannot cancel this obligation with money, but we can alleviate the sufferings of those who have borne the brunt of the strife if we do not exact the last pound of flesh.

The Never-Ending Circle

THE British government has again raised the price of coal to the consumer, this time only six shillings per ton. The increase is to meet the higher cost of wages and the reduction in working hours. This is perhaps one of the most severe blows that labor has given itself for some time. It is surely a boomerang that will be felt most seriously by those employed in the manufacturing and export industries.

Great Britain has little water power. Her industries have been built upon her coal mines, and unless every manufacturing and shipping nation experiences a like increase in the cost of fuel, England places a handicap upon her business that no adjustment at home can meet. But if every nation should do the same, it would be equivalent to marking up the price of every product that labor consumes, and labor would gain nothing but the illusory pleasure of having more money pass through its hands in a given time.

Some day, some time—it may be far away, but it will come—labor will learn that in normal times there is only one way of raising the standard of living, but one way of increasing the pleasures of life, and that is by harder work, more efficient labor; by increased production per unit of labor.

Australia Seizes Coal

ENGLAND is not alone in her troubles with the coal miners and the production of coal. The Prime Minister of Australia has taken over the output of that commonwealth. It is the intention of the government to fix wages and the conditions of labor, as well as the price of coal. If this results in lowering production and increasing the price of fuel, as has been the case in England, the government will find that it has "fixed" some industries depending upon cheap fuel to an extent that will enable them to do without fuel or labor. It is to be hoped that the Prime Minister and the miners will both see the light before it is too late.



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Silver Volatilization in Smelting*

It Is Necessary To Distinguish Between Volatilization and Dusting—Mechanical Loss Due to Ebullition Has Nothing To Do With the Vapor Pressure Or True Volatilization

By **FREDERIC P. DEWEY**
Assayer, Bureau of the Mint, Washington, D. C.

MUCH has been written about the Parkes process for desilverizing base bullion with zinc. It is invariably stated that little silver goes over with the zinc in distilling the crusts, or that there is practically no loss of silver in this operation. Diligent search and inquiry failed, however, to disclose more than a single actual determination of silver in the distilled zinc, in one of Raymond's¹ reports. This gives a portion of 0.00012%, or 0.035 oz. per ton, a small proportion.

Johnston² presents a most interesting and valuable review regarding vapor pressure and volatility of high-boiling-point metals, containing much information and many useful references. He gives the boiling point of zinc as 920° and the vapor pressure of silver as 10⁻³ mm. at this temperature; the boiling point of lead as 1640° and the vapor pressure as 1 mm. at 960°, and the boiling point of silver as 2090°.

Groves and Turner³ heated gram samples of an alloy of silver and zinc containing 50.46% silver in a vacuum, with the results shown in Table I. In the last test of the

TABLE I. RESULTS OF HEATING SILVER AND ZINC ALLOYS IN A VACUUM

Temperature, Degrees	Time, Min.	Weight, Gram.	Residue Silver, Per Cent	Zinc, Per Cent
500	45	0.7382	65.86	34.14
500	120	0.7350	68.46	31.54
600	120	0.6052	83.28	16.72
700	120	0.5104	98.68	1.32
1000	30	0.4924	99.33	0.67

series, 99.33% of the zinc volatilized and should have shown 3.13% silver, 912.75 oz. per ton. They also heated a gram of silver-lead alloy, containing 49.60% silver, in a vacuum for two hours at 1000°, and obtained a volatilization of 99.4% of the lead and 8.31% of the silver. The sublimate should have shown 7.61% silver, or 2226 oz. per ton.

Friedrich⁴ distilled zincs containing 0.01 to 1% silver at 1165° to 1392° for varying periods of time, the tests being accompanied by checks of pure silver. The actual losses varied from 2.5 to 8.2% of the silver. The net losses, which he regarded as largely mechanical, were from 0.4 to 5.8%. Five checks weighing from 2.5 to 260.45 mg. lost from 2 to 3.4% on heating at 1165° for 30 minutes.

Blakemore⁵ gives the following assays of blue powder obtained in distilling crusts carrying 1000 to 2000 oz. silver and several hundred ounces gold per ton—so-called "gold crusts": Silver, 1.18, 6.89, and 20.12 oz.; 2.18, 7.32, and 20.78 oz., and 5.47, 15.32, and 332.21 oz. per ton. He suggests that the high result was caused by bullion getting into the condenser, but Sulman⁶ states that melted zinc in the presence of oxygen gives "solid par-

ticles" "capable of carrying off finely divided gold," so that the highest result may have been caused by a leaky retort. Excepting the case of the high silver, the gold varied from a trace in three cases up to 2.74 oz. per ton, with 20.78 oz. silver. With the wealth of data in this paper, it is curious that no assays of the distilled zinc are given.

At Lautenthal⁷, in the oxidation of the zinc by steam, the flue dust showed—ZnO, 69.6%; PbO, 28.2%; Ag, 8.8 oz. per ton. In an experimental distillation of cyanide precipitate, Clevenger⁸ found 7.2 oz. silver and 0.8 oz. gold per ton. Rose⁹ reviews the loss of gold and silver in the volatilization of zinc and adds some tests. H. H. Alexander, superintendent Maurer plant, A. S. & R. Co., kindly supplied seven miscellaneous samples of Parkes zinc, which yielded me the results given in Table II.

TABLE II. ASSAY OF MISCELLANEOUS SAMPLES OF PARKES ZINC

No.	Silver, Oz. per Ton	Gold, Oz. per Ton
1	28 0	0 14
2	33 0	0 17
3	41 0	0 20
4	75 5	0 41
5	77 0	0 29
6	325 0	1 25
7	604 5	2 91

The results shown in Table II are entirely contrary to the book statements. They also indicate wide diversity of conditions in the distilling. It has been suggested that the high results might be due to the use of old retorts for condensers, but only iron condensers were used. Mr. Alexander has reported three inventory assays, which show similar results as follows:

No.	Silver, Oz. per Ton	Gold, Oz. per Ton
1	69	0.26
2	158	1.56
3	325	1.33

Mr. Alexander also sent me two sets of four samples taken during the course of two distillations, which gave the results shown in Table III. E. B. Braden, general

TABLE III. ASSAY OF DISTILLATION SAMPLES OF ZINC

No.	First Set		Second Set	
	Silver, Oz. per Ton	Gold, Oz. per Ton	Silver, Oz. per Ton	Gold, Oz. per Ton
1	22.5	0.12	13.0	0.05
2	10.6	0.03	6.1	0.05+
3	2.5	tr	2.1	tr
4	3.0	0.02-	1.5	tr

manager of the Selby plant of the American Smelters' Security Co., kindly supplied a set of three time samples which showed:

No.	Silver, Oz. per Ton	Gold, Oz. per Ton
1	4.8	0.13
2	1.9	0.07
3	1.5	0.01

These time sets show that it is possible to distill the zinc out of the crusts so that it carries only slight amounts of silver, but the miscellaneous samples show that proper care is not always exercised and much silver

*Schnabel's Metallurgy," Translation by H. Louis, Vol. 1: p. 552.

²Trans. Inst. M. E., Vol. XXXIV, 1902: p. 912.

³Trans. Inst. M. E., Vol. XIV, 1904-05: p. 392.

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¹Mineral Resources of the United States for 1873": p. 482.

²Jr. Ind. Eng. Chem., Vol. IX, Sept. 1, 1917: p. 873.

³Tr. Chem. Soc., Cl., 1912: p. 585.

⁴Metalurgia, Vol. V, 1908: p. 594.

⁵Trans. Aust. Inst. M. E., 1898: p. 221.

⁶Trans. Inst. M. E., Vol. XIV, 1904-05: p. 431. See also Sulman and Peed, Jr., Soc. Chem. Ind., Vol. XVI, 1897: pp. 966-7.

may be carried along with the zinc. This is undoubtedly mechanical and has no connection with volatilization. It is caused by excessive ebullition of the zinc in the retort, due to allowing the temperature to rise too high.

In all, I have made eighteen assays of Parkes zinc, and Mr. Alexander has furnished three giving the following silver results, the gold figures being too small to count:

Time Samples,		Miscellaneous		Miscellaneous	
Oz. per Ton	Samples,	Oz. per Ton	Samples,	Oz. per Ton	Samples,
1.3	4.3	28	138		
1.5	6.1	33	325		
1.9	10.6	41	325		
2.1	13.0	69	604.5		
2.5	22.5	75.5	...		
3.0	...	77	...		

Friedrich¹⁹ reviewed and investigated methods of determining silver in zinc and gave determinations on thirty-one samples of a wide variety of zincs. Two did not show surely detectable silver, two showed 0.00002% silver on 1-kg. samples, seventeen showed less than 0.001%, six showed 0.001 to 0.002% and four showed from 0.00221 to 0.00648%. The most satisfactory way I have found for determining the silver in zinc is to dissolve the zinc in sulphuric acid, filter, scorchify the residue and cupel. Many tests on the filtrate failed to show silver on nearly neutralizing the acid and adding a limited amount of sulphureted hydrogen water. Under these conditions some sulphide of zinc will be separated as a perfectly white precipitate, which may be tinged yellow when cadmium is present.

The Alexander crusts run fairly uniformly from 4800 to 5500 oz. doré per ton. The Selby crusts are approximately 5000 oz. per ton, about 50 fine in gold.

I have also determined the lead in the time samples and have figured the parts of lead per part of silver going over with the zinc and have given the results in Table IV.

TABLE IV. PARTS OF LEAD PER UNIT OF SILVER IN ZINC SAMPLES

No.	Alexander				Selby	
	First Set		Second Set		Lead Parts per One	
	Per Cent.	Part Silver	Per Cent.	Part Silver	Per Cent.	Part Silver
1	0.89	11.6	0.96	21.6	0.88	53.5
2	0.88	24.3	0.75	51.2	0.90	138.0
3	0.88	102.8	0.95	130.3	1.24	278.0
4	1.51	147.0	1.30	253.9	.....	.....

These results show most emphatically that lead does not promote volatilization of the silver. On the contrary, they demonstrate that the lead protects the silver from the drag of the volatilizing zinc. In distilling zinc out of Parkes crust there appears a complex result, the details of which should be sharply defined. There is, first of all, the straight volatilization of the metals due to vapor pressure. There is the drag of the volatilizing zinc upon the other metals. There is the purely mechanical loss due to excessive ebullition of the charge, and this has nothing to do with the vapor pressure or true volatilization. The drag of the volatilizing zinc must decrease as its proportion decreases and the proportion of silver increases, but this might be overbalanced by the greater vapor pressure arising from an undue increase of temperature. Also, the increase in the proportion of lead in the bath must oppose the drag of the volatilizing zinc. Thus it happens that in the early stages of a properly conducted distillation the zinc carries more silver than at the end.

At various times during the lead determinations the

solutions showed the color of iron and No. 3 of the first time set from Mr. Alexander showed 0.4%. In his second set only qualitative tests were made. Iron appeared in every sample, but in widely varying amounts. In the Selby set I found: No. 1, iron 0.55%; No. 2, iron 1.10%; No. 3, iron 0.70%.

The conditions in distilling zinc from ores are markedly different from the crust conditions, particularly in that there is no bath of lead to hold the silver back and there may be dusting. K. Stock, general manager, Earlesville Zinc Co., has kindly supplied a set of samples made in a test to "produce spelter of the new Government regulations for A-grade out of crude spelter produced from Butte and Callahan ores." The ores were supposed to carry about 20 oz. silver per ton and to require about 2½ tons to produce a ton of spelter. In samples representing the first, second, and third draw spelter from straight Butte ore I found the following:

No.	Silver, Oz. per Ton	Lead, Per Cent.	Parts per One Silver
1	0.164	1.0	1778
2	0.583	1.3	750.5
3	1.178	2.25	557

Though there is an increase in both silver and lead in these samples, the amounts of silver shown are small, and the increases are not proportional. The increase may have been owing to increase in temperature during the distilling. In any event, these figures show that the carrying capacity of the lead for silver must have been low.

Starting with zinc as low in silver as these results indicate, it could not be expected that the redistilled metal would yield definite results. From 101½ gm. of R-1, I obtained 0.21 mg. of silver; from 70½ gm. of R-2, the silver bead was not visible to the naked eye; from 75½ gm. of R-6 the bead was just about visible. I did not test any of the other R's for silver. The lead results were: R-1—lead, 0.25%; R-2—lead, 0.08%; R-3—lead, 0.07%; R-4—lead, 0.10%; R-5—lead, 0.07%; R-6—lead, 0.07%. The first sample showed the most lead, and by qualitative tests it showed the most cadmium, as would be expected. I am much indebted to W. R. Ingalls for assistance during the course of this investigation.

Many of the statements of volatilization losses in smelting include the loss by dusting. The necessity of distinguishing between true volatilization and dusting is well shown by a month's record of the commercial cupels at the Balbach S. & R. works (equipped with a Cottrell condenser), as kindly given me by Mr. Dieffenbach. The dust collected showed only 40% of lead, proving that it contained much mechanical dust. This was due to the fact that over 70 tons of rich slimes were treated on the lead bath. The dust collected showed 0.64% of the silver charged and 0.072% of the gold. With so much mechanical dusting of rich stuff, the amount of silver and gold actually volatilized must have been extremely small.

Eilers²⁰ exhaustive paper on the baghouse in lead smelting furnishes some pertinent illustrations. The Murray, Utah, plant smelts the ordinary run of silver-lead ores of the West. The charge runs low in both lead (10-12%) and silver. In smelting 254,794 tons, there was collected 0.44%, or 1124 tons of fume, showing only 0.0149 oz. gold and 2.62 oz. silver per ton, or 0.097% gold and 0.085% silver charged. Though it carried only 28.42% lead, or 3160 parts to 1 part silver,

¹⁹Zeit. f. Angew. Chem., Vol. XVII, 1904: p. 1636-44.

²⁰Trans. A. I. M. E., Vol. XLIV, 1913: p. 708-35.

it also carried 36.6% arsenic, or 48.3% arsenious oxide. It showed only 2.9% silica, and may be considered as essentially volatilized material. In 4.5 years' run the fume carried 0.049% of the gold charged and 0.063% of the silver. It showed 4401 parts of lead to 1 part of silver.

The blast furnaces at Omaha, Neb., treat various plant products, with some ore. The charge is high in lead, often 40%, and rather low in precious metals. In one year, 74,112 tons yielded 580 tons of fume, carrying 1615 oz. silver, or 2.78 oz. per ton. It showed 230 tons lead, or 4154 parts to 1 part silver.

A complete illustration of volatilization in smelting operations under oxidizing conditions is afforded by the record of the converter baghouse at Omaha. These converters bessemerize leady copper matte, about 90 oz. silver per ton, with various byproducts and ores, to blister copper. The fumes pass through about 1200 ft. of flues to a fan and thence to the bags. Six samples were taken from this flue, generally at 200-ft. intervals, and one sample was taken from the baghouse. The analyses show that, certainly after the first 400 ft., the fume consisted essentially of volatilized material in the form of sulphates and oxides. If both the lead and the combined SO_2 are calculated to lead sulphate, the interesting comparison in Table V is obtained. At first there were other sulphates besides lead, but at the end there was an excess of lead oxide.

TABLE V. DISTRIBUTION OF LEAD SULPHATE IN FLUE

Lead		SO_2		Sulphate of Lead		Lead		SO_2	
Feet	Per Cent.	Equivalent, Per Cent.	Feet	Equivalent, Per Cent.	Feet	Equivalent, Per Cent.	Equivalent, Per Cent.	Feet	Per Cent.
200	81.96	95.18	800	94.55	85.60				
400	87.82	87.60	1100	92.21	88.36				
600	93.97	86.43	1200	94.26	78.02				
			Bags	96.60	81.92				

That the volatilizing lead exerted little or no drag upon the associated silver is manifest from the following table showing the parts of lead per one part of silver:

Distance, Feet	Parts Lead	Distance, Feet	Parts Lead
200	3889	800	9421
400	5833	1100	8750
600	7892	1200	11739
		Bags	6875

During one year 1551 tons of fume carried 5559.44 oz. silver, or 3.58 oz. per ton. It also carried 1325.387 tons lead, or 85.45%, which would be 6953 parts per 1 part silver. It is essentially an oxide fume, practically free from sulphates.

Fulton¹² gives an analysis of fume showing 40.57% oxide of zinc and 6.7 oz. silver per ton and one with 34.34% arsenious oxide and 5.07 oz. silver per ton. Roesing¹³ bessemerized base bullion with 12.4 oz. silver per ton, bringing it up to 196.3 oz. per ton. The fume showed 75% lead and 2.5 oz. silver per ton. The litharge was over 1200° and very fluid. It showed 1.05 oz. silver per ton.

These results confirm my Parkes process figures regarding the slight effect of volatilizing zinc and lead in promoting the co-volatilization of silver. As far as they go, they also indicate that even arsenic has little effect. The effect of arsenic is, however, largely dependent upon the temperature of the operation. I have roasted many charges of rich arsenide ores from Cobalt, Canada, at a very low temperature for the purpose of converting as much as possible of the arsenic into metallic arsenates.

With about 40% arsenic and several hundred ounces silver per ton, a little more than half the arsenic remains in the roast. From the furnace to just beyond the fan five samples of the arsenious oxide showed 3.62, 6.18, 6.89, 6.9, and 7.4 oz. silver per ton. Further along, at and in the bag, the arsenious oxide was very white and uncontaminated with dust. Three samples showed 1.69, 2.00, and 2.04 oz. silver per ton. A ton of arsenious oxide represents approximately 6.5 tons of ore.

Wright¹⁴ obtained a base silver, about 800 fine, containing much arsenic, from these ores. On bessemerizing and refining this bullion the impure arsenious oxide produced showed about 800 oz. silver per ton.

Hand Sorting in Idaho

According to a report on mining districts of Idaho recently issued by the Bureau of Mines, hand sorting is practiced to a more or less extent at many of the mines and mills. Where hand sorting is employed and the mill is some distance from the mine, the sorting is usually done at the mine, although at a few places the ore is sorted at the mine and also at the mill. At some of the mills, when the ore is rather coarsely disseminated, both mineral and waste rock are sorted. The quantity of shipping ore thus sorted out, which is known as "crude ore" or "high grade," varies from a few per cent to as high as 60 per cent of the total tonnage of concentrates shipped.

The usual method of procedure in hand sorting is as follows: The oversize passes from the grizzly onto a wide conveyor belt, where the ore is washed with a spray of water, so that the sorters can distinguish the mineral from the waste rock more readily. Men stationed on each side of the conveyor belt sort from the washed material either the mineral or the waste rock and drop it into shoots leading to the respective bins.

A paper on hand sorting of mill feed was presented by R. S. Handy, mill superintendent of the Bunker Hill & Sullivan Co., Kellogg, Idaho, at the meeting of the Columbia Section of the American Institute of Mining and Metallurgical Engineers, held at Kellogg, on Nov. 17, 1917. This paper was most interesting and instructive, as was the discussion that followed. Mr. Handy claimed that hand sorting of the mill feed is not necessary, and that it is cheaper, in fact, to treat the mill feed direct, without previous hand sorting. There seems to be no question that Mr. Handy, who has made careful study of the treatment of the Bunker Hill ore, is correct in assuming that for this particular ore and under the conditions in the mill it is best to treat the mill feed direct without hand sorting. Whether, under different conditions, hand sorting is essential or not should be determined for each individual ore.

Screen Sizing at Anaconda is done entirely in the coarse-crushing and concentrating division of the copper concentrator at the Washoe Reduction Works, primarily to secure a product of the required size, with a minimum amount of slime and with as much as possible of the valuable mineral liberated for recovery by gravity concentration. At the zinc concentrator no gravity concentration methods are in use. The screening, however, is conducted as at the copper plant, producing a 1½ to 2 mm. feed for the ball mills. The screens used are revolving trommels 3 by 6 ft. with 1 in., ¾ in. and 4 mm. round holes and 1½ by 12 mm. slotted holes. All screens are steel. No screens finer than 1½ by 12 mm. are used.

¹²Bureau of Mines, Bull. 84, 1915; p. 33.

¹³Eng. and Min. Journ., Vol. LIII, 1892, p. 431. E. U. H. Z. LI, 1892, 102.

¹⁴Eng. and Min. Journ., Vol. CVII, p. 263, from Trans. Can. Min. Inst., 1918; p. 992.

Placer Mining in Oregon

Hydraulic Elevators Which Have a Lift of 89 Feet Will Be Replaced by a Water Classifier That Requires Driving a 700-Foot Tunnel—Operating Costs Will Be Reduced

By A. E. KELLOGG
Gold Hill, Oregon

THE original "old channel," or bed of the ancient river, the dream of which has caused many a weary Oregon prospector to renew the search, has recently been uncovered at the Esterly mine, situated in the Waldo district, in the southwest part of Josephine County. A pit 25 ft. below the level of the former workings has been piped, and operations have opened up a bed of gravel that shows a different character from the clay banks which have proved so profitable during the last fifty years of active operation of the mine. The extent of the new deposit has not yet been determined, as no exploration has been done at this

The Esterly property, combining the old Logan, Simmons and Cameron placers, has been a profitable producer for more than fifty years. It now consists of 4200 acres, practically all of which is payable ground. The water rights attached to the property consist of a flow of 14,000 miners' inches, water being supplied by a system of ditches that total twenty-five miles in length. The property was purchased for \$140,000 in 1916, from James Logan, who successfully operated it for many years, by the Waldo Corporation, of Seattle, Wash., George M. Esterly is manager and superintendent. According to mint shipments, the annual output of the



ESTERLY PLACER MINE, JOSEPHINE COUNTY, OREGON
Showing pit, hydraulic giant in operation, elevators, and tailing flumes

particular place, although many prospect shafts were sunk during a preliminary investigation. No clean-up has yet been made on which it is possible to base an estimate of the gold contained in the ground, but sufficient panning has been done to demonstrate the presence of much coarse gold. Heretofore the gold secured from the ground covering this deposit has been fine, and flour gold was found to be evenly distributed through the clay banks, which range from 15 to 35 ft. in depth. These deposits, according to Kay,¹ have averaged about 12½ c. in gold per cu. yd., and contain some platinum.

mine for the last three years has averaged \$45,000 in gold dust and \$10,000 in platinum.

HYDRAULIC ELEVATORS TO BE REPLACED BY WATER CLASSIFIERS

A hydraulic elevator system has been erected to provide sufficient grade for the disposal of tailings, which are lifted by two elevators a distance of 73 ft. A recent erection of a third elevator has increased the lift to 89 ft. above the pit opened up on the new deposit. All standard placer gold-saving devices are in use, although owing to the flour-fineness of the gold, a considerable amount is lost in the tailing. Mr. Esterly is

¹"Oregon Bureau of Mines 1916 Handbook," p. 143.

planning the construction this season of a "water classifier," his own invention, which he is confident will recover 90% of the mineral values. He also purposes to do away with the elevator system by building a race to the Illinois River. This plan will require a 700-ft. tunnel through serpentine, which will cost between \$40,000 and \$50,000. The new system of operating, when completed will release for actual mining a volume of water several times that which is now being used to mine a daily output of 1000 cu.yd. at a cost of about 6c. per yard, and will reduce the cost of mining to ½c. per yard. The lighting equipment for night operation consists of a battery of nine 2000-c.p. searchlights and many 1000-c.p. tower lights.

The Waldo district is about twenty-five miles long in an east and west direction and fifteen miles wide. It is a region of rugged mountains, except on the western border, where the Illinois River valley is rather flat. The valley, an excellent agricultural land, varies in elevation from 1400 ft. to 1700 ft., and the mountains are from 4000 ft. to 6000 ft. in height. The area is heavily timbered, especially at the higher elevations, and forms a part of the Siskiyou National Forest Reserve. The nearest shipping point is Grants Pass, about forty miles distant, although a fourteen-mile branch railway now extends toward the district from Grants Pass.

GEOLOGY OF THE WALDO DISTRICT

The rocks of the district are chiefly sedimentary, including argillites, quartzites, and limestone, and dark-colored sub-siliceous igneous rocks, including andesite, serpentine, auganite, and pyroxenite. Smaller areas of other rocks are known, such as Cretaceous gravels and sands. The oldest rocks are the Paleozoic argillites and limestones, which occupy much of the mountainous part, not only that drained westward to the Illinois River, but also that drained eastward to the Applegate River. In general, these rocks strike northeast and dip steeply eastward. They are interbedded with andesite greenstone in many places, and are overturned so that the oldest beds of the series are on the eastern border lying above the younger beds to the westward. The entire Paleozoic series lies above the still younger Galice formation of the Jurassic period near Waldo and Kirby.

According to Diller,² the overlying position of the Paleozoic rocks is due to faulting in this locality. Andesite and basic igneous rocks largely altered to serpentine are associated with the argillites of the Galice formation. Near Waldo there is still a small area of Cretaceous gravels and conglomerate, which has served as a source of placer gold. This lies unconformably above the Jurassic argillites. The latter are steeply inclined to the east, whereas the Cretaceous gravels are nearly flat. On the basis of fossils, these have been referred to the Horsetown formation of the Lower Cretaceous or Comanchean. It is probably that these gravels were formerly much more widespread in this region than they are at present.

The youngest rocks in the Waldo district are the alluvial gravels, which are still being formed by existing streams. In the mountainous part of the district they are confined to narrow strips along the water-courses, but in the Illinois River valley, near the Estero mine, they are more extensive.

The mineral resources of the district include copper,

gold, silver, chromium, platinum, manganese, and Eme-stone. Gold and silver deposits occur both as placer and metalliferous quartz veins. The placer deposits have been worked successfully for more than sixty years and are still far from exhausted. During the war considerable copper and chrome were shipped from the district.

Packing Goods for Shipment To South America

Insufficient and insecure packing of goods which are shipped to South America by American manufacturers has been the subject of frequent criticism. Shipments of machinery are often too lightly packed, the shipping cases or crates are smashed in transit, and considerable damage is inevitable. All machinery consigned to South American countries should be heavily boxed. Small pieces should not be tied to larger pieces in the same crate, but should be securely boxed and shipped separately. All shippers should assume that their packing cases and crates will receive rough usage in transit in South American countries, and such cases should be designed accordingly. An American consular agent in South America, in writing to the Guaranty Trust Co. of New York, calls particular attention to this fault of American shippers.

Vulcan Steel Products Co. Awarded Huge Contract Abroad

A contract involving a quarter billion dollars for rebuilding the devastated area in the Nancy district of France has been signed by the Vulcan Steel Products Co., of New York. Associated with the Vulcan company in the enterprise are two large contracting concerns, the McClintic-Marshall Construction Co. and MacArthur Brothers Co. Negotiations have been in progress ever since the signing of the armistice between Rodney D. Chipp, general manager of the Vulcan company, and the Committee of Nancy. The \$250,000,000 figure appears in the contract, but it is estimated that before the work is completed half a billion dollars will have been spent. The contract was signed some time ago, but actual work has awaited the peace treaty. One of the largest stockholders, who is also a director, in the Vulcan Steel Products Co. is T. Coleman du Pont.

Manganese Ore in India

At a recent meeting of manganese-mining companies, according to the *Journal of the Society of Chemical Industry*, of May 15, 1919, the position of manganese ore in India was described by Sir Thomas Birkett. During the last year the mining industry experienced all the disadvantages arising out of war conditions, and consequently production was considerably restricted. New ore formations have been found at the principal mines, but the cost of working has risen considerably, owing to increased wages.

India has now to be prepared for a serious contingency. The Caucasus mines will again reopen, and there are other mines in Egypt and Africa which threaten formidable competition. Egyptian and African deposits are more favorably situated than those in India for putting manganese ore on the European market, and unless the government helps the industry by various concessions in regard to transport, it has a gloomy future.

²"Oregon Bureau of Mines 1916 Handbook," p. 291.

Ancient Tin Mining in South Africa*

Mines Are in Waterberg District, About Forty Miles West of the Pretoria-Pietersburg Railway
—The Ore, Cassiterite, Occurs in Well-Defined Lodes
In Quartzite and Sandstone

WHERE in the course of their prospecting the ancients came upon rich ore, they followed it down until beaten by water or the rock became too hard to treat. Where ore occurred in pockets, flats, or pipes it was followed and taken out with a cleanness which is truly astonishing. Generally speaking, the ancients mined so thoroughly, and left so little behind them, that in one instance the occurrence of ore left in place is very interesting. The old miners must have been disturbed and left suddenly—either a raid occurred or the entrance may have fallen in—otherwise they would not have abandoned such a large number of stone hammers, nor would they have left the working unfilled and a face of good ore for their modern successors, who have taken from the deposit approximately seventy tons of ore containing 7 per cent metallic tin.

ANCIENT METHODS OF BREAKING GROUND

The ore was broken or chipped away with hammer and gad. The gads were of steel, roughly rectangular in section $1\frac{1}{2}$ by $\frac{3}{4}$ in. and 12 in. to 18 in. over all, made in one continuous taper from the head to a fine point. The metal was of extremely fine quality, being a mild steel of exceptional purity, equal in quality to the best Swedish iron. The following is an analysis: Silicon, 0.17; sulphur, 0.01; phosphorus, trace; manganese, nil; combined carbon, 0.35 per cent.

The hammers employed by the primitive miners were of stone and roughly spherical in shape, in diameter from 3 to 5 in., and weighing between 3 and 6 lb. They are the hard unweathered round lumps which remain as a result of the spheroidal weathering of diabase. The majority of the hammers probably came from the farm Overwacht [in South Africa] where a diabase dike outcrops. A few of the hammers are of hard felsite, of which many small dikes traverse the area under discussion. The hammers appear to have been held in the hand, and no handle was used. Many hammers have had a deep concentric groove cut round a mid-circumference, due to the constant tapping on the head of the gad. That fairly effective work could be done with a stone hammer was shown by a hammer boy at Rooiberg, who collared and drilled, with a set of modern steel drills and a handleless stone hammer, a hole 36 in. deep in ground in which over the same drilling period, but using a 4-lb. hammer, he could put in a 54-in. hole.

Where the ground was too hard to break with hammer and gad, the method of fire-setting was employed, a process which was used as recently as forty years ago in Norway. On the "H" lode at Rooiberg a pile of wood ready for fire-setting was found in the face of a flat, elongated, old working. The wood was about 4 ft. long and 4 in. to 5 in. in diameter, stacked near the face in a roughly conical pile. It had been such a length of time in the air-tight working that when touched it crumbled to an impalpable powder. In addition to the small hammers, occasionally very large hammers or mullers were

discovered. These were used either to break up large lumps, the result of fire-setting, or to grind to a powder the broken ore before transport to the surface. One such stone was quite smooth, roughly oval in shape, and measured 9 in. in diameter at a mid-section, 14 in. across its longest axis and weighed 70 lb. It was found lying in one of several artificial dish-shaped depressions which covered the floor of a horizontal pocket, where grinding had evidently been done underground.

Most of the ancient workings were filled in before being abandoned. This is also a Rhodesian experience, and the reason for doing so is hard to conceive, but probably it was a superstitious or religious one. The other explanation advanced by some, that the filling-up was to hide the existence of a mine, seems to the writer out of court in an area like Rooiberg, where the small mines were as thick as diggers' claims on the river diggings: more particularly as no working was filled up until (except in a few cases) it had been scraped bare of all payable ore. Particularly at Leeuwpoot have the workings been most carefully filled in with a mixture of rubble, broken waste and surface soil. The remarkable feature at Leeuwpoot is that the ancients have left no other records of any kind. Not a gad nor a hammer has been found in any working, nor are there any traces at surface of smelting operations. The principal old workings there are over the so-called "H. G." section.

None of the old workings at Leeuwpoot is deeper than 40 ft., and they have been broken into at several points from the modern chambers below. There is no apparent reason why the ancients should have stopped at that depth. The tin is found here in a very wide kaolinized body, which is quite soft. Nor could water have been the cause of abandonment, for the present mine, 300 ft. deep, can be kept dry with a skip only. There is every evidence that the ancients must have mined a considerable tonnage, apart from the fact that the Leeuwpoot company has extracted 80,000 tons of ore between the ancients' lowest limit and the modern 100-ft. level.

MANNER OF STOPING AND TIMBERING

As a variant of the total fill-in method was one used on the Empire lode at Rooiberg. Here the lower section of a stope was found open. About half way up the stope, which was narrow, stull pieces 18 in. to 24 in. long were wedged between foot and hanging wall, and these were lagged over with rough bush timber and the stope was filled in on top of the lagging with the usual mixture of rubble, broken waste, and sand.

Another well-known mining practice was followed at Weynek. Here the tin occurs in soft clayey interbedded lodes dipping 10 deg. west, and varying in thickness from a few inches up to 4 ft. The majority of the stopes do not go down more than 50 ft., but the principal one followed the lode to a depth of 120 ft. on the dip. The stope had been started as an open cast with a width of about 20 ft. along the strike. It then bellied out below to a maximum width of 50 ft. on the strike, coming

*Excerpt from an article by Max Bauman in the *Journal of the Chemical, Metallurgical, and Mining Society of South Africa*, February, 1919.

down at the bottom to 15 ft. The average width of the stope was 30 in., but at places this narrowed down to 10 in. (actually measured). At that flat dip and narrow width no full-sized man could work, and the actual ore breaking must have been done by small boys or by an undersized race like the Bushmen. This stope is of particular interest from the fact that a number of pillars were left in it, not, as might have been supposed, to support the hanging, but simply because the mineral sought was not present in the ore. In addition to following the ore down from the surface by small shafts or open casts, there is an instance at Weynek of a working having been entered by an adit at right angles to the strike of the lode.

The longest continuous ancient working is that on the South End lode at Rooiberg. Here the ancients stripped the outcrop from the surface to a depth varying from 15 to 27 ft. over a length of 620 ft. on the strike. The average width on the top of the cleaned-out workings was 20 ft., which narrowed down considerably at the bottom. Modern work below that of the ancients has shown the existence of a narrow but rich lode. Of sampled development, 450 ft. gave an average of 11.4 per cent metallic tin over 7 in. Over a stoping width of 30 in., and at the present price of tin (£220), this is equivalent to over 80s. per ton mined. The probability is that the ore at surface was much richer, and, judging by the width of the workings, the deposit was also considerably wider. Much of the stoped-out lode had been filled in as usual. There was evidence of the filling having been done in two distinct periods. At one spot, where the working was being bottomed and the filling had been cut through from top to bottom, it was observed that there was a layer, several feet in thickness, of sharp broken waste and rubble at the bottom. This was covered by a layer of surface sand about 2 ft. thick; above this was another layer of waste and rubble, and covering this to normal ground level was a top layer of surface sand. The intermediate sand layer was not uniform throughout, but was made up of a succession of laminae of light and dark-colored sand, each lamina probably representing the washings over one rainy season, and the number of laminae indicating a considerable number of years occupied by the washing-in process.

The working clearly showed an early period of mining, then a long interval of abandonment, followed by a second period of mining, and final abandonment. From the appearance of some of the relics found here, some of the work must have been of comparatively recent date. On a ledge, and hidden away after the manner of the modern native, was found a gad, a stone hammer, a knobkerrie, and an adze with a handle. The adze was 12 in. long, with a 5-in. cutting edge set at right angles to the plane of the handle. It ended in a tapered shank which fitted into a tapered hole in the handle—a method of fastening which today is still being used for native axes.

LIGHTING

The question of underground illumination has an important bearing on the subject of the age of these workings. The working in one case is open to daylight, and the afternoon sun shines right into the toe of the stope. It was therefore probably worked throughout without artificial illumination. In the case of the narrow and low pockets in another stope, however, it was

impossible for the old miners to have done the careful and clean work which they did without some kind of artificial light.

Dr. Theal points out that the Bantu have no lamps, and R. N. Hall infers from this that the ancient miners of Rhodesia could not have been Bantu. But, on the other hand, no remains of anything resembling a lamp has been found locally. It is possible that the darker workings were mined in earlier times by a people who were acquainted with an artificial light, and that intricate workings were worked in more recent times. One working is extensive, and, unlike most other workings, was never filled in by the old miners. As it lies in the bed of a storm water course, it became filled up with clean water-borne sand, probably in the space of a few years. It was holed into by chance at its deepest point, 55 ft. below the surface, by a modern drive. The working was cleaned out in the hope of finding ore left in place, but with disappointing results. At the bottom a tree was found 6 in. in diameter at base and about 14 ft. long, with the branches hacked off about a foot from the stem, and which had evidently been used as a primitive ladder. The wood is said to be what is locally called *Olievenhout*, and was in a good state of preservation. Further, about 50 ft. down, an earthenware pot was found, which was still soot-encrusted. It is almost spherical in shape, 7 in. in diameter and 5 in. deep, of fairly coarse texture and resembles in all respects a modern Basuto cooking pot.

The broken ore was probably carried to the surface in baskets or grass bags, the material of which is so perishable that no remains have been found. It is possible, too, as a good many earthenware pots have been discovered, that these were also used for transport. The largest pot discovered was almost spherical in shape, 16 in. diameter and 14 in. deep, and holding about seven gallons. Mention has already been made of the discovery of a crude ladder, and in an old working on the Empire lode, at Rooiberg, a number of steps or footholds can be seen which have been cut out from top to bottom of the soft foot wall of the working, dipping at 75 deg.

METALLURGICAL

Some of the ore was probably ground to powder underground, though the greater quantity was reduced to that state at surface, as is proved by the large number of mullers and grinding stones found everywhere. In the course of trenching, broken ore has frequently been found a few feet below the surface, evidently having been dropped while it was being transported. As these odd pieces have almost invariably been of extreme richness, one is forced to the conclusion that the ancients worked only ore of high tin content.

The ore, after being reduced to powder, was washed either in flat dishes of earthenware, closely woven baskets or perhaps by some method of calabashing, as in Nigeria. The spruit running through the Rooiberg property was probably the principal scene of these washing operations, but in one case they appear to have used an old working as a slime pit. This was an ancient open-cast on the Empire lode, at Rooiberg, roughly rectangular in shape, 45 ft. long by 20 ft. wide at top, narrowing down to 4 ft. at a depth of 15 ft. The material in this pit was unmistakably slime tailing, being much finer than the surrounding reddish surface sand and was arranged in alternating light and dark layers which dipped at 15 deg. The slime assayed 1.2

per cent metallic tin, and about 200 tons was excavated and treated in the modern mill.

All the ore mined by the ancients came from near the surface, and would contain little or no sulphide. By panning, the lighter tourmaline, gangue, carbonates of copper, and oxides of iron would be easily removed, leaving a concentrate of perhaps 70 per cent metallic tin. The concentrate was probably not calcined, for an ingot of bronze found contained 2 per cent of arsenic, and several tin ingots discovered were very impure.

SMELTING

The principal center of smelting appears to have been an outlier to the Elandsberg Range, known as Smelters Kop. The kop is a steep, fairly flat-topped hill about 1½ miles from the Rooiberg mine. The edge of the plateau on top is guarded by the usual rough Basuto stone schanzes, such as may be found anywhere in the Transvaal. Scattered over the top are many small slag heaps—some of the slag containing considerable sized beads of tin—and innumerable broken pieces of coarse earthenware. These are the remains of crucibles and tuyères used by the ancients.

It is much to be deplored that in the early days of modern mining here, the value of Smelters Kop as a record of the past was not recognized and that no attempt was made properly to investigate the smelting site. A decade of picnicking has done much to obliterate any evidence which could have been scientifically recorded. It is impossible therefore to reconstruct the ancient smelting furnaces, which were probably blast furnaces similar to the primitive kind formerly used in the Straits by Chinese. The blast may have been produced after the Bantu manner, with two skin sacks, or after the Chinese manner, with a hollowed-out tree, with piston and long piston rod.

Apart from Smelters Kop, numerous smelting sites, with their remains of slag and broken nozzles, are to be found on Olivebosch, Haartebeestfontein, Weynek, and Blaauwbank. On the latter farm a most interesting ancient furnace bottom was discovered. It was a circular ring of hard-baked clay, about 2 ft. in diameter and 1½ in. higher than the ground around it. In the sand on the outside of it was found an unformed lump or ingot of bronze, evidently the result of an overflow of molten metal through a crack in the bottom of the furnace. The composition of the ingot was as follows, the figures being approximate only: Cu, 80 per cent; Fe and Al, 5; Ni, 3; Sn, 7; As, 2; gangue, 3 per cent.

The presence of arsenic may be due to non-calcination of the tin concentrate used; but the nickel content is rather remarkable. It is interesting to note that this farm Blaauwbank, where the ingot was found, is one of the few places in South Africa where nickel is known to occur. On the western boundary of Haartebeestfontein small heaps of slag have recently been discovered containing 30 to 35 per cent of oxide of tungsten and 2½ per cent of metallic tin.

HISTORICAL

Who were the ancient miners, and when did they work here? The presence of underground timber in a good state of preservation, the comparatively small size of trees growing in some of the large workings, and the finds of crude earthenware pots and implements pointing to a race resembling and no further advanced

than present-day Basutos, all tend to show that some of the workings are of recent date. Confirmation of this could be deduced from the following:

In 1723 Jan v. d. Capelle, an official of the Dutch East India Co. at Delagoa Bay, reported to the Governor and Council of the Policy at the Cape: "At the end of the year just passed natives have been at La Goa from the countries 'Paraotte' and 'Machicosje,' who not only brought copper but also tin for purposes of barter. The copper was of very fine color. The tin was of medium good color, but somewhat brittle and light, as may be seen from two samples of staves (bars or ingots). One of these is much harder than the other, as would happen if remelted. They state that the tin was found on the banks of a river in the country 'Machicosje,' is gathered in baskets, cleaned of sand, and then smelted to bars for the purpose of barter. All the inland dwellers use this tin (also such as they buy from us), which they alloy with copper for the purpose of making necklets and bracelets. That is, no doubt, the reason why their ornaments have such a high polish and are more pliable than those of the company."

Nine years later this same van de Capelle reported to the Cape that he had purchased 56 bars of tin from natives at Delagoa. Now, Rooiberg is only 260 miles due west of Delagoa Bay, and it is a fair inference to assume that these bars came from Rooiberg or its neighborhood. Dr. Moffat mentions that as late as 1826 he came across a Mohurutsi coppersmith near the Molopo who could smelt bronze, and with a draw plate drew his own copper or bronze wires for making bracelets. All this would point to the modern date of the workings under discussion by people of Bantu stock, either Basuto or Bapedi.

FORMER PRODUCTION

A careful estimate—though only an approximation, of course—shows that 18,000 tons of ore was taken from the Rooiberg area alone. The small lots of broken ore occasionally found indicate that the old workers smelted only ore high in tin content. Their tailings contained over 1 per cent metallic tin, and their average recovery was probably not less than 5 per cent metallic tin. Thus, 18,000 tons at 5 per cent metallic tin would give a recovery of 900 tons, or, say in round figures, 1,000 tons of metal. Judging by analogy, it is fair to assume that from Weynek, Leeuwpoot, and contiguous territory a further 1,000 tons was recovered, or an output of 2,000 tons from this whole area. The greater part of this would be turned into bronze. Assuming that the average alloy had the tin content of the locally found bronze, 7 per cent metallic tin, the 2,000 tons of tin expressed as bronze would amount to, roughly, 30,000 tons. What became of this 60,000,000 lb. of bronze? The Bantu in the 1,000 years since they crossed the Zambesi could not have used up that quantity for bracelets and necklets only.

It is, therefore, necessary to conclude that the mining, though some of it is recent, extended over a much longer period than 1,000 years, and that a large portion of the bronze was not absorbed by South Africa, but was exported. There must therefore have been some remote period when these mines were opened up and the product was smelted and utilized by an ancient civilized race of traders. In fact the available evidence correlates the ancient tin miners with the ancient gold miners of Rhodesia.

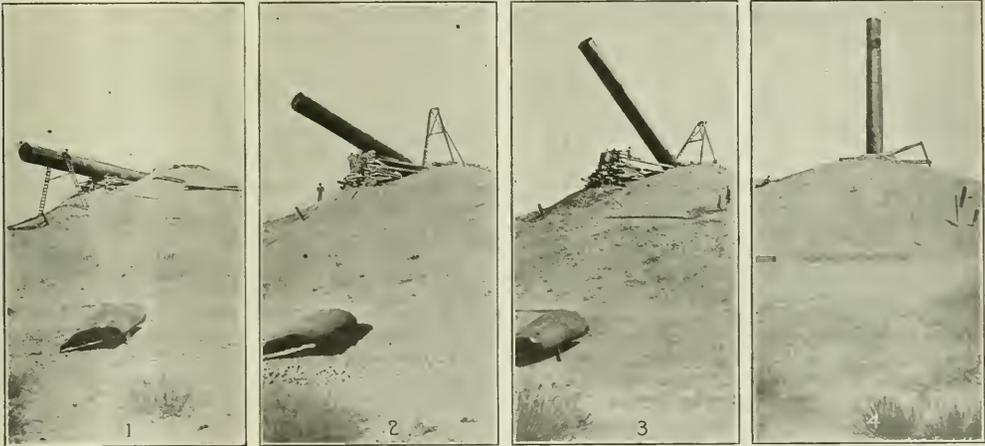
Solving a Stack-Raising Problem

Thrown Fifty Feet From Its Foundation by a Windstorm, a Smeltery Stack Was Re-erected And Established in Final Position at Considerably Less Than Estimated Cost

BY MARTIN FISHBACK
Mining Engineer, Benson, Arizona

IN REMODELING a copper-smelting plant at Benson, Ariz., one of the problems to be solved was the replacing of a stack 6 ft. in diameter, 75 ft. long, made of 1-in. steel plates, originally put up in sections and placed on top of a small hill, where a shaft 30 ft. deep connected with a 200-ft. tunnel leading from the dust chamber. The stack was originally placed on top of a concrete foundation, but not anchored or supported except by guy wires. A short time before the present owners took over the plant, the stack, which, like all other smelting equipment on the property, was new and had never been used, was torn from its moorings during a heavy windstorm, and thrown down the hill about 50 ft. from its foundation. The extreme top-end of the stack, which, of course, hit the ground the hardest, was flattened out. By sacrificing a section of this part

lb. Two of these were "snaked" to the top of the hill, and one was placed on each side of the old concrete foundation, 14 ft. apart and parallel to the direction in which the stack had to be moved. The other two timbers of similar dimensions were placed about 30 ft. down the hill, opposite to the side on which the stack was lying, and were to serve as the "dead man," or pulling point. The timbers were placed as shown on the side elevation in the accompanying cut, the ends toward the direction of pull being notched into the hillside about 1 ft., and the pulling point established 10 ft. from this end. This left 22 ft. as "cantilever weight" of both the two timbers, which was several times more than sufficient to sustain the weight of the stack to be lifted. No further tying down was required.



STAGES IN THE RE-ERECTION OF A SMELTERY STACK

of the stack, the remainder of the flattened portion was forced back into shape by jackscrews, and then held there by placing two "sprags" of 3-in. steel pipe, 6 ft. long. The jacks were then removed. That completed the repair work on the stack itself.

The next step was to carry the stack up the hill and place it where it belonged. Its weight was approximately 14,000 lb. The power-plant at the smeltery was undergoing repair and overhauling, and it was necessary to replace the stack entirely by hand. To "snake" it up the hill 50 ft., on an incline of 30°, and then up-end it and put it back into place did not appear to be an easy job with the equipment available. The method finally worked out and adopted, however, proved efficacious and economical, and will be described for the benefit of those who may have to solve a similar problem.

There were at hand four heavy timbers, each 12 x 20 in. x 32 ft. long, each timber weighing about 2000

The two timbers placed on top of the hill were tied together and braced on the side next the "dead man," to prevent side slipping and spreading. The front or side next the stack had to be left open for the path of the stack when raised. A two-legged derrick, or bipod, made of 8 x 8 in. Oregon pine, 22 ft. long, as shown, was securely reinforced with heavy iron straps, and hinged or pivoted on the two heavy timbers; this was accomplished by bolting heavy 1-in. iron on the bottom ends of the bipod, and chiseling out a groove 8 in. deep and 1½ ft. long in the timbers, allowing free movements of the hinges. A 2-in. hole was bored horizontally through the timbers, intersecting the groove, and drilled into the old concrete foundation to a distance of about 8 in. The bipod was then raised with the iron loops in their position in the grooves, and a 2-in. iron bolt or pin driven through the timbers and iron loops, and into the concrete. The bipod was thus se-

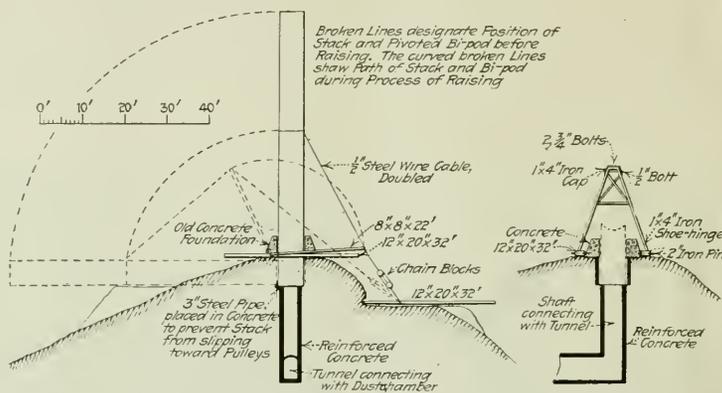
curely hinged and had free play. Driving the iron pins into the old concrete prevented any movement of the large timbers, and the hoisting apparatus was ready.

While the gear was being assembled an open cut was excavated between the timbers on the side facing the stack, in order to place the base of the stack 10 ft. below the top of the old foundation, in its former position. This necessitated blasting out enough of the old concrete on that side to allow the stack to pass through and within the old concrete walls. A solid foundation for the new position of the stack had already been provided by a system of square sets constructed of reinforced concrete from the bottom of the shaft to the new foundation of the stack. The stack was then rolled around on the hillside by the cant-hook method (with chains and 3-in. steel pipes) until it was in direct line with the open cut and for a straight pull to its new position. A skidway was then provided

and attached to another set of chain-blocks; and by this system each of the two chain blocks worked independently, and permitted the shortening of the cable for a new pull when the limit of each chain-block had been reached about every 10 ft. of pull. The total distance of pull was approximately 40 ft., which necessitated a shortening of the cables four times before the stack was in position.

The maximum load to be lifted was, of course, at the beginning. For the first 10 ft. of pull the chain blocks were assisted by jackscrews and supported by following up with cribbing, as shown in the halftone. From there on the stack was raised exclusively with the chain-blocks, as described.

When placed in its final position, a collar of reinforced concrete, from its new base to the top of the old foundation, was poured around the stack. No guy wires are required. The stack is firmly planted, and



DETAILS OF EQUIPMENT FOR RAISING STACK

by laying some $\frac{3}{8}$ -in. steel sheets in position. A $\frac{1}{2}$ -in. steel cable was looped around the end of the stack nearer the foundation. The stack was pulled up the hill over the steel sheets by a three-ton chain-block, and eased into the open cut, with the end of the stack within two inches of the proper position for up-ending.

To prevent the stack from slipping ahead during the raising process, a 3-in. steel pipe, 4 ft. long, was placed in the concrete immediately in front of the rim of the stack, allowing a few inches to extend above the rim. The other end of the stack was then raised up with jackscrews and supported with blocks and timbers, placing the stack in a horizontal position. While in this position about 40 ft. of the top end of the stack was painted.

A $\frac{1}{2}$ -in. steel cable was then looped around the stack three times, 30 ft. from the top end, and held in position and kept from slipping by lugs bolted to the stack. The two cable ends were then looped around the top of the bipod and securely fixed with cable clamps. The angle of the bipod inclining over the stack at this stage was 65° , or, in other words, this was the angle intercepted between it and the stack. The distance, or length, of the fixed cable between the stack and bipod was 32 ft. From the bipod the two cable ends were then carried down to chain blocks hooked to the "dead man." One cable was double-looped around the chain-blocks hook and returned up toward the top of the bipod, where it was connected with the twin cable with cable clamps. The other cable end was arranged in a similar manner

it is reasonable to assume that nothing less powerful than dynamite will ever bring it down again.

The estimated cost of raising was \$500. When the job was completed, the total labor cost was \$315.59, and material used amounted to \$54, including concrete support and all. Hence the actual expense came well within the estimated cost of solving the problem.

Workmen's Compensation

Employers Should Study the Law of the States in Which They Operate and Legal Decisions and Departmental Rulings

By CHESLA C. SHERLOCK

NO EMPLOYER, engaged in a specialized avocation, can have more than a hazy conception of the workmen's compensation acts until he comes to study them in connection with his own trade or industry. It is then only that he can have some measure of comprehension as to just how these acts affect his business. This does not mean that employers are generally uncertain as to the law, but it does mean that the average statute is so worded as to be obscure to everyone until the courts have interpreted the details in the light of actual cases arising within the various trades and callings.

Mining is certainly a specialized industry, and it is an extra-hazardous one. It is so unusual, as far as risk is concerned, that many of the states have enacted laws specifically applying to the mining business. For instance, the Alaska Compensation Act operates upon the mining industry entirely. One employer raised the point that, as this act applied to only one industry, it was class legislation and therefore unconstitutional. The Federal court (Johston vs. Kennecott Copper Co., 248 Fed. 407, p. 413) said that the classification of subjects for regulation by law was a function of the legislative branch of the Government; and that, though class legislation is generally prohibited, if the application is limited, and it affects all alike that are within its sphere, it is not within the prohibition. The compensation act of Alaska, although applied to the mining industry alone, affected everyone engaged in mining, even though remotely, and it was not unconstitutional upon this ground. The act was to include "mining operations," which was sufficiently broad to include everyone in the industry, in the opinion of the court.

In determining the interpretation of an ambiguous statute which is capable of two or more constructions, the Utah court (Ind. Com. vs. Daly Min. Co., 172 Pac. 301, p. 306) held that the court must take into consideration the object the Legislature had in enacting the law. If it be possible to give the act a construction which would render it largely ineffective and useless, and, likewise, possible to give it another construction which will make it effective and of benefit, the court must follow the latter construction, so far as it is possible in accordance with the principles of law and statutory construction. The basis of the payment of compensation is often a serious question for employers to determine, especially when they are engaged in mining operations. Compensation acts usually provide that the workman shall be compensated in accordance with the average weekly wage he has earned for the year preceding the date of injury.

In those not infrequent instances in which the workman changes his employment several times within the year, or changes his grade within the same employment, employers are naturally anxious to know just what his measure of compensation is. This is a difficult question, especially if the earnings of the employee have been irregular and hard to ascertain. In Kansas, however, it was held (Bundy vs. Petroleum Products Co., 172 Pac. 1020, p. 1021) that the employee is entitled to compensation based upon his earnings or those of other persons in the same grade of service, although the injury had been received when he was employed in a different grade at less wages, to which he had been assigned for a short time by reason of lack of work for the period in the employment for which he had been hired. This decision declares that the mere work at which the man happens to be engaged at the precise time of his injury does not absolutely fix or limit his amount of recovery, although it will have that effect in the majority of cases, for most men are injured at the work for which they were regularly employed. It means that substantial justice must be done in each case; and if the man has been worth more and has earned more than the immediate work which caused his injury, he is entitled to the compensation legally attaching to the higher rate of wage.

Generally, there is an attempt to do away with the technical and the arbitrary in compensation practice, so

as to make it as simple and free from legal technicalities as possible. There are provisions in every statute as to the time within which the workman must file his claim for compensation. Employers are seldom allowed to profit by these time limits, however, the courts and commissions usually being disposed to listen to the workmen, even if their applications have been made at a time subsequent to that specified in the statute. But in a Michigan case (Basse vs. Banner Coal Co., 167 Northwestern 954, p. 955) it was shown that the Michigan laws required the claimant to file his claim within six months after the date of the injury. In this suit the workman had failed to make either an oral or a written claim until after the statutory time had elapsed. Then a written claim was presented, but it was not entertained, the court saying that it could not be heard, because the rights under the act had expired, so far as this injury was concerned.

The question of dependency also raises many uncertainties in the mind of the employer when it comes time to make settlement. This is especially true of the case where a son or daughter has contributed to the support of the parents. The question that most frequently puzzles the courts and employers is whether the reasonable value of the board which the child consumed should be deducted from the amount of the contribution which has been made to the parents each week. If this is allowable under the law, the deduction will make a material difference in the amount to be paid the dependents. In a Michigan case (Engberd vs. Victoria Copper Min. Co., 167 Northwestern 840, p. 841) the court held that in instances in which a son had been living with his parents and contributing to their support, the reasonable value of his board should be deducted from the amount of the contributions made. This, however, is not the rule in all states, lively controversies frequently being waged over this point.

The compensation acts, as is generally known, secure the payment of compensation to workmen who have been incapacitated from earning their regular living by means of an accident arising out of and in the course of the employment. The employer's liability extends to the work the employee is hired to do and no further. In a case where a workman was injured while in his employer's hospital, it was held that he was not entitled to compensation, because he had not received his injury arising "out of and in the course of the employment."

These are, it is true, apparently trivial points, but they are those about which there is the greatest misunderstanding. Ninety per cent of the litigation involving the compensation acts, particularly in their application to mining operations, arises through the demand for their adjudication.

At all times employers engaged in mining operations, as well as others, must remember that the true criterion of their liability is the compensation act under which they are working. It explicitly defines the limits of their liability, and with the aid of the courts upon uncertain and complex sections of the law it should not be difficult to ascertain what the law really is upon any given point. These decisions should serve to clear the most obscure sections of compensation acts.

Manganese Exports From Brazil in 1918 amounted to 393,388 metric tons, according to a recent consular report. For the first time in five years shipments of this ore from Brazil showed a decrease.

Gold Mining and Milling in Colombia



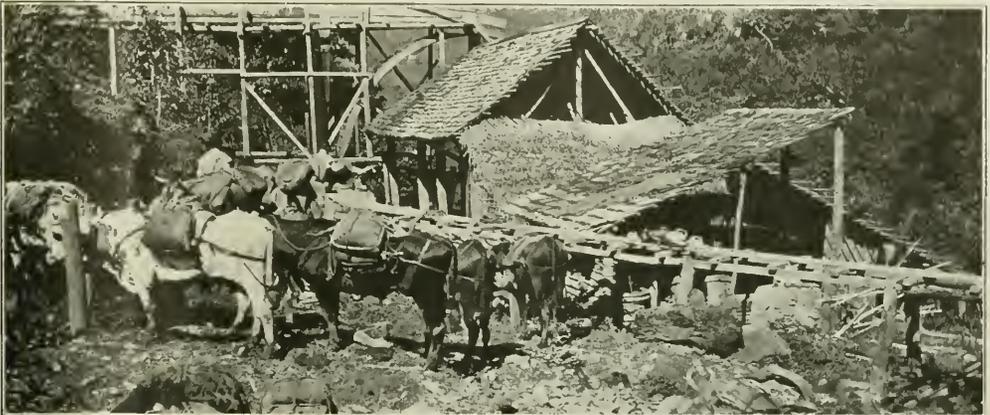
UPPER ADIT AT EL RECREO MINE, IBAGUÉ DISTRICT



LOWER ADIT AT EL RECREO

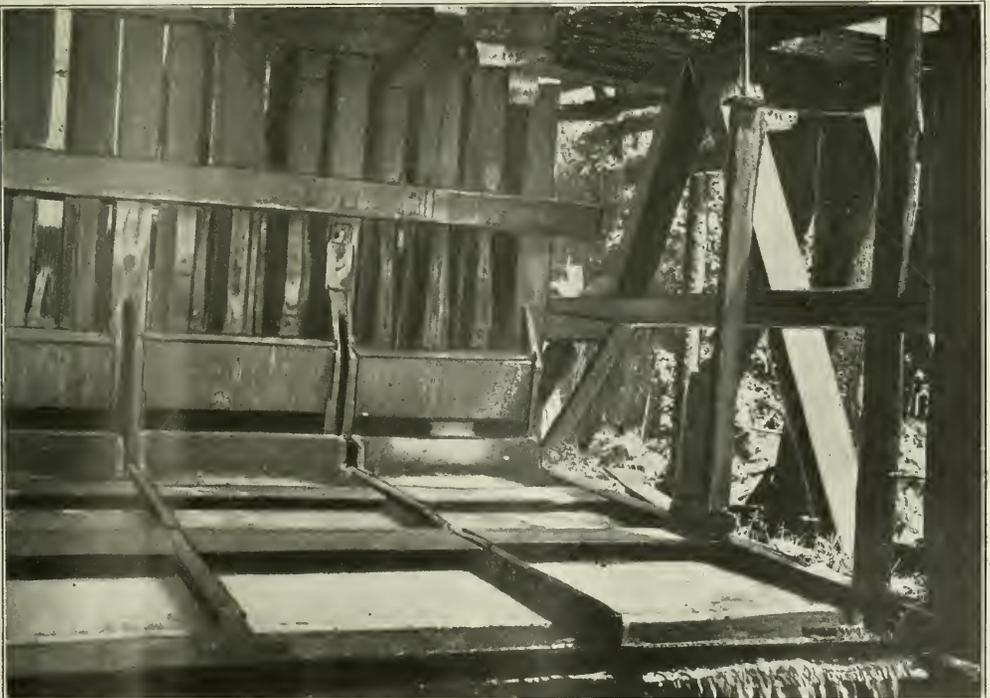


WOODEN STAMP MILL AND TAILINGS POND AT EL RECREO MINE. OWNER'S HOUSE IS SHOWN IN THE BACKGROUND, AND BELOW THAT CAN BE SEEN THE ROOF OF A SECOND WOODEN MILL.



OXEN CARRYING ORE FROM OTHER PROSPECTS TO STAMP MILL AT EL RECREO MINE

Gold mining, in the district of Ibagué, declined during 1918, on account of the extremely high prices for supplies and the difficulty of obtaining them, even at those prices. Blasting gelatin was \$70 per box of 50 lb., carbide could not be obtained at any price, and the mines had to return to the use of tallow candles, made locally. The mines, especially gravel mines operated with small capital, experienced considerable trouble for some months in disposing of their product, on account of the low dollar exchange, but this condition improved, and at the close of the year the Medellín mint was able to coin all the gold produced. The El Recreo mine operated one wooden stamp mill throughout the year, and the profits were used for development work. The holdings of this property were extended in 1918 and now comprise 84 vein claims. (A Colombian claim is 600 m. by 240 m.) Two promising finds have been made in this ground, and are being developed. At one of these about 300 tons of ore, removed in the course of development work and crushed in the wooden stamp mill, yielded an average of 15 g. of gold per ton, on the plates alone. The second new discovery occurs in a chloritic schist, in a narrower but high-grade vein. Other operations in the Ibagué district during 1918 were as follows: La Golondrina mine employed a few men on development work, although its four wooden stamp mills were idle; La Norcasia mine, a new producer, started a wooden stamp mill and cyanide plant during the latter part of the year, and La Veta mine, abandoned by its former owners, was prospected by Emery Koch, an American miner.



INTERIOR OF WOODEN STAMP MILL, EL RECREO MINE, IBAGUÉ DISTRICT, COLOMBIA

New Uses for Zinc*

Zinc Institute Is Told That Publicity Is Necessary To Inform Public of the Desirable Qualities and Varied Industrial Applications of the Metal—Suggestions For Promoting Use of Zinc

BY GEORGE S. HARNEY

American Zinc Products Co., Greencastle, Ind.

FIRST and foremost, gentlemen of the Institute, I think we ought to begin our campaign of publicity right here at home. I think we ought to so change our phraseology and nomenclature that the word "zinc" should be omnipresent in our discussions. "Jack" and "spelter" are good names, perhaps, but they do not convey to the world that they are zinc. "Galvanizing," besides being a misnomer, is certainly not the correct term for coating a substance with zinc. "Zincking" a substance—zinc-coated sheets, nails, wire and similar material—would be an expression that would convey to the ear of the public the fact that zinc was used to preserve that metal or substance, and from this the public would learn that zinc was the principal factor in the operation. Similar reasoning should apply to "sherardizing" and other processes in which zinc and the preserving qualities of zinc are necessary to give the other metals life and standing in the commercial world. I suggest these changes for the reason that not one person in ten of this great public that we want to win to the uses and benefits of zinc knows that the words "jack," "spelter," "galvanizing," and "sherardizing" have any relation to zinc and its preserving properties. And if the public did know these things our battle would be half won.

Second, zinc needs a press agent. I do not refer to the grandiloquent and verbose personage who writes the fanciful stories of the prima donna's diamonds, nor the lurid pictures of the circus, its daring performers and rare animals, but the artist that would write the interesting stories of the usefulness of this strange metal and of the benefits it confers on mankind. Such articles I am sure would go "big" in our trade papers and publications, and, in view of the fact that the newspapers are searching everywhere for readable and instructive paragraphs that will interest humanity, they would no doubt willingly print them.

INFLUENCE OF TRADE PAPERS

Our trade papers have been very kind, in times past. They, too, are deeply interested in our success. If short and readable stories concerning the diverse and industrially valuable applications of zinc are furnished them, they will give such articles their initial push on their voyage over the world and on their mission of instruction. But these stories must use the word "zinc." The daily paper wants general items of interest, and not trade names. It wants short stories of human interest.

Stories about zinc may be semi-scientific in their nature. The world is ready to hear again the story of the Swiss clock that is run by the expansion of zinc. It will willingly read of the non-conducting properties of zinc as it relates to heat and cold. Why, even the

story of how in years past zinc has been abused in having to work under so many noms-de-plume and noms-de-guerre is a good one and will not only be read, but it will correct an old-time error and aid the work we seek to do.

Such publicity should come from this Institute. I recall the concentrated publicity that has been engendered by manufacturers and producers of other products, and they were not so favorably situated. Take cement. One cent per barrel from the manufacturer, contributed to a central bureau, gave his product the publicity he sought. The railroad was told how to construct a water tank, and the farmer was instructed in making a pig trough of cement. Within the year, school children could talk in cement terms and knew of its uses. Team work won for cement. Team work will win for zinc!

I realize that we have in this Institute two divisions or sections that are not directly interested; but both are bound together in mutual interests in the production of the parent raw material. The producers of zinc pig desire to promote its wide consumption and distribution, and the users of the base metal seek to accomplish the same object.

PUBLICITY SHOULD ORIGINATE WITH THE AMERICAN ZINC INSTITUTE

We can well afford to waive any thought of direct results, if the whole trade is benefited by our team work. This Institute, I think, should father and promote the project of general publicity for our metal. It will cost little, but the general benefits in the education of the public as to what zinc will do, and what damage and deterioration it will prevent, will be enormous. We will all reap a benefit far beyond our personal contributions.

Thus far I have spoken only of publicity. From personal knowledge I know that "advertising" is not always "publicity." Like the grains of the "sower who went forth to sow," some advertising falls on "stony ground." But, to carry the simile further, the kind that falls on fertile soil will put you on "velvet" for life. If the "copy" is well prepared and the right media are selected, no one factor in your business will "bring home more bacon" than advertising. It is the red blood of business and the trade stream in the seas of commerce. No matter how humble or how pretentious, it speaks a vital story. The signboard at the crossroads, and the full-page ad in the big national daily, both have a clientele, and in both mediums the public will be informed of the merits of your wares.

Getting down to brass tacks (which are made in part of everlasting zinc), I would recommend that every producer of pig zinc adopt a trade name for his product, and in so far as his budget will allow him to do so he should herald that trade name to the world as being *zinc* and fit for use where zinc should be used.

* Excerpt from an address made at the St. Louis meeting of the American Zinc Institute.

In this work, our way has been blazed for several years past by the New Jersey Zinc Co., which has persistently and consistently insisted, through the trade journals and other media, that "Horsehead" and "Bertha" are the pure and proper metals for all human requirements to which zinc can be put. I am frank to tell you now that one of my purposes in coming here was to compliment our New Jersey friends on this pioneer work, as I feel that it has benefited all. Just how much benefit has been reaped by the company itself I hope will be told by those who represent the company at this meeting.

In referring to our New Jersey friends by name, I do not mean to convey the impression that they are the only users of printer's ink, but I believe you will agree with me that they have ventured further out into the general field than any of the rest of us, and that they have persistently stuck to their trade names. If they have been benefited, so will you be benefited. If their work has carried to the public something of the uses and benefits of zinc, this publicity, multiplied by the number of similar producers, will give an idea of the total. Personally, I feel that the results will be enormous, and if consistently carried on for a period of three to five years the public will be fully informed as to the usefulness of our product.

Now, as to those of us who deal more with the finished product, the field for publicity presents even a better opportunity. In the coming years zinc is to have a more extensive use. Those who fabricate the pig zinc or rolled sheets into a finished product must tell the world of its utility and usefulness, if they are to succeed. Be it a sheet for a roofing, or a slab for casting, the word "zinc" should follow on to the consumer.

USES OF ZINC TO BE EMPHASIZED

Hereafter, the world will get its vegetable products, such as teas, tobaccos, and like commodities, in zinc containers. It must be told that it is a zinc container, and that zinc is the very metal that will properly preserve the content. Nay, more: the man who offers the spurious substitute must be publicly denounced, and, if possible, prosecuted for his counterfeiting. We must no longer keep our light under the bushel. It is zinc that preserves steel and iron, and wood and fabrics. We must proclaim this fact wherever possible. Every advertisement must boldly proclaim that the product is zinc, and science will verify that zinc is the best metal for such use.

Because I have rambled somewhat in handling the subject assigned, may I offer a summary:

First. Zinc should at all times be referred to as zinc; this to correct past errors and aid the public in learning that zinc is the world's everlasting metal.

Second. This Institute should take up the matter of a press agent or publicity bureau, from which will come the true stories of the wonderful properties of the world's most useful metal.

Third. The producers of pig zinc should, if possible, give a trade name to their product and give as wide publicity as is possible to its merits.

Fourth. Those of us who market a finished product from zinc must say that it is of zinc, and refer to the metal's property of preserving the content as placed therein. The best part of the zinc producer's advertising story is that his product is made of zinc, and he should so inform the world.

Industrial Relations Commission Reports on Canadian Situation

High Cost of Living Chief Cause of Unrest—Whitley, Colorado and Leitch Plans Compared—Joint Industrial Councils Recommended for Canada

TORONTO CORRESPONDENCE

THE Canadian Commission on Industrial Relations, appointed to consider and present recommendations for securing improvement in the relations between employers and employees, has presented a comprehensive majority report from the chairman, Judge Mathers, and four other members. The commission finds that the high cost of living is one of the chief causes of labor unrest, and reports that there is everywhere a great reluctance to risk unemployed capital in new enterprises or the expansion of existing ones, owing to prevailing conditions. It approves of the ground taken in the peace treaty that "labor should not be regarded merely as a commodity or an article of commerce." The report recommends legislation providing for an eight-hour workday and a weekly rest of at least twenty-four hours; a minimum wage law, especially for women, girls and unskilled labor; state insurance for those unable to work; proportional representation from grouped constituencies, and restoration of freedom of speech and of the press. The commission approves of the principle of collective bargaining, which in its opinion does not necessarily imply the "closed shop."

The report outlines and makes suggestions as to various types of joint industrial councils, including the Whitley plan as in operation in about forty large British industries; the Colorado plan, which is in force in many American and some Canadian plants, and the Leitch plan, which is based on the American constitution. The essential feature of all these systems is that the human factor in industry is to be regarded as of first importance. The commission believes that in Canada a beginning should be made with joint plant councils, and more extensive organizations of district and national councils evolved therefrom as necessity arises. Every council must be the result of the unfettered choice of both employees and employers, and any attempt to enforce a definite plan upon either would be foredoomed to failure. Some machinery, however, should be established to take the initiative and bring the parties together. It is therefore recommended that a bureau should be established under the Minister of Labor to compile available information and statistics, and maintain officers, who would act between employer and worker.

The minority report, signed by Senator Smeaton White and Frank Pauze, finds that unemployment is largely due to the unequal distribution of labor. It expresses a doubt whether the Whitley plan would be suitable to Canadian conditions and considers that the Colorado plan, or a system similar to that under experiment by the Imperial Oil Co., would be more workable. The minority commissioners did not find any real poverty that was not properly taken care of by local institutions, and considered that a system of old-age pensions or unemployment insurance might seriously affect the ambition of the worker. They suggest the encouragement of joint industrial councils where such are established and that employers and employed be urged to institute forms of co-operative insurance, or other provision for pensions to old employees who are sick or invalidated.

Mining Convention at Nelson, B. C.

Meeting of 200 Delegates Representing Various Sections of the Northwest—Formation of a British Columbia Branch of the Canadian Mining Institute—Interesting Addresses On Current Problems in the Canadian Mining Industry

ABOUT 200 delegates assembled on June 20, 1919, at Nelson, B. C., to organize a branch of the Canadian Mining Institute, in the interest of the mining men of the British Columbia interior. The convention was opened by S. S. Fowler, manager of the Blue Bells mines, near Riondel, B. C., who was selected as temporary chairman. Mr. Fowler explained the importance of the proposed organization in bringing about association and cooperation of mine operators, and for the purpose of establishing a means of acquainting government officials with the needs of the industry. Suggestions regarding the usefulness of the new branch were made by E. T. Hodge, professor of geology at the University of British Columbia; Ernest Levy, James Anderson, and Randolph R. Bruce.

Spokane, and of the debt of gratitude which that city owed to the mines of the Boundary district and the Kootenays. Mr. Armstrong delivered a message of goodwill from Philip N. Moore, former president of the A. I. M. E.

During the afternoon the American Institute of Mining and Metallurgical Engineers and the Canadian Mining Institute held a joint meeting, S. S. Fowler presiding. Three interesting papers were presented: "Mining Methods at the Granby Mines, Phoenix," by C. M. Campbell; "Nodulizing Copper Concentrate," by Oscar Lachmund, and "Tunneling Reminiscences," by Major Angus W. Davis.

The convention reassembled on June 21, Nicol Thompson, chairman of the Bureau of Mines, Board of Trade,



BIRD'S-EYE VIEW OF THE CITY OF NELSON, B. C.

Following formal organization of the branch, the delegates elected S. S. Fowler chairman, and W. G. Wilson secretary, to serve during the ensuing year. James Anderson, of Kaslo; Randolph R. Bruce, of Windermere; A. G. Langley, of Ravelstoke; F. S. Peters, of Rossland, and S. G. Blaylock, of Trail, were elected members of the executive committee. A reception was held in honor of the delegates, and addresses of welcome were delivered by Mayor J. A. McDonald, and the Hon. John Keen, Speaker of the British Columbia Legislature. L. K. Armstrong, secretary of the American Institute of Mining and Metallurgical Engineers, spoke of the importance of the mining industry to the city of

Vancouver, presiding. Charles Camsell, of the Dominion Geological Survey, delivered an address on the geological features of the gold deposits of British Columbia. Mr. Camsell commented on the decrease in the gold production of the province, and pointed out the probable reasons therefor. He stated that the decrease in output was so alarming at one time that a commission was formed in England to discuss the problem of extending aid to the industry. In commenting on the gold production of Western Canada, Mr. Camsell said:

"It is not safe to argue that because each mile of Cordilleran chain to the south of the dominion has produced so much in mineral wealth, an equal amount per

mile will be found in the Canadian portion; but the difference is as yet so great, and so much of our country remains to be prospected, that we can well afford to feel that our production in gold, as well as in other metals, must increase until the difference per mile is greatly reduced. This and other conditions lead one to believe that as soon as industrial unrest is settled

and stated that practically all the gold deposits of British Columbia belonged to the second or younger period of mineralization, and that the whole production of gold is from these deposits. He said, further, that "All formations are believed to be closely related to the great intrusions of plutonic rocks that took place in the Jurassic period, and were formed at the time of intru-



DELEGATES TO THE CONVENTION GROUPED OUTSIDE CONVENTION HALL

we will have reached the downward limit of gold production in this province, and any change will be for the better. The same cannot be said of the outlook for gold production in the United States, but it is being urged there as a patriotic duty to produce gold, in spite of difficulties and discouragements, in order to maintain

or shortly afterward. Some of them appear as contact metamorphic deposits formed on the border of the igneous bodies, but most of them occur as veins both in the igneous bodies and in the intruded rocks in a zone surrounding the igneous bodies. No workable gold deposits have been developed in British Columbia whose



LOOKING UP THE KOOTENAY LAKE, FROM NELSON, B. C.

their reserve and their credit, which is based on that reserve. The same duty devolves on Canadians, and I would earnestly urge prospectors to devote more time and effort to the discovery and development of gold deposits."

Mr. Camsell referred to the geological occurrence of primary gold deposits in the North American continent,

origin may be attributed to the early Tertiary period, such as are found in Colorado, Montana, Utah and Idaho, or to the late Tertiary, as the bonanza deposits of Nevada, and portions of the adjoining states, and in Mexico. From 65 to 75 per cent of the gold produced in the Province of British Columbia is obtained from the smelting of copper ores, but in describing or dis-

curring gold deposits in this paper I purpose considering only those deposits in which gold is the principal metal obtained. Placers need not be considered, as they are secondary, and derived from erosion from the primary deposits."

Mr. Camsell discussed the chief districts from which a production of lode gold has been made, including Atlin, Princess Royal Island, Bridge River, Hedley, Rossland, Nelson, Ymir, and Sheep Creek. Unfortunately, the interesting details of these districts cannot be published at this time, because of the limitations of available space.

REVIEW OF THE MINING INDUSTRY

The Hon. William Sloan, Minister of Mines, reviewed the mining industry of the province, and in the course of his remarks he said in part:

"The aim of the provincial government is to establish the best of relationship between capital and labor. Only by so doing can the best results be obtained in the development of our natural resources, and this refers especially to the great mining industry in which we are so much interested. When in New York recently, I had many inquiries as to the situation in this province, and the prospects for profitable investment, and am therefore certain that as soon as the industrial unrest to which I have referred, and of which we all are so painfully aware, subsides, we shall be able to take up the work, confident that the sinews of war will be available in ample volume. It is a matter of comment outside the province that the mining laws of British Columbia are fair and just, and of such a character as to encourage the capitalist to find in the development of its minerals as safe a field for investment as is to be found anywhere. In the matter of taxation I may say that the policy of the government is to base its assessment to a constantly greater degree on net incomes alone. At present, unfortunately, there are not enough net incomes to make this possible and to pay the bills.

ORE-TESTING PLANT ASSURED

"While in Ottawa I conferred with the Hon. Mr. Burrell, Minister of Mines, on the matter of the establishment of an ore-testing plant in British Columbia. There has been an agitation for one here for many years. Mr. Burrell informed me that it was the government's intention to begin work on such a plant, the required finances having been provided by the dominion Parliament. I know of the difficulties experienced in this section because of the lack of facilities for the determination of what class of mill should be provided for the treatment of various kinds of ore, and there is no doubt that an ore-testing plant is a necessity in this district.

"It is interesting, in touching on the complexity of some of our ores and the consequent difficulty experienced in effecting full recovery of their values, to recall a statement made in Nelson a few weeks ago by J. J. Warren, general manager of the Canadian Consolidated Mining & Smelting Co., in the presence of Mr. Beatty, the president of the Canadian Pacific Ry. He stated that Mr. Blaylock, of the company's metallurgical staff, and his assistants had discovered a process by which silver, lead, and zinc can be recovered from the Sullivan mine ore. He is reported to have said also that the problem of the treatment of the low-grade gold-copper ores of the Rossland mines had been solved, and that within a short time the Rossland mines of the com-

pany would be turning out between 2,000 and 5,000 tons of ore daily.

"I sincerely trust that I have correctly interpreted the purport of these statements. The first should mean much to the operators of properties, of which there are not a few, with ore similar generally to that of the Sullivan mine. The second should result in the bringing to the historic mining camp of Rossland that prosperity which it has enjoyed for so many years and which we all are interested in seeing continued.

"With respect to the iron and steel industry, which is a matter to which I, as Minister of Mines, have been devoting much attention, I may say that we have on the coast and elsewhere large deposits of magnetite ores. These are of exceptional purity. We have been handicapped by the lack of hematite. As to what has been done, most of you are familiar with the Bounty Act, passed by the provincial government, granting a bonus of \$3 a ton on pig iron produced in the province from local ores. This so far has not given the results hoped for, and was followed by an investigation of the possibility of the development of our iron ores by electric smelting. Alfred Stansfield was commissioned to come to the province and make a report thereon. His report indicates that our magnetites can be so treated, but that the cost of power stands in the way of making the enterprise a commercial success. Recently an electric smeltery expert came to the government and stated that he had an improved method by which it would be possible to treat our ores more economically. As the government is much interested in this possibility, a small grant was made in order that this method might be demonstrated, and the results of the experiments will be known at an early date."

ADDRESSES AND RESOLUTIONS

Among the many other interesting addresses made at the convention were: "Revival of Local Treatment as Regards Flotation," by Francis A. Thomson, dean of the College of Mines, Moscow, Idaho; "The Iron and Steel Industry in British Columbia," by E. T. Hodge, professor of geology, University of British Columbia, which was followed by a discussion by Mr. Armstrong, of Spokane; "Platinum and Other Minerals Found in the Ultra-Basic Rocks," by William Thomlinson, of New Denver; "Mining and the Distribution of Minerals in the Kootenays," by A. G. Langley, district engineer for mineral survey district No. 5, and "Mineralization of Northern Manitoba," by R. C. Wallace, The Pas, Manitoba, the last paper being read by Mr. Armstrong. Mr. Fowler, as chairman of the committee appointed to investigate the justice or injustice of the charges levied by the Consolidated Mining & Smelting Co. on custom ore, gave a summary of the findings of the committee, which was to the effect that the charges had been justified.

The convention closed with the discussion and passage of a number of resolutions. The first was to the effect that returned soldiers be provided with an opportunity to prospect for minerals, the dominion government being asked to provide \$200,000 to permit 200 returned men to be sent into the field. The second resolution requested the provincial government to arrange for the purchase of powder in large quantities for use in each mineral district, to be sold at a minimum charge. The third resolution called upon the government to appoint more district mining engineers.

DETAILS OF PRACTICAL MINING

Suggestions From Practice for the
Superintendent, Foreman,
and Miner

A Home-Made Slip-Joint

BY GEORGE S. STURGES

Manager, Jacket-Crown Point-Belcher Co., 1026 Mills Bldg.,
San Francisco, Cal.

Some years ago the Jacket-Crown Point-Belcher Mines Co. lost its incline sinking pumps when a fire started in the incline above the pumps, which were two-stage electrically driven centrifugals, and caused the water level to rise rapidly until it was approximately 200 ft. vertically above the point where it stood at the time of the fire.

After some time the management decided to recover the lost levels, which had been under water for about 25 years before the above pumping plant had been installed. It was impossible to duplicate the pumps without heavy expense and long delay, but I secured three two-stage centrifugals, one of which was used as an extra, and rigged up a long truck to fit the track in the incline. One of these pumps was placed at the lower end of the truck, and at the other end a 75-hp. motor was secured and belted to the pump. The truck was

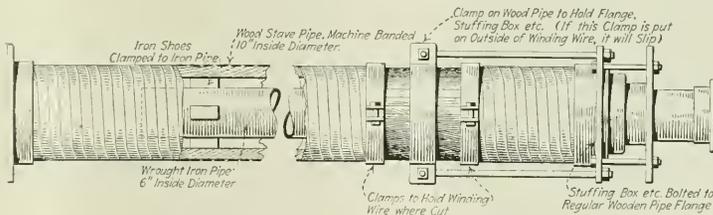
Laying Out Short-Radius Curves

BY JOHN FABER HANST

Mining engineer, 261½ Cross St., Pittsburgh, Pa.

A method for laying out short-radius curves underground, and one that is particularly useful in driving drifts on a curve, is as follows. It has the advantage of being so simple that the miners themselves can apply it, its utilization requiring no calculation, and the results are sufficiently accurate for all ordinary work:

A curve templet of a required radius is laid out on a level floor, or on level ground, by the engineer, using a steel tape of sufficient length. To do this, a center point is marked, and, with the tape lengthened to the exact radius, an arc is struck off on a piece of 1-in. plank of any convenient length, 10 ft. being about right. The same is done with another plank half the length of the first. Similar cross-pieces are marked at each end of the curve planks, taking care to nail them exactly at 90° to the curve. This is easily done, provided the curve planks are held firmly in position when the



PIPE SLIP-JOINT USED IN RECOVERING SUBMERGED LEVELS

lowered on the incline by means of an electric winch, installed for use on the regular pumps, and was connected to a 10-in. machine-banded stave pipe by means of the home-made slip-joint shown in the accompanying sketch. The incline was fairly dry, and, although not entirely desirable for permanent service, the belted pump and motor, together with another similar unit placed on the first unwatered station, recovered the two lost levels and the big pumps, which were eventually placed in operation again. The motors were, of course, rewound, but otherwise the pumps were not damaged.

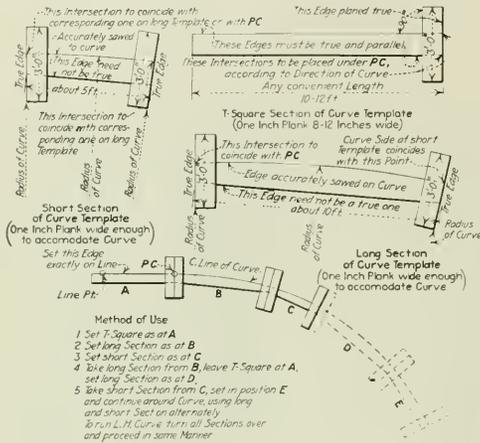
The discharge line from the pumps was made of machine-banded stave pipe and of different strength, to withstand increased pressure as the pumps were lowered. The particular piece from which the slip-joint was made was of that pipe used for the highest pressure, that it might be serviceable throughout the entire drop of the temporary pump. Approximately 1,150,000 gal. of water was pumped through the slip-joint every 24 hours. Such equipment as was available was utilized, but the joint construction would have been simplified had wrought-iron pipe been used instead of the wooden pipe, as explained in the article.

arc is struck off and that the end points are marked. The edge of the tape itself will serve to strike off the correct line on which to nail the cross-pieces. The templet being constructed, proceed as follows:

At the *point of curve (P.C.)* of the curve set a plug or place a nail in the cap. On tangent, and in a direction opposite to the curve, set another line point at such a distance that it will fall within the length of the T-square section of the templet. Place the T-square with one edge on line, using plumb bobs suspended from the line plugs, and with the outside intersection of the straight-edge and the head exactly at the *P.C.* Holding this firmly, bring one curve templet so that the head coincides with the T-square head, and with the curved edge running in the proper direction. To reverse the direction of curve, simply turn the templet over, thus using the same templet for right or left curves. Now hold the curve templet and bring the shorter templet to position, carrying one ahead of the other as far as necessary. In this manner, with one setting of line plugs by the engineer, the miners can check up their drift after each blast, or as often as desired. The short and long sections enable the true line to be carried

right into the breast at all times without difficulty.

Of course, when the P.T. is approached, it will be necessary for the engineer to run a survey around the curve and spot the exact P.T., giving lines for the tangent at the same time. Most of this work, however, can be done in the office, especially if the survey points are figured on a co-ordinate system. This, by the way, is the only logical and systematic way of surveying a mine, and with a good accurate map on a scale of 50 ft.



METHOD OF LAYING OUT SHORT-RADIUS CURVES

to the inch it is possible to determine the position of a point with great accuracy.

For the benefit of those to whom this method of laying out a curve is new, sketches of the templet and the manner of application are appended. The method is in general use in many of the mines of the Lake Superior iron ranges, and, so far as I know, was developed by the engineers of the Cleveland-Cliffs Iron Company.

Uses for Empty Carbide Cans*

By E. P. HUMPHREY

Several uses can be made of the 100-lb. tin carbide containers, instead of throwing them away. They have a small refund value, but when the freight is paid it amounts to practically nothing. One use is to place them in the machine shop so that the machinists can put their turnings and borings into them, one for each kind; and then, when a car of scrap is to be loaded, the filled cans are placed in this car. The blacksmith also should have some of these containers for his scrap ends. The practice is not only a great labor saver for the mine or shop operator, but also for the receiver of the car, as it greatly facilitates unloading.

These cans may also find place in the shop as receivers for dirty cotton waste and wiping cloths. Some reclaim the cotton waste, and the oil residue is used on gearing. A few cans of this oily waste are handy in the winter time for thawing pipes. A locomotive fire may be easily started with it, saving good waste and oil which the engineer is likely to use in order to secure a quick, sure fire.

Another use lies in substituting the cans for bags in

carrying feed to mules in the mines. They can be easily cleaned and dried, and with the screw top are moisture and rat proof. This feature is especially useful in the small mine, where there may be only one mule that is cared for by the driver. The tendency when bags are used, as in ordinary practice, is for the feed to get wet and be left out for the rats.

Motor Generator for Mine

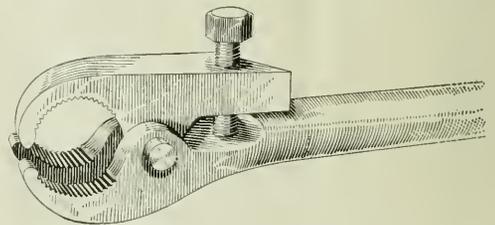
There are periods when the electrical load of a mine is light, and then, in an instant, the demand for power may jump to several times the average. Such conditions occur with the starting or stopping of hoists and locomotives, and demand an extra high peak-load performance of the generating apparatus. This is especially true as regards synchronous motor-generator sets, because the generators are denied the relief afforded by the fall in speed of an engine-driven set, being run at constant speed.

A new synchronous motor-generator set, which embodies the continuous power-factor correction common to such sets with very high overload and peak capacity, has recently been put on the market by the Westinghouse Electric and Manufacturing Co. It consists of a Type-G 3-phase, 60-cycle, synchronous motor, driving a Type-SK 150-275-volt compound generator. The machine has three bearings, the pedestals and field frames being mounted on a common bedplet. The full-load rating is based on continuous capacity with 35° C. rise on the generator, 45° C. on motor armature, and 50° C. rise on motor field, with 80% power factor. After a two hours' run at 50% overload, the generator temperature rise will not exceed 55° C., and the motor 55° C. On test, commutation was satisfactory at 250% load. The compound field is adjusted to give 10% increase in voltage from no load to full load.

A Sure-Grip Wrench*

By CHARLES H. WILLEY

A wrench which may be made of a convenient size and will be found invaluable for the purpose of gripping any round stock, pipe, studs, or similar material is shown in the accompanying cut. The device is in-



WRENCH FOR ROUND STOCK

vented to answer the need of a positive grip wrench for removing stubborn pipes and studs. The pin is slipped out when putting the wrench on or removing it from the work. By screwing down the small threaded bolt, the jaws of the wrench exert a firm grip on the pipe or stud.

*From Coal Age, Apr. 24, 1919.

*From Coal Age, Apr. 3, 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Our Mineral Wealth

Pooling of information at the Peace Conference regarding the mineral deposits of all countries has served to emphasize the great mineral wealth of the United States. Dr. J. B. Umphey, the geologist in charge of foreign mineral deposits for the U. S. Geological Survey, who was in Paris as a special mineral adviser, points out that in the past the course of conquest and the seat of empire have been determined by mineral deposits. These, he believes, will now determine industrial supremacy. In 1913, the latest normal year, the United States held first place in the production of thirteen of the thirty most important mineral commodities. It held second place in the production of four, while it contributed 5 per cent of four other minerals.

The United States, during 1913, on which year Dr. Umphey bases his figures, produced 39 per cent of the world's coal; 36 per cent of the iron; 56 per cent of the copper; 37 per cent of the zinc; 30 per cent of the silver; 17 per cent of the tungsten; 38 per cent of the molybdenum; 65 per cent of the petroleum; 95 per cent of the natural gas; 16 per cent of the arsenic; 43 per cent of the phosphates, and 20 per cent of the salt.

In the same year, the Transvaal produced 41 per cent of the world's gold; Russia, 99 per cent of the platinum; Peru, 76 per cent of the vanadium; Russia, 55 per cent of the manganese; Rhodesia, 35 per cent of the chromic iron; Canada, 85 per cent of the nickel; China, 53 per cent of the arsenic; India, 59 per cent of the mica; Spain, 54 per cent of the pyrites; Italy, 43 per cent of the sulphur; Germany, 99 per cent of the potash; Chile, 99 per cent of the nitrates; France, 58 per cent of the bauxite; Austria, 39 per cent of the graphite; Malay States, 40 per cent of the tin; Spain, 31 per cent of the mercury, and Austria, 74 per cent of the magnesite.

Virginia Emery Equal to Turkish

Emery deposits developed in Virginia during the war are yielding a product in every way equal to Turkish emery, according to F. J. Katz, of the U. S. Geological Survey. This opinion was expressed after tests had been made at the Bureau of Standards. Mr. Katz doubts, however, if it will be possible for the Virginia production to continue, as the freight rate from the southern part of the state to the emery-crushing mills in New York, Massachusetts, and Pennsylvania is such as to make it impossible to compete with the Turkish product, which reaches this country largely as ballast for light, bulky cargoes. As the operation in Virginia is small, there is no expectation that a tariff can be secured, and it is anticipated that work will have to stop as soon as imports from Turkey are resumed. The fact, however, is established that the country is independent of foreign supply if conditions warrant the development of the Virginia deposits on a large scale.

War-Minerals Relief Act Interpreted

By Attorney General

Material reduction in the number of claims which will be allowed under the War-Minerals Relief Act will result from an opinion by the Attorney General in interpreting Section 5 of the act. The opinion was rendered to the Secretary of the Interior as follows:

I acknowledge receipt of your letter of June 25, 1919, asking my advice as to the proper construction of the words "request or demand" as used in Section 5 of that Act of Mar. 2, 1919 (40 Stat. 1272). The part of this section containing these words is as follows:

"That the Secretary of the Interior be, and he hereby is, authorized to adjust, liquidate, and pay such net losses as have been suffered by any person, firm, or corporation, by reason of producing or preparing to produce, either manganese, chrome, pyrites, or tungsten in compliance with the request or demand of the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation."

The words "request" and "demand" are both synonyms of the word "ask." A demand might perhaps be said to be a "peremptory request." The claims recognized by this section are those of persons who have suffered loss by "producing or preparing to produce either manganese, chrome, pyrites, or tungsten in compliance with the request or demand of the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation." That is, one of the five governmental agencies must have asked (either by request or demand) the claimant to produce or to prepare to produce one of the four named minerals. The statute specifies the five agencies authorized to make request or demand for the production of minerals, specifies the minerals, and specifies that the production, or preparation for production, must have been "in compliance with the request or demand" of one of the five agencies.

The language used could hardly be more clear or allow less room for construction. No claim based upon a general appeal or solicitation is authorized by it, but to come under the statute the claimant must have been asked specifically by either the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation to produce or prepare to produce one or more of the four named minerals.

In your inquiry you state:

"Many claims have been filed which appear to be based upon an asserted reliance upon appeals to the general public for the production of these minerals alleged to have appeared in the newspapers, etc."

As I have stated above, the statute does not authorize the recognition of a claim based upon a general solicitation or appeal. This is apparent from the provision itself. It is also apparent from the history of the enactment (which it is unnecessary to detail here) that it was intentionally framed so as to exclude such claims as are referred to by you.

The Federal Reserve Board announces the removal of all restrictions from the export of bullion, coin, and currency. Applications and licenses are no longer required. An exception to the ruling is that part of Russia under Bolshevik control.

William Thum, Noted Metallurgist, Dead

Inventor Prominent in the Introduction and Development of the Electrolytic Refining Process in the United States Expires at Hammond, Ind.

WILLIAM THUM, metallurgist and inventor of prominence, and a pioneer in the art of electrolytic refining in the United States, died on June 28, 1919, at his home, at Hammond, Ind. Mr. Thum was born in Germany in 1863, in the parish house of his grandfather who was a clergyman in the small town of Bleichenbach, Oberhessen. After spending about seven years of his early boyhood days on the coast of Wales, where his father, F. A. Thum, a distinguished mining engineer of the Clausthal School of Mines, was in charge of a zinc plant, he attended preparatory schools in Germany until 1879, when he, with his parents, came to the United States.



WILLIAM THUM

In 1883 Mr. Thum became assistant superintendent of the Balbach Smelting & Refining Co., at Newark, N. J., and there, in association with his father, he began the development of the first electrolytic refinery in the United States, laying the foundation of an industry which has assumed gigantic proportions in this country. At the time of Mr. Thum's connection with the Balbach Smelting & Refining Co., that company was using the Parkes process for lead refining.

In 1904 Mr. Thum served as superintendent of the De Lamar Copper Refining Co., at Chrome, N. J., and in 1906 he became superintendent of the electrolytic lead refinery of the United States Metals Refining Co., at East Chicago, Ind. This was the first plant of its kind in the United States. A refinery was in operation at Trail, B. C., and another at Newcastle-on-Tyne, but these plants recovered no byproducts except gold and silver.

At East Chicago, Mr. Thum developed a process which recovered bismuth, tellurium, and antimony as

byproducts in the electrolytic refining of lead. Later he took out a number of patents, among which are: A patent for a process for the electroplating of metals, especially lead; one for the separation of bismuth from copper, which covered a particular feature of the complete process; a patent for an apparatus for use in the Pattersonizing process, and one for an improved method of construction for a round-bottom tank. Another patent was for a horizontal cell for parting doré bullion which is today in use in a number of plants, and which was an improvement on his father's earlier design.

However, Mr. Thum's most important general contribution to the metallurgical art was a method which made practicable the basic process of Anson G. Betts, which had been previously patented in the United States.

William Thum was one of the most versatile of men, in addition to his distinguished professional attainments. He painted in oils and watercolors and was dextrous with the pencil in caricature. He spoke French as fluently as English and German, and read Latin with great facility, from which he would frequently quote. Mr. Thum was interested in botany and possessed an extensive knowledge of bird and animal life. Being an ardent hunter in former years, he made many trips to Maine for moose and in recent years he indulged in duck shooting.

Mr. Thum was well known for his charity, sympathy, and general human qualities. During the war, he was active in the many Liberty Loan campaigns, and took a prominent personal part in the proceedings of the specific patriotic societies of the East Chicago-Hammond district in Indiana.

The Waihi Gold Mining Co., Ltd., In 1918

During the year 1918, according to the last report, the Waihi Gold Mining Co., Ltd., treated 188,998 short tons, dry weight. The ore was mined from seventeen different reefs, which contributed to the total production in amounts ranging from 84 to 59,138 tons. The gold and silver sold realized £387,065. Interest (including £3,109 income tax deducted therefrom) amounted to £23,282, and £4,491 was received from a neighboring mine for ore inadvertently mined in previous years, making a total of £414,838. The expenditure in New Zealand and London, including development work at the mine, amounted to £215,564, leaving a balance of £199,274. The above sum, added to the balance of £62,435 brought forward from the preceding accounts, totals £261,709. After all appropriations, including dividends amounting to £99,181, the balance remaining to the credit of revenue account at Dec. 31 was £52,953.

The ore reserve shows a decrease of 116,846 tons, of which 96,955 tons is from the general account and 19,891 tons is from the suspense account. The total reserve on Dec. 31, 1918, was 602,789 tons in suspense account and 556,761 tons in general account.

The development and dead-work footage amounted to 7,366.5 ft. in 1918, of which 3,975.5 ft. was in connection with the extraction of suspense ore. No shaft sinking was done during the year. The mill ran 298.6 days. The average number of stamps running was 120,412. The ore crushed amounted to 188,998 tons, representing a daily average stamp duty of 5.255 tons, being a decrease, compared with the previous year, of 0.091

tons per stamp day. The average number of tube mills running was 6.89.

The average assay of the ore treated was 0.375 oz. gold and 2.764 oz. silver, a total value per ton of £1 16s. 10.25d. The average assay of the residue was 0.026 oz. gold and 0.456 oz. silver. The average extraction was 93.1 per cent of the gold and 83.5 per cent of the silver, or 91.7 per cent of the total gold and silver in the ore treated. The proportion of the ore treated as sand was 21.77 per cent, as slime 76.81 per cent, and as concentrate 1.42 per cent. All concentrate produced, amounting to 2,676 tons, was treated in the concentrate-treatment plant.

George S. Rice Discusses Trip To Foreign Fields

Reclamation of French Mines Delayed—England Considering Discontinuance of Coal Exports—Germans Mining Coal for France Under Military Control

WASHINGTON CORRESPONDENCE

THE French are showing engineering ability second to none in the rehabilitation of their coal mines, according to George S. Rice, chief mining engineer of the U. S. Bureau of Mines, who just has returned from a personal survey of the coal situation in France, Belgium, Germany, and England. The reclaiming of the French mines, however, is being delayed by the French governmental policy, which Mr. Rice does not undertake to criticize. The policy to which he refers is that of opposing the purchase of foreign mining machinery, owing to the overwhelming balance of trade against France.

In Great Britain, Mr. Rice found that the financial interests are frankly calculating the effects of a total discontinuance of coal exports from England proper. Apparently, England needs all the coal she can produce. It is evident that present restrictions on local consumption of coal cannot be continued indefinitely. Mr. Rice found powerful influences at work tending toward the nationalization of coal mines. He gained the impression, however, that the opinion of the majority of the people is that the time is not ripe for the nationalization of the coal industry. That sentiment, however, may not have crystallized to the point where it may be effective in preventing such a step.

Mr. Rice went to Europe several months ago at the head of a Bureau of Mines commission. He now is engaged in writing a report on the great deficiency in the fuel supply of Europe. He also will reduce to a report other observations and conclusions that he reached as a result of his trip. In a running story of his survey, Mr. Rice says:

"On our arrival in Paris, thanks to Professor Probert, our itinerary was practically arranged. Through the kindness of Secretary Baker, a military automobile was placed at our disposal. This greatly facilitated our movements in a territory where ordinary means of transportation are largely disrupted. We visited first the Lorraine iron mines. Then we went to the French steel plants which had been destroyed by the Germans. We visited the mining areas of Luxemburg and those in the vicinity of Metz, after which we went through the Sarre coal fields, where we saw the German miners working under French military control, helping to sup-

ply, in part, the loss of production in the Pas de Calais field. We then returned to Paris via Verdun, where we had the honor of spending the night in the citadel as the guest of the commandant. We had an opportunity to go over the whole battle area on which occurred the most intense conflict in the whole history of clashing arms.

"On return to Paris, Dr. Cottrell left us to visit the air-fixation plants in Germany. Professor Probert and I went to the Pas de Calais coal field. In addition to examining the mines which had been wilfully destroyed, we made interesting observations at the principal French mines which escaped that fate. These mines continued in operation during long periods when they were under shellfire. Professor Probert then returned to the United States. I was requested to take part in an advisory capacity on coal matters in an Allied conference with German representatives at Cologne. The object of the conference was to obtain information as to what Germany had to offer in exchange for foodstuffs. As France and Italy each was in great need of coal and coke, it was hoped that Germany might have a surplus of these fuels. It proved that Germany had no coal and coke from the Westphalian field to offer, other than that already going to the occupied territory on the west bank of the Rhine. Strikes and labor difficulties, ascribed partially to food shortage, had cut down the output. It was at this conference that the Germans complained that the French had made no accounting to them of the coal taken from the Sarre Valley. Major General Gailard, who presided, merely smiled and did not call attention to the fact that they also had received no bill for the damage done French coal mines. The bearing of the Germans on that occasion was not that of those who recognize military defeat.

"While waiting for the conference to convene, I had time to visit the mines on the west bank of the Rhine in the Westphalian field and the remarkable brown coal field near Cologne. On the return from Cologne I visited the mining region of Belgium from one end to the other—from Liège to Mons—and thence continued over the line into the devastated region as far as Lens.

"I was detained in Paris by some matters pertaining to the Economic Commission's work, but as soon as I could get away I went to the south of France to visit the St. Etienne, Marseilles, and Alais coal fields. I was interested particularly in the latter, where there are great outbursts of nearly pure carbonic-acid gas which appears to be held under a very high compression in the coal.

"I then went to England, where I visited the typical iron mines in the Cleveland and Cumberland district; the oil-shale workings in Scotland and various typical collieries."

American Institute of Mining and Metallurgical Engineers

From a technical point of view, the Chicago meeting of the Institute, to be held Sept. 22 to 26, inclusive, promises to be one of the most interesting in its history. The wealth of material in the line of technical papers for discussion is greater than has been offered for any previous meeting. More than 150 papers have been submitted to the committee, which is finding it no small task to arrange a program with a minimum of conflicts among papers on allied subjects.

One of the excursions to be made by the Institute as a body during this meeting is to the La Salle district. A special train leaving Chicago early Thursday morning will take the members and guests to La Salle, Ill., where automobiles will convey the different parties to the coal mines, cement works, and zinc smelteries. For the ladies, and for others of the party not particularly interested in these industrial operations, the La Salle hosts plan an automobile trip to Starved Rock.

South African Gravity Stamp Practice*

The Use of Large-Mesh Stamp-Battery Screens, Together With an Increase in Tonnage, Raises the Question of a Substitute

FEW novel ideas have come into practice in Witwatersrand metallurgy during the last decade. Sixteen years ago H. S. Denny (who was at the time second in command to his brother in the technical administration of the affairs of the General Mining and Finance Corporation) read his noteworthy paper on "Main Reef Milling and Cyaniding Practice," and proposed certain reforms which had previously been adopted in other parts of the world, notably western Australia. Mr. Denny's valuable contribution to the technical literature of the gold fields was quickly followed by the adoption of some of the innovations suggested.

The New Goch and Glen Deep erected tube mills, fine grinding soon became general practice at most of the large and modern mills of the Rand, the mill screening employed became coarser and coarser, and the duty of stamps, which in 1903 seldom exceeded five tons in the 24 hours, rose to proportions which demonstrated that the functions of the gravity stamp battery had in some degree been changed. The new metallurgy grew apace, and, before long, tube mills were installed from one end of the Reef to the other. Fine grinding became part and parcel of Main Reef practice, and slime, which was the bugbear of the metallurgist in the earlier days of the fields, quickly lost its terrors.

Then followed a period in which the practical ramifications of the new metallurgy were extended to the adoption of filter presses and agitators, and as knowledge of these devices became extended and practice improved, the tendency to create more and more slime advanced in keeping with the growing tendency to make the apertures in the mill screening coarser and to throw more and more duty upon the tube mills. Today no less than 80% of the gold recovered by a leading mine is obtained from the slime product.

The evolution of the new metallurgy can easily be traced from the early part of 1903, when there was not a single tube mill at work along the Reef, up to the present day, when every mine from South Randfontein to Springs employs one or more of these machines for secondary pulverization of the ore, and between 300 and 400 tube mills are in daily operation. The development of the new metallurgy has been even and unchecked, and for the last year or two it has seemed as if a stage of general practical perfection had been reached. Details are constantly being experimented with or improved on, but the general impression has been that an established technical status of high capacity has been

attained, as well as reasonable cost and low residues, which does not offer or suggest much scope for the adoption of any important or epoch-making ideas.

Bearing all this in mind, it is at least interesting to learn that there is a suggestion that in the equipments of the future the gravity stamp may disappear altogether. In support of this view it is pointed out that screening as coarse as a 1/2-in. mesh is being employed in at least one of the newer mills, and it is contended that ore can be reduced to this size by means of a system of stage crushing in rock breakers, and by the employment of a form of crusher combining both the gyratory principle of the Gates type with the percussive action of the Blake-Marsden. I understand that the Sturtevant crusher is considered to comply with the necessary requirements, and there is one school of thought which claims that by the employment of these methods the stamp battery, with its heavy capital charges, becomes unnecessary.

The employment of coarse mill screening has resulted in the duty of a stamp being increased to a figure unheard of 12 or 15 years ago. On the Further East Rand there are three or four reduction plants in which the amount of ore crushed is over 20 tons per diem. In January, for instance, the duty per stamp at the Government Areas was nearly 25 tons in the 24 hours, and at the Modder Deep it was 23.8 and at the Van Ryn Deep 22.4 tons. Latterly the Chamber of Mines has discontinued the inclusion of a column exhibiting stamp duties in the monthly analysis of output. This publication now, however, gives more detailed information in regard to stamps and tube mills erected and at work and running time in respect of both forms of ore crushers, and the following table of stamp duties on the newer Far East Rand mines, compiled from the chamber's January returns, should be instructive in connection with the subject of the present achievements and functions of gravity stamps in the more modern plants of the Rand:

STAMP DUTIES AT MINES OF THE FAR EAST RAND

	Erected		At Work		Days Milling		Tons Crushed	Stamp Duty per 24 Hours
	Stamps	Tube Mills	Stamps	Tube Mills	Stamps	Tube Mills		
Brakpan.....	140	12	110	10	23.0	26.94	42,000	16.6
Government Areas.....	200	25	180	22	23.77	24.83	106,500	24.8
Modder B.....	104	8	104	8	27.01	28.66	58,000	20.5
Modder Deep.....	70	8	70	8	26.66	26.88	44,400	23.8
New Modder.....	236	15	236	15	22.44	21.86	76,000	14.3
Springs Mines.....	80	8	80	8	18.87	20.14	33,350	22.1
Van Ryn Deep.....	90	9	90	9	21.2	25.07	42,000	22.4

These figures demonstrate that the tube mill now performs a considerably greater proportion of the work in the reduction plant than formerly, and the contention under consideration is that large savings on capital account can be effected in new plants by eliminating stamp batteries altogether and feeding the product of the final crusher direct into the tubes. The idea is not a novel one. Many attempts have been made in other parts of the world to supplant the gravity stamp by utilizing rolls, grinding pans, and other devices.

In most instances the cost of maintenance has been the chief factor detrimental to the substitution of other devices for the California stamp, and the claim that the employment of crushers or combined gyratory and percussive action can prove satisfactory rivals to the present system of crushers and stamps will have to be proved before it finds many adherents.

*Reprinted from the *S. A. Mining and Engineering Journal*, Mar. 15, 1919.

Monthly Copper Production for 1919

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

	MONTHLY CRUDE-COPPER PRODUCTION, 1919			
	March	April	May	June
Alaska shipments (a)	1,471,398	2,153,691	1,134,272	2,374,843
Arizona:				
Arizona Copper	2,800,000	2,400,000	2,400,000	2,400,000
Calumet & Arizona	4,602,000	3,822,000	4,308,000	4,872,000
Cons. Ariz. Smelting	720,000	770,000	690,000	.....
Inspiration	6,700,000	6,900,000	6,200,000	6,300,000
Magma	1,000,212	674,943	730,548	.....
Miami	4,551,115	4,489,748	4,909,380	4,385,865
New Cornelia (a)	1,980,000	2,000,000	1,408,000	2,708,000
Old Dominion	2,574,000	2,389,000	2,564,000	2,015,500
Phelps Dodge	6,434,000	6,560,176	6,783,900	6,680,335
Ray	3,792,000	3,650,000	3,975,000	3,890,000
Shattuck Arizona	2,452	Nil	Nil	Nil
United Verde	Nil	Nil	1,250,000	3,525,000
United Verde Extension	Nil	Nil	Nil	2,806,849
California:				
Mammoth	1,475,000	1,386,000	620,000	Nil
Michigan:				
Calumet & Hecla	9,652,053	8,554,113	6,796,819	5,439,761
Other Lake Superior (b)	6,500,000	6,500,000	6,500,000	6,500,000
Montana:				
Anaconda	13,900,000	13,750,000	13,500,000	10,530,000
East Butte	1,700,230	1,347,580	1,414,460	1,513,360
Nevada:				
Nason Valley	Nil	Nil	Nil	.....
Nevada Cons.	3,650,000	3,763,000	3,700,000	3,715,482
New Mexico:				
Chino	3,770,000	3,498,747	3,583,396	3,615,458
Utah:				
Utah Copper	8,366,000	9,420,000	9,125,000	9,528,000
Eastern smelters (b)	1,400,000	1,400,000	1,400,000	1,400,000
Total reported	87,040,460	85,428,998	83,072,975	.....
Others, estimated	15,000,000	13,380,000	9,580,000	.....
Total United States	102,040,460	98,808,998	92,652,975	.....
Imports: Ore and concentrates, etc.	10,146,979	9,773,655	7,946,560	.....
Imports in blister, etc	49,564,356	22,781,489	15,997,164	.....
Grand total	161,751,975	131,364,142	116,596,699	.....
British Columbia:				
Granby Cons.	667,142	1,333,523	1,848,802	.....
Mexico:				
Boleo	2,039,520	1,433,040	1,322,720	1,256,640
Cananea	3,200,000	3,000,000	3,000,000	3,000,000
Phelps Dodge, Mexican properties	1,900,000	1,702,000	1,552,000	1,735,000
Other foreign:				
Cerro de Pasco	4,838,000	4,780,000	4,034,000	4,026,000
Chile	4,368,000	5,024,000	5,066,000	.....
Katanga	3,262,800	4,298,970	2,094,370	.....
Baekus & Johnston	2,144,825	.....	.....	.....

(a) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery. (b) Estimated. (c) Official figures of the U. S. Department of Commerce; includes Kennecott production from its Alaska mines.

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 were as follows:

	1918	1919
January	165,431,568	135,733,511
February	160,011,364	111,649,512
March	185,525,168	102,040,460
April	163,207,090	98,808,998
May	181,070,350	92,652,975

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Granby, Cananea, Braden, Cerro de Pasco, and Chile. As a matter of record, however, the individual figures are given after the total. We also report the copper output of the Boleo and Katanga companies, which does not come to the United States.

Cupro-Nickel Stock for Sale

The War Department, through the Director of Sales, has recently been making inquiries designed to develop a market, other than that afforded by the United States Mint, for approximately seventy-five carloads of cupro-nickel, the material from which the five-cent piece is coined. This material was acquired by the department for making metal jackets that incase the .30 calibre

bullets, and other small-arms ammunition. The alloy obtained for military purposes has a slightly higher copper content than that used for coinage. It consists of 85 per cent copper and 15 per cent nickel. Cupro-nickel is stronger than brass, and maintains through long usage a natural nickel finish.

New Suits Brought for Deportation At Bisbee

Cases Rushed Through Just Before Two-Year Statutory Time Limit Expires—Plaintiffs Ask Over \$5,000,000 Damages—Some Arrests on Criminal Charges

AS AN OUTGROWTH of the Bisbee deportation which took place July 12, 1917, civil suits to the total of 272 were filed on July 10, at Tombstone, Ariz., the county seat of Cochise County. Damages amounting to over \$5,000,000 are sought, on the ground of alleged assault, bruising, beating, and wounding by plaintiffs; 166 of the cases ask for \$20,000 damages each, one-half of which is claimed for actual damages and the remainder for punitive damages; 75 of the cases ask for \$25,000 each, and 31 ask for \$10,000 each.

The plaintiffs in the majority of the cases are men who it is alleged were deported, or their families or relatives. The defendants for the most part are the same, the following list covering the principal ones: El Pasc & Southwestern Railroad Co.; Phelps Dodge Corporation; Copper Queen Consolidated Mining Co.; Calumet & Arizona Mining Co.; Shattuck-Arizona Copper Co.; Walter Douglas, president of the Phelps Dodge Corporation; M. J. Cunningham, vice-president of the Bank of Bisbee; Harry C. Wheeler, former sheriff of Cochise County; Charles W. Allen, James R. Henderson, Ben Frankenburg, Mose Newman, all prominent merchants of Bisbee; Grant H. Dowell, manager of the Copper Queen company, of the Phelps Dodge Corporation; Arthur Notman, superintendent of the Copper Queen company; L. C. Shattuck, manager of the Shattuck-Arizona Copper Co.; J. P. Hodgson, manager of the Morenci branch of the Phelps Dodge Corporation; H. H. Stout, smeltery superintendent, Douglas Reduction Works; W. H. Brophy, former manager of the Phelps Dodge Mercantile Co.; Gerald Sherman, consulting engineer, Phelps Dodge Corporation; Charles F. McDonald, cashier, Citizens' Bank & Trust Co., Bisbee; also several other prominent citizens of Bisbee.

In addition to the above civil suits, over fifty arrests of prominent Bisbee men have been made on criminal charges preferred by some of the men deported, in each case the bond being fixed at \$2,000. Assistant County Attorney Roark authorized the statement that owing to the crowded condition of the Superior Court docket, together with the fact that it will take considerable time in the justice court to dispose of the cases now in progress, the state would probably await the final outcome of the present cases before filing the next list. The criminal cases will be given a preliminary hearing in the court of Justice W. C. Jacks, of Douglas, who stated his intention of trying one case a day and keeping the calendar moving as rapidly as possible, the first case to be heard on July 11.

It is understood that all of the above cases were rushed through and filed prior to July 12, 1919, thus coming within the two-year limit prescribed by the statute of limitation.

BY THE WAY

The Engineer in Civic Life

Among the engineers who have risen to distinction in civic life is Mayor Walton, of Oklahoma City, who is a consulting civil engineer. When recently a vigorous chapter of the American Association of Engineers was organized at Oklahoma City, the Mayor honored the association's national secretary, C. E. Drayer, of Chicago, by conferring a policeman's commission upon him. The club that no doubt goes with the commission can be used to remind "Monads," of the Oklahoma chapter at least, of their duties as citizens, whenever the occasion arises.

Educational Advantages

"Speakin' o' this 'ere simplified spellin' an' pronunciation, m'son," said Cap'n Dick, "reminds me o' the time w'en Jan Tregillis made h'up 'is min' to get educated. Jan, 'e'd never putten much stock on learnin', an' w'ile 'e naved all bout minin' an' such 'e figgered as 'ow 'e h'ought to h'improve long lines o' readin' an' writin'. So 'e starts h'out gawin' to night school. Cordin' to 'im, 'e wuz doin' fine, an' mighty proudd wuz 'e of 'is 'eadway. One day 'e got 'old of Billy Penglase, an' sez 'e to 'im, 'Ere, Billy, this 'ere readin' is simple nuff. Naow 'ere's sumthin' in this paper that's plain as can be, an' yet I'll bet there be them chaps 'o can't make un h'out no 'ow. C-A-T. Now I naws that spells cat, an' E spells 'e, 'e cat. An' 'ere's G-O-R-Y, gory. W'y that's simple nuff; that there word spells bloody tomcat."

D. E. A. C.

Froth

The proposed San Bernardo mill, in San Miguel County, Col., is to be a 100-ton flotation plant, with ball mills for grinders and oil as an ore dressing, according to a local paper. A slip of the tongue, perhaps, in speaking thus of the oil used in flotation. But flotation, after all, must be a puzzling thing to the layman, and laxities of speech may be pardoned. Mother Shipman really foretold the art when she prophesied that "iron would on water float." There is a bare chance that the old lady knew more about it than she let on, and if the Minerals Separation people will hunt up the records they may be able to acquire what few remaining rights they do not already possess—with the aid of the courts, of course.

But to get back to our puzzled layman, who has always considered oil the great soother for troubled waters. How confused must he be on finding oil used in flotation with the opposite result! Here too, the law of gravitation is suspended and Sir Isaac Newton seems a faker. And about it all is a fascination that attracts layman, metallurgist, and lawyer alike.

Astrology in the Oil Fields

"Doing business by mail assures you Uncle Sam's protection," advertises the Astro Oil Association, of Fort Worth, Tex. Sometimes it also brings the Post Office inspectors down upon you, the association would do well to note. At any rate, oil geologists must get

together, unionize, or do something to keep astrologers from breaking into the game and grabbing all the profits. "The ancient wise men were astrologers," runs the association's advertisement; "kings followed their counsel and successful men do so today. Professor Richard S. Bacon, famous astrologer, fully demonstrated to us his ability to locate oil pools. Our geologist has found a structure, surrounded by proven fields, and Professor Bacon says it contains oil in paying quantity. They may both be wrong, but we are betting our money they are right." The public is invited to subscribe at only \$1 per share.

A Silverless Islet

Silver Islet is all right except for the silver, in the opinion of Horace V. Winchell, who takes exception to a "romantic and highly colored article" about this property on the shore of Lake Superior, which was recently published in the *Minneapolis Journal*. The impression conveyed, according to Mr. Winchell, is "one calculated to induce optimistic individuals to spend money fruitlessly in further exploration of this property." In a letter to the *Minneapolis paper*, Mr. Winchell describes the property briefly as follows:

The Silver Islet mine was discovered by John Morgan, one of the party of surveyors who were working under the direction of Thomas Macfarlane, a well-known geologist who had been engaged by the Montreal Mining Co. to survey and prospect that company's Lake Superior properties in 1868.

The country rock at Silver Islet and upon the adjacent mainland consists of a series of dark slates and other sedimentary rocks of Animikie series. These slates are cut by sills and dikes of basalt, a massive eruptive rock which rests in steep bluffs and escarpments around the shores and islands of Thunder Bay. The rich silver ore was found only in the basalt and in the black slate immediately adjacent thereto. It occurs in a fissure vein from 8 to 10 ft. in average thickness with occasional enlargements to 20 or 30 ft. This vein extends downward to the underlying quartzites and probably into the still deeper-lying granite. In these formations the vein is distinctly impoverished and does not carry enough value to pay for working.

I do not conceive it to be the province or duty of the newspapers to protect the careless individual from unwise speculative ventures, but, on the other hand, I question the policy which leads them occasionally to publish statements which are not only erroneous, but which may easily aid the unscrupulous promoter in parting the sucker from his wealth. The business of mining is attended with sufficient hazard, even when carried on with good judgment and understanding of all the facts which may be known, and it should not be cumbered with the additional encouragement and romance aroused in the mind of the inexperienced reader by such inaccurate statements as those above referred to.

It is the opinion of those best qualified to judge, and in possession of all the facts with reference to Silver Islet, that *the silver is not there*; that the property has been thoroughly prospected and mined, and that further attempts to operate this property have little chance of success. The mine was not extraordinary in its ore nor in the production. The dividends paid from it were probably not large, and many other properties in the United States and Canada have exceeded many times its value and production.

The article in question appeared in the Sunday magazine section of the paper named, on June 22.

Advices to Washington are that blast furnaces are being blown in in the Liège district, Belgium. Among those started are the furnaces of the Cockerill Company, at Seraing.

NEW PUBLICATIONS

International Mining Law. By Theo. F. Van Wagenen. Cloth, 5 x 7½; pp. 342. McGraw-Hill Book Co., New York, 1918.

This work on the mining laws of the world contains a mass of interesting and important information, and the reader may get an excellent idea of their characteristics and varying features. The name is a misnomer. There is no code of "International Mining Law," strictly speaking, each country having its own individual laws. The work might better have been entitled "Mining Laws: a Comparative and Historical Treatment." The author gathered this material with the idea of informing himself as to the need of revision of the Federal mining law in force in the Western part of the United States. As a result of his research, which is presented in this work, he came to the conclusion that "its fundamental principles are sound." As a whole this work is excellent, and the conclusions are justified in the main. There are some details, however, to which exception might be taken. For example, the author states that no serious effort has been made to change the American mining law for nearly fifty years. As a matter of fact, one of the most determined efforts radically to change this system was made in 1879 and 1880, when the Public Land Commission, composed of J. A. Williamson, Clarence King, A. T. Britton, Thomas Donaldson, and J. W. Powell, authorized by Congress for the purpose of reporting on all of the public land laws, made its report, which was published in 1880, and most emphatically recommended that the mining laws be radically amended.

The author also states that we have a more complete record of the ancient Spanish mining laws than has been preserved in any other part of the world. He probably had in mind the most excellent commentaries on the mining laws of Spain by Gamboa, but with the exception of this work and one or two others the literature accompanying the ancient Spanish mining law is comparatively limited. On the other hand, the ancient mining laws of the original Germanic states are embodied in a literature that is unequalled in extent and detail of treatment by any other ancient system in the world.

The author, in commenting on the pioneers who rushed to California upon the discovery of gold, also states that they "consisted mainly of American working men of *limited education* but unlimited virility and well endowed with common sense and a fundamental idea of justice." As a matter of fact, they were "educated, intelligent, civilized, and elevated men of the best classes of society" (*California Herald*, N. Y., Jan. 16, 1849). Speaking of one of the early mining conventions in which the miners made their own laws, an historian says:

"The number of talented men in this Convention was noted, although it was not unusual for such bodies in the early Fifties to be composed of men who might have sat in legislative halls with credit to themselves and all concerned"—"History of Amador County," pp. 145-146, 1881.

The author is not of the opinion that the extralateral right as developed in Germany was productive of much litigation. As a matter of fact, the extralateral right was abolished as to claims thereafter located in the various states composing Germany, beginning in the early part of the nineteenth century until 1865, when this change became universal, and the reason given for this change was that the character of the right gave rise to excessive litigation. The Germanic extralateral right, however, was much more complex and difficult of ascertainment than the corresponding right in the American mining law, and though excessive litigation has been given as a reason for the proposed repeal of the extralateral features of the American mining law, the true objection is, more properly, expensive litigation. The number of extralateral cases arising in the United States is comparatively limited when we consider

the magnitude of the industry involved, and the proportion that extralateral cases bear to cases arising under other phases of the mining law is a small percentage, being only 2 or 3 per cent of the total mining litigation.

The author is not in favor of the abolition of the apex and extralateral rights doctrine, but would modify it so that the extralateral right would attach only to the vein or deposit first discovered, limiting the rights to secondary veins by vertical boundary lines. It is difficult to see where in this change would improve the present situation, and it would certainly add materially to the amount of litigation.

In conclusion, the author feels that the American Federal mining law compares favorably with other mining-law systems of the world, and he is correct in his statement that, before attempting to repeal or modify our law as it now exists, those who advocate the change should become familiar with these other systems of mining law and their underlying principles. A woeful ignorance of results that would ensue if the law were amended as is generally suggested has been betrayed by many of those who have taken the lead in advocating a radical change in the mining law of this country.

Many well-meaning critics have recommended the outright abolition of the extralateral right and discovery features of American mining law. Those who advocate this without radically changing all our public land laws at the same time have no conception of the manner in which these laws dovetail and what a profound effect any change on the one side is going to make if those on the other side are not correspondingly profoundly modified. To wipe out the extralateral and discovery features from our law is to eliminate the major part of our mining law that exists today and to leave the field open for agricultural claimants and blackmailers, who could at once take advantage of this radical change, for it would leave the miner at their mercy.

The great difficulty with our whole system of mining law is that its framers were not prophetic enough to recognize that the only mining law which will bear the test of time is based upon a complete separation of title to mineral deposits from the title to the surface, wherever this is possible. Practically all of the mining law systems of the world have incorporated this fundamental conception. It then becomes easy to deal with agricultural and surface claimants who have no title to the underlying minerals, and who can possess only superficial deposits that cannot be dissociated from the actual surface. The extralateral feature of our mining law is practically the only attempt that has been made in our law to bring about this severance, if we except recent acts of Congress providing for the severance of the surface from underlying deposits of coal, oil, potash, and other metals and minerals. Whether it is too late at this day so profoundly to alter our mining law is a practical question that will take a Solomon to answer.

Mr. Van Wagenen's book has added materially to the information now available upon the general subject, and should be read by everyone interested in the proposed revision of our mining laws. It is also a convenient work of reference for those who have occasion to consult foreign mining laws.

WILLIAM E. COLBY.

Electric Generation and Distribution in Canada. By Leo G. Denis. Paper, 6¾ x 9¾; pp. 296, illus. Commission of Conservation, Ottawa, Canada, 1918.

Bibliography of Petroleum and Allied Substances in 1916. By E. H. Burroughs. Paper, 5¾ x 9; pp. 159. Bull. 165, U. S. Bureau of Mines, Washington, D. C.

Sand and Gravel in Ontario. By A. Ledoux. Paper, 6½ x 9½; pp. 138, illus. Report of the Ontario Bureau of Mines, Vol. 27, Part 2; Toronto, Canada, 1918.

Eighteenth Biennial Report of the Bureau of Labor Statistics of the State of California, 1917-1918. Paper, 5¾ x 9; pp. 470. John P. McLaughlin, Commissioner, 948 Market St., San Francisco, Cal.

Estado Actual y Porvenir de la Industria Minera en los Departamentos del Sur. By Carlos Basadre y G. Paper, 6¼ x 9½; pp. 64, illus. "Boletín No. 93," Cuerpo de Ingenieros de Minas del Peru, Lima, Peru, 1918.

- The Evaporation and Concentration of Waters Associated With Petroleum and Natural Gas. By R. Van A. Mills and Roger C. Wells. Paper, 6 x 9; pp. 104, illus. Bull. 693, U. S. Geological Survey, Washington, D. C.
- Fifteenth Biennial Report Issued by the Bureau of Mines of the State of Colorado for the Years 1917-1918. By Fred Carroll, Commissioner. Paper, 6 x 9; pp. 206, illus. Bureau of Mines of the State of Colorado, Denver, Col.
- Industrial Health and Efficiency. Final report of the British Health of Munition Workers' Committee. Paper, 6 x 9; pp. 374, illus. Bulletin, U. S. Bureau of Labor Statistics No. 249, U. S. Department of Labor, Washington, D. C.
- Mémoire Traitement Thermique des Obus (Application de la Méthode Taylor). By Léon Guillet. Introduction and notes by Henry Le Chatelier. Paper, 8½ x 10½; pp. 154, illus. Publication de La Revue de Metallurgie, Paris, France, January, 1916.
- Third Annual Report of the State Oil and Gas Supervisor of California, for Fiscal Year 1917-1918. By R. P. McLaughlin, State Oil and Gas Supervisor. Paper, 6 x 9; pp. 602, illus. Bull. 84, California State Mining Bureau, San Francisco, Cal.
- The Limestone Deposits of New South Wales. By J. E. Carne and L. J. Jones. Issued by direction of the Honorable J. C. L. Fitzpatrick, Minister of Mines. Card-board, 5½ x 9½; pp. 411, illus. "Mineral Resources No. 25," Geological Survey of New South Wales, Sydney, Australia, 1919.
- Trautwine—The Civil Engineer's Pocket-book. Twentieth edition, revised and enlarged. By John C. Trautwine. Leather, 4 x 6½; pp. 1,528. Trautwine Co., Philadelphia, Pa., 1919.
- This long-established standard handbook needs no review, as most engineers are familiar with its good features and its limitations.
- Manual of the Chemical Analysis of Rocks. Third Edition, Revised and Enlarged. By Henry S. Washington. Cloth, 5½ x 9; pp. 271. John Wiley & Sons, New York, 1919.
- A selection of methods for the chemical analysis of silicate rocks, especially those of igneous origin. The book is intended for the use of chemists and petrologists.
- Guía Industrial de Bilbao de 1918. Cloth, 7½ x 10½; pp. 124, illus. Sociedad General Española de Publicidad, Bilbao, Spain.
- A directory of concerns and individuals doing business in Bilbao. It includes lists of mining and metallurgical companies, manufacturers of hoisting ropes, carbide and explosives, and other materials, which will be of interest to the mining industry.
- The Energy Resources of the United States: A Field for Reconstruction. By Chester G. Gilbert and Joseph E. Pogue. Paper, 6 x 9; pp. 165, illus. Bull. 102, Vol. 1, U. S. National Museum, Washington, D. C.
- This bulletin deals largely with petroleum as an energy resource. For those interested in a broad treatment of the subject in its relation to the public interest there is much material of value in this publication.
- The Decline and Ultimate Production of Oil Wells, with Notes on the Valuation of Oil Properties. By Carl H. Beal. 6 x 9; pp. 215, illus. Bull. 177, U. S. Bureau of Mines, Washington, D. C.
- A useful bulletin which gives much needed information about the methods for estimating the future and ultimate production of oil properties and the application of these methods to oil-land valuation. Part 2 deals with the decline and ultimate production of different oil fields of the United States.
- Annual Statistical Report of the American Iron and Steel Institute for 1917. Cloth, 6 x 9½; pp. 96. American Iron and Steel Institute, 61 Broadway, New York, 1919.
- An excellent statistical summary of the production of pig iron, steel ingots and castings, rolled iron and steel, tin plates, galvanized sheets, pipes, tubes, and similar forms, iron ore, coal, and coke. It is stated that the compilation of these statistics was delayed owing to special work undertaken at the request of the War Industries Board and the War Trade Board.
- Iron and Steel, a Pocket Encyclopedia, Including Allied Industries and Sciences. By Hugh P. Tiemann, with an introduction by Henry Marion Howe. Leather, 4 x 6½; pp. 514. McGraw-Hill Book Co., New York, 1919.
- In the introduction to this little book Henry M. Howe says: "I commend the book without reserve to the whole family of steel metallurgists, be they millmen, metallo-graphists, teachers or students." The book is a combination of a dictionary, a cyclopedia and a handbook and is useful as a quick reference on iron and steel.
- Mineral Statistics. Paper, 5 x 8; pp. 31. Copies will be sent on request by *Engineering and Mining Journal*, 10th Ave. at 36th St., New York City.
- This pamphlet is a reprint of the principal statistical tables from the Annual Review Number of the *Engineering and Mining Journal* and a few from later issues. They have been reproduced in this form for ready reference, but, in some cases, the record has been completed, which could not be done at the date of original publication, and in other instances the figures have been corrected in the light of later information.
- The U. S. Geological Survey: Its History, Activities, and Organization. Institute for Government Research, Service Monographs of the U. S. Government, No. 1. Cloth, 5½ x 8½; pp. 163, illus. D. Appleton & Co., New York, 1918.
- The first of a series of monographs giving the history, development of service, functions, organization, plant, laws and regulations governing, appropriations, expenditures and other data of important governmental divisions. This particular volume gives in condensed form, suitable for convenient reference, full information about the U. S. Geological Survey.
- The Design of Walls, Bins and Grain Elevators. By Milo S. Ketchum. Third Edition, Revised and Enlarged. Cloth, 6 x 8½; pp. 556, illus. McGraw-Hill Book Co., New York, 1919.
- A well-known book which has already reached its third edition. This issue contains new material on economic design of reinforced-concrete retaining walls; formulas for wedge-shaped reinforced-concrete beams; formulas for calculating the unit pressures on bin walls; the report on the design of retaining walls, adopted by the American Railway Engineering Association in March, 1917, as well as other minor additions.
- Report of a Joint Committee Appointed from the Bureau of Mines and the United States Geological Survey by the Secretary of the Interior To Study the Gold Situation. 5½ x 9; pp. 84, illus. Bull. 144, U. S. Bureau of Mines, Washington, D. C.
- The findings of a committee appointed in July, 1918, by Secretary Lane to investigate the gold-mining situation in the United States. The committee consisted of Hennen Jennings, chairman; J. H. Mackenzie and Charles Janin, of the Bureau of Mines, and H. D. McCaskey and F. L. Ransome, of the U. S. Geological Survey. The bulletin will be useful to students of economics and to mining engineers.
- The Weight Per Unit of Brake Horsepower of a three-cylinder vertical Diesel oil engine, as given in a catalog for several sizes, is shown in the following table:
- | Net Brake, Hp. | Weight Range Lb. per Brake, Hp. | Net Brake, Hp. | Weight Range Lb. per Brake, Hp. |
|----------------|---------------------------------|----------------|---------------------------------|
| 150 | 446 to 533 | 400 | 390 to 525 |
| 200 | 420 to 510 | 500 | 405 to 464 |
| 300 | 400 to 530 | 600 | 386 to 500 |
- The weights are approximate only, and the larger weight includes a heavier flywheel than the smaller.

PERSONALS

AMOR F. KEENE, of the Gold Fields American Development Co., Ltd., who was formerly associated with H. C. Hoover's and other London mining and exploration companies, has been elected a director of Johnson, Matthey & Co., Inc., recently formed to take over the business in the United States of Johnson, Matthey & Co., Ltd., of London, England, dealers in platinum and precious metals, assayers and refiners for the Bank of England, bullion merchants, metallurgists, analysts, and manufacturing chemists. Mr. Keene has also been elected a director of the South American Gold and Platinum Co. and of the American Trona Corporation.

F. F. Sharpless has moved his office from 17 Madison Ave. to 115 Broadway, New York.

John E. Penberthy, mining engineer, of Gleeson, Ariz., has returned home from a trip of examinations.

W. E. Bennet returned to New York during June after several months' trip to the properties of the Chile Exploration Co.

Thomas O. McGrath, auditor, Shattuck-Arizona Copper Co., is with his family for a month's vacation at Southern California coast points.

W. W. Thayer, secretary of California State Mining Bureau, has again taken up his duties after a three months' absence due to influenza-pneumonia.

W. V. De Camp has recently left New York to accept a position as field engineer for the Western Metallurgical Co., with headquarters at Humboldt, Ariz.

W. E. Cockfield, of the Canadian Geological Survey, and party are making an examination of the country along the Ogilvie Range, in Yukon Territory.

Lieutenant Frank G. Berton, of the Canadian Engineers, who previous to his enlistment was gold recorder at Dawson, Yukon Territory, has returned from overseas.

Harry J. Wolf has resigned as professor of mining in the Colorado School of Mines and has accepted a position on the editorial staff of the *Engineering and Mining Journal*.

Major Charles S. Haley, 521st Engineers, is expected to return from France about Aug. 1 and plans immediately to reopen offices as consulting mining engineer.

C. Carleton Semple has returned to Lima from an examination of silver-lead and coal properties near Parquin, and is now examining copper properties near Huancaya, Peru.

Fletcher Hamilton, California State Mineralogist, has returned to San Francisco from Sacramento, where he had been sitting on the Board of Equalization and Readjustment of Oil Correction and Review.

Edward H. Robie, formerly assistant metallurgist with the International Nickel Co., of Canada, Ltd., at Copper Cliff, Ontario, has accepted a position on the editorial staff of the *Engineering and Mining Journal*.

A. M. McQueen, of Toronto, vice-president of the Imperial Oil Co., is in Edmonton, Alberta, in connection with the extensive program of exploration now being carried on by the company in Northern Alberta.

James J. Warren, of Toronto, who has been managing director of the Consolidated Mining & Smelting Co. of Canada since 1915, has been elected president, succeeding the late W. D. Matthews. He will continue to act as managing director.

Ralph Arnold, having completed his Government service, announces the resumption of his practice as consulting

Captain Hallet R. Robbins, Military Intelligence Division, U. S. A., formerly metallurgical engineer for the Granby Consolidated Mining, Smelting & Power Co., Ltd., has been recalled from Peking, China, where he was on duty as assistant to the American Military Attaché, for discharge from the military service.

Harold A. Linke has just returned from the coast, where he was engaged with the U. S. Housing Corporation of the Department of Labor on construction of "Vallejo Project 581," a town for civilian employees of Mare Island Navy Yard. Mr. Linke has resumed his professional practice, with office at 416 Boston Building, Salt Lake City, Utah.

G. L. Schmutz has reopened his office in Douglas, Ariz., and will conduct a general engineering business under the firm name of Schmutz & Rugen. Mr. Schmutz was efficiency engineer of the Pilares Mine of the Phelps Dodge Corporation, near Naco, Sonora, Mexico. O. N. Rugen is now serving as first lieutenant in the 301st Engineers in Germany, and expects to return soon.

Charles W. Badgley, has recently been appointed superintendent of the El Paso Smelting Works, succeeding **James Heggie**, who accepted the position of superintendent of the Verde Extension Copper Co., of Jerome, Ariz. **Paul Stein**, formerly of El Paso, but more recently of Hayden, Ariz., has been made assistant to Mr. Badgley. Mr. Stein until lately was assistant superintendent of the Hayden smelter.

Howard I. Young, for several years manager of mines for the American Zinc, Lead & Smelting Co., for the Joplin-Miami district, has been transferred to the company's properties at Mascot, Tenn., succeeding **J. N. Houser**, who has been promoted to a position with the company at New York. Mr. Young will move from his home at Carthage, Mo., to Mascot, but will retain the management of the Joplin district operations.



AMOR F. KEENE

petroleum geologist and engineer, with offices at Union Oil Building, Los Angeles, Cal., and 120 Broadway, New York. Cable, Ralfarfoil.

Lewis A. Parsons has resigned his position as engineer of mines with the International Nickel Co., Copper Cliff, Ontario, to accept the associate editorship of the *Mining and Scientific Press*, San Francisco. **Allan F. Brock** succeeds Mr. Parsons at Copper Cliff.

Roy E. Collom, petroleum technologist, resigned from the staff of the *California Oil and Gas Supervisor*, July 1. Mr. Collom immediately entered upon similar duties with the U. S. Bureau of Mines, his present headquarters being at the Customs House, San Francisco.

Captain W. H. Wright has received an honorable discharge from the Army and will resume his former connections with the Malm-Wolf Company. Captain Wright will be engaged in the examination of mining properties in Alaska during the next two or three months.

OBITUARY

Samuel T. Wellman, of Cleveland, Ohio, prominent in the iron industry on the Great Lakes, died suddenly of heart disease at Stratton, Me., on July 11.

Oskar Simmersbach died in Berlin, Germany, on Dec. 14, 1918, at the age of forty-seven years. He entered the Technische Hochschule at Aachen in 1891 and later went to the Mining Academy at Berlin, where he was engaged in the study of iron and steel metallurgy. He followed blast-furnace work at the Mathilden Hütte in Harzburg and the Ponnernmarch Hütte, in Upper Silesia, after the completion of his education. Mr. Simmersbach became professor of metallurgy in 1909 in the Technische Hochschule at Breslau.

During his later years Professor Simmersbach was the author of many articles on iron and steel metallurgy published in *Stahl und Eisen*. His book "Foundation of Coke Chemistry" was published in 1895 and translated into French and English.

MINING SCHOOLS

Carnegie Institute of Technology announces the organization of a co-operative department of mining engineering. A four-year course is open to boys with a high-school education, and a two-year course, planned for the man in the mines, is open to those who have had a common-school education and two years of experience in or about mines, or in their management. The latter course will include the fundamental and elementary subjects and practical application in field work.

INDUSTRIAL NEWS

Portable Machinery Co., Inc., Pas-saic, N. J., has issued a circular stating that the patents of the company for the manufacture of a scoop conveyor have been infringed by a competitor.

The American Brass Co. has issued a loose leaf folder on schedules for base prices and extras for seamless tubes manufactured of brass; commercial, Tobin and phosphor bronze, and copper. Also a folder on brass, bronze, and nickel-silver sheets, wire-rods, and brazed tubes.

National Bank of Commerce, New York, has issued a statement on the "Trend of Brazil Trade," showing the increase of United States exports to that country, from \$51,000,000 in 1913 to \$89,000,000 in 1918. British shipments decreased from \$80,000,000 in 1913 to \$50,000,000 in 1918.

Edison Storage Battery Co. announces the removal of its district office in Pittsburgh, Pa., to Room 431 Union Arcade Building. The change has been made necessary by the tremendous increase in the volume of business handled through this office. The new location provides better facilities and has larger office space.

The Midwest Engine Co., Indianapolis, Ind., announces the appointment of B. H. Downing as eastern sales manager, with offices at 111 Broadway, New York, where he will have direct supervision over all sales in the Eastern and Atlantic Coast states on Diesel and oil engines, steam turbines, and centrifugal and reciprocating pumps.

War Department, office of ordnance district chief, offers for sale a quantity of building brick, now in storage at the Manchester plant, Laclede Gas Light Co., St. Louis, Mo. The following are

the approximate lots: Hard red facing brick, 160,000 and 130,000; salmon-colored soft, 92,000. Quotations are requested on material f.o.b. Manchester plant.

A. J. Meier & Co., industrial engineers, Boatmen's Bank Building, St. Louis, Mo., issues a summary of the reports and data on the manufacture of lithopone, which includes the process and properties of the Collinsville Zinc Corporation. A discussion of the mining properties situated near Moselle, Mo., with estimation of available ore suitable for lithopone manufacture, is appended.

The Cutler-Hammer Mfg. Co., of Milwaukee, recently opened an office in Detroit, situated at 905 Kresge Building, to expedite the handling of orders and to give the company's customers in and about Detroit better engineering service. This office is a branch of the Chicago office. H. S. Kinsley, who is in charge at Detroit, has with him C. W. Greenman and M. Dugliss, both of whom were recently mustered out of service.

Chicago Pneumatic Tool Company announces the appointment of L. C. Sprague, formerly district manager of sales at New York, as manager of Western railroad sales, with headquarters at Fisher Building, Chicago, and H. G. Barbee as manager of Eastern railroad sales with headquarters at 52 Vanderbilt Ave., New York City. Nelson B. Gatch, formerly at Chicago, has been appointed district manager of sales at New York, succeeding Mr. Sprague. Announcement of Mr. Gatch's successor at Chicago will be made later.

Mark R. Lamb, who has recently returned from a four months' commercial trip through Europe, has just completed the purchase of a controlling interest in the New York Steel Exchange, Inc., with which will be combined his own export business. Mr. Lamb's foreign connections were largely in South America, until his recent opening of a branch office in Paris. This office will be in the Eclair Building as soon as that new office structure (the only one in Paris) is ready for occupancy. Mr. Lamb has taken the management of the enlarged company.

TRADE CATALOGS

Carbo-Hydrogen Apparatus. The Carbo-Hydrogen Co. of America, Benedum Trees Building, Pittsburgh, Pa. Catalog; 61 x 9; 27 pp.; illustrated. Describes the use of carbo-hydrogen apparatus for cutting steel and wrought iron.

Stationary and Portable Air Compressor Equipments. Allis-Chalmers Manufacturing Co. Bulletin 1,105; 8 x 10½; 8 pp.; illustrated. Descriptive of electrically driven air compressors built in two capacities—100 cu.ft. and 150 cu.ft. piston displacement.

Jeffrey Standard Apron Conveyors. Jeffrey Manufacturing Co., Columbus, Ohio. Catalog 258; 8½ x 11; 74 pp.; illustrated. A general discussion is given in the first pages on the subject of handling material mechanically with standardized units. Twenty-one pages of tabled specifications are included on standard steel and wood apron conveyors, which should prove generally valuable to engineers. The many excellent illustrations showing adaptations of these machines to a wide range of materials and conditions convey considerable information.

NEW PATENTS

U. S. patent specifications may be obtained from the *Engineering and Mining Journal* at 25c each.

Aluminum and Uranium Alloy. Louis Fenn Vogt, Washington, Pa., assignor to Standard Chemical Co., Washington, Pa. (U. S. No. 1,304,224; May 20, 1919.)

Briquetting Apparatus and Process. Fred Allen Jordan, Sellwood, Ontario, Canada, assignor to Moose Mountain, Ltd., Sellwood, Ontario, Canada. (U. S. Nos. 1,304,185 and 1,304,186; May 20, 1919.)

Cable Splice. Newton K. Bowman, Canton, Ohio, assignor to the American Mine Door Co. (U. S. No. 1,304,534; May 27, 1919.)

Concentrates—Process of Treating Concentrates. Walter G. Swart, Duluth, Minn., and Bethune G. Klugh, Aniston, Ala. (U. S. No. 1,303,411; May 13, 1919.)

Converter—Automatic Tuyere Cleaner for Metallurgical Converters. Charles J. Arch, Douglas, Ariz. (U. S. No. 1,303,755; May 13, 1919.)

Drill-Steel-Pinning Device. Jesse Dittson, Littleton, Col., assignor to the J. Geo. Leyner Engineering Works Co., Littleton, Col. (U. S. No. 1,306,106; June 10, 1919.)

Electric Furnace. Ivan Rennerfelt, Djursholm, Sweden. (U. S. No. 1,305,167; May 27, 1919.)

Flotation of Minerals. Clement Linwood Perkins, Pittsburgh, Pa., assignor to Metals Recovery Co., New York, N. Y. (U. S. No. 1,302,966; May 6, 1919.)

Thorium—Recovery of Thorium. Lonnie W. Ryan, Chicago, Ill., assignor to Lindsay Light Co., Chicago, Ill. (U. S. No. 1,307,153; June 17, 1919.)

Thorium—Treatment of Thorium Fluoride. Lonnie W. Ryan, Chicago, Ill., assignor to Lindsay Light Company, Chicago, Ill. (U. S. No. 1,307,152; June 17, 1919.)

Zinc—Method of Handling Anodes in Electrolytic Baths. Heber M. Stuart, Baltimore, Md., assignor to Electrolytic Zinc Co., Inc., New York, N. Y. (U. S. No. 1,299,519; Apr. 8, 1919.)

Smoke—Metallurgical Smoke Filter. William H. Bates, Jr., Boston, Mass. (U. S. No. 1,302,281; Apr. 29, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief
of Interest to Engineers
and Operators

SAN FRANCISCO, CAL.—July 10

The War-Minerals Relief Commission reached San Francisco July 5. Hearings for chrome, manganese, tungsten, and pyrite producers are being held daily in the Post Office Building. At present 83 claims for reimbursement are listed, but this number will probably be considerably increased, and the commission expects to remain here for at least three weeks.

The Big Hill Mining Co., a California corporation, is preparing for extensive development of three of the important properties in the Cove mining district, in Southern California. The active operation to follow development and installation of modern machinery will lead to a revival of productive mining in the district, which is among the oldest deep mining districts in California. The properties optioned by the Big Hill company are the Lady Belle, Bull Run, and Jeff Davis, all of which were producers more than thirty years ago, and one of which, the Jeff Davis, as far back as the middle 60's. The production of the district in the thirty years of active life up to 1893 totaled several million dollars from a depth not greater than 400 ft.

The Cove district is in Kern County, forty-two miles by wagon road north of Caliente, at an average elevation of 3,000 ft. The formation is granite and slate, the granite predominating. Nine ledges or

tricts spread to other parts of the state, the prospect of a large increase in gold production in the south as well as in the north is thought to be favorable.

Directors of Twenty-One Mining Co. have been vindicated by the final decision of the Superior Court of California. Judge Thomas F. Graham signed the judgment in their favor, reversing a former finding in favor of the plaintiff, Flinn. At the first hearing the latter testified he had paid \$25,000 for an option on property, purchase price to be \$250,000, and charged that F. M. Phelps had salted the samples, upon the discovery of which he demanded his money back. Judge Graham ruled that Flinn was entitled to recover. The defendants were granted permission to work the mine by the Federal District Court and uncovered a vein from which \$200,000 in gold was taken. Upon this showing was based the second decision. The \$25,000 paid for the option remains with the defendants. The defendant has a right, it is stated, to complete the purchase, but without title to the \$200,000 already removed.

SPOKANE, WASH.—July 11

Idaho Mine Owners' Association has joined the recently organized Silver Producers' Association. Ravenel Macbeth, secretary of the Idaho association, said in Spokane recently that it was his belief that the new organization will be able to keep the con-

of them going to Butte. All other operators in the district have followed the lead of those at Mullan.

BOISE, IDAHO—July 10

The Gold Hill & Iowa Mine, at Quartzburg, Idaho, forty miles northeast of Boise, controlled by the Boston & Idaho Dredging Co. interests, is working 100 men. Recent development has demonstrated the virtue of careful geologic study of the deposits, which has resulted in finding virgin orebodies of better grade than formerly. The milling capacity has been increased from 50 to 100 tons per day. A cyanide plant is now being installed to treat the concentrates by a process worked out by F. C. Brown, a local cyanide engineer. A good recovery is expected on \$50 to \$100 concentrates, about five tons of which is being produced per day. At present this is being shipped to the Salt Lake smelters at a high freight and treatment charge. This is the oldest gold-lode mine in Idaho, and has been successfully operated for the last fifty-four years, with a total output of between three and four million dollars and a maximum depth of 550 ft.

The I. X. L. group of copper claims, in Washington County, taken over last autumn by local wool growers, has since been under development and now has an 800-ft. crosscut tunnel penetrating a flat-dipping zone of quartz monzonite with primary chalcocite, the sulphides com-



COVE MINING DISTRICT, KERN COUNTY, CALIFORNIA, LOOKING NORTH WEST FROM RED HILL. 1, CONTENT; 2, PEARSON'S GULCH; 3, SUMNER GULCH; 4, LADY BELLE; 5, SHART; 6, LODGE; 7, RED HILL

lodes can be traced by bold croppings. The main lode is the Sumner, having a general width of 150 ft., and produces large tonnage of milling ore. The Bull Run, Jeff Davis, and Lady Belle veins have a length of 300 to 800 ft. and are 12 to 20 ft. wide, carrying high-grade ore from \$35 to \$100 per ton. These mines are situated about one-half mile north of Kernville, which is about forty miles in direct line northeast of Bakersfield. The district is well supplied with water from Kern River. The Southern California-Edison Co. diverts water from this stream at Kernville for generation of electricity. The Big Hill Mining Co. has water rights capable of providing ample hydro-electric power for mining and milling. The present equipment consists of hoists, Cameron pumps, an assay office, and other surface buildings, which will be supplemented by additional modern equipment as development and operation may demand. The district has been comparatively quiet for several years, but the owners of the various mines are only awaiting the final undertaking of a corporation provided with the means to mine on a commercially profitable scale. There is no question as to orebodies. It is merely a matter of adopting modern methods in mining and ore treatment. There has been a recent revival of gold mining all through the state in the last few months. Unless the strikes for increased pay of miners in the Nevada County dis-

trict of the price of silver in New York instead of in London. He said, "The prevailing belief that the price of silver will remain up has resulted in a great impetus to silver mining, and there is a revival in the early-day silver camps of southern Idaho, with many inquiries for properties."

Prospectors are expected to take advantage of the new Indian appropriation act and get on to the Indian reservations of Washington, especially the Colville and Spokane reservations, where there are known gold, silver, copper, tungsten, and other mineral resources.

WALLACE, IDAHO—July 10

The Five-Day Strike as a protest against the trial and conviction of Mooney did not materialize in the Coeur d'Alene district except at Mullan, where a number of I. W. W.'s were employed at the Morning, Hunter, and National mines. The strike was limited to members of that organization, which is chiefly made up of Finns, with a few professional agitators. The total number who went out was probably not more than 200, and a notice signed jointly by the operating companies was promptly posted to the effect that all employees who failed to report for work on July 7 would receive their time. The managers have gone further and announced that no member of the I. W. W. will be employed. As a result of this, most has been an exodus of the I. W. W., most

ing practically to the surface with no important zone of oxidation. The last 400 ft. of the zone passed through by this company's crew, as reported by conservative samplers, gives an average value of 12 per cent copper, with 50c. gold and silver per ton. The prevailing sulphide is soft high-grade chalcocite, with chalcocite facings. As the zone is penetrated the mineral formerly segregated on cleavage lines becomes more disseminated in the grain of the rock and mixed with magnetite and marcasite. The conditions suggested magmatic diffusion, and segregation of primary copper sulphide, and at the present stage of the development indicate a new type of porphyry copper deposit of some magnitude, there being two distinct zones of mineralization on the property, 500 and 800 ft. wide, respectively, and a mile long.

SALT LAKE CITY, UTAH—July 11

Mineral Locations totaling 2,373 were made in Utah in 1918, according to the report of the Surveyor General for the state. Since the first of the year there have been 482 applications for mineral survey. Utah's Production of Primary Copper in 1918 was 230,564,908 lb., compared with 227,840,447 lb. in 1917, making it fourth in the list of copper-producing states, as it was in 1917. Preliminary figures to this effect have just been issued by the U. S. Geological Survey.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ARIZONA

Cochise County

CALUMET & ARIZONA (Bisbee)—Production of copper in June was 4,872,000 lb., of which 4,142,000 was available for company.

DRAGON MOUNTAIN (Johnson)—To build concentrator.

KEYSTONE COPPER (Johnson)—Planning 100-ton flotation mill. Property developed to 635 ft. depth. Ore mainly sulphide, with some oxide on sixth level. H. W. Miller president and manager.

Gila County

SUPERIOR & BOSTON (Globe)—Assessment of \$1 per share, payable Aug. 8, stock of record, July 19. Property examined by C. W. Eotstford, who recommends diamond drilling from lower levels in search of Old Dominion vein in schists where commercial primary ore is hoped for. Crosscutting to south on 300 level to cut veins in that section, and drifting east on 1200 level to locate intersection of Old Dominion and Great Eastern veins beyond Quo Vadis fault line, started on 300 level bulkheaded off by Old Dominion helmet men.

INSPIRATION (Inspiration)—Copper production in June, 6,300,000 lb.; May, 6,200,000; June, 1918, 10,300,000 lb.

Greenlee County

ARIZONA COPPER (Clifton)—Copper production for June was 2,400,000 lb.

Mojave County

UNITED EASTERN (Oatman)—Main shaft below 1,500 ft., to be sunk to 1,600, reaching greatest depth of district. Ore-body crosscut on 1,400, with same values as on 665 level.

Maricopa County

RED ROVER (Phoenix)—Electric equipment installed and large concentrator planned to handle copper and silver ores developed on three levels. Development to be extended from 500 to 1,000 level. Property, 8½ miles northeast of Phoenix, owned mainly by F. A. Gillespie, of Tulsa, Okla., with B. A. Gillespie manager.

Pima County

NEW CORNELIA (Ajo)—All machinery on hand for new test of flotation mill to be in operation at early date. Ore in leaching beds now given additional washing, five in all, with material increase in copper saving. Two large towers added for reduction of ferric iron by sulphurous acid gas, doubling capacity in this respect. Plans being made for washing of tailings dumps of 3,000,000 tons, with expectation of precipitating 1,000,000 lb. of copper. Production of copper in June was 3,440,000 lb., of which 2,708,000 lb. was shipped; 2,500,000 smelting ore, and 482,000 cement copper.

Pinal County

RAY CONSOLIDATED (Ray)—Copper production in June was 3,890,000 lb.; May, 3,975,000.

SILVER KING OF ARIZONA (Superior)—New three-compartment shaft being sunk at rate of about 3 ft. per day. Will go to 1,000 ft. and at 600 level will crosscut to orebody to prospect ground below 400 level, which has been under water for many years. Mill, 25-ton capacity making high-grade concentrate from 40-oz. silver ore coming from old shaft. Flotation giving 95 per cent recovery. New head-frame shown in accompanying cut.

Yavapai County

GRAND ISLAND (Jerome)—Diamond drilling resumed. First drill working from main shaft on 500 level. Hole expected to cut vein outcropping on company's Arizona Girl claim. Will drill two other holes on same level north of main shaft toward adjoining Shea property.

Yuma County

SWANSEA CONSOLIDATED (Swansea)—Thirty miners working on development. Flotation mill of 250 tons' capacity installed.

CALIFORNIA

Calaveras County

MORGAN MINE (Carson Hill)—Rich ore going to mill from 200, 300, 500, and 675 levels. Monthly average approximates \$60,000. Being operated by Carson Hill Gold Mining Co., which is also developing group of claims on south side of Carson Hill.

Inyo County

BELMONT (Keeler)—Owned by W. L. Hunter, has been leased to syndicate headed by General Strong, late Commandant at Camp Kearny, and General Breckenridge, who are now equipping property for extensive working.

Kern County

SILVER DISCOVERY near Randsburg reported to show excellent mineral values. Two carloads shipped to Selby smeltery, first averaging \$45 per ton. Property near railroad and paved highway.

Nevada County

WILLIAMSON BROS. and C. Cole, of Washington, Cal., hauling 40 per cent chrome ore to Nevada City for shipment east. Grade said to yield owners fair profit.



NEW HEAD FRAME AT SILVER KING OF ARIZONA PROPERTY, SUPERIOR, ARIZ.

P. BOKAY developing Bokay Bonanza and Monte Carlo claims. G. G. Gates, of Oakland, Cal., examining Excelsior and Bokay holdings.

IDAHO-MARYLAND (Grass Valley)—Machinery being overhauled preparatory to unwatering and exploring lower levels. Will work south Idaho adjoining.

SULTANA (Grass Valley)—Not to be closed on account of partial flooding during recent strike. Water being lowered rapidly.

UNION HILL (Grass Valley)—Will be closed and plant dismantled. Mine damaged by flooding. Future operations will be through new shaft. Property part of Idaho-Maryland group.

MOUNTAINEER MINES CON. (Nevada City)—Ray C. Rossen, commissioner appointed by Superior Court of Nevada County, authorizes sale on Aug. 12 of all holdings of company to satisfy judgment for over \$151,000 obtained by Peter Bender, of Santa Clara County, on July 2. Property west of Nevada City and includes about 30 lots and patented quartz claims.

MURCHIE (Nevada City)—Clear title obtained by R. E. Steele, owner, when bid in for delinquent taxes.

Idaho County

ENGELS COPPER (Engels)—Examination recently completed by engineers for D. C. Jackling.

Shasta County

UNITED STATES (Kennett)—Mammoth smeltery produced no copper in June, owing to mine and smeltery being closed during month. Plant still down.

Sierra County

TABLE ROCK (Sierra City)—Has broken into gravel at end of 3,000-ft. tunnel. Gold coarse and heavy. Runs \$85 per five feet of drift.

COLORADO

Boulder County

SMUGGLER M. & M. (Jamestown)—Another carload of gold ore shipped, coming from oreshoot on new vein parallel to Struggler vein. Driving crosscut from 200 level west to cut new vein showing on surface.

Gilpin County

GREGORY BULL stamp mill in Central City leased for three years to Fuller MacCulloch, operating Becky Sharp and other properties in Russell district.

CORNUPEDIA (Apex)—Extensive development and milling program awaits report of George E. Collins, of Denver.

SACO DE ORO (Apex)—Air compressor, drill sharpener, and other equipment recently shipped to property.

Montrose County

RADIUM ORE SAMPLING (Montrose)—O. Barlow, Willmarth, manager, paid \$1 per lb. for 75 lb. high-grade carnotite ore in Telluride recently.

Sau Mignel County

TELLURIDE ORE SHIPMENTS for June totaled 109 cars. Tomboy shipped 60 cars to Durango; Smuggler, 25 cars to Durango and 20 to Pueblo; John G. Wagner, 2 cars of concentrates from the Cimarron; and Liberty Bell, 2 cars of concentrates.

VALLEY VIEW LEASING & MINING (Ames)—Company which took over San Bernardo mine last year plans to equip 100-ton flotation plant at once, to be designed by Walter L. Reid, mill superintendent of Smuggler Union company. Mill will be erected on Matterhorn side of railway at Yellow Mountain. Small force engaged for year retimbering and widening tunnels, tracks and chutes. Considerable good ore blocked out. Will ship ore recently cut in tunnel on 4th level to Durango smeltery. Company also owns property on Yellow Mountain adjoining Silver Bell and Caribou mines, on which several veins of milling ore have been cut. Will start new tunnel on San Bernardo 200 ft. below lowest workings to cut vein in good ore. Otto Beselack, of Ames, Col., president and manager.

Summit County

BEMROSE-BOSTWICK (Breckenridge)—Placer in Hoosier Gulch operated under lease with good results. Pay gravel over-lein with black muck that must be worked off before giants can work effectively.

CARBONATE (Breckenridge)—Several carloads of sorted lead carbonate ore ready for shipment. Property under lease and option to Samuel Klous and others, of Boston.

POWDER RIVER GOLD (Breckenridge)—Handling 4,000 cuyd. daily of Blue River's placer deposit on B. & L. placer. Deposit 48-55 ft. deep. Gold becoming coarser upstream.

Teller County

REVA GOLD (Cripple Creek)—Company, operating Rose Nicol mine, has cut five-foot orebody on main Rose Nicol vein on 8th level, connected with 1,000 level of No. 2 shaft of Portland Gold Mining Co.

STRATTON ESTATE (Cripple Creek)—F. M. Kurie, operating through Star of Bethlehem shaft, is mining good ore from blocks leased on Shurtloff, one carload bringing settlement of \$61 per ton.

IDAHO

Shoshone County

MARSH (Burke)—Statement just issued shows tangible assets \$18,153. Company has few men employed doing surface exploratory work, which will be followed by development from main tunnel. Shaft abandoned for present, and no further work to be done in it until orebody has been opened above.

SHERMAN (Burke)—Final payment of bond on old Union group made this week. Total amount of bond \$150,000. Originally held by Sherman Development Co. Control sold to Days, one of the terms being payment of balance due under bond. New company organized called Sherman Lead Ore developed in two tunnels, and another tunnel being driven 600 ft. deeper. Considerable ore encountered, but main shoot not yet reached. Ore, lead-silver and zinc.

BUNKER HILL & SULLIVAN (Kellos)—Only one furnace at smeltery running last few months, but announced that second will soon start. Plant has four furnaces.

SUNSHINE (Wallace)—Absorption of Sunset Banner group of claims by Sunshine Mining Co. completed this week, when stockholders of Sunset company received stock for original holdings on basis of one share of Sunshine for four shares of Sunset Banner. Properties adjoin on Beaver Creek. Sunshine will soon start crosscut to explore ground at depth.

KANSAS

Joplin-Miami District

EMPIRE DEVELOPMENT (Miami, Okla.)—Completing jig plant at mine near Hockerville. Crusher and rolls to be operated by electricity.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Copper production in June was 5,439,761 lb. Anheuser produced 700,000 lb.; Allouez, 138,340; C. & H., 3,221,220; Centennial, 87,900; Isle Royale, 655,400; La Salle, nil; Osceola, 603,550; and Superior, 33,100. Calumet & Hecla and Allouez production announced wage increase of 15% on July 15.

VICTORIA (Victoria)—Stamped 6,425 tons in June, recovering 137,077 lb. copper, including mass. Pounds ingot per ton of rock estimated at 14.4. Has not shipped any copper to smeltery since February.

Gorebie Range

DAVIS (Ironwood)—Repairs to shaft, which was burned out four months ago, completed down to 16th level, below which little damage was done. Fire stopped all pumping, and water has risen about 500 ft. in shaft. After this fire removed new and larger pumps with hoist being kept on 24th level to handle large flow of water which may be encountered as development work approaches Newport mine. Electric-driven pumps will probably be used.

NEWPORT (Ironwood)—Explanation of recent general increase of this and Anvil mine by outside experts may be found in statement coming from Milwaukee office that Newport Mining Co. has joined new combine which will manufacture tubes and other steel products. No changes in local management expected.

PABST (Ironwood)—Development at new vertical shaft will be suspended for week or more, owing to burning out of bucket-hoist motor. Water being kept down by bailer rigger on cage. Crosscut 8 x 15 ft. in granite on 24th level of this shaft, driven 145 ft. in June, by three shifts of men, and in month better progress being made, with shoveling machine and seven men per shift.

PURITAN (Puritan)—Mine shut down for week while repairs are made to wooden headframe.

MINNESOTA

Cuyuna Range

THOMPSON (Crosby)—Mine not shipping and practically all ore removed. Originally operated as underground mine, then stripped and milling used. Photograph shows typical formation of Cuyuna Range orebodies.

MISSOURI

COLLINSVILLE ZINC CORP. (St. Louis)—Formed to convert part of smelting capacity of Collinsville smeltery at Caneville, Ill., to make lithopone. Has issued \$500,000 of bonds and 10,000 shares of stock of no par value.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT (Wise River)—Ground softening in upper Idaho crosscut being driven toward fissure. Big Hoie bridge of Montana Southern Ry. subsidiary, now being constructed near Wise River, to which point steel has been laid. Railway will afford outlet for company's Elkhorn ores. Estimated will reach mines within sixty days.

SHEEP CREEK (Wise River)—Three feet of ore opened at grass roots, and two carloads ready for shipment with completion of Montana Southern. Ore reported high in silver, ranging from \$5,000 to \$7,000 car lot. Several shallow shafts on property.

Cascade County

CASCADE SILVER (Neihart)—Narrow orebody reported uncovered below the 500 level. Vice-president H. L. Maury files answer to suit of Paul A. Gow, director, denying illegality of directors' meeting, at which Maury, who was present, was voted 130,000 shares for "services rendered" to distribute as he saw fit. Value of stock around \$300,000. Mr. Gow contends completion was unreasonable for whatever service could have been rendered, and asks court to order stock restored to treasury.



THOMPSON CUT, CROSBY, MINN., ON CUYUNA RANGE

Jefferson County

LEGAL TENDER (Clancy)—Power line under construction. Two more carloads of ore almost ready for shipment. Ore fissures narrow, but good grade.

LIVERPOOL (Clancy)—Old shaft being retimbered and power line constructed.

ANGELICA (Wickes)—Shipping lead-silver ore regularly to East Helena plant of American Smelting & Refining Co. Ore showing on lower levels continues good.

Lincoln County

LUKENS HAZEL (Libby)—Will build 200-ton concentrator and power plant. Surveying for two-mile pipe line from Granite Creek to proposed mill site. Will haul concentrates by auto truck nine miles to Libby. Contract let for timbers. Telephone line being built from Libby to mine.

Mineral County

TARBOX (Saltsee)—Directors have decided to install 150-ton concentrator, to represent expenditure of \$75,000. Orebody of good grade opened 15 ft. wide.

Powell County

CHAMPION (Deer Lodge)—Tunnel being driven to open property at depth. Mine is old-time producer.

EMERY (Deer Lodge)—Preparing to build electric power line to mill and to rework old waste dump.

MONARCH (Elliston)—Will start tunnel soon. Sawmill construction also completed. Air compressors installed.

Silver Bow County

ANACONDA (Butte)—Operations for July will show considerably less than 55 per cent of normal, as measured by metal output. Mooney protest demonstration serving to call large number of miners from work. Labor controversy over wages affecting working forces.

BUTTE & SUPERIOR (Butte)—Tonnage increased at Black Rock mill. Ore showing good in development work easterly in Four Johns' claim.

DAVIS-DALY (Butte)—Miners who left work to join Mooney strike have returned, and sinking of Colorado shaft resumed. Planning to resume capacity operations. Now working at less than 50 per cent of normal.

EAST BUTTE (Butte)—Pittsmont smeltery will soon resume at capacity. Company giving considerable attention to development of all ground in Wyoming fields.

NEVADA

Lyon County

MASON VALLEY MINES (Thompson)—Diamond drilling and other prospecting below main tunnel level has recently demonstrated large tonnage of good ore in new workings.

NORTHERN LIGHT COPPER (Yerington)—Bond and lease taken by Mason Valley Mines Co. Shipping ore from development work. Deepest shaft down 250 ft., last 80 ft. in sulphides. Orebody 10 ft. wide at bottom. Trucking expense almost prohibitive.

Nye County

BELCHER DIVIDE (Divide)—E. J. Roberts has uncovered new ledge crossing both Belcher and Belcher Extension, apparently about 50 ft. wide, assaying \$3 to \$29 per ton, a few samples running higher.

BROUGHER DIVIDE (Divide)—New vein cut on 505 level, 3 ft. wide. Drift on 177 level advanced 550 ft. Expect to reach junction of Divide Extension and Tonopah Divide vein within 100 ft.

DIVIDE EXTENSION (Divide)—Drifts on 45 level of Caldwell shaft still in high grade recently opened. Roy Hardy, consulting engineer, states ore in both hanging-wall and foot-wall drifts averaging \$75 per ton. Shaft down 80 ft. and vein will be crosscut again when it reaches 100 ft. Crosscut on 425 level of old shaft that is being driven to pick up vein opened in Caldwell shaft has advanced 25 ft. Andrew Walz, consulting engineer for Sherwood Aldrich, recently examined property.

TONOPAH DIVIDE (Divide)—Main vein opened in 530 level crosscut at expected distance of 125 ft. from shaft. Crosscut driven into vein 8 ft. without reaching foot wall, and drifting begun on hanging wall. No assay figures given, but management stating vein is in good commercial ore. Chief value in gold on fifth level, it is unofficially stated. Southeast drift on second level extended to get over "big bulge," where vein on third level attains 80-ft. width. Drift now out 325 ft., last 50 ft. averaging \$150 per ton, according to management.

White Pine County

NEVADA CONSOLIDATED (McGill)—Copper production in June was 3,715,482 lb.; May, 3,700,000.

NEW MEXICO

Grant County

D. L. HILL, of Lordsburg, has purchased from Klein and Reynolds old silver property in Gold Hill district, twelve miles north. Work will be started soon.

CO-OPERATIVE (Lordsburg)—Mill foundation complete. E. Walters, superintendent; A. Tabor, mill boss.

HOMESTEAKE (Lordsburg)—Taken over by E. M. Luckey from J. Arnett, and under examination by G. C. Pidgeon for John Gleason and James Parks. Ore carries gold, silver, copper and lead.

LUCKY STRIKE (Lordsburg)—Small ground cleaning out old silver property. T. Lister, owner.

OCTO (Lordsburg)—Main shaft down 225 ft. Labor reported scarce. Working 25 men. E. K. Davis, superintendent.

RUTH (Lordsburg)—Under lease by W. T. Scarborough, who has car silver-lead ore ready to ship to El Paso smeltery.

CHINO COPPER (Santa Rita)—Copper production in June was 3,615,458 lb.; May, 3,583,396.

OKLAHOMA

Joplin-Miami District

WEST VIRGINIA (Miami)—Planning construction of new mill on lease two miles east of Quapaw, Okla. Now sinking second shaft.

U. S. ZINC SMELTING (Picher)—Again in charge of Manhattan mine after turning it over to John A. Skinner, of Webb City, a year ago. Mine producing more heavily of late.

VANTAGE (Picher)—H. P. Sharpe and associates have bought interest of J. H. Denny. Sharpe became manager, succeeding O. A. Sneed, one of original owners, who sold out about six months ago.

FIG V. (Quapaw)—Controlling interest bought by Fred W. Mackey, of Vinita, Okla. Changing from steam to gas power. Fred Parish, superintendent.

SOUTH DAKOTA

Custer County

AMERICAN MICA PRODUCTS (Custer)—Property near Oreville being worked and mica shipped to Custer, where it is trimmed and sorted for market.

NATIONAL MICA (Custer)—Mica mine near Oreville has resumed operation. Product shipped to Hot Springs, where it is being prepared for market.

Pennington County

NATIONAL TIN (Hill City)—Machinery for concentrator arrived and being installed. Cowboy shaft being enlarged to one of three compartments, after which it will be sunk to 500 ft. Mohawk undergoing thorough development.

GERARD (Keystone)—Ore of good grade cut by tunnel to depth of 400 ft. Option on property given to New York interest, which will thoroughly develop ground.

St. Lawrence County

HOMESTAKE (Lead)—Report for year ended Dec. 31, 1918, shows surplus, after deduction of charges and taxes, of \$305,417, equal to \$1.21 a share earned on \$25,116,000 quantity, against surplus of \$1,195,383, or \$4.75 a share, in previous year.

TEXAS

Coryell County

LARGE ACREAGE LEASED near Coprus Cove, west of Temple, by New York men, and drilling will be started at once. Stated fourteen carloads of machinery and track work on ground.

Rockwall County

SPUDDING IN for deep well on Blake Mouldin Ranch, near Ozona, will be done at once. Ryan Petroleum Co., of New York, has built derrick on Roy Henderson Ranch. Equipment ordered from Oklahoma sufficient to sink this well to 4,000 ft. if necessary. E. B. Kirk, superintendent in charge. Drilling will be done on upper ranch of Robert Massie and on ranch of County Judge Charles E. Davidson, by Eddy, Licklow & Thomas, of Stephenville, Tex., and Tulsa, Okla. This firm has made third location on ranch of John Carson, in Pecos County, and materials expected on ground early in July.

Jefferson County

GULF PRODUCTION (Beaumont)—McFadden No. 2 well, at Spindle Top extension, said to flow in fifteen days' drilling. No. 1 McFadden well furnishes enough gas for fuel in drilling this well.

TEXAS CO. (Beaumont)—Will be drilling soon on Fee No. 1 and No. 2 wells.

Liberty County

BIG FOUR (Hull)—Came in as gusher and now making good production on pump. Well only 1,500 ft. deep, or 1,000 ft. less than near-by wells; oil 33 gravity, that from deeper wells being 22. Exhausted gas under pressure will cease flowing, but no signs of sanding up indicated.

Orange County

WILD-CAT WELL being drilled on Fletcher farm, twelve miles north of Beaumont. Gas seepage known here for years.

UTAH

Jaab County

BIG HILL (Eureka)—Property, recently taken under development by Knight interests, to be opened by shaft to depth of 1,000 ft. Old shaft on property 200 ft. deep, to be enlarged and retimbered, when further sinking will be started.

CHIEF CONSOLIDATED (Eureka)—Surface work on unpatented claims in eastern and northern Tintic, arranged for under contract, practically completed.

COPPER LEAF (Eureka)—Shaft down 1,200 ft. Second fan installed to improve air.

EUREKA METALLURGICAL (Eureka)—Small experimental operation, for some time to be electrified. Results of work reported satisfactory, and company stated to have funds for operation on larger scale.

LEHI TINTIC (Eureka)—Development of ore recently opened to be continued. Shaft to be sunk to 500 ft. and prospecting done, as indications point to more ore at depth.

TINTIC EASTERN (Eureka)—Company proposed to operate group of nineteen claims adjoining Tintic Standard and Apex Standard. Officers: J. E. Myers, president; Andrew L. Hurley, vice-president; J. H. McChrystal, G. W. Morgan and G. A. Udall.

TINTIC STANDARD (Eureka)—Six-day shutdown over July 4 used in completing change to new equipment and to making repairs in main shaft. No. 2 shaft down 1,000 ft., and after cutting of station will be sunk to 500 level. Railroad to property expected to be completed by Sept. 1. **ZUMA (Eureka)**—Ore opened on 500 level followed by winze almost to 800 level, where drifting has been started to cut ore, which has apparently dipped away from winze.

SHOWERS (Silver City)—Hoisting plant and all buildings destroyed by fire. Loss estimated at \$12,000. Owned by Walker Bros., Salt Lake City. Worked under lease.

Salt Lake County

UNITED STATES (Bingham Canyon)—Fire that broke out in mine on June 27 continuing, and owing to presence of gas, unable to be under control for several days. About 350 men out of employment until fire abates (July 8).

HOWELL (Salt Lake City)—Operations resumed.

UTAH COPPER (Salt Lake City)—Copper production for June was 3,528,000 lb.; May, 9,125,000.

Summit County

PARK CITY getting back to normal conditions after strike and shipments again being made. During week ended July 5, there were shipped 1,586,060 lb. of ore Silver, Validity, Silver King, Coalition, Judge Mining & Smelting, and Daly West. Good miners still scarce in this camp.

Utah County

SOUTH PARK (American Fork)—Contract let for raising and sinking on fissure bore cuts expected 150 ft. above tunnel and Cardiff limestone below it. Ore expected to be found making off from fissure into beddings.

WASHINGTON

Ferry County

VIRGINIA (Danco)—Directors visit property and decide to resume operations in August.

Stevens County

NORTHWEST MAGNESITE (Chewelah)—Has resumed operations with one kiln, and fills order several hundred tons to go to Eastern concern which needs product to tide over until shipments can be received from Australia.

UNITED COPPER (Chewelah)—Oscar Lachmund made general manager. Conrad Wolfe, former manager, retains presidency and will develop property he owns in Nevada.

LOON LAKE COPPER (Loon Lake)—Company says George T. Crane for \$131,250 and George Turner for \$21,250, alleging that while in control Crane secured treasury stock worth 70c at 11½c a share, and Turner secured 40,000 shares of stock worth \$35,000 for \$3,750.

NORTHPORT S. & R. (Northport)—Has begun shut for \$100,000 against Lone Pine Surprise Co., at Republic, Wash., for value Northport company's property at Republic; also similar suit against Insurgent Gold Mining Co. for same amount.

WISCONSIN

Zinc-Lead District

FRONTIER MINING (Galena)—Company one of most successful independent operators in Wisconsin field. Is operating operating and Middle mines, at Benton, and kin lease. Drilling in progress on Jeffries and John Gray leases, at Hazel Green.

MINERAL POINT ZINC (Galena)—Mines of company now in operation are Penn Bend and Hoskins, at New Diggins. Coker No. 1 at Livingston, and Black Jack, at Galena. In addition company continues cleaning out old mine shafts without milling, to oxide plant at Mineral Point. Additional orebodies blocked out by drill at Coker and Hoskins properties.

VINEGAR HILL ZINC (Platteville)—Operating is Jefferson, Graham, and North Unity mines, and reopening Tewdale mine, at Livingston. Is sinking new shaft and drilling on Copeland lease, at Shullsburg.

WISCONSIN ZINC (Platteville)—Operating Champion, C. A. T., and Longton mines, all at New Diggins, and drilling. Footy lease, west of abandoned Winshell, where results of drilling so far obtained indicate proximity of another orebody.

CANADA

British Columbia

CORK PROVINCE (Kaslo)—Operating mill one shift.

GIBSON (Kaslo)—Supreme Court decision at Vancouver, B. C. gives controlling interest to J. M. Wolbert and Louis Chassy, both of Spokane, instead of D. K. May, also of Spokane.

SILVER BEAR (Kaslo)—R. F. Green and Clive Fringle buy \$10,000 and take \$100,000 option on property near Kaslo, formerly owned by Frank Helme, of Nelson. New owners will develop it along with Silver Bell group.

SILVER BELL (Kaslo)—Owners have acquired adjoining Silver Bear group, and will consolidate.

NELSON M. & D. (Nelson)—W. W. Shaffner, manager, reports company will develop Whittewater and Comstock groups on Cascade Creek district. One crew driving tunnel to reach orebody.

PREMIER (Portland Canal District)—Building assay office and accommodations for large force. Portable sawmill at work and road being repaired for heavy hauling.

OHIO (Retailik)—Dr. F. C. Descent and other Spokane men have taken bond on Ohio mine, near Kaslo, for \$10,000, and expect to equip property.

BLUE BELL (Riondel)—Unwatering in progress. Low-grade lead carbonate ore shipped last year was important part of Ainsworth division's production. Shipments discontinued on signing of armistice.

SILVERSMITH (Sandon)—J. B. White, president, reports 3-ft. orebody cut in drift on 8th level. In drifting for this tunnel passed through orebody 100 ft. long and 4-16 in. wide, in which clean ore contained 136 oz. of silver per ton and 70 per cent lead. Mine production in June about 300 tons of concentrates.

Ontario

KENNEDY-BOSTON (Boston Creek)—Vein 14 in. wide partly stripped and some ore extracted.

MILLER INDEPENDENCE (Boston Creek)—Men who went out on strike have returned under practically old conditions.

PATRICIA SYNDICATE (Boston Creek)—Destruction of mill by fire has caused loss estimated at \$75,000; insured for about \$30,000.

QUEEN OF SHEBA (West Shining Tree)—Most camp buildings destroyed by forest fires.

BAILEY (Cobalt)—Justice Sutherland has upheld Master-in-Ordinary in refusal to allow sale of property to A. J. Young, of Northern Customs Concentrators, Ltd., with which it was proposed to amalgamate Bailey.

CROWN RESERVE (Cobalt)—Will develop claims located in Larder Lake district.

DOME (Porcupine)—Stated that company will issue monthly reports.

McINTYRE (Porcupine)—Cutting station at 1,200 level of shaft, and will continue shaft to 1,375 ft., which will be main haulage level and will be equipped with electric locomotives.

VIFOND (Porcupine)—Directors have decided to keep property closed down until labor difficulties are finally settled.

MEXICO

Sonora

GRENE CANANEA (La Cananea)—Production in June was 3,000,000 lb. copper, 147,730 oz. silver and 600 oz. gold. Production of copper unchanged from April and May.

KORFA

ORIENTAL CONSOLIDATED (Usan)—June clean-up, \$84,830; May, \$90,530. Completion of dam expected by May 10. Heavy rainfall between May 4 and May 10 increased flow into mines so that Chorro hydro-electric plant could not furnish enough power for pumps. Taracol mill therefore shut down to drive Taracol auxiliary electric plant by mill steam engine. Tonnage thus reduced. Four weeks' time also lost on Suribong power project owing to rains. Completion of dam expected by July 20. Taracol and Tabowie mills will be closed part of rainy season, owing to need of power for pumping. Labor and political situation unchanged.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

July	Sterling Exchange	Silver		July	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
10	449	106 $\frac{1}{8}$	53 $\frac{1}{2}$	14	446 $\frac{1}{2}$	106 $\frac{1}{2}$	53 $\frac{3}{8}$
11	449	106 $\frac{3}{8}$	53 $\frac{1}{2}$	15	442	106	53 $\frac{1}{8}$
12	447 $\frac{1}{2}$	106 $\frac{1}{8}$	53 $\frac{1}{2}$	16	434	104 $\frac{1}{2}$	54 $\frac{1}{8}$

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

Daily Prices of Metals in New York

July	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.
10	19.85@20.10	10	68	5.40	5.17 $\frac{1}{2}$ @5.20	5.17 $\frac{1}{2}$ @5.20	7 $\frac{1}{8}$ @7 $\frac{1}{4}$
11	20.25@20.75	11	68	5.40@5.45	5.17 $\frac{1}{2}$ @5.20	5.20	7.30@7.40
12	20.75	12	68	5.40@5.45	5.20	5.20	7.40@7.50
14	20.80@21.00	14	68	5.50	5.27 $\frac{1}{2}$ @5.30	5.27 $\frac{1}{2}$ @5.30	7.45@7.55
15	21.30@21.90	15	68	5.50@5.52 $\frac{1}{2}$	5.27 $\frac{1}{2}$ @5.30	5.30	7.55@7.60
16	21.90	16	68	5.50@5.55	5.30	5.30	7.62 $\frac{1}{2}$ @7.67 $\frac{1}{2}$

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

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

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

July	Copper			Tin		Lead		Zinc	
	Standard	Electrolytic	Spot	Spot	3 M.	Spot	3 M.	Spot	3 M.
10	96	97	100	250 $\frac{1}{2}$	249	23 $\frac{1}{2}$	23 $\frac{1}{2}$	41 $\frac{1}{2}$	42
11	94 $\frac{1}{2}$	95 $\frac{1}{2}$	99	246 $\frac{1}{2}$	245 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	41 $\frac{1}{2}$	42 $\frac{1}{2}$
12	94	95	99	246	245	23	24	41	42
14	97 $\frac{1}{2}$	98 $\frac{1}{2}$	100	246	245 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	41 $\frac{1}{2}$	42 $\frac{1}{2}$
15	100 $\frac{1}{2}$	101 $\frac{1}{2}$	103	250 $\frac{1}{2}$	249 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	42 $\frac{1}{2}$	43 $\frac{1}{2}$
16	105	105 $\frac{1}{2}$	106	254 $\frac{1}{2}$	254 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	43 $\frac{1}{2}$	44 $\frac{1}{2}$

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240lb.

Metal Markets

New York—July 16, 1919

This was a week of furious activity in the major non-ferrous metals, with the exception of tin. Copper, lead, and zinc all experienced noteworthy advances in price, especially copper.

The rise in copper has been favorably received in Great Britain, where it has afforded an opportunity for some reduction in the government's stock of copper, but the statistics of July 1 showed that the latter still amounted to about 100,000,000 pounds.

With the present sentiment, both here and in England and France, large unsold stocks of the metals have ceased to be a factor of immediate importance. Whether this is a case of familiarity breeding contempt, or the reflection of the prevalent opinion that present metal values are relatively low, may be left to individual opinion.

The stocks of metals in the hands of the British Ministry of Munitions July 1, with the corresponding figures for June 1 in parentheses, were as follows: Copper, 99,227,520 lb. (107,502,080); lead, 271,342,400 (268,591,680); zinc, 88,289,600 (86,078,720); aluminum, 23,874,080 (24,458,560); nickel, 5,492,480 (7,956,480); antimony, 9,784,320 (10,080,000).

The further decline in sterling exchange, which this week fell to the lowest point heretofore recorded, is necessarily reflected in the London quotations for commodities. It has a disastrous effect upon contracts entered into previously that are now being executed. For the first time since the beginning of the war there were transactions in German exchange this week, the quotation of the mark being about 8c.

Freights to Hongkong and Kobe from San Francisco are unchanged at \$14 per ton. In transatlantic freights

the rate from New York to British ports is 0.9c. per lb.; to French ports quotations are irregular, but appear to be higher.

Copper

At the close of our last week copper stood at 20c. per lb., delivered, or 19.85c., f.o.b. New York. Some sellers thought that the advance was ended, and on the following day sold liberally at unchanged prices, but buyers simply took the bit in their teeth and ran away with the market. On Thursday and each succeeding day there was an enormous demand, which was in no-wise checked by the sharp advances in price that were made from day to day by the producers. The characteristics of a sellers' market, which have now obtained for about three months, were more in evidence than ever, and producers could easily refuse to sell to undesirable customers. Thus there was a general refusal among the principal offices to sell for speculative accounts.

Japan was again a large buyer, both through the Export Association and outside of it, and the Japanese demand was largely responsible for the advances in the market. Among domestic consumers wire-drawers continued to be the principal buyers, but there was substantial business with brass-makers. The aggregate business was large and exceeded the total of the previous week.

The London quotations of £115 for futures and £106 for spot correspond with 22 $\frac{1}{2}$ c. and 20.70c., respectively, c.i.f., with exchange at 4.39.

Germany made at least one direct inquiry for copper this week, and there were other inquiries which were assumed to be indirectly for German account.

The labor situation at Butte remains substantially unchanged. It has become a play between the I. W. W. and the American Federation of Labor, i. e., between the radical and conservative parties. In the meanwhile a great unrest continues.

There was riot this week at Rome, N. Y., where the strike is still in effect. At Hastings-on-the-Hudson some of the men have returned to work.

Copper Sheets—The base price of copper sheets is 31 $\frac{1}{2}$ c. per lb. Demand strong. Copper wire is quoted at 25 $\frac{1}{2}$ c. in carload lots, f.o.b. mill. Market strong. Heavy buying during last two months. Most mills reported loaded with orders up to Oct. 1.

Tin

The market is mainly in the hands of the American smelters, but brokers are able to do some business in resale lots

and in futures. However, the largest consumers of tin are finding that their business is becoming very good, and, consequently, they are not disposed to sell such surplus stocks as they may have. High-grade tin—electrolytic, Lamb & Flag and Straits—was quoted at 70c. right through the week. Straits tin for July shipment declined as low as 51c., but rallied and today was quoted at 52c.

Lead

There was a tremendous speculative demand for this metal, which combined with very substantial demand from consumers, enabled those producers who still had stocks to relieve themselves materially, and, indeed, enabled them to realize advances over the price of the A. S. & R. Co. Consequently, the A. S. & R. Co. was led to advance its price to 550c. on July 14, but the demand continuing strong, higher prices were realized by outside sellers. Lead for future delivery commands a premium over prompt. Chemical lead continues in strong demand and commands a premium.

Among domestic consumers, corrodors were the principal buyers this week.

British advices report that the consumption of lead in Great Britain is increasing. The corrodors are unable to keep up with the demand. However, the sheet and pipe trades are lagging. This is simply a repetition of the experience of America.

Zinc

Very large business was done during the week at steadily advancing prices. Some producers who had been holding their stocks of spelter for a long time became free sellers on the advance, but their offerings were readily absorbed. Galvanizers were important buyers. There were large purchases for speculative account. High-grade zinc is quoted at 81@82c.

Belgian zinc smelters are steadily getting into working order.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. Market quiet.

Antimony—Reports respecting this market were rather conflicting, but, on the whole, we characterize it as having been a little stronger, and quote spot at 81@82c. The Chinese producers have been selling large quantities of antimony to Denmark and Norway, the final destination of which is supposed to be Germany.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.10 per lb. for wholesale lots—500 lb. and over. No change.

Cadmium—Quoted at \$1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, \$1.75 per lb. No change.

Nickel—Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—The rise to \$107, at which the market closed last week, was

only maintained a few days, after which the price declined to \$103, and the market became rather quiet.

Silver and Platinum

Silver—The feature of the last week has been the weakness in the sterling exchange market. Offerings have been so much in excess of the demand that the demand rate has dropped from \$4.49 on July 10 to \$4.34 on July 16. This fall in exchange has seriously affected the price of silver and more than offset the advance of 3/4d. per ounce in London bid price. Silver has ruled around \$1.06 3/4 for London shipment, but China banks have paid a premium over London price and bought considerable amounts.

Mexican dollars at New York: July 10, 81 1/2; July 11, 82; July 12, 81 1/2; July 14, 82 1/2; July 15, 82; July 16, 80 1/2.

Platinum—In very strong demand. We quote \$105@110 for refined ingot.

Palladium—Quiet at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., July 12—Zinc blende, per ton, high, \$52.75; basis 60 per cent zinc, premium, \$50; Prime Western, \$47.50@50; sludge and flotation, \$47.50@45; calamine, basis 40 per cent zinc, \$30@25. Average settling prices, blende, \$44.07; calamine, \$30.29; all grades of zinc, \$43.71.

Lead, high, \$66.55; basis 80 per cent lead, \$63@60; average settling price, all grades of lead, \$63.49 per ton.

Shipments the week: Blende, 6,371; calamine, 171; lead, 1,036 tons. Value, all ores the week, \$351,690.

While most buyers were finessing along Friday morning waiting for sellers to accept a \$45 basis, one buyer picked up 1,500 tons on \$47.50 basis. Then the price went to \$50 basis. Buyers of ore for sheet-zinc factories noted the trend early and made their purchases on \$50 basis. Except for the 1,500-ton lot, blende prices generally advanced \$5 per ton. The production this week is 40 per cent below the average of the first six months.

Platteville, Wis., July 12—Blende, basis 60 per cent zinc, \$50 base for premium grade and \$47.50 for high lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$60 per ton. Shipments reported for the week are 1,586 tons blende, 195 tons galena, and 197 tons sulphur ore. For the year to date the totals are 53,757 tons blende, 3,039 tons galena, and 7,573 tons sulphur ore. During the week 2,842 tons blende was shipped to separating plants. The upward trend in the zinc-ore market has already caused the reopening of several mines, and others will follow.

Other Ores

Chromite Ore—Business was reported at \$25 per ton, f.o.b. California point, for ore running 40 per cent and better.

Manganese Ore—South American ore is offered at 65c. per unit, Baltimore. Buyers are not disposed above 55c.

Molybdenum Ore—Quoted nominally at 75@80c. per lb.

Tungsten Ore—Some business in Chinese and Japanese ore was reported at \$7@87.50. Some sales of scheelite were reported at \$10.

Other Minerals

Graphite—The situation is practically unchanged, with the exception that marine freight rates from Ceylon to New York have advanced about £1 per ton for August shipment over the July rate. Another slight advance will be recorded for September and October shipments. Only very small quantities are being imported, as there is little demand in the market. Prices remain practically stationary, the following being quoted for Ceylon trade: Lump, 13 1/2c@14c.; chip, 10 1/2@11c.; dust, about 7 1/2@8c. All prices are c.i.f. New York, ex ship. The market for domestic grade is dull.

Nitrate—Conditions are reported unchanged. The Government continues to liquidate its stocks, and the end of the Government accumulation is said to be in sight. Imported material is being delivered in small quantities, but a revival of regular shipments is expected. Prices are generally quoted at \$3.25 per cwt., carload lots, for immediate shipment, but one large firm has named \$2.95.

Pyrites—Spanish pyrites is quoted at 18c. per unit for furnace ore, c.i.f., New York or other Atlantic port, and 18 1/2c. at Gulf ports. Market slow and unsettled; hand-to-mouth buying. Price will decrease with ocean freights.

Iron Trade Review Pittsburgh—July 15

The American Iron and Steel Institute reports that steel-ingot production in June, by thirty companies which in 1918 made 84.03 per cent of the total output, amounted to 2,219,219 gross tons. From this the annual rate in June by the entire industry may be computed at 32,850,000 tons a year, or 67 per cent of capacity, taking the latter at 49,000,000 tons a year. The 67 per cent for June compares with the following for preceding months: January, 87; February, 85; March, 77; April, 65; May, 54. Production probably dropped to about 50 per cent at the middle of May, and, as production was increasing during June, the rate at the close of the month was probably about 70 per cent, showing a remarkable recovery, from 50 to 70 per cent in a month and a half. Production has not increased materially since the first of July. The increase in production previously recorded reflects the increase in the buying of steel products which began about the second week of May.

Contracting for steel products is now on a fairly large scale, the buying up to the latter part of May having been simply by placing actual shipping orders. Contracts made generally run to the end of the year. It is claimed some automobile makers have contracts for bars and perhaps other products to

July 1, 1920. The sheet mills have refused to contract for automobile sheets beyond this year, proposing that contracts for the first half of next year be at a \$5 advance, to which the automobile makers demur. The fact that contracting has been in vogue since about the first of June is reflected by the Steel Corporation's statement of unfilled obligations, which showed an increase of 610,545 tons during June, against a decrease of 518,375 tons in May and decreases averaging 640,000 tons a month in the six months December to May inclusive.

The finished-steel market may be a trifle quieter in a few lines, but in sheets, tin plate, and pipe, at any rate, the bookings thus far this month are well in excess of the average rate in June. Pipe bookings are running about double the capacity and sheets bookings from 50 to 75 per cent in excess of capacity. Tin-plate demand has had a great spurt in the last few weeks, due largely to additional demand for the California fruit and vegetable packs. All tin plate for California use must leave mills by about Aug. 10. There is increased demand for tin plate for the salmon pack; also better export demand, exports in May having been 14,000 tons.

There is a fair movement in the pig-iron market, though tonnages are not as large as in June. Price irregularities have practically disappeared, these having been due largely to furnaces in other districts endeavoring to sell in the local market. The Valley furnaces are all firm and are comfortably sold up.

There is a heavy demand for sheet bars, but little tonnage passes through the open market, mills simply ordering their supplies from regular sources, as these sources prove adequate and there is no chance of securing price concessions. The Steel Corporation is experiencing some difficulty in supplying its sheet and tin-plate subsidiary with sheet bars, and is putting its Columbus works in operation to improve the supply. Billets and slabs are in light demand. We quote: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; rods, \$52.

Quoting prices on 80 per cent ferro-manganese have now settled down to \$115, furnace, for domestic, and \$115, c.i.f., for English, with prospects that inquiry would develop special prices. Spiegeleisen presents no regular market, being quotable nominally at about \$30@\$33 for 18 per cent, delivered.

The market for Connellsville furnace coke for spot or prompt shipment has reverted to \$4, where it stood before the market was forced up to \$4.25 by buying intended to provide against shortages due to Independence Day and other celebrations. So many ovens have been blown in lately that a surplus may develop. Foundry coke easily retains its recent advance. We quote: Spot furnace, \$4; spot foundry, \$4.75@\$5.25; contract foundry, second half, \$5@\$5.50, per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

	Silver					
	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.128	36.682	44.356	48.438
Feb.	77.685	85.711	101.128	37.742	42.792	48.027
Mar.	73.861	88.082	101.128	36.410	43.620	48.171
April	73.875	95.347	101.128	36.963	47.448	53.843
May	74.745	99.507	107.135	37.940	48.980	52.104
June	76.971	99.500	110.430	39.065	48.875	53.896
July	79.016	99.623	110.430	40.000	49.000	53.896
Aug.	85.407	100.292	110.430	43.418	49.077	53.896
Sept.	100.740	101.128	110.430	50.920	49.500	53.896
Oct.	87.532	101.128	110.430	44.324	49.500	53.896
Nov.	85.891	101.128	110.430	43.584	49.500	53.896
Dec.	85.960	101.128	110.430	43.052	48.492	53.896
Year	81.417	96.772	110.430	40.851	47.516	53.896

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

	Copper					
	New York			London		
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	(a)	110.000	92.238	125.000	106.619
Mar.	23.500	14.866	110.000	76.821	125.000	82.071
April	23.500	15.246	110.000	77.800	125.000	82.071
May	23.500	18.864	110.000	77.800	125.000	82.071
June	23.500	17.610	110.000	83.062	125.000	85.227
July	25.904	(a)	110.000	89.607	137.000	85.227
Aug.	26.000	(a)	122.000	100.000	137.000	85.227
Sept.	26.000	(a)	122.000	100.000	137.000	85.227
Oct.	26.000	(a)	122.000	100.000	137.000	85.227
Nov.	26.000	(a)	122.000	100.000	137.000	85.227
Dec.	(a)	(a)	118.447	100.000	133.167	85.227
Year	24.628	(a)	115.530	100.000	130.507	85.227

(a) No Market.

	Tin					
	New York			London		
	1918	1919	1918	1919	1918	1919
January	85.500	(a)	67.702	293.227	248.557	(a)
February	92.000	(a)	66.801	311.522	223.963	(a)
March	(a)	(a)	67.934	318.875	236.843	(a)
April	(a)	(a)	72.508	321.907	225.275	(a)
May	(a)	(a)	72.900	324.217	234.398	(a)
June	(a)	(a)	71.240	331.923	228.263	(a)
July	(a)	(a)	(a)	390.900	(a)	(a)
August	(a)	(a)	(a)	343.905	(a)	(a)
September	(a)	(a)	(a)	323.550	(a)	(a)
October	(a)	(a)	(a)	323.550	(a)	(a)
November	(a)	(a)	(a)	267.736	(a)	(a)
December	(a)	(a)	(a)	(a)	(a)	(a)
Av. Year	(a)	(a)	88.750	330.138	(a)	(a)

(a) No average computed.

	Lead					
	New York			St. Louis		
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	27.227
February	6.973	5.657	6.859	4.754	29.00	28.675
March	7.201	6.623	6.991	4.992	29.00	27.527
April	6.772	4.982	6.701	4.722	29.00	24.888
May	6.818	6.018	6.704	4.773	29.00	25.832
June	7.611	5.940	7.511	5.070	29.00	24.544
July	8.033	(a)	7.750	(a)	29.00	(a)
August	8.050	(a)	7.750	(a)	29.00	(a)
September	8.050	(a)	7.750	(a)	29.00	(a)
October	8.050	(a)	7.750	(a)	29.00	(a)
November	8.050	(a)	7.750	(a)	29.00	(a)
December	6.504	(a)	6.324	(a)	40.00	(a)
Year	7.413	(a)	7.222	(a)	30.10	(a)

	Zinc					
	New York			St. Louis		
	1918	1919	1918	1919	1918	1919
January	7.836	7.273	7.661	7.222	34.00	56.045
February	7.811	6.623	7.639	6.273	34.00	46.150
March	7.461	6.500	7.286	6.150	34.00	38.500
April	7.890	6.463	7.400	6.150	34.00	38.500
May	7.314	6.429	7.114	6.079	34.00	35.477
June	8.621	6.001	7.791	6.651	34.00	36.763
July	8.688	(a)	8.000	(a)	34.00	(a)
August	8.953	(a)	8.635	(a)	34.00	(a)
September	9.442	(a)	9.000	(a)	34.00	(a)
October	8.801	(a)	8.451	(a)	34.00	(a)
November	8.491	(a)	8.141	(a)	34.00	(a)
December	8.163	(a)	7.813	(a)	30.00	(a)
Year	8.159	(a)	7.890	(a)	34.180	(a)

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

	Pig Iron, Pittsburgh					
	Bessemer			No. 2 Foundry		
	1918	1919	1918	1919	1918	1919
January	\$37.25	\$33.60	\$33.95	\$31.40	\$33.95	\$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	33.60	33.95	31.40	33.95	32.40
April	36.15	29.36	32.95	27.15	33.95	28.15
May	36.30	29.36	32.95	27.15	33.95	28.15
June	36.30	29.36	32.95	27.15	33.95	28.15
July	36.60	(a)	33.40	(a)	34.40	(a)
August	36.60	(a)	33.40	(a)	34.40	(a)
September	36.60	(a)	33.40	(a)	34.40	(a)
October	36.60	(a)	33.40	(a)	34.40	(a)
November	36.60	(a)	33.40	(a)	34.40	(a)
December	36.60	(a)	33.40	(a)	34.40	(a)
Year	\$36.67	\$36.62	\$33.70	\$30.83	\$34.45	(a)

† As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. Exch. †	July 15	Boston Exch. †	
		July 15	July 15
Alaska Gold M.	34	Adventure	114
Alaska Juneau	34	Almeck	66
Am. Sm. & Ref. com.	87 1/2	Armadillo	46
Am. Sm. & Ref. pf.	103	Alto	46
Am. Sm. Sec. pf. A.	148	Arizona	20
Am. Zinc	27 1/2	Ariz. Prod	40
Am. Zinc pf.	53 1/2	Blattman Mines	29
Am. Zinc pf. A.	27 1/2	Butte	40
Am. Zinc pf. B.	27 1/2	Butte-Balaklava	4
Am. Zinc pf. C.	27 1/2	Cabmet & Ariz.	79 1/2
Am. Zinc pf. D.	27 1/2	Calumet & Hecla	406
Am. Zinc pf. E.	27 1/2	Carroll Hill	116
Am. Zinc pf. F.	27 1/2	Chino	25 1/2
Am. Zinc pf. G.	27 1/2	Copper Range	85
Am. Zinc pf. H.	27 1/2	Day West	12
Am. Zinc pf. I.	27 1/2	Day-Daly	10 1/2
Am. Zinc pf. J.	27 1/2	East Butte	17 1/2
Am. Zinc pf. K.	27 1/2	Franklin	73 1/2
Am. Zinc pf. L.	27 1/2	Grady	13
Am. Zinc pf. M.	27 1/2	Isaacoek	117
Am. Zinc pf. N.	27 1/2	Isaacoek	117
Am. Zinc pf. O.	27 1/2	Isaacoek	117
Am. Zinc pf. P.	27 1/2	Isaacoek	117
Am. Zinc pf. Q.	27 1/2	Isaacoek	117
Am. Zinc pf. R.	27 1/2	Isaacoek	117
Am. Zinc pf. S.	27 1/2	Isaacoek	117
Am. Zinc pf. T.	27 1/2	Isaacoek	117
Am. Zinc pf. U.	27 1/2	Isaacoek	117
Am. Zinc pf. V.	27 1/2	Isaacoek	117
Am. Zinc pf. W.	27 1/2	Isaacoek	117
Am. Zinc pf. X.	27 1/2	Isaacoek	117
Am. Zinc pf. Y.	27 1/2	Isaacoek	117
Am. Zinc pf. Z.	27 1/2	Isaacoek	117
Am. Zinc pf. AA.	27 1/2	Isaacoek	117
Am. Zinc pf. AB.	27 1/2	Isaacoek	117
Am. Zinc pf. AC.	27 1/2	Isaacoek	117
Am. Zinc pf. AD.	27 1/2	Isaacoek	117
Am. Zinc pf. AE.	27 1/2	Isaacoek	117
Am. Zinc pf. AF.	27 1/2	Isaacoek	117
Am. Zinc pf. AG.	27 1/2	Isaacoek	117
Am. Zinc pf. AH.	27 1/2	Isaacoek	117
Am. Zinc pf. AI.	27 1/2	Isaacoek	117
Am. Zinc pf. AJ.	27 1/2	Isaacoek	117
Am. Zinc pf. AK.	27 1/2	Isaacoek	117
Am. Zinc pf. AL.	27 1/2	Isaacoek	117
Am. Zinc pf. AM.	27 1/2	Isaacoek	117
Am. Zinc pf. AN.	27 1/2	Isaacoek	117
Am. Zinc pf. AO.	27 1/2	Isaacoek	117
Am. Zinc pf. AP.	27 1/2	Isaacoek	117
Am. Zinc pf. AQ.	27 1/2	Isaacoek	117
Am. Zinc pf. AR.	27 1/2	Isaacoek	117
Am. Zinc pf. AS.	27 1/2	Isaacoek	117
Am. Zinc pf. AT.	27 1/2	Isaacoek	117
Am. Zinc pf. AU.	27 1/2	Isaacoek	117
Am. Zinc pf. AV.	27 1/2	Isaacoek	117
Am. Zinc pf. AW.	27 1/2	Isaacoek	117
Am. Zinc pf. AX.	27 1/2	Isaacoek	117
Am. Zinc pf. AY.	27 1/2	Isaacoek	117
Am. Zinc pf. AZ.	27 1/2	Isaacoek	117
Am. Zinc pf. BA.	27 1/2	Isaacoek	117
Am. Zinc pf. BB.	27 1/2	Isaacoek	117
Am. Zinc pf. BC.	27 1/2	Isaacoek	117
Am. Zinc pf. BD.	27 1/2	Isaacoek	117
Am. Zinc pf. BE.	27 1/2	Isaacoek	117
Am. Zinc pf. BF.	27 1/2	Isaacoek	117
Am. Zinc pf. BG.	27 1/2	Isaacoek	117
Am. Zinc pf. BH.	27 1/2	Isaacoek	117
Am. Zinc pf. BI.	27 1/2	Isaacoek	117
Am. Zinc pf. BJ.	27 1/2	Isaacoek	117
Am. Zinc pf. BK.	27 1/2	Isaacoek	117
Am. Zinc pf. BL.	27 1/2	Isaacoek	117
Am. Zinc pf. BM.	27 1/2	Isaacoek	117
Am. Zinc pf. BN.	27 1/2	Isaacoek	117
Am. Zinc pf. BO.	27 1/2	Isaacoek	117
Am. Zinc pf. BP.	27 1/2	Isaacoek	117
Am. Zinc pf. BQ.	27 1/2	Isaacoek	117
Am. Zinc pf. BR.	27 1/2	Isaacoek	117
Am. Zinc			

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

	Large		St. Louis	Chi-cago	San Fran-cisco	New York	
	Mill	Lots				Cur-rent	One Yr. Ago
Blue Annealed	Pittsb-urgh						
No. 10	3.55	4.64	4.57	5.80	4.57	5.50	
No. 12	3.60	4.69	4.62	5.75	4.62	5.55	
No. 14	3.65	4.74	4.67	5.90	4.67	5.60	
Black							
Nos. 18 and 20	4.15	5.24	5.17	6.75	5.17	6.30	
No. 22 and 24	4.20	5.29	5.22	6.80	5.22	6.35	
No. 26	4.25	5.34	5.27	6.95	5.27	6.40	
No. 28	4.35	5.44	5.37	7.05	5.37	6.50	
Galvanized:							
No. 10	4.70	5.79	5.72	7.30	5.50	6.85	
No. 12	4.80	5.89	5.82	7.30	5.50	6.95	
No. 14	4.80	5.89	5.82	7.30	5.50	6.95	
Nos. 18 and 20	5.10	6.19	6.12	7.60	5.90	7.25	
No. 22 and 24	5.25	6.34	6.25	7.75	5.95	7.30	
No. 26	5.40	6.49	6.42	7.90	5.20	7.45	
No. 28	5.70	6.79	6.72	8.20	5.50	7.75	

STEEL RAILS—The following quotations are per gross ton i.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	Year Ago	Current	One Year Ago
Standard bessemer rails	\$45.00	\$65.00	\$45.00	\$65.00
Standard openhearth rails	47.00	67.00	47.00	67.00
Light rails, 8 to 10 lb.	2.58*	3.36*	2.83*	3.36*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.79*	3.09*
Light rails, 25 to 45 lb.	2.45*	3.00*	2.70*	3.00*

* Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Fran-cisco
	Current	Year Ago			
Standard rail road spikes, 4-in. and larger	\$3.35	\$3.90	\$4.27	\$4.44	\$5.65
Track bolts, 1/2 in. and larger	4.35	4.93	5.17	Premium	6.60
Standard section angle bars	3.00	3.25	4.22	Premium	4.60

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsb-urgh		New York		St. Louis	Chi-cago
	Mill	Cur-rent	One Yr. Ago	1 Yr. Ago		
Beams, 3 to 15 in.	\$2.45	\$3.47	\$4.245	\$3.54	\$3.47	
Channels, 3 to 15 in.	2.45	3.47	4.245	3.54	3.47	
Angles, 3 to 6 in., 1/2 in. thick	2.45	3.47	4.245	3.54	3.47	
Plates, 3 in. and larger	2.45	3.52	4.245	3.54	3.47	
Plates	2.66	3.67	4.495	3.54	3.67	

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$2.55	\$2.55	\$4.5

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL				
	Mill	Cur-rent	One Yr. Ago	Chi-cago	San Fran-cisco
1/2 in. and larger	\$4.20	\$4.72	\$6.141	\$4.72	\$4.79
3/4 in. and larger	4.30	4.82	6.241	4.82	4.89
1 in. and larger	4.45	4.97	6.391	4.97	5.04
1 1/4 in. and larger	4.70	5.22	6.741	5.32	5.29

CONE HEAD BOILER
Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chi-cago
Galvanized iron rigging	12%	12%	12%
Galvanized cast steel rigging	12%	12%	12%
Bright plow steel	35%	35%	35%
Bright cast steel	22 1/2%	22 1/2%	22 1/2%
Bright iron and iron tiler	5%	5%	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Pittsburgh				
	Mill	Cur-rent	Chi-cago	St. Louis	Den-ver
Straight	\$5.75	\$7.50	\$6.50	\$6.25	\$8.50
Assorted	5.75	7.50	6.50	6.40	8.75

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh:
Iron bars..... 2.75c. Steel bars..... 2.35c.

COAL BIT STEEL—Warehouse price per pound is as follows:
No. 12 \$0.16 Cincinnati \$0.18 Birmingham \$0.18 St. Louis \$0.18 Denver \$0.18 Chicago \$0.16

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	14c.	13c.	15c.	15c.
Hot Low	18c.	14c.	15c.	20c.

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card of National Tube Co. for steel pipe, Cardy A. M. Byer's for iron, both dated Mar. 21, 1919.

Inches	BUTT WELD		Inches	Iron	
	Steel Black Per Cent.	Galvanized Per Cent.		Black Per Cent.	Galvanized Per Cent.
1 to 3	37 1/2	44	1 to 1 1/2	39 1/2	23 1/2
2	50 1/2	38	1 1/2 to 2	39 1/2	23 1/2
2 1/2 to 6	53 1/2	41	2 to 2 1/2	31 1/2	17 1/2
7 to 12	50 1/2	37	2 1/2 to 3	32 1/2	18 1/2
13 and 14	41	37	3 to 4	34 1/2	21 1/2
15	38 1/2	37	4 to 12	31 1/2	18 1/2
BUTT WELD, EXTRA STRONG PLAIN ENDS					
1 1/2 and 2	46 1/2	29	1 1/2 and 1 3/4	39 1/2	11 1/2
2 to 3	55 1/2	43	2 to 3	39 1/2	24 1/2
3 to 4	56 1/2	44	3 to 4	39 1/2	24 1/2
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	48 1/2	37	1 1/2	25 1/2	10 1/2
2 1/2 to 4	51 1/2	40	1 3/4	31 1/2	17 1/2
4 to 6	50 1/2	9	2	33 1/2	20 1/2
7 to 8	46 1/2	33	2 1/2 to 4	35 1/2	23 1/2
9 to 12	41 1/2	28	4 to 6	34 1/2	22 1/2
			7 to 8	26 1/2	14 1/2
			9 to 12	21 1/2	9 1/2

From warehouses at the places named the following discounts hold for steel pipe.

	Black		Chicago
	New York	Cleveland	
1 to 3 in. butt welded	42%	43%	57 1/2%
3 1/2 to 6 in. lap welded	42%	45%	53 1/2%
Galvanized			
	New York	Cleveland	Chicago
1 to 3 in. butt welded	31%	34%	44%
3 1/2 to 6 in. lap welded	27%	30%	41%
Malleable fittings, Class B and C, from New York stock sell at list plus 15%.			

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list price:

	New York		Cleveland		Chicago	
	Current	Year Ago	Current	Year Ago	Current	Year Ago
Hot pressed square	\$3.25	\$1.00	\$1.90	\$1.40	\$2.00	\$1.05
Hot pressed hexagon	2.70	1.00	1.90	1.20	2.00	.95
Cold punched square	3.25	1.00	1.90	1.20	2.00	1.30
Cold punched hexagon	2.70	1.00	1.90	.75	1.90	1.50

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	75%	60-1-10%
Chicago	50%	60%
Cleveland	60-10-10%	65%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
1 by 4 in. and smaller	60%	50%	50-10%
Larger and longer up to 1 in. by 30 in.	50%	40%	40-10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

	New York	Cleveland	Chicago
For wrought-iron washers:			
New York	\$2.75	\$3.50	\$2.25
For cast-iron washers the base price per 100 lb. is as follows:			
New York	\$4.00	\$3.75	\$4.00

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots		Less Than Carload Lots	
	N. Y.	Chi-cago	N. Y.	Chi-cago
Tar felt (14 lb. per square of 100 sq ft.)	\$60.00	\$60.50	\$61.00	\$61.50
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37.00	37.00
Asphalt felt	63.00	63.00	67.50	67.50

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and Cincinnati:

	1-Ply		2-Ply		3-Ply	
	e. l.	i. l.	e. l.	i. l.	e. l.	i. l.
No. 1 grade	\$1.45	\$1.70	\$1.80	\$2.05	\$2.15	\$2.40
No. 2 grade	1.30	1.55	1.60	1.85	1.90	2.15

Asbestos asphalt-saturated felt (14 lb. per square) costs \$1.58 per ton
Slate-surfaced roofing (red and green) in rolls of 108 sq. ft. costs \$2.00 per roll in carload lots and \$2.25 for smaller quantities.
Shingles, red and green slate 5-in. sh., cost \$5.00 per square in carloads, \$5.25 in smaller quantities, in Philadelphia.

HOLLOW TILE—

Table with 4 columns: City, 4x 12 x 12, 8x 12 x 12, 12x 12 x 12. Rows include St. Paul, Seattle, Los Angeles, New Orleans, and P. O. b. factory.

LUMBER—Price per M in carload lots:

Table with 4 columns: City, 8x 8-In. x 20 Ft. and Under, 12 x 12-In. 20 Ft. and Under. Rows include Boston, Cincinnati, Kansas City, Seattle, New Orleans, St. Paul, Denver, Atlanta, Montreal, Winnipeg.

Table with 4 columns: City, 1-In. Rough, 10 In. x 16 Ft., 2-In. T. and Gr. 10 In. x 16 Ft. Rows include Boston, Cincinnati, Kansas City, Seattle, New Orleans, St. Paul, Denver, Atlanta, L. s Angeles, Montreal, Winnipeg.

Table with 4 columns: City, Mill, St., San Francisco. Rows include Wire, Cnt.

Table with 4 columns: City, Current, One Month Ago, with Bags. Rows include New York, Jersey City, Boston, Chicago, Philadelphia, Cleveland, Denver.

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

Table with 4 columns: City, Current, One Month Ago, with Bags. Rows include New York, Jersey City, Boston, Chicago, Philadelphia, Cleveland, Denver.

LIME—Warehouse prices:

Table with 4 columns: City, Hydrated per Ton, Lump per 300-Lb. Barrel. Rows include New York, Kansas City, Chicago, St. Louis, Boston, Dallas, San Francisco, St. Paul, New Orleans, Atlanta, Denver.

LINSEED OIL—These prices are per gallon.

Table with 4 columns: City, Current, One Year Ago. Rows include Raw per barrel, Sg. d. lms.

WHITE AND RED LEADS—in 50-lb. lots as follows in cents per pound:

Table with 4 columns: City, Current, 1 Year Ago. Rows include 100-lb. keg, 25- and 50-lb. kegs, 12-lb. keg, 5-lb. cans, 1-lb. cans.

MINING AND MILLING SUPPLIES

Table with 4 columns: Hose, Underwriters' 2 1/2-in., 1-in. per ft., First grade, Second grade, Third grade.

LEATHER BELTING—Present discounts from list in the following cities are as follows:

Table with 4 columns: City, Medium Grade, Heavy Grade.

WHITE LACING—30% off for cut; 62c. per sq. ft. for side 1/4 in.

Table with 4 columns: City, Manila Rope.

PACKING—Prices per pound:

Table with 2 columns: Item, Price per pound. Rows include Rubber and duck for low-pressure steam, Asbestos for high-pressure steam, Duck and rubber for piston packing, Flax, regular, Flax, w. proofing, Compressed asbestos sheet, Wire insulation asbestos sheet, Rubber sheet, Rubber sheet, wire insertion, Rubber sheet, duck insertion, Rubber sheet, cloth insertion, Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes, Asbestos wick, 1/2- and 1-lb. balls.

REFRACTORIES—Following prices are f. o. b. works, Pittsburgh:

Table with 2 columns: Item, Price. Rows include Chrome brick, Clay brick, 1st quality fireclay, Clay brick, 2nd quality, Magnesite, dead burned, Magnesite brick, 9 x 4 1/2 x 2 1/2, Silica brick, Standard size fire brick, 9 x 4 1/2 x 2 1/2, St. Louis—Fire Clay, \$35 to \$50, Birmingham—Fire clay, \$40-\$45; silica, \$40-\$50; magnesite, \$90; chrome, \$120, Chicago—Second quality, \$25 per ton.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Table with 4 columns: City, Material, 7 1/2 in. x 9 in., 6 in. x 8 in., by 8 Ft. 6 in., by 8 Ft. 6 in.

Table with 4 columns: No., Price per tie at Missouri mills, St. Louis prices about 25c. higher.

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels

Table with 4 columns: City, New York, In Bbl., Carloads, Denver. Rows include Pure steam-distilled pine oil, Pure destructively distilled pine oil, Pine tar oil, sp. gr. 1.02-1.035, Crude turpentine, sp. gr. 0.96-0.99, F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

Table with 4 columns: City, Current, One Year Ago, Cleveland, Chicago. Rows include White, Colored mixed.

WING CLOTHS—Jobbers' price per 1000 is as follows:

Table with 4 columns: City, Current, One Year Ago, Cleveland, Chicago.

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

Table with 4 columns: City, Low Freezing, Gelatin, Black Powder. Rows include New York, Boston, Cincinnati, Kansas City, New Orleans, Seattle, St. Paul, St. Louis, Denver, Dallas.

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Denver, 42c.; Chicago, 31c.; St. Louis, 31c.

SODIUM SULPHIDE—In New York the price per pound is 4 1/2c. for concentrated, 2c. for crystals. The St. Louis price is 6c. for 2 1/2c. for crystals. The Denver price is 32c. The Chicago price is 6c. for concentrated, 3 1/2c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 10c. per lb.; Chicago, 13c., Denver, 13c. St. Louis, 11c., less than car lots 12c.

ALUMINUM DUST—Chicago price is 1.30 per lb.

MINERS' LAMP CARBIDE—Prices net f. o. b. cars at warehouse points.

Table with 4 columns: City, Union 100-Lb. Drums Per Ton, Cameo 100-Lb. Drums Per Ton, 25-Lb. Drum Per Drum. Rows include East of the Mississippi, North of Chattanooga, Southeastern portion U. S. A., Texas (except El Paso), El Paso, Texas, Denver, Colo., West Coast.

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Number 4

The Mexican Situation

DURING the week ended July 23 there were no new or startling developments in Mexico, nor was there any change in the situation within that country; but a very decided interest has developed in the United States the last few days as to what is happening on the other side of the Rio Grande. Suddenly, for some unexplained reason, the daily press has opened its columns and is making known to the American people something of the troubles of that unhappy land. Many of the regrettable acts of violence to which attention is now being called can scarcely be attributed to the Mexican government; they may rather be attributed to the lack of a government, or the inability of the government to give adequate police protection. This fact should be emphasized, and the impression that the government really approves of the murder of foreigners should so far as possible be corrected.

Sudden and violent outbreaks on the part of the daily press are likely to do one of two things: there will develop in the minds of the people the idea that Mexico must at once be overrun by an American army, a development of the jingo spirit, or the action of the press will be similar to the removal of the cork from the soda-water bottle—a sudden effervescence and all is over. It is to be hoped that neither of these things will happen in the present instance, but, rather, that as the result of this publicity Congress will inform itself fully in respect to Mexico, learn positively of her troubles and their causes, and then take such steps as may be necessary to remove those causes.

The House Rules Committee began its inquiry on July 21, calling Ambassador Fletcher for information. Though Mr. Fletcher may be well posted, and able to give the President and the State Department private and valuable advice, he cannot appear with the same freedom at a public hearing. It is quite conceivable that should he have told all of the truth he would have henceforth been *persona non grata* in Mexico City. On the other hand, by leaving unsaid what he knows or believes to be true, such a witness could create in the minds of his hearers the impression that things in Mexico were not half so bad as painted.

As this investigation proceeds, others in a less delicate position than Mr. Fletcher may be able to throw more light on the problem. That the House proposes to get at the bottom of the situation is indicated by the list of subjects mentioned in the Gould resolution of inquiry, the subjects for inquiry being as follows:

1. The relations, economic, political and military, of the Government of the United States with the Republic of Mexico from the year 1910 until the date of the report to be made.

2. The conditions and incidents leading up to, concerned in or responsible for such relations.

3. The economic, political, and physical treatment accorded to American and other foreign citizens in

Mexico and elsewhere as to their lives and properties in the Republic of Mexico, subsequent to 1910.

4. The extent to which the Government of the United States, through ministerial assurances to foreign governments or otherwise, has obligated the people of the United States for the collection, payment or liquidation of public or private claims against the government or people of the Republic of Mexico.

5. The policy and activity of the Government of the United States in presenting and pressing claims of American citizens for loss of life and property by violence, confiscation, retroactive legislation, or governmental activity, in seeming violation of the tenets of international law, since 1910, including measures taken and representations made to the government of Mexico in efforts to forestall the inimical effects of such acts or measures of the Mexican government.

6. The individual and factional responsibility for robbery, maltreatment, and murder of American citizens in the Republic of Mexico and on American territory contiguous thereto.

The Senate Foreign Relations Committee has approved the King resolution asking the State Department for information on the following points:

What steps or measures are being taken to prosecute claims made by American citizens for damages in Mexico or what steps are contemplated?

How many Americans have been killed in Mexico since the retirement of Porfirio Diaz?

The amount of claims filed with the department for damages in Mexico.

Full information as to the confiscation of American property in Mexico.

How many Americans have been compelled to leave Mexico on account of disorder?

The value of American property abandoned in Mexico because of disorder?

The number of American citizens now in Mexico and the amount of their property?

Undoubtedly, the State Department has much of this information, and will furnish it, but these questions by no means cover the field respecting which the Senate should inform itself. The same questions might be asked for the peoples of all other nations, not the least for Mexicans themselves, for, as pointed out by the *Journal* last week, foreigners have been small losers as compared with the people of the country.

If the future action of the Government is based solely on the deaths and losses of American citizens, that action is likely to be inadequate for the occasion. It is the unfortunate circumstances of a large percentage of the population and the chaotic condition of nearly all industry that make our consideration of these matters imperative. If we interfere, we must interfere for the benefit of all sufferers—it must be no selfish interference.

The present agitation has brought prompt answers from Mexico City to the effect that vigorous action will be taken immediately to apprehend criminals, but when Mr. Fletcher tells us that so far as he knows there have been few apprehensions and comparatively little punishment administered in the case of murders committed since he has been ambassador, we can expect little from official promises.

Article 27

THE active interest now being shown in Washington in respect to Mexican affairs is aroused through two kinds of acts, those obviously illegal and those committed under the guise of legality. Among the latter, American property holders are particularly affected by the provisions of Article 27 of the new constitution of the republic. Perhaps the greatest interest will center around this article, which is extremely radical and is retroactive with regard to all titles acquired since 1876. Among other things, Article 27 provides that:

"(a) No foreign corporation or individual can legally acquire or hold any mines, oil wells, land or other real property in Mexico unless he renounces his citizenship.

"(b) No corporation, either domestic or foreign, can own agricultural, grazing or other rural lands in Mexico, and if title to such property is already vested in a corporation provision is made for its acquisition by the respective state governments in exchange for state bonds.

"(c) No corporation owning a mine, oil well, factory or other industrial enterprise can hold or acquire land in excess of its actual immediate requirements, the area to be determined by the federal or state executive.

"(d) No foreign corporation or individual can, under any condition, hold or acquire ownership to lands or waters within sixty miles of its frontiers or thirty miles from the seacoast.

"(e) The ownership to all minerals, solid, liquid or gaseous, is declared to be vested in the nation, regardless of existing rights based upon the old constitution.

"(f) All contracts relating to the acquisition of natural resources made since the year 1876 are subject to revision by the present government, and the executive is authorized to declare them null and void."

Attitude of Labor

Regarding Immigration

THE attitude of the labor unions respecting immigration is not entirely clear. A resolution was passed by the American Federation of Labor at its Atlantic City meeting strongly urging Congress to prohibit immigration of all kinds of labor during a period of the next four years. Later, at a meeting of the Pan-American Federation of Labor in New York, it was pointed out that the prohibition asked did not cover political refugees or the families of workers already in this country. "Political refugee" sounds well, but it includes the material that makes I. W. W.-ism, Bolshevism and communism. Do the unions want that? Scarcely. The president of the American Federation is reported to have said: "I would provide that any one might enter who had a union card and who promised to fight to maintain the standards of life for which the American worker had fought."

Now, just what is it that the unions do want and do believe regarding additional supplies of labor coming into this country during the next few years? It is important that we know, because the unions will have influence in shaping new legislation.

The coal mines are, as has been repeatedly pointed out, very short of labor. Metal mines have had a surplus of common labor, at least more than they could employ at the high rate of wages demanded, but there has been no general movement of the metal miners toward the coal mines, which for a number of years have been operated largely by foreign labor. Some of the coal miners have gone to other work; some have returned home; others will do so when they can secure passage; and in the last four years few have come to this country to take their places. If the Federation is urging the prohibition of immigration with the object of cutting off the normal labor supply of the United States in order to keep wages at a high mark, and if this policy is followed by our Government, there is danger, and very grave danger, that the normal amount of fuel will not be mined. If this happens, industry and the labor depending upon it must suffer proportionately. On the other hand, if the Federation asks only that immigrants should possess union cards before entering the States, this is another matter, for it places no restriction on the number of laborers coming into the country.

The Federation says that its object in asking for new legislation is to maintain the high standard of living toward which the American laborer has striven. If this is its motive—and none can be more admirable—would it not be more pertinent to ask that an educational qualification be the determining factor of an immigrant's requirements, rather than that the possession of a union card be made mandatory?

Made in Germany

ARE we soon to see again in our laboratories, on our beakers, evaporating dishes, and sundry apparatus, the little label bearing that mark of quality, "Made in Germany," or is it to be replaced by a label that means superior quality—"Made in America"?

It is announced from Washington that trade between the United States and Germany is to be resumed immediately, dyes, chemicals, and potash being excepted. Whether it is wise or expedient to make these exceptions may be questioned, but the arguments for excepting apply with equal if not greater force to chemical and physical apparatus. For years our colleges and institutions of learning have been permitted to import chemicals and apparatus free of duty, and they did import from Germany, because the material was good and cheap. In consequence of this, many students have known no other material than that bearing the little label. Passing from college into industrial laboratories, chemists have continued to buy and use only that material bearing the insidious motto "Made in Germany."

With the blockading of ports, importations came to an end. When the demand arose, the American manufacturer was able to produce practically everything for which a demand was made. Instruments of precision and apparatus made during the last few years have equaled in quality anything of the type obtained from abroad.

We realize that Germany has bills to pay, and that there will be still more bills when our metals and cotton

start for German ports. Germany has no gold with which it is practicable to pay for imports. The bills must be paid with her handiwork; and yet it will be with deep regret if these bills are paid with such apparatus as German dreams of conquest have forced us to learn to make—to make even better than she wrought.

Hard pressed as our colleges are, they can better afford to dispense with some material than to continue to teach their young men and women that "it can only be made in Germany."

The repeal of the law permitting free importation for institutions of learning will probably do more good in the way of developing and sustaining a key industry, a necessary home industry, than it will do harm in limiting the laboratory equipment of our universities.

International Mineral Statistics

DETAILED plans for the organization of the League of Nations are now being formed. Economists and statisticians in Washington have advanced reasons for the establishment of a mineral statistical organization within the League. Is it not an opportune time for the mining industries to consider the advisability of such an organization, and to express their opinions?

It has been pointed out that figures of mineral production in Europe before the war were camouflaged, but those engaged in our mineral industries depended upon these figures in the absence of more reliable information. Are we to revert to such practice in years to come, or shall we devise a better way of informing the public regarding fundamental data on raw materials, essential for the study of trade conditions?

Arguments in favor of the proposed organization are that it will supply reliable information regarding important mineral developments, prices in the principal markets, and special legislation affecting mineral industries; that it will present more comparable classifications, and encourage common units of measurement. It is claimed that such an organization will serve to lessen speculative elements in world trade, and to stabilize mineral industries.

The Place

For an Engineer

AMONG the able men who have served upon the Interstate Commerce Commission—and there have been several—we fail to note the name of a single engineer. New members are appointed from time to time, and, in the new order of things that may be brought about as the result of our Government's temporary control of the railways, additional members may be necessary to accomplish the fulfillment of all of its functions. The conditions afford an opportunity for one of our engineering societies, or for several of them, to bring to the attention of President Wilson the advantage of appointing an engineer to act upon the commission.

In the creation of the commission it is fair to assume that Congress thought that it was forming an organization that would have a judicial mind, and that rates would be established and maintained that would be equally fair to transportation companies and to the public. Something went amiss. The collective mind was not judicial, or misinterpreted data were placed before it, and there have been many cases of serious in-

justice. The commission has called before it from time to time some of the best engineers of the country, but they have not been a part of the body, and have had no part in its decisions. Engineers have prepared the data for appraisals and rate making. The literature upon valuation, maintenance, and depreciation has been compiled almost entirely by engineers. Its interpretation is properly the work of a technically trained mind. It is unfortunate that there has not been at least one engineer on the commission.

A somewhat similar situation occurs in a mining organization in which the president and all of his directors are men of large affairs, but know nothing or but little of the technique of mines. They employ engineers, and often take their advice, but do so blindly, because of inability to weigh that advice fully.

Nearly all the larger and more successful mining companies of today number one or more engineers on their directorate, and with such a make-up we find that poor advice is seldom taken, and that sound advice is fully appreciated and quickly acted upon. So with the Interstate Commerce Commission we believe that the inclusion of an engineer in its membership would add materially to the wisdom, justice, and rapidity of its decisions, and that inaccurate or erroneous data would stand less chance of receiving serious consideration.

Protection of the

Potash Industry

APART of the protection which the producers of potash have sought from Congress is coming from an unexpected source—from Germany. A dispatch to The Associated Press under date of July 11 says that the potash syndicate has petitioned the government for permission to raise the price of potash 100 per cent, owing to the increased cost of production.

One of the factors that may lead toward cheaper food, for which we all long, is cheap fertilizers, and of these potash is one of the most essential. We are rather inconsistent when we demand cheap food and at the same time ask protection for an industry still in its swaddling clothes. Perhaps the report from Weimar indicates that the cheap potash of former days will not be produced and marketed again, and that the high tariff which seemed essential may not, after all, be necessary to the life of the potash industry in this country.

The "Investment Trust"

THE mineral industry of the United States is vitally interested in the success and early consummation of the "investment trust," proposed by H. P. Davison, or in the "consortium of bankers," as proposed by Frank Vanderlip in his recently published book, "What Happened in Europe." Our metal market will materially improve or become normal, the stock market to the contrary notwithstanding, only when Europe has been provided with a credit with which it can buy. And the only source of that credit lies in the surplus funds of this country. Mr. Vanderlip does not put it too strongly when he says, respecting the arrangement of a credit: "The danger in not doing this promptly, or in not doing it at all, is so extreme that it is no exaggeration to say that failure to do this may mean a breakdown in European civilization which will involve the whole world."



RESCUE CREW AT ARGONAUT MINE, JACKSON, CAL., UPON OCCASION OF RECENT FIRE

From left to right: H. M. Wolflin, at that time State Mine Inspector; N. S. Kelsey, general manager of the Argonaut Consolidated Mining Co.; B. W. Dyer, engineer in charge of U. S. Bureau of Mines Rescue Car No. 5; J. S. Schoning, foreman miner; Karl T. Sparks, First Aid miner; C. A. Lanham and K. Lutz.

Photographs From the Field

GENERAL VIEW OF SMELTERY, BEACH TOWNSITE AND LOADING WHARVES OF GRANBY CONSOLIDATED MINING, SMELTING & POWER CO., ANYOX, B. C.



The Platinum Situation*

Shortage in Platinum and Platinum Group of Metals Attributable to Disturbances of Normal Production Created by the War—Uses of Platinum and Possibilities for Maintaining Supplies

BY JAMES M. HILL

Geologist, U. S. Geological Survey, Washington, D. C.

THERE has been some confusion in past discussion of the uses of platinum, which is no doubt attributable to the lack of appreciation of the fact that all commercial platinum is not the pure metal. The pure metal is required for chemical work of all kinds, but for many purposes the iridium alloys are used. Platinum for electrical use contains 15 to 50 per cent iridium, but averages 25 per cent, and jeweler's platinum carries 5 to 10 per cent iridium. Palladium, another of the platinum group metals, is also of importance, chiefly

dental industry also should be classed as essential. Pure platinum is required in the chemical industry for catalyzers in the manufacture of sulphuric acid and for the manufacture of nitric acid from ammonia. For the sulphuric-acid industry, platinum chloride is the primary material containing platinum. Asbestos or anhydrous magnesium sulphate, soaked in platinum chloride and then baked to drive off the chlorine, forms what is known as "contact mass," which is charged into the chambers of contact-acid plants. Very fine-mesh plat-



FIG. 1. MAP OF THE WORLD, SHOWING SITUATION OF PLATINUM DEPOSITS

in the form of palladium-gold alloys, which can be used to replace platinum in the dental and jewelry industries. Rhodium, one of the rarer elements of the platinum group, has a limited utility in electrical pyrometers. Osmium and ruthenium, the remaining members of the platinum group, appear to be of only slight application, though osmium, when properly used, is said to be a possible substitute for iridium to harden platinum alloys.

The essential uses of platinum metals are in the chemical and electrical industries, and probably the

inum gauze is used for the catalyzer in nitric-acid plants. Some gauze made for this purpose has a reinforcing edge of platinum-iridium wire.

Platinum utensils of various kinds, including crucibles, dishes, tongs, and triangles, are required in every chemical laboratory. It is possible to substitute palladium-gold alloys, or even gold, nickel, nichrome, and silica for some chemical utensils, but no substitutes have been found which will entirely replace platinum chemical ware.

Platinum-iridium alloys have been used extensively by the electrical industry, but substitutes are constantly

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being developed. Tungsten, molybdenum, and nickel-chrome alloys are the principal substitutes, but they have not supplanted platinum in the industry. The primary use of platinum-iridium alloys in electrical work is in contact points, and the proportion of iridium necessary in the alloys is directly dependent on the intensity of the current passing through the contacts and the speed at which the contacts move. Probably the largest consumption of platinum alloy is in the manufacture of telephone and telegraph equipment, including sending and receiving instruments, switchboards and relays. There is also a large consumption of platinum for contacts in the magnetos needed for various kinds of internal-combustion engines. Automobile makers are, however, developing starting systems which do not require platinum in their construction, so a lessening future demand from that quarter may be expected.

Platinum has an important application in dentistry, though palladium-gold alloys are being used as substitutes. It would appear, however, that the substitutes are not entirely satisfactory, and it may be necessary to go back to platinum for certain dental purposes. The principal uses in dentistry are for pins for crown work, pins for fastening artificial teeth to plates, and as foil for making cavity molds in which to bake porcelain fillings.

shown that the quantity of platinum in blister copper sent refiners is very small; the highest assays reported by him indicated only 1,825 oz. per 100 tons of blister.

The nickel ores of Sudbury, Canada, are particularly rich in platinum and palladium, but apparently all nickel ores carry some of these metals. A considerable part of the nickel made is not refined electrolytically, but is used directly for making alloys. If this practice were changed, the world's supply of platinum and palladium would be considerably augmented.

The platinum placers of the world are so definitely related to intrusive basic igneous rocks, including pyroxenites, peridotites, and dunites, that there is practically no question of the association of the metal with them. In fact, in British Columbia, Spain, and Russia platinum has been found in place in these types of rocks.

Platinum does not exist in all placers derived from basic rocks, but, so far as known, it is not found in placers derived from other types of rocks. Prospecting for platinum placers, therefore, resolves itself first into a search for deposits of gravel derived in large part from pyroxenite, peridotite, and dunite. A large amount of prospecting has been done in Russia and Spain, based on this theory. Much of this work has been successful in so far as locating platiniferous placers has been concerned, but many recent discoveries do not appear to be of commercial importance.

TABLE I. ANALYSES OF CRUDE PLATINUM FROM VARIOUS PARTS OF THE WORLD

	North America			South America				Oceania				Russia		Kamenon-cy	Kos-winsky	Kan-jak-owsky	
	Cali-fornia	Cali-fornia	Oregon	Colombia	Colombia	Colombia	Colombia	Borneo	Wales	Australia	Tasmania	Taguil	Iss				Per
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Pt.	85.50	63.30	61.45	72.07	86.20	86.16	80.00	82.60	75.90	61.40	76.16	80.10	82.46	83.50	83.50	60.39	60.39
Ir.	1.05	0.70	0.40	1.14	0.85	1.09	1.55	0.66	1.30	1.10	2.68	1.38	1.79	2.74	6.80	2.74	6.80
Rh.	1.00	1.80	0.65	2.57	1.40	2.16	2.50	.....	1.30	1.85	0.54	0.30	0.69	0.62	0.80	0.62	0.80
Pd.	0.60	0.10	0.15	0.19	0.50	0.35	1.00	.....	Trace	1.80	0.27	0.30	0.18	0.28	0.19	0.18	0.28
Os	.....	.....	.....	.....	.....	0.97	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Is ^a	1.10	22.55	27.30	10.51	0.95	1.19	1.40	3.80	9.30	26.00	1.50	4.47	4.99	0.79	20.21	0.79	20.21
Au.	0.80	0.30	0.85	.....	1.00	.....	1.50	0.20	.....	1.20	.....	0.09	0.27	0.07	.....	0.27	0.07
Fe.	6.75	6.40	4.30	8.59	7.80	.....	7.20	10.67	10.15	4.55	14.72	7.68	9.49	11.05	11.11	11.05	11.11
Cu.	1.40	4.25	2.15	3.39	0.60	0.40	0.65	0.15	0.41	1.10	3.39	0.65	0.54	1.14	0.49	0.54	1.14
Sand.	2.95	.....	3.00	1.69	0.40	.....	4.35	.....	1.22	1.20	.....	.....	.....	.....	.....	.....	.....
	101.15	99.40	100.25	100.15	99.70	100.35	100.15	98.06	99.58	100.20	99.26	94.95	100.41	100.19	100.04	100.04	100.04

(a) "Is," abbreviation used for osmiridium.

The non-essential consumption of the platinum metals is in jewelry, and it seems certain that this misuse of these metals must be stopped in order that industrial development may continue, for the world's stock of platinum is small, and prospects for large additions to this stock are far from bright. The chemical and electrical industries have absolute need for platinum. The women of the world should carefully consider whether their wish for ornaments made of platinum is worthy of consideration when the problems of future industrial necessities are under review. On the face of it, the answer must be negative. Let the world's supply of platinum be put to its highest use for the welfare of mankind, and not misused for the gratification of the vanity of the few.

GEOLOGICAL DISTRIBUTION OF PLATINUM

Practically all of the platinum metals so far recovered have been taken from placer mines, although a small quantity of platinum and palladium is won by the electrolytic refiners of copper and nickel matte and gold bullion. Platinum and palladium appear to be common in copper ores from deposits of all types, though the quantity in any particular lot of ore is ordinarily so small that it does not appear in the assay. Eilers' has

Chromite is a characteristic heavy constituent of platinum sands, and in some deposits can be recovered as a byproduct in mining operations. Olivine is also associated in considerable amounts. Magnetite and ilmenite, though ordinarily present in the concentrates from platinum placers, are more characteristic of placers in which gold is the most valuable constituent.

Platinum is such a rare metal, and is found in such small quantities in its mother rock, that certain physiographic conditions are necessary on which to predicate commercial deposits. Most important of these conditions is extremely prolonged or deep and rapid weathering of the primary deposits. In the Russian field, rock-weathering has been in progress for great geologic time. On the other hand, in Colombia, South America, it seems that, though the period of weathering has been relatively short, it has been so rapid that the same result has been obtained. Ordinarily, platinum is not found in commercial quantities in gravels which have not been reconcentrated, and the richer placer deposits of the world appear to be the results of repeated reconcentrations of platinum-bearing material.

Crude or placer platinum is not pure metal, but contains, besides other metals of the platinum group, more or less iron, nickel, and copper. Russian crude platinum is ordinarily sold on the assumption that it contains 83 per cent platinum metals, and Colombian crude averages

^aEilers, A., "Notes on the Occurrence of Some of the Rarer Metals in Blister Copper," Trans. A. I. M. E., Vol. 47, 1913, pp. 217 to 218.

about 85 per cent platinum metals. Some placer platinum, so called, carries a large proportion of osmiridium. Thus, the Oregon and California crude platinum carries from 25 to 45 per cent iridium, and nearly pure osmiridium is found in Tasmania.

The analyses of Russian², Colombian³, and American⁴, platinum in Table I serve to illustrate the wide divergence of metal content of crude platinum.

GEOGRAPHICAL DISTRIBUTION OF PLATINUM

As will be seen from the map, Fig. 1, platinum is found widely scattered throughout the globe, though the importance of some of the localities indicated is prob-

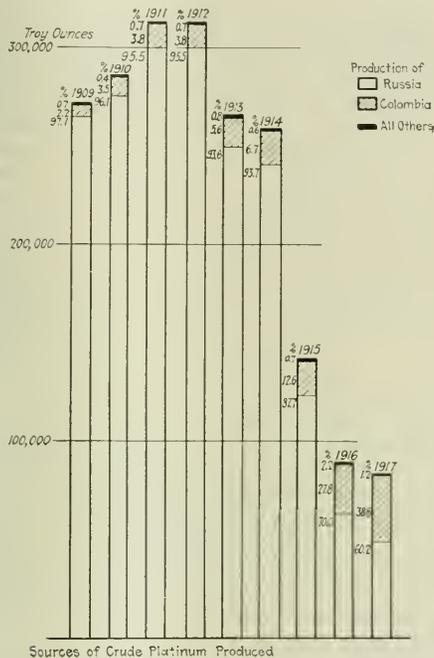


FIG. 2. RELATIVE IMPORTANCE OF THE PLACER PLATINUM-PRODUCING COUNTRIES OF THE WORLD

lematical. The Russian deposits are of first importance, followed in order by Colombia, Canada, the United States, and the Australian provinces. The reason that Canada ranks so high, though her output of placer

TABLE II. ESTIMATED WORLD'S PRODUCTION OF PLACER PLATINUM, 1909-1917, IN TROY OUNCES

Country	1909	1910	1911	1912	1913	1914	1915	1916	1917
Borneo and Sumatra	500	200	30	30	200	30	100	60	80
Canada	30	30	30	30	50	30	100	60	80
Colombia	6,000	10,000	12,000	12,000	15,000	17,500	18,000	25,000	32,000
New South Wales and Tasmania	440	332	470	778	1,500	1,248	303	222	50,000
Russia	264,000	275,000	300,000	300,000	250,000	241,200	124,000	63,900	50,000
United States	672	390	628	721	483	570	742	750	605
Totals	271,642	285,952	313,128	313,529	267,233	260,548	143,145	89,932	82,685

platinum is small, is because of the platinum and palladium that are recovered in the treatment of the Sudbury nickel-copper ores.

The relative importance of the placer platinum-producing countries of the world can best be judged by the

²Duparc, Louis, "Le Platine et les Gites Platiniferes de l'Oural"; Soc. des Eng. Civ. de France, Bull., Jan.-Mar., 1916.

³Kemp, J. F., "The Geological Relation and Distribution of Platinum and Associated Metals"; U. S. Geological Survey Bull. No. 193.

past production, which is shown in Table II' and graphically in Fig. 2.

Russian placer deposits have supplied approximately 95 per cent of the platinum in the world. The principal placer deposits rich in platinum are in the central Urals, in the Perm Government, near Nishni-Tagilsk, Nishni-Turinsk, and Verkhoturshi, Fig. 3. The richer deposits are on the eastern slope of the mountains, principally on the Iss and Veeya tributaries of the Tura River of the Obi drainage. Several important placers are found on the west slope of the mountains on the headwaters of the Chusovaia and Kama rivers of the Volga drainage. Near Nishni-Tagilsk, platiniferous placers are worked both on the Taguil, a tributary of the Obi, and on the Martian, a headwater stream of the Volga drainage. There are a few streams south of Ekaterinburg in which platinum and osmiridium are found, chief of which is the Myasai. In these placers, though platinum is the predominant metal, gold is also found.

Most of the platinum has undoubtedly originated from the disintegration of dunitic, pyroxenitic, or peridotitic rocks. The period of weathering has been very long, and there have been many changes in the drainage systems, which have now reached maturity. The stream grades are low, the inter-stream relief is relatively slight. The platinum has probably been reconcentrated many times, and is won principally from present valley gravels, though the pay channels do not always follow the present river channels. Some bench ground representing old river channels is worked, particularly in the Nishni-Tagilsk region. The pay gravels ordinarily rest on bedrock, though concentration on clay false bedrock is fairly common.

The pay dirt varies from a few inches to as much as 6 ft. in thickness. It has few large boulders, but has considerable clay in many places. The overburden varies from 2 to 16 ft. in thickness, averaging from 8 to 10 ft. It consists of a thick basal portion of practically barren gravel and sand, or clay and sand lenses interlayered with gravel, which is overlain by 2 to 3 ft. of clay sand and vegetable matter similar to the "muck" of the Alaskan mines.

The greater part of the Russian output in the past has been obtained by hand-washing, but of recent years much of the ground has been reworked by dredges, though it is still probable that over 75 per cent of the Russian output is from hand labor. In the shallow ground, up to 8 ft., deep hand-mining is carried on by open-cut methods. In the deeper ground, shafts and drifting have been employed. For the deposits in river channels crude hand dredges have long been and still

are used for raising the gravels. About thirty-five modern dredges were engaged in platinum mining prior to the war. Clay is so generally found in the gravels that specially designed machines have been used to save the platinum, and the newer dredges have special devices to cope with this problem.

The platinum district of Colombia covers the upper

⁴Hill, J. M., "Platinum and Allied Metals"; U. S. Geological Survey, "Mineral Resources, 1916," Pt. 1, p. 3, 1917.

waters of the Atrato and San Juan rivers, in the Choco district of northwestern Colombia, Fig. 4. Platinum is known as far north as Beté, on the Atrato, and in many of the tributaries of the San Juan, which enter from the east. (See attached map, Fig. 4, copied from a published report by Granger.) Most of the platinum exported from Colombia has come from the Condoto River, a headwater stream of the San Juan. It is stated that in this stream the platinum is about 75 per cent of the value obtained. On the Atrato the platinum content

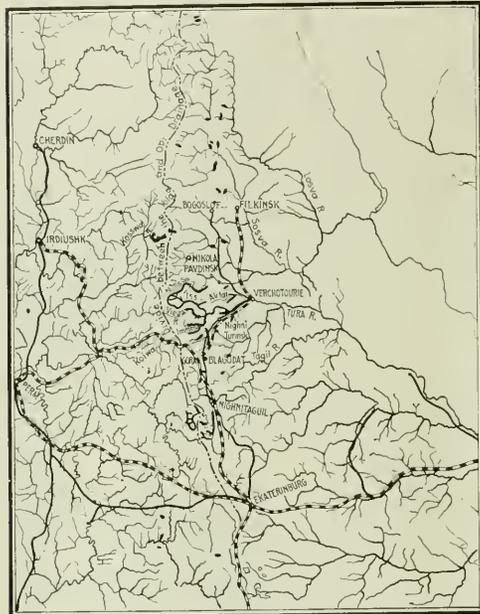


FIG. 3. MAP OF THE PERM GOVERNMENT, RUSSIA, SHOWING IN DETAIL LOCATION OF PLATINUM-PRODUCING PLACERS

is lower, ranging from 5 to 15 per cent. Platinum and osmiridium also occur in the streams south of the San Juan drainage, which enter directly into the Pacific, notably the Micaí and Patia, though little authentic data concerning them are available.

According to Dr. Tulio Ospina⁸, Director of the School of Mines, Medellín, Colombia, platinum is found widespread in conglomerates which cover an extensive area in the Atrato and San Juan basins. The metal has been reconcentrated in the present stream channels from which the major output of platinum comes. According to the statements of various observers, there are places on the interstream areas in which platinum has been concentrated. These areas are, from all accounts, old stream channels. The primary platinum deposits evidently are to be looked for on the west slope of the western ridge of the Andes, though no literature which gives detailed information on the geology of this range has been found. Peridotite, dunite, and other basic igneous rocks are represented in the platiniferous gravels.

There is scant information upon which to base an estimate as to the possible reserves of platinum in Colombia. Little has been published on the subject that gives good data on the geology of the country, but from all accounts it seems safe to assume that Colombia holds much promise and should be more carefully prospected.

Over 90 per cent of the platinum mined in Colombia is won by natives, mostly women, who wash the gravels in *bateas*. One dredge is now in operation in Colombia, though other dredging operations have been tried, which were, through various causes, not successful.

CANADA

A small quantity of platinum is produced each year by the placer operations on the Tulameen River, in British Columbia. The metal was derived from a mass of peridotite and dunite, which outcrops on Olivine Mountain west of the main drainage. The gravels of this area are apparently deep. Some platinum is found in the upper 8 to 20 ft., concentrated on a false bedrock as well as on bedrock. Reports were current during 1917 of discoveries of platiniferous placers on Peace and Willow rivers, but no definite information concerning the size or value of the deposits is yet available.

Most of the yearly output of platinum and palladium of Canadian origin is recovered as a byproduct in the electrolytic refining of the metal obtained from the Sudbury nickel-copper ores. That a far greater production of both metals from this source is possible has been shown by the Royal Ontario Nickel Commission.

UNITED STATES

Placer platinum is won in California, Oregon, and Washington. The dredges at the base of the Sierra Nevada mountains produce a large part of the placer platinum output of the United States, principally because of the great yardage handled rather than because of any particular concentration of platinum in the gravels derived from the Mother Lode belt. In northern California, the Klamath and Trinity rivers, particularly the Hay Fork of the Trinity, carry platiniferous gravels. In southwestern Oregon platiniferous gravels have been found at several places on the Illinois, Sixes, and Rogue rivers. Along the beach from Bandon, Ore., to Eureka, Cal., platinum occurs with the black sands, and has been won at a number of mines both near the present strand line and on ancient elevated beaches. In the Blue Mountains of eastern Oregon, and in the Strawberry Range south of John Day River, a few placers have been worked which carried platinum. In Washington, particularly on the south fork of Lewis River, near Yacolt, platinum has been found, and it is reported on the beaches from the Straits of Juan de Fuca south.

All of the platinum-bearing placers in the United States are closely associated with chromiferous serpentines derived from peridotites or pyroxenites. The concentration of platinum has not been great, the original quantity was not large, and consequently none of the areas seems capable of important production. Most of the crude platinum from the Pacific Coast placers carries considerable osmiridium as well as platinum.

As previously stated, the great bulk of the platinum won in the United States is from the dredging fields at the base of the Sierra Nevada mountains from Butte to Stanislaus County. The gravels in these fields are the result of several concentrations, though their platinum

⁸"Proceedings of the Second Pan-American Congress," Vol. 8 1917.

content cannot be considered high. In practically all of the other stream placer areas the gravels have not been subject to such extensive reconcentration, and in some places recent grave's carrying platinum have been found.

The beach deposits are the result of repeated concentration. The platinum and gold particles are excessively small, flaky, and difficult to separate from the heavy sands. The gold and platinum of the beach deposits are concentrated in the dark bands of sand caused by tidal and wave concentration. The payable lenses are rarely over one foot thick and taper out in short distances. It is, therefore, practically impossible correctly to estimate reserves.

Within the last two years a little platinum has been won from some widely scattered localities in Alaska, chief of which are the Dime, Bear and Sweepstake Creek placers, in eastern Seward Peninsula; the Boob Creek placers, Tolstoi district, Lower Yukon, and from beach deposits on Kodjak Island. Platinum also occurs in the

The greater production has been from the osmiridium-bearing gravels of the Savage River drainage in the Bald Hills mining district, in the northwestern part of Tasmania. Little has been published concerning the extent of these gravels, which were derived from the weathering of a series of sediments intruded by basic igneous rocks.

In New South Wales, beach deposits similar to those of California and Oregon are found from Beachy Head north past Clarence and Richmond rivers into Queensland. Apparently commercial exploitation of these deposits has had the many ups and downs of similar undertakings on our Western coast.

Some platinum was obtained from an old buried channel in the Platina or Fifield district, in central New South Wales. The 6 to 10 ft. of pay gravel of this deposit lies under an overburden of from 20 to 80 ft. Water is scarce in the district, and was not developed in sufficient quantities to warrant large-scale operations. Apparently the channel is strictly limited and has been mined about as extensively as is commercially possible.

SPAIN

Platinum in what may prove to be commercial placer deposits has been found in the Sierra Ronda, in southern Spain, about fifty miles northwest of the port of Malaga. Apparently the gravels have not been handled many times, as the concentration of platinum is not particularly great and it is problematical whether extensive development will be warranted.

OTHER REPORTED OCCURRENCES

A small amount of platinum is produced as a by-product from gold dredges on the Irawady River, in India, and from the tin dredges in the Dutch East Indies. Unconfirmed reports have reached the Survey of discoveries of platinum deposits in Westphalia, Germany; in southern Siberia, at various places in Mexico, and from several localities in Ecuador and Peru. Platinum is known to occur in some of the streams, as well as in certain of the gold deposits, of the Minas Geraes districts of Brazil. In southwestern Borneo platinum occurs in the gravels of streams rising in the Bobaris Mountains, in the Tanath-Laut district. Several Russian writers have provided information on this region, the latest, giving analyses of native platinum and osmium-ruthenium, being published in *Mus. Acad., Sci., Petrograd*, Vol. 6, pp. 49-95, 1915.

CONTROL OF THE WORLD'S PLATINUM DEPOSITS

As will be seen from Table II and the map showing the location of placer deposits, Russia has political control of approximately 90 per cent of the world's supply of this valuable metal. Colombia controls the next largest area of platinum gravels. It seems probable that Canada, in her resource of nickel ore at Sudbury and the known placers in the Tulameen and Barkersville districts, has control of the third largest reserve of platinum. The known deposits under the political control of the United States in Alaska and on the Pacific Coast are relatively insignificant. Great Britain controls the platinum of its colonial possessions in Australia, Tasmania, and India. The output of the Dutch provinces of Borneo and Sumatra is relatively small, although there is a possibility that the production from these countries may be increased. Spain may, perhaps, control a small output of platinum, though it is not dem-



FIG. 4. MAP OF CHOCO REGION, COLOMBIA, SHOWING AREA IN WHICH PLATINUM HAS BEEN FOUND

Upper Kahiltna drainage, north of Anchorage. Copper ores rich in platinum are produced at the Rambler mine, south-central Wyoming; from the Boss mine, in southern Nevada, and ores rich in palladium from a mine recently opened in southeastern Alaska.

AUSTRALIA AND TASMANIA

Platinum and osmiridium have been won in small quantities from Queensland, New South Wales, and Tasmania. Platinum is also reported from New Zealand.

onstrated that the production from that country will ever be large.

Prior to the war French commercial interests practically dominated the Russian platinum industry through the operations of the *Compagnie Internationale du Platine*. This company not only had extensive mining holdings, but also had contracts with some of the Russian platinum producers for their output. There were, however, some Russian companies which were more or less independent of the French company, and there are a large number of small miners and peasants who know no allegiance to any particular buying concern. The larger platinum-producing companies in Russia were the *Compagnie Internationale du Platine*, Shouvaloff's company, the Demidoff company, the Nicolo-Pavdinski company, and the Platina company.

The production from dredges has always been relatively small, as compared with the output made by other methods. It is estimated that about 80 per cent of the platinum won from the Russian placers is recovered by hand labor by lessees (*starateli*), who contracted to dispose of their production to the companies owning the ground and pay a royalty for the privilege of working. Since the war the peasants and miners are virtually in control of all the mines, and the original operators have little to do with their operation or management, and all reports indicate that none of the dredges is in operation and that little if any hand mining has been done.

The most important platinum-bearing placers in Colombia are controlled by American financial interests, and the most important concessions are being operated by subsidiaries of the General Development Co. Late in 1917 a British company was organized for the development of holdings on the Opogodo River, in the upper San Juan drainage. If the present conditions are not changed by action of the Colombia Congress, it is probable that American financial interests will continue to dominate the Colombia platinum.

It is understood that a large part of the placer area of the Tulameen River, British Columbia, is controlled by American capital. A few claims on the Upper Tulameen are controlled by Canadian interests. An American company has recently been organized for the purpose of exploiting certain prospective areas in the Barkersville region, in north-central British Columbia, and it is understood that Canadian capital has rather extensive holdings on the Peace River, in northern British Columbia, which are reported to contain considerable quantities of platinum. The nickel deposits of Ontario, which have a considerable prospective value as producers of both platinum and palladium, are operated by the Mond Nickel Co. and the International Nickel Co.

THE PLATINUM-REFINING INDUSTRIES

It is a peculiar fact that though the larger part of the Russian crude platinum is sold through a French company, England has handled a large part of the output of Russia. The Johnson Matthey Co., of London, is the largest platinum refiner in England. Other English dealers and assayers, as listed by the Munitions Board, are Lees & Sanders, the Warstone Smelting Works, the Sheffield Smelting Works, and Johnson & Sons. The chief platinum refiners in Germany are W. C. Heraeus and G. Siebert, of Hanau, and F. Eisennad & Co. According to Russian figures, about 25 per cent of the Russian output prior to the war was refined in Germany. The chief platinum refiners of France are Quenessen, de

Belmont, Legende et Cie., and *Compagnie Internationale du Platine*, the other refiners being Lyon Allemand, Lecht Lyonnais, Herique Marrett, and Bonnen, Hesse Fils.

In the United States the chief platinum refiners are Baker & Co., the American Platinum Works, Irvington Smelting & Refining Works, J. Bishop & Co., the Chemical Research Laboratory, H. A. Wilson Co., Belais & Cohn, Kastenhuber & Lehrfeld, Goldsmith Bros. Smelting & Refining Co., the Roessler & Hasslacher Chemical Co., Wildberg Bros., and Shreve & Co. There are also a number of refiners of scrap materials who handle platinum.

Prior to the war it is believed that there was more or less interlocking of interests of Johnson Matthey, of London; Quenessen, of Paris; Heraeus, of Hanau, and Baker & Co., of New York, but it has been stated that when war was declared these various companies were separated.

PRESENT SITUATION

As explained, owing to the situation of the chief platinum-producing regions, Russia has been the source of practically all of the world's platinum, though commercially the French controlled the marketing of the bulk of the Russian output. Since 1914 practically no platinum has been exported from Russia, and what little did get out came mostly to the United States. The situation of the various countries can be summarized as follows:

Russia normally used little of her own platinum, exporting it to England, France, and Germany. The country had virtually no platinum-refining capacity, the industry being controlled by French and Russian capital, with more or less German influence. Since the beginning of the Great War, Russia's platinum mines have not been extensively worked, and, in fact, the production from them has decreased at least two-thirds. Any accumulated stocks of platinum that may have been in Russia have probably found their way out of the country. It is doubtful if more than 50,000 oz. of platinum could be obtained in Russia now. There can be no question that a number of the Russian platinum deposits are still very valuable. It is stated on excellent authority that in all probability it would not be difficult for Americans to obtain control of some of the important mines, notably the Shouvaloff and Demidoff, and the purchasing of independently produced platinum might well be in the hands of American interests.

Before the war Germany refined about 25 per cent of the Russian production of platinum. In 1918 it was stated that works had been built at Wenden to treat large reserves of shale which carry one ounce of platinum per ton. Germany had built up great chemical and electrical industries, which required large stocks of platinum, and probably was in fair position with regard to the metal when war was declared. It seems probable that there is a shortage of platinum in Germany at present for any great expansion of either chemical or electrical industries. It is questionable whether German money will be available for investment outside of Germany for some time, and it consequently does not seem that there should be much competition with new German investors. However, it is known that German money was employed in the financing of the pre-war platinum operations in Russia.

France, through her control of the bulk of the

Russian output, was in position to have accumulated considerable stocks of platinum metals, and that she did so is indicated by the fact that the government did not undertake any regulation of the platinum industry until early in 1918. There were fairly large chemical and electrical industries in France, and it does not appear that great expansion of the chief industries requiring platinum was necessary. However, it is believed that the stocks of platinum metals which had been accumulating in France are now for the most part exhausted. In all probability the French *Compagnie Internationale du Platine* will make every effort to renew its contracts with the Russian platinum producers, and surely it will reopen its own mines at the earliest opportunity.

About 70 per cent of the Russian, probably half of the Colombian, and most of the Australian and Indian platinum was sold in England prior to the war. It is believed that not all of this was refined in England, for considerable amounts of crude platinum were exported from England to the United States. However, it cannot be questioned that large stocks of the platinum metals were on hand in England when war was declared. England had to build a great chemical industry during the war, and quickly used what reserves she had, so that the government early saw the necessity of controlling the use of platinum metals. English capital, through its many Russian connections, is undoubtedly in a strong position to enter more extensively than heretofore in the Russian platinum industry, and there can be little question that English financiers have already considered this possibility. That England realizes the industrial importance of platinum metals is evidenced by the government's interest in new ventures in platinum prospecting and mining.

FORECAST OF FUTURE OF THE PLATINUM MINES

At present the Russian platinum fields are practically idle. The dredges are for the most part not operating, and the industry is disorganized by the endeavors of the masses to work the mines. It will require considerable expense and several months, if not years, to rehabilitate the Russian platinum industry. The known deposits of the Russian field are becoming exhausted, and the reserves of identified platiniferous gravels are stated by Duparc to have a life of twelve years, based on the pre-war rate of production, or, stated differently, the known deposits are capable of producing between 3,000,000 and 3,600,000 oz. of platinum before they are exhausted.

Colombia appears to have large reserves of unworked platinum-bearing ground, though so little detailed information is available concerning these deposits that it is unsafe to predict their future. All reports indicate that the Choco district is well worthy of careful prospecting, which will probably be repaid by the discovery of considerable areas of platinum-bearing ground.

The Canadian deposits hold some promise for future production of platinum. Several recent discoveries of the metal along the Rocky Mountains in British Columbia, from the Tulameen to the Stikeen, indicate that further search may be rewarded. If reports are true, there is a considerable area on the Willow and Peace rivers which can be dredged for the recovery of gold and platinum. The most important Canadian platinum reserves are in the Sudbury nickel deposits, but it will require a change from present metallurgical practice

to give the maximum output of platinum and palladium from these ores.

In the United States, there does not appear to be hope for a considerable increase in the production of platinum. In fact, it may be that the output will be materially less when the new refineries for the treatment of Sudbury ores are completed in Canada. The placer deposits carrying platinum are for the most part relatively small. Many of those in northern California and Oregon cannot be worked at a profit, and few of them are available for dredging. As the gold-dredging field along the base of the Sierras becomes exhausted, the output of platinum in this country will decline in proportion, barring the discovery of new ground and deposits of gravel richer in platinum than those now known. Platinum is being discovered in new localities in Alaska each year, and it seems probable that the supply from this source may increase.

The various Australian platinum deposits do not appear particularly promising, as regards future production, with the possible exception of the Bald Hill dredging field, in Tasmania. The Fifield deposits are apparently nearly exhausted, and the beach deposits in New South Wales and Queensland are too low grade, and the values are too erratic in distribution, to appear of much commercial interest. The Spanish deposits have not been sufficiently explored to determine their extent, but from the published reports it does not appear that they will be found to be either large or particularly rich.

CURRENT PRICES

There has been some discussion recently of the value of platinum and platinum metals, the trend of which is to the effect that the present price—\$105 per oz.—is several times the actual value of the metal. Just before the war platinum was sold at \$45 per oz. In 1910 it was priced at \$33, and in 1906 it was about on a par with gold—\$20 per oz.

The price of platinum for the next few years will probably not reach the pre-war level, and it is reasonable to believe that the price for several years will remain nearer \$75 than \$50 per oz. Though some platinum may be released from sulphuric-acid works soon after peace is declared, it is probable that this platinum will be absorbed by other industrial establishments, notably nitric-acid plants, as fast as released. Large quantities of platinum now in industrial use will likely find their way to the general market, which is markedly short of supplies.

The Santa Gertrudis Company, Ltd.—During the quarter ended March 31, 1919, the mill crushed 98,012 dry short tons of ore. Value of bullion produced, £231,676; working expenses, including development and shipping and selling, £158,523; estimated profit at mines, £73,153. Expenditures for construction and equipment, £472. The crushing rate averaged 95.1% of full capacity. The company's profits are being earned at present on ore of an average grade of between 11 and 12 oz. silver, and 1.3 dwt. gold per ton. Total development in the Santa Gertrudis mine amounted to 1854 ft., of which 665 ft. was in payable ore, 498 ft. in vein below pay, and 691 ft. in country rock. Total development in El Bordo mine was 2024 ft.; of which 408 ft. was in payable ore, 119 ft. in vein below pay, and 1497 ft. in country rock, principally counter drifts for haulage ways. The retimbering of El Bordo shaft was completed to the 415-meter level. At the Malinche group, the Santo Tomas shaft has been retimbered for three compartments to the 170-meter level.

The Use of Oil in Diesel Engines*

Specifications Must Be Definitely Established and Conform to Most Efficient Operation—Treatment, Filtering, Conveyance, and Storage of Oil—Construction and Situation Of Tanks Should Be Planned Carefully

By L. H. MORRISON

THE question, "Why do three makes of engines act so different with the very same oil," was asked by Kelly, in the course of a conversation covering several subjects relevant to the use of Diesel engines.

"Because the results obtained depend a great deal on the engine," said Egan. "If the oil is a little heavy, the compression will affect the combustion. If the compression pressure, and consequently the temperature, is low, there isn't enough heat in the combustion chamber to ignite the oil thoroughly, and the exhaust will be smoky, because of unburnt carbon passing into the exhaust. Another evidence of the poor combustion will be the decreased horsepower. As to the high compression necessary to secure proper combustion of the heavier oils, it is well to bear in mind that this requires a higher injection pressure."

"Why so, chief?" asked Kelly, who was trying out one of Egan's cigars and was devoting most of his attention to that piece of "rope."

"A little exercise of your gray matter would prevent that question," retorted J. R., who rather objected to Kelly's cigar confiscation habits. "Can't you see that if the pressure in the cylinder is high, the air pressure must also be high to have the same pressure drop through the atomizer? If heavy oil is to be used, of course, the engine compression can be increased by inserting shims between the connecting rod and the big end. But even with the compression high enough to burn this heavy oil, it is necessary to raise the injection pressure anyway. Before Kelly asks why, I'll say that the heavy oil has greater frictional resistance passing through the atomizer, and a higher air pressure must be used."

"Well, chief," began Woods, "what kind of fuel oil do you recommend? I've just read a catalog, and it looks like that engine can burn any oil."

"Yes, I've read those catalogs, and they claim to burn anything from anthracite to buttermilk. But there is a lower limit as well as a higher limit to the gravity of oil that can be used continuously. Any oil that will flow through an inch pipe can be used in our engines for a day; but I won't state definitely the length of time the engines will be down for cleaning the cylinders and loosening up the rings. The desirable oil is one that will burn clean, leaving no carbon deposits."

"How about kerosene, then, chief?"

"That is a reminder, Woods, of your old days of running a hot-ball engine. Kerosene is the thing in such a mill. With a Diesel engine it is too light and volatile. Even if the fuel-valve cage is water-cooled, it is pretty warm down close to the nozzle, and much of the kerosene will vaporize. This is especially true when an open nozzle is used. When the needle valve opens, the air pressure blows this gas into the cylinder without any 'braking' effect. There then occurs the ignition of a considerable mass of fuel gas, which will cause a knock or

pre-ignition pound. The engine has a tendency to run hot. This, of course, is due to the fact that most of the kerosene is injected at or before dead-center, which means less power production and more heat absorbed by the engine itself.

"The same objection applies to the oil that is popularly known as distillate, which has a gravity of from 36 to 44 deg. Bé. I've found we have had better success using the distillate known as desulphurized fuel oil that has a gravity from 28 to 34 deg. Bé., and, though black in color, is clean and practically free from grit. It flows fairly freely, which is a boon in winter, when the heavier oils are practically useless unless heating coils are used in the storage tank."

"What oil showed up best in the tests, chief?" Kelly inquired.

"The 28- to 34-deg. oil burned better, the exhaust showed clearer, and after a ten-hours' run the cylinders

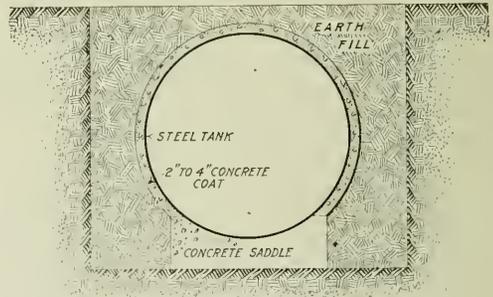


FIG. 1. PROTECTING A BURIED STEEL STORAGE TANK

were clean, and the valves free from carbon. It will cost more per gallon than the 20-deg. oil that we tested the first day, but the amount used per year and the cost of repairs will be less."

"How about that 'slop' which came from Mexico? I didn't fancy that when we ran it out of the barrels." It was Kelly who relieved himself of this caustic opinion regarding the fuel from our southern neighbor.

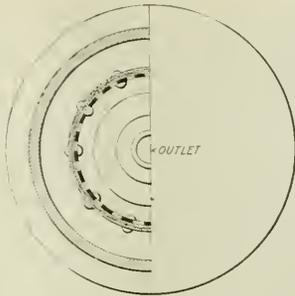
"Your taste, Kelly, for once was very good. I confess I was attracted by that cheap oil. I'd heard of several plants using it. We wrote to one plant, asking their experience, and the reply was favorable. During these tests I learned from the oil man that this identical plant was having trouble.

"The difficulty with that 14-deg. oil is that it gums up the engine. You know how much work we had cleaning the piston heads and loosening up the rings. Such an oil wouldn't do where an engine was to be fully loaded for hours at a time. It has no place in an engine unless used in connection with an ignition oil."

"What oil?" Woods was quick to inquire.

"In a minute, Woods, we'll look into what I mean by

*From an article "Talks on Diesel Engines" in *Power*, May 6, 1919. The article is one of a series on Diesel engines appearing in several issues of that publication.



Sect on A-B

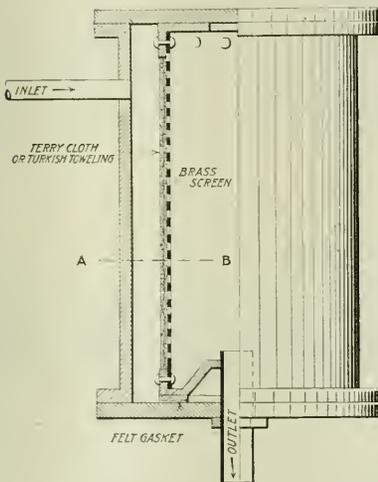


FIG. 2. HOME-MADE FILTER FOR FUEL OIL

ignition oil. I believe you fellows should know what oil we expect to use this year. Here are the specifications: Heat value, not less than 18,500 B.t.u. per lb.; gravity at 60 deg. F., from 28 to 34 deg Bé.; residue, not over 10 per cent after a sample has been heated in an oven for 100 hours at 550 deg. F.; flash point, 160 to 220 deg. F.; burning point, 180 to 275 deg. F.; sulphur, not over 0.5 per cent; water, not over 0.25 per cent; and the oil to have an asphaltum base.

"There should be a filter between the storage tank and the engine tank. We use the home-made type shown in Fig. 2. As you see, the top and the inside screen can be removed for cleaning without breaking a single pipe joint. By the use of the two filters, one can always be at work. There is only one feature that requires care. Always be sure that the felt packing rings are in place when you insert the screen. This screen is made of perforated brass sheet, and is covered with two folds or layers of terry cloth, although we are actually using Turkish toweling, as we have no real terry cloth."

"Mr. Egan, what sort of storage tank is the best?" Woods questioned, as it was evident Egan was through with his filter.

"If a plant is under 500 hp. a steel tank is best, I think. It is more expensive than a concrete tank, but

the ordinary concrete man cannot build a leakproof tank. The size required will not justify securing an expert, and so the steel tank is the best to use."

"How about a wood tank?"

"A wood tank has one thing attractive about it—its low cost. But the low cost proves expensive in a year's time, owing to the rapid evaporation of the oil. No matter how low grade it is, there are some lighter portions, and the hot sun seems to draw these through the wood staves. I'd estimate a loss of at least 10 per cent.

"As to the steel tank, it doesn't pay to use too light a plate. The shell should be of $\frac{3}{16}$ - or $\frac{1}{4}$ -in. material and the heads should be $\frac{1}{2}$ in. thick. The longitudinal seams should be double-riveted, but the girth seams may be single-riveted. If a capacity of 8000 gal. is required, one tank will do, but for a greater capacity use two tanks. Then you have a chance to clean out the slime from one while the other is full."

"How about putting the tanks in the ground?" broke in Woods.

"By all means," said Egan. "If they are above ground, there is always a fire hazard, and the pipes are exposed to injury and meddling. Place them on concrete saddles in a pit about a foot deeper than the diameter of the tank, and pack earth in the pit, leaving about 4 in. between the dirt and the tank, as shown by the cross-

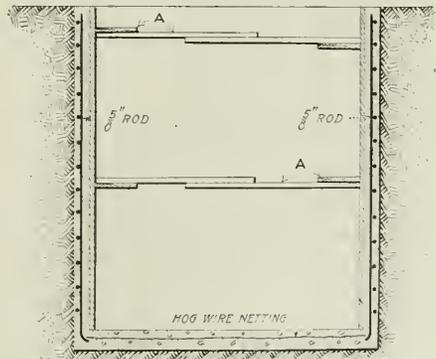
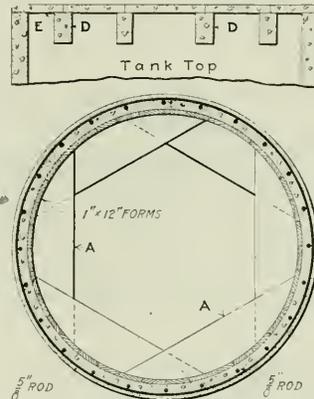


FIG. 3. CONSTRUCTION OF CONCRETE STORAGE TANK

section, Fig. 1. Then pour in concrete, covering the entire surface of the tank. If wooden forms are used, the concrete covering can be made as low as 2 in. thick. Of course, the concrete must be fairly neat to run through this narrow space. You then have a rust-proof storage.

"In making concrete tanks I favor the vertical cylindrical type. Many square tanks have been built, but they all tend to crack at the corners. Some people say that if oil leaks into the surrounding dirt it will form a cement and prevent further leakage. The trouble is that a lot of oil is lost before this cement job is finished.

"It is easy to build a round concrete tank. Dig a circular pit of the necessary diameter and depth, as shown in Fig. 3, and inside it build up a cylindrical form made of boards 1 in. by 12 in., held to shape by the segments A. Use hog wire netting to reinforce the bottom, insert the vertical reinforcing rods about 18 in. apart, and to them wire the circles, spaced about a foot apart. Then run in the concrete between the wooden form and the sides of the pit."

"How about the top?" asked the Scotsman.

"That's the hardest part," said Egan. "Some use a wooden roof, but we covered ours with concrete slabs

a check valve in the line. Run the other end to the coils, and then arrange to discharge the coils into the cooling-water sump. By cracking the regulating valve slightly a circulation of hot water is set up.

"If you ever install an outfit, use considerable care with the oil piping. Every joint should be threaded carefully and made up without red lead or other compound. Remember that oil will leak at joints that are water-tight. Never use anything but heavy-pattern brass valves with nickel seats and valve disks.

"An important adjunct to every Diesel plant is a starting tank of kerosene. Even with a good grade of fuel oil, it is hard to start an engine on cold mornings. Using kerosene for the first five minutes will bring the engine up to speed quickly and warm up the combustion chamber and valves."

"Now, chief, what did you mean by ignition oil?" Woods inquired.

"Well, as I stated, low-grade oils, such as Mexican, ignite slowly. If an engine runs at 180 r.p.m., there are three revolutions per second. If the period of combustion is 10 per cent of the piston stroke, it cannot exceed 1/60 of a second. When you recognize that the beginning of the injection of the fuel and its atomization are necessarily slow, and consider the time spent in

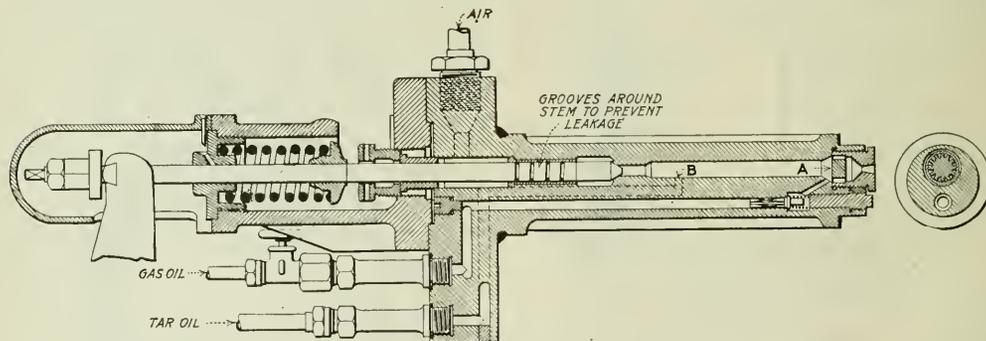


FIG. 4. SECTIONAL VIEW OF KOERTING NOZZLE FOR GAS OIL AND TAR OIL

supported by reinforced girders. Our tanks were 12 ft. in diameter and 16 ft. deep, and we used four girders, *D*, each 8 in. by 12 in. cross-section. To make them we built a wooden form having that cross-section and inserted twelve 1-in. iron rods to reinforce the concrete. We ran the girders of different lengths, to suit their position on the tank. The slabs *E* were not reinforced, but were grouted together, and the job was satisfactory."

"Chief, you spoke of 14-deg. oil needing heating coils in the tank. I notice that our tank has coils, even if we do use light oil."

"That's a thing all storage tanks should have. It makes the fuel easier to handle and no steam boiler is needed. There are two methods of operating the coils without a boiler. The first is to operate the engine cooling-water system under pressure, or, as it is called, use a closed system. By arranging the necessary regulating valves, part of the discharge can be bypassed through the tank coils. It takes some time to heat the oil to 120 deg. F., but once it is warm the coils will keep it at this temperature. The second method is to arrange a jacket about part of the engine exhaust pipe. Connect this to the overhead water tank, using

mixing the atomized fuel and the air, as well as the cooling effect of the injection air, it is evident that there are many factors that tend to retard the combustion. Even when using a high-grade oil this period is none too long.

"Low-gravity oil demands a longer time in which to be atomized, mixed with the air charge, and ignited. The oil particles are larger than in the case of light oils, and the actual time of burning is longer. To utilize a low-grade petroleum oil or tar, one of several methods must be adopted. The first method is to heat the heavy oil or tar to a temperature around 200 deg. F. and to raise the injection-air temperature to avoid any chilling action during the atomization of the charge. This method is fairly satisfactory with oils above 16 deg. Bé., but with lower-grade oils and tar I've never heard of any plant using it successfully.

"The second method is a variation of the first. The oil is heated, and a small amount of gas oil of from 25 to 35 deg. Bé. is mixed with it in the storage tank. It is practically impossible to keep the two oils thoroughly mixed without resorting to some form of mechanical agitator. In one plant a motor-driven paddle wheel such as is found in a brine-cooling tank was em-

ployed. The light oil thus added is called an ignition oil. Its purpose is to supply a fuel that will ignite quickly, raise the cylinder temperature and produce a flame. This plan works with any petroleum fuel, but is not good when tar oil is used. In tests using mixtures of tar oil and gas oil, it has been proved that 25 per cent of tar oil and 75 per cent of gas oil is the best mixture when the engine is to operate on a varying load. If the engine is to develop full load all the time, a 50-50 mixture can be used, because a high temperature is maintained. Consequently, it would be advisable to use gas oil for low and half loads, reserving the use of the tar mixture for three-quarters and full loads only.

"Another method involves the use of a small amount of gas or solar oil that is deposited close to the nozzle and blown into the combustion chamber ahead of the tar oil. The oil ignites at the ordinary Diesel temperature and provides a flame positively to ignite the tar when it enters the combustion chamber. This plan demands a fuel valve that has separate tar-oil and gas-oil connections, as well as separate fuel pumps. In the Koerting valve, shown in Fig. 4, the ignition oil is deposited at *A*, just behind the nozzle plate, and the tar at *B*, and as the valve opens the air blast blows the ignition oil in ahead of the tar."

Metals Required for the German Steel Industry*

Molybdenum and Vanadium Can Be Obtained From Domestic Sources, but Nickel, Chromium, and Tungsten Must Be Imported

THE supply of metals required for the German steel industry is the subject of a recent monograph by Beyschlag and Krusch (1918), who arrive at the conclusion that sufficient molybdenum and vanadium can be obtained from home sources, but nickel, chromium, and tungsten must be imported.

In 1913 Germany consumed about 6,000 tons of nickel and 100 tons of cobalt. About 500 tons of the former was obtained from the nickel-cobalt ores of Frankenstein, Schneeberg, St. Blasien, and Sohland, and the remainder from New Caledonia and Canada, sources which must be tapped again after the war. All the chromium used has hitherto been imported. In 1913, a total of 23,251 tons was obtained from New Caledonia, Rhodesia, and Turkey. In the same year, 400 to 500 tons of tungsten was extracted from native ores, of a total consumption of 4,500 tons, the imported material coming from Spain, Portugal, Argentina, India, Australia, Malaya, and England.

Prior to the war, molybdenum was used in Germany solely as a source of chemical preparations; only in the works at Teutschenthal was ferromolybdenum produced for export to England. The best native source is the Mansfeld copper schists, which contain 5 per cent of molybdenum ore; and the wulfenite deposit at Werdenfels, in Hölenthal, near Garmisch, still awaits exploitation. The total home demand could be met by the vigorous working of the native copper schists.

The demand for vanadium was small before 1914. Today it is from 600 to 800 kg. per month. German South-West Africa (Otavi) formerly supplied 60 to 150 tons of mottremite, containing 8 to 10 per cent of

vanadium. Iron ores and clays have a small vanadium content, and slags show 0.5 to 0.7 per cent vanadium; and the copper schists also contain this metal. Foreign sources of supply are Colorado, Utah, Pennsylvania, New Mexico (Siena de los Cabellos), and Peru (Mina Rapros). In 1911 the last-named produced 2,151 tons of ore, equal to three-fourths of the world's production. The German demand will probably be about eighteen tons, and this should be obtained by recovery from slags.

The authors advise the accumulation of a reserve of the above metals, sufficient to last five years, which could be used instead of gold for covering the issue of paper currency. The state should acquire the following (in metric tons); Nickel, 20,000; chrome ore, 150,000; wolframite, 10,000; molybdenum, 750, and vanadium, 45. These would have a total value of 341.75 million marks (about £17,000,000).

Panama Manganese-Ore Deposits

According to a report of the British Consul at Colon, published in the *Ironmonger* recently, new deposits of manganese ore have been discovered in the high country near Boqueron, in the valley of the Chagres River, in the Republic of Panama. The deposits are "bedded" and outcrop at the surface, and these outcrops are more prominent near the summit of the ridges. Owing to rapid erosion and disintegration, part of the ore has broken up in the form of boulders, which are scattered throughout the intermediate ravines. These boulders are, in almost every instance, of solid ore, and many of them weigh more than 150 tons.

All development work has been confined to open cuts and pits, and at the two mines already started it is estimated that there are approximately 30,000 to 40,000 tons of surface ore in sight, which, with little hand sorting, will average better than 50 per cent manganese. With water-power and cheap labor available, finer ores which are embedded in clay can be concentrated at small cost. The Boqueron River could furnish adequate power for any operations that might be projected, and could produce at minimum flow at least 2,000 hp.

Duty To Equip Mines Modernly

By A. L. H. STREET

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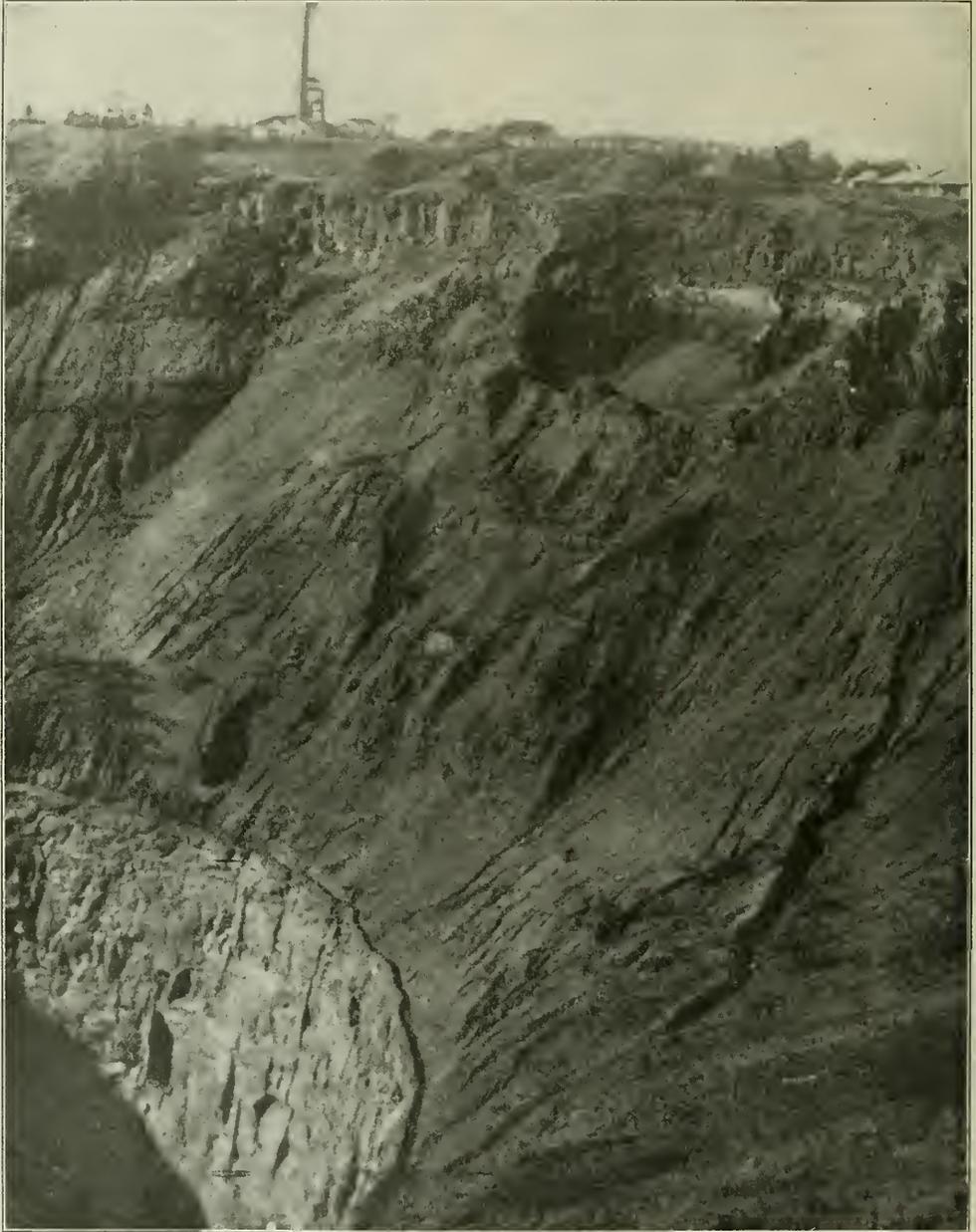
A question presented to the Alabama Supreme Court recently, concerning the liability of a mine operator to an employee for injury to the latter, was whether the operator was guilty of actionable negligence in using poles across a mine entry to prevent cars from running back into the mine, instead of having a derailing switch installed. (*Kilgore vs. Connors-Weyman Steel Co.*, 80 *Southern Reporter*, 454.)

The court took this view of the question: An employer need not adopt machinery and appliances of any particular kind, nor the best and safest to be had. And he need not install every known safety device. His legal duty is merely to discontinue old and insecure methods, and to adopt such improvements as are in ordinary use in prudently conducted mines similarly situated.

The court holds that evidence to the effect that well-regulated mines had derailing switches was in itself insufficient to show that prudently conducted mines in the particular locality, situated similarly to the defendant's mine, used derailing switches.

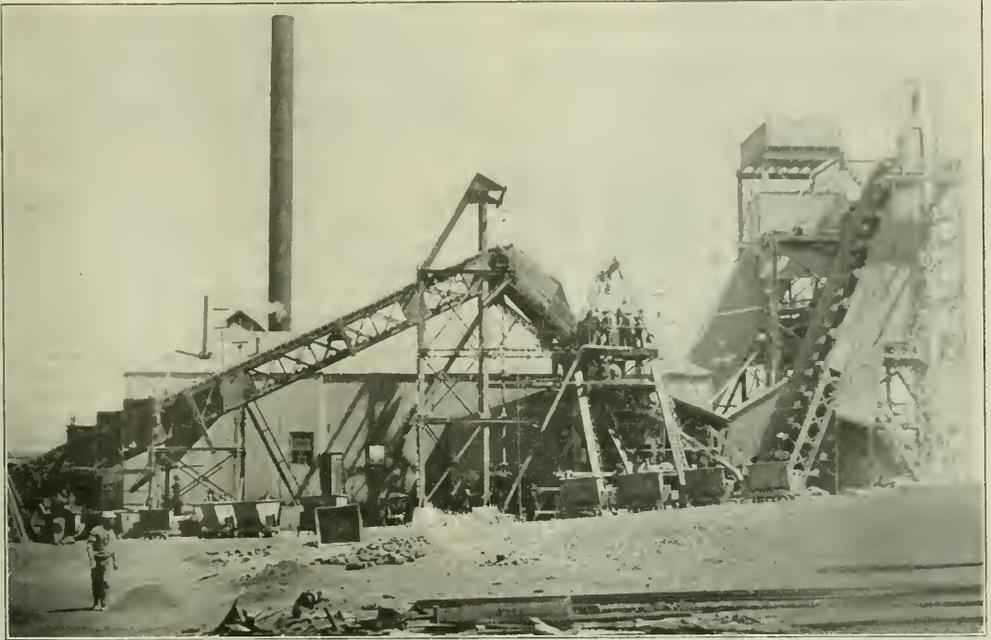
*From a translation in the *Journal of Chemical Industry*, May 15, 1919; from *Metall u. Erz*, Feb. 8, 1919.

Diamond Mines in South Africa

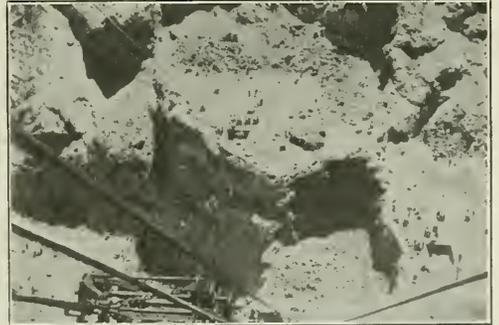
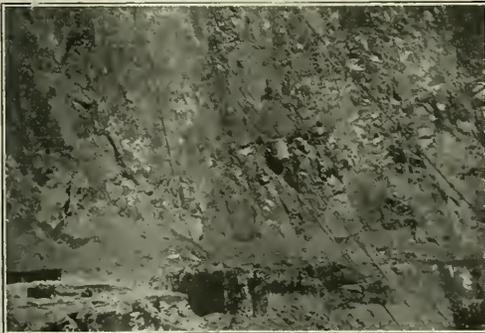


THE KIMBERLEY MINE AT KIMBERLEY, CAPE COLONY

It is impossible to get a photograph showing the entire depth of this pit, nor can the bottom be seen from the edge of the crater. The shaft, which runs down parallel, has now reached a depth of about 4,000 feet.



WASHING PLANT AT THE JAGERSFONTEIN MINE, JAGERSFONTEIN, ORANGE FREE STATE



VIEWS OF OPEN PIT AT JAGERSFONTEIN DIAMOND MINE, SHOWING AERIAL TRAMWAY

Rand's Financial Aspect

Yield on Capital Invested Amounted to Less Than 2½ Per Cent—Calculation of the President of the Chamber of Mines—Amortization

By A. COOPER KEY

FOR the five years previous to the Great War, the average profit made by the mines of the Rand was 9s. 9d. per ton, but last year the rate, by the operation of ever-increasing working costs, had fallen to 6s. and the early months of this year have witnessed a further drop. Owing to the greater tonnage coming into the aggregate run from the richer mines in the Far East Rand, the recovery is 1s. 6d. higher than in 1914 and about the same as in 1910 and 1912. Were it not for this factor the profit would only be about half the pre-war figure. In these circumstances it is not surprising to find Sir Evelyn Wallers, president of the Chamber of Mines, declaring in his address delivered at the meeting of that body that "A considerable portion of the Rand shareholders' dividends are, unfortunately, either practically or actually non-existent. . . . Even taking the industry as a whole, it will be found on investigation that it is now paying under 2½ per cent on the capital that has been invested in it."

This statement is characterized by the *London Financial Press* as a "startling assertion" and regarded as a dismal view, the mines of the Far East Rand being looked upon as likely to improve the position; but the expected advances are unlikely to be considerable, except in the case of the new Modderfontein, which has now completed its program of expansion, to be largely defrayed out of present profits, or from those accruing in the next few years; while these may be neutralized by further decline in the dividends of the Central Rand companies. The greatest mine known to the fields, the Robinson, may not be milling this time next year, and even if it is, it will be on only low-grade (main reef) ore. Last year the smallest profit in the whole course of its existence was recorded, the return being about £65,000, compared with £1,000,000 ten years ago.

A CONCISE SUMMARY

Sir Evelyn Wallers puts the excess costs attributable to the war at £6,000,000, of which £4,000,000 represents increased cost of mining supplies. His summary is so clear and concise that it may well be quoted, though I have anticipated some of the figures in an earlier article.

The effect of these increases on the prosperity of the industry was also more marked in 1918 than in any previous year. The dividends declared by the Witwatersrand Gold Mines in 1918 amounted to only £5,144,077, compared with £8,073,436 in 1914. Analyzing the dividends declared as between the Far East Rand mines and the remainder of the Witwatersrand, the heavy fall in dividends becomes still more evident. In 1914, out of the total dividends declared of £8,073,436, the sum of £6,357,933 was declared by mines other than on the Far East Rand. In 1918, those same mines declared dividends of only £1,929,430—a hopelessly inadequate return on the capital invested in them. The working profits decreased from £11,553,697 in 1914 to £7,500,270 in 1918, and from 9s. to 6s. per ton. Working costs increased from 17s. 1d. in 1914 to 21s. 7d. in 1918, and the total costs from £21,943,692 in 1914 to £26,848,547 in 1918. It is true that this increase in working costs (most of which are expended on the Witwatersrand) coupled with the distribution of war expenditure on supplies, separation allowances, and similar charges, has resulted in the unprecedented prosperity of the community, and we have certainly thus expended in working costs an additional sum of at least fifteen millions sterling during the period of the war, assuming equal ton-

nages treated. It is, however, a short-sighted view which considers that the elimination of a reasonable profit to the shareholder by the distribution of that profit in costs is really a satisfactory position, more especially when it is remembered that in many cases the continuation of operations by the mines has been possible only by a policy of extracting the richer ore in too large a proportion, thus shortening the lives of the mines, and, in the long run, the life of the community.

AMORTIZATION OF WORKING CAPITAL

One must avoid rushing to the conclusion of swift mental arithmetic that because the dividends paid are £5,000,000 and the rate on capital is 2½ per cent, £200,000,000 is invested in the Rand mining industry. The explanation of the low yield lies in the large amount required for the amortization of (a) the value of the property being gradually exhausted by every year of mining work, and (b) the value of development and equipment. In 1913, some figures placed in evidence before the Economic Commission by the Chamber of Mines showed the latter to be £2,250,000. We may now increase this to £2,500,000 at least, in view of the larger equipment expenditure of Far Eastern mines during the intervening five years. Last year the tonnage crushed was 25,000,000, so the amortization allowance for working capital amounted to exactly 2s. per ton. To correct any possibilities of duplication of development expenditure under working costs and under capital account, the chamber reduced the total unit figures 18 per cent. The latter would thus become 1s. 7½ d., which compares with 1s. 5d. assumed in 1913. Obviously, the annual contribution for amortization remains fixed; it may even increase if the period of aggregate mine life is reduced, and increases when expressed on the unit basis if the tonnage crushed diminishes, as indeed it has done.

A sum of about 1s. 3d. per ton is required to meet profits tax and war levy, miners' phthisis compensation charges, claim licenses and other similar expenses. Reconstructing the table given in the evidence of the chamber in accordance with last year's results adduces the following:

	Per Ton	Per Ton
Average yield per ton, 1918		27s. 11d.
Working costs	21 a. 7 d.	
Other operating costs (excluding profits tax)	5s.	
Amortization of working capital	1s. 7½ d.	
Amortization of property	1s. 7½ d.	2s. 3d.
		2s. 8d.
Profits tax and war levy		10d.
Margin for remuneration of capital		1s. 10d.

THE RAND'S NOMINAL AND CASH CAPITAL

In the evidence referred to, the chamber took vendor capital (for properties) as being the same amount as the equipment development capital, a figure closely calculated for the purposes of Mining Taxation Act. This appears to give a figure in excess of that shown in statistics issued by the Mines Department. The total capital is shown by the latter as £103,400,000, though a rather lower figure, £91,000,000, is obtained by adding the issued capital, the premiums on shares, debentures, and temporary advances.

Actual cash supplied (which of course excludes vendor scrip given for the properties) was much less, namely £51,500,000, a figure which would be reduced by no less than £17,000,000 by premiums written off and debentures repaid. Some authorities argue that there is no need to amortize the working capital, inasmuch as many of the mines have repaid the original capital several

times over. In support of this line of reasoning they point to the Robinson, which has paid twenty times in dividends the amount expended in development and equipment. The expert can choose among these different sets of figures, but if £100,000,000 be assumed to be reasonably correct, it is clear that the yield of the Rand companies, after allowing for amortization of working capital, but not of vendor capital, is only about 2½ or 3 per cent.

FURTHER FALL IN THE MARGIN FOR REMUNERATION

The rate of profit in January was only 5s. 8d. per ton and in February 5s. 6d. per ton. It has been shown that amortization of working capital, minor expenditure items, profits tax, and war levy alone represent 3s. per ton. This leaves only 2s. 6d. per ton for amortization of property expenditure and remuneration of capital. Even when the profit was 10s. per ton, the Chamber of Mines said: "The producing mines of the industry are as a whole only paying their way in respect of adequate remuneration of capital, and there is no margin whatever for the imposition of further taxation." Since then, the war levy, an entirely new provincial taxation, has been imposed, or, should one rather say, super-imposed?

Of course, all the foregoing applies to average results, those of individual companies varying within wide limits. The Rand industry may not be singular in yielding a poor return upon the investments. One recalls calculations that every sovereign worth of gold has cost 25s. to 30s. to produce and the microscopic financial returns upon both American and British railway investments when, in similar fashion, they are viewed in the aggregate.

Improvised Snowshoes

BY CHARLES E. DUTTON*

Goldfield, Nevada

During January, 1916, many sections in the United States had exceedingly heavy snows. I was in an isolated camp, seven miles from town, short of provisions, and had to move. There was no wood suitable for making skis, so I turned my attention to the problem of snowshoes. At first, I could find nothing to use for a frame, or webbing. After looking at every conceivable object in camp, I finally saw several empty five-gallon Standard Oil tins, and, remembering that they had pulled me out of the hole many a time, having served in various ways from a washpan to a bake oven, I decided to give them a chance, with the result shown in the accompanying photograph.

The top and bottom of the can were cut out first, then the side was ripped at the seam. The remaining sheet of tin was then flattened out, the corners at one end were rounded off for the toe, and the other corners cut down to the heel. This furnished a light binder, or substitute for webbing.

After pulling off a couple of redwood strips of ¼ by 3-in. battening from one of the shacks, they were cut as shown and tacked to the tin with long carpet tacks and cleated on the upper side. The cross-pieces were then tacked to the upper side, after spacing them so that the heel of the boot might rest squarely on the one, and the sole evenly on the other. The tops of old discarded boots were nailed on, thus making it possible for

the snowshoes to be laced over the toe of the wearer's boots.

On account of the shoe being entirely flat, the toes occasionally dug into the snow, but when town was



SNOWSHOES MADE FROM FIVE-GALLON OIL TINS

reached, this was remedied by nailing on the ends of two old automobile fenders. I made several trips to town and back with the improvised snowshoes, and kept them on hand for another emergency.

Increasing the Life of Mine Timber

Mine operators have learned that it is absolutely necessary to keep all timbers used in the interior of the mines in the best of condition. The many cave-ins and accidents that have resulted from the deterioration of timbers are evidences of the necessity of proper precautions. The timbers used as supports and struts across the top of the passageways in the mines are subject to the action of gases and fumes which occur in the mines, and also to insect attack. These different destructive agencies cause the decay of the wood, and as a result the timbers last only about six or seven years on the average. Of course, they may not actually fail at the end of that period, but beyond that time their condition is such that they are considered unsafe.

It has been found that the life of the timbers can be doubled and even trebled by coating them with a creosote compound which will fill up all the pores on the exterior of the timber and prevent gases, fumes, and other agencies from acting on the wood. The coating of the timbers is a simple and easily performed process and is quite economical. Its application will prove a profitable investment.

In Handling Flotation Concentrates at Anaconda no samples are regularly taken of the thickened concentrates discharged from the thickening tanks. Hand samples of the filtered concentrates are taken at two-hour periods, and the samples placed in covered pails. One sample covering each eight-hour shift is weighed, dried, the dry pulp weighed and the percentage of moisture calculated.

A Phase of the Apex Law

How Its Application Has Operated To Thwart Development—Decisions Enunciating Its Principles, and Remedial Suggestions

BY CHAS. E. DUTTON

Mining Engineer, Goldfield, Nev.

IN THE early days of mining there was no deep mining below the surface, and I believe the intent of the early metal miners was to apply the apex principle to "oreshoots and deposits," instead of to the "ledge or vein" as later interpreted by the law. No miner cares much for a vein or ledge after he has mined the ore. Oreshoots are generally about as deep as their length, and they vary in length from a few feet to hundreds, rarely reaching 1,000 ft. Sometimes new oreshoots are found a hundred feet or more below the upper ore occurrence, and yet apex within the claim. At other times no new oreshoots may be found in the vein as far as mining can go. Hence, prospecting underground for new oreshoots must continue, as it did originally near the surface.

It is a fortunate thing for a prospector to make an original discovery of ore on or near the surface. But what about the large number of others who may locate the adjoining ground in each direction, irrespective of ore or ledge. They are also prospectors, and often their claims are developed into mines, sometimes before the original discovery of the district becomes successful. The law does not, or at least should not, play favorites. Here is a Claim X, half a mile east and parallel to the original discovery. A shaft is sunk to gain depth, the four directions are prospected, and ore is found. This stimulates the claim owners between the two strikes. Now, it rarely happens that prospectors keep claims very long when they can sell them, ore or no ore. In either case somebody wants them for their ore value or for manipulation, or both. Years later X, now a corporation, is served with an apex suit by the original claim owner half a mile or more west, now also owned by a corporation. Investigation of the underground workings between the two discloses geological evidence in favor of the continuity of the original vein. To appreciate the result, take as an example the evidence given in the "Booth vs. Jumbo Extension" case at Goldfield, Nev. H. V. Winchell in his report to the Jumbo Extension makes the following statement:

Summarizing the results of my examination, which while not complete as to all of the very extensive workings of the Goldfield Consolidated, yet has led to definite conclusions, I find as follows: (1) There is a large vein on the Booth claim, which outcrops at places on the surface and probably crosses both of its end lines. (2) The Booth end lines are parallel. Hence the claim has dip rights in the directions of its end lines. (3) The orebodies in the Jumbo Extension property are probably on the Booth vein, and in a general way on its descent into the earth, and between the planes of its end lines extended in their own direction. (4) The Booth claim was located before any other claim on this vein, and hence has superior rights upon the dip, in cases of conflict.

In addition to the probability thus clearly indicated that the Jumbo Extension Co. cannot expect to prevail in an apex suit fought to a finish in court, there are other considerations which should be carefully taken into account in this connection. Mining litigation is expensive in many ways. Besides the actual expenses of developments, of lawyers and experts, the mine is often forced to suspend

mining operations over long years, and dividends are consequently stopped. Indeed, the costs of such litigation frequently run into hundreds of thousands of dollars, with both litigants suffering and neither of them deriving any benefit or certain of the ultimate outcome.

As the presumptive owner of ore beneath your surface, you have a certain strength of position; in view of the necessarily great cost of developing and proving their case it can hardly be supposed that the Booth Co. desires to fight the case out. Under these circumstances I would certainly advise you to bring about a settlement of the matter through some sort of compromise or consolidation with the Booth. If you can effect an arrangement by which you would surrender one-quarter of the proceeds derived from your ground you would not only escape from an embarrassing and dangerous position, but would be enabled to continue your operations without delay and save the large expense of litigation.

J. R. Finlay, in his report to the Jumbo Extension, concludes with the following statement:

I do not believe that this present controversy between the Booth and the Jumbo Extension ought to be made any exception to the rule that has been established here. It will be good business to compromise by giving the Booth Co. an interest 25 per cent or less in Jumbo Extension for a vertical side-line agreement. Such a compromise, whatever the abstract rights and wrongs of the case, will, in my judgment, be wise for the following reasons: (1) The Booth has a formidable apex position, which, if decided finally by the courts, might give it absolute ownership of the minerals on the Velvet claim. (2) The mere cost of defending such an attack, plus the loss of time, is worth the compromise suggested above. (3) The various compromises recited above indicate that it has seemed good business for owners of apex rights to make large concessions to the owners of the surface. In no case have they exacted more than perhaps 60 per cent of the mineral rights which they might have claimed. (4) In the present case, the owners of the apex are hampered by a good many considerations of equity and common law which might weaken their position very greatly; but, as nearly as I can make out, you are not warranted in ignoring the strength of the Booth apex position. If we cut the matter short by reducing the Booth claim to one-quarter we get near enough to a fair settlement for all practical purposes. So long as negotiations for such a settlement seem promising, I think you are warranted in concentrating your efforts in putting them through and in the meantime cutting down to a minimum the expenditures for litigation.

Judge S. S. Downer, in his report to the Jumbo Extension, reaches the following conclusion:

In view of the foregoing, and particularly in view of the fact that men of the eminence of Mr. Finlay have, after exhaustive examination, submitted such discouraging reports as to the physical facts involved in the litigation, we recommend that you make the settlement proposed.

Charles S. Sprague, vice-president and general manager of the Jumbo Extension, in a report to his stockholders (1915), giving the history of the Booth apex, says:

Negotiations by both the Reorganized Booth and the Jumbo Extension Mining Co. were carried on in an amicable spirit, with the expressed desire of each to avoid extended and expensive litigation. Without expressing a view as to the justice of the United States apex law, we had to face the fact that the law was upon the statute books and applied in this case in favor of the Reorganized Booth Mining Co. As the latter company could not have legally claimed all the vein within the Jumbo Extension ground and all ore contained therein (or practically everything of value belonging to the latter company), it must be conceded that the Reorganized Booth Mining Co. was eminently fair, if not liberal, in the settlement. In this connection, too, it should be understood and appreciated that the Jumbo Extension obtained from the Booth more than the usual "side line" agreement. A distinction must be kept in mind between a deed to ground and a deed to ore in the same ground. The Merger Mines Co. deeded to the Jumbo Ex-

tioned Co. the Velvet claim, which supposedly carried with it the ore within the claim. But it subsequently appeared that the Velvet claim did not own the ore within its boundaries, but, by reason of an apex, the ore belonged to the Reorganized Booth Co.; in other words, the Velvet claim was of value only because of surface rights and any other possible ore that might be found therein outside of the Booth vein. This is important, in view of the threatened suit against the Jumbo Extension by minority stockholders of the Merger, who were dissatisfied with the actions of the Merger directors in selling the Velvet claim to the Jumbo Extension and who would have the deed to the Velvet annulled. Should this suit be brought, and a decision be given to the plaintiffs, their victory would be a hollow one. While it would restore the claim, it could not deprive the Jumbo Extension of the ore within the claim, which, after all, is practically the only value that attaches to it. To make claim to the ore as well as to the surface rights, the Merger Co. would have to disprove the contention of the Reorganized Booth to apex rights. In this they are stopped, as the Merger Mines Co. has already acknowledged the validity of the apex claim of the Booth by agreeing to give the Booth 750,000 shares of Merger Mines stock for a deed to the Booth-Jumbo Extension vein, which enters the Merger ground after traversing the Jumbo Extension.

The compromise resulted in the Jumbo Extension paying the Booth company 300,000 shares of its capital stock and \$15,000 cash dividends due on the stock. In addition, it cost the Jumbo Extension \$12,000 cash to conduct the case. At this writing the Booth has received 1,550,000 shares of stock in compromise from four companies, besides having agreements with the Goldfield Consolidated, Jumbo Jr., and Lone Star, which have not been made public. All machinery on the Booth claim was removed after the Jumbo Extension settlement in 1915, and no work has been done since.

A recent manager of the Merger stated that the apex litigation cost that company \$40,000. The cost of conducting all these cases probably runs over \$100,000. The Reorganized Booth Mining Co. has never produced a pound of ore, but in one year, 1916, it disbursed \$350,000 in dividends received from the sales of stock which it owned. There are no mining developments to record in its one claim, but, by virtue of its physical lay, the courts have sustained its contentions of apex rights to the main lode of the camp. The company is said to hold in its treasury 250,000 shares of Spearhead, 250,000 shares Kewanas, 600,000 shares Merger Mines, 21,000 shares Tonopah Divide and approximately \$12,000 in cash, and to have no debts. Here is a case of one claim having extralateral rights, interfering with ore extraction and underground developments in twelve or more other claims, without ever producing any ore of its own.

H. V. Winchell said recently: "We are the only people, with the single possible exception of Rhodesia, in Africa, where that extralateral right provision still lingers. We have found it difficult to convince our Congressmen of our sincerity in advocating its abolition, and the mining men have encountered considerable opposition on the part of Western bar associations, when they attempted to minimize the amount of litigation called for."

The only chance the adjoining claim owner has today is to settle out of court, and the Booth case is an illustration of what that means. It is human nature to take what the gods give. After reading the article on "Rand Gold Mining" in the *Journal* of Mar. 15, 1919, which states that "the ore-carrying body is a tilted wall of conglomerate extending from east to west in an al-

most uninterrupted stretch of sixty miles and sloping to the south at an angle of from 30 to 40 degrees in the central portion of the Rand," I can well imagine where most of the \$2,500,000,000 worth of gold produced would probably have gone if rights similar to our extralateral rights had prevailed.

There is no valid reason, in my opinion, why extralateral rights should be retained. British Columbia made the change from the apex law, to the admiration of all mining men who have had experience there. The Philippine code is expressed in similar language. That system, already adopted within the jurisdiction of the United States, is an initial step.

The "extralateral right" is given by Section 2,322, U. S. Revised Statutes. It contains 252 words. The first 121 words give "exclusive right of possession of all the surface included within the lines of the location and of all veins, lodes, and ledges, throughout the entire depth, the top of apex of which lies inside of such surface lines extended downward vertically." These words give no extralateral right; the right is given and defined in the remaining 131 words of the section. It appears to me that the most simple, easy and effective way to abolish the extralateral right will be to amend Section 2,322 by retaining the first 121 words, and repealing the remainder of the section, thereby creating fixed vertical end and side lines, irrespective of strike or dip, of veins, lodes, or ledges.

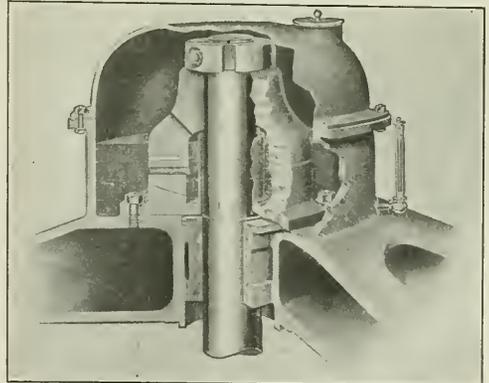
Thrust Bearings

Differentiation of the General Types—Detail of Construction, Installation, Lubrication and Practical Operation

By E. U. GIBBS

Engineering Department, S. Morgan Smith Co., York, Penn.

THURST bearings are of two classes—those in which the load is supported by plates or surfaces between which are placed balls or rollers on which the revolving plate is carried, and those in which the load is supported by plates or surfaces between which is maintained a film of oil. The former are recognized



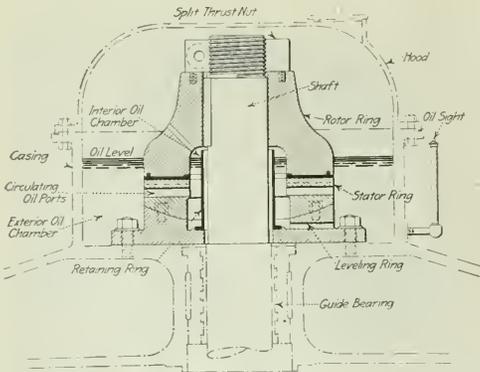
GIBBS THRUST BEARING FOR VERTICAL SHAFT

as the well-known roller-and-ball thrust bearings, and are suited for comparatively light loads and low speeds. Great care must be exercised in making and installing this class of bearing, and provision made to avoid overload; but it has its advantages, especially when the thrust is small and the speed low.

¹A. I. M. M. E. Bull. April, 1919, p. 659.

The second type mentioned is known as the oil-bath thrust bearing, which antedates the ball or roller bearing, having been in use on ships since the use of the propeller. This thrust bearing is known as the marine type, and consists of several collars, turned on the shaft, between which stationary rings are fitted. These are shaped like a horseshoe, for passing over the shaft, and have a soft-metal (babbitt) face for bearing against the collars on the shaft. The bearing surfaces between the collars and the rings are lubricated by means of oil cups attached to the stationary rings, so that the oil is carried by a system of grooves in the soft metal in such a manner that the rubbing faces were constantly covered or separated by a film of oil. Thrust bearings of this character are classified as wet-surface bearings, and operate satisfactorily if the thrust load per square inch on the bearing surfaces does not exceed 50 lb. If exceptional care is exercised in the manufacture and installation of this class of bearing, loads up to 100 lb. per sq.in. have been successfully carried. The demand for a thrust bearing capable of carrying heavy loads was created by engineers in the development of the vertical-shaft hydraulic turbine. About the year 1904, hydraulic-turbine builders began to recommend that vertical-shaft turbines be directly connected to vertical-shaft generators. This type of generator had not been developed to any degree by the generator builders in this country. A small number of machines were installed at Niagara Falls, N. Y., but these were considered large machines at this time. However, European builders had started to specialize and had endeavored to secure contracts in this country. The foreign builders were using ball or roller bearings to support the thrust on the vertical shaft. These machines did not exceed 1000-kw. capacity.

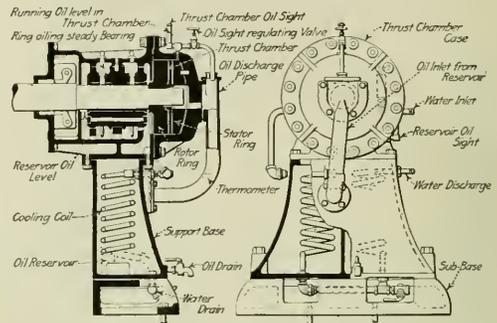
The barrier in the development of the vertical-shaft direct-connected unit was the development of the generator of this type. The problem with the generator designers was the thrust bearing, and in the first installation of this type the thrust bearings were built and installed by the turbine builder. The thrust bearings



DETAILS OF VERTICAL SHAFT BEARING

of the units installed at Niagara Falls consisted of a stationary ring attached to a base, and a revolving ring attached to the shaft, all inclosed in a cast-iron casing. The running faces of these rings were machined so as to form a chamber between them, into which oil was pumped under pressure. This forced the rings apart so that the revolving ring was floating on a film of high-

pressure oil. Should the oil pressure fail for any cause whatever, the metal rings came in contact, and the bearing went out of service immediately; likewise the unit, with an accompanying loss in output of power and the cost of repairs to the bearing. These bearings, with all the necessary pumps and equipment, are expensive to install, and so were used only in large plants.



DETAILS OF HORIZONTAL SHAFT BEARING

It was evident that a new bearing would have to be developed which would operate without external high pressure, and could be installed at a moderate cost. The oil-bath bearing offered the best solution of the problem, and after several years of experimenting along these lines, the Gibbs thrust bearing was developed in 1911. It consists of three principal elements; namely, a rotor ring, a stator ring and a leveling ring, inclosed in a casing and submerged in oil.

An accompanying illustration shows a bearing for a vertical shaft. A leveling ring is bolted to the base of the casing. The top face of the levelling ring is made spherical, to fit the spherical face on the bottom of the stator ring. The top face of the stator ring in this particular bearing has six radial grooves and six wedge faces. The ports in this ring allow the oil from the outer chamber to pass into the inner chamber, formed by the retaining ring and the inside of the stator and both rotor rings. The circulation of the oil is toward the shaft from the outside chamber to the inner chamber and then outward through the radial grooves in the top face of the stator ring. The rotor ring is provided with a sliding fit on the shaft and is held by a feather key. The bottom face of the rotor ring is of genuine babbitt metal and runs on the top face of the stator ring. The split thrust nut is used to adjust the shaft to take up any deflection that may arise in the support or foundation of the machine.

When the average pressure per square inch exceeds 200, the oil in the outside chamber is circulated through cooling coils by means of a low-pressure pump. With average pressure below 200 lb. per sq.in., cooling coils can be placed in the chamber and no exterior circulation of the oil is required, the circulation of the oil within the bearing itself being sufficient.

For a horizontal shaft, two separate bearings are used, a journal bearing and a thrust bearing. The journal bearing is used as a steady bearing to support the shaft and maintain its proper alignment. It is of the standard ring-oiling type, with removable shells in an outer casing. The casing is supported by a hollow base which is filled with oil. Coils, through which water circulates, are placed in the hollow base for cooling the

oil after it passes through the thrust bearing. The thrust bearing proper consists of two principal elements, a rotor ring and a stator ring. The rotor is a cast-iron ring keyed to the shaft, and rests against a shoulder so that it cannot move endwise along the shaft. It has a babbitt-metal face. The stator is a cast-iron ring, and the wearing surface consists of four to twelve sectors, depending on the diameter of the ring, produced by as many radial grooves across the bearing face.

Each segmental face is part flat and part tapered or inclined like a wedge, so that when the rotor is revolving on the stator, in oil, it draws or forces the oil across the inclined surface, and consequently builds up a pressure between the rotor and stator, this pressure being in equilibrium with the load on the rotor. The back face of the stator is spherical and fits into the spherical seat of the case head. This allows for a small alignment with the rotor. The stator is prevented from rotating by means of a dowel pin in the case head.

The thrust bearing is lubricated automatically by the rotor, which is partly submerged in oil, which is a little below the bottom of the shaft. The rotor and stator rings are inclosed in a casing or thrust chamber which is connected by proper opening to the oil chamber under the journal or steady bearing, to which the oil passes from the reservoir or tank beneath.

When the rotor revolves, owing to its being partly submerged, it carries up oil with it and fills the thrust chamber surrounding the thrust rings. The only exit through which the oil may escape is through the radial grooves in the stator to the centre of the stator, where it discharges into the discharge pipe, which carries it back to the oil tank below, thus completing the circulation. The oil, in passing through the radial grooves in the stator, passes across the bearing faces; consequently the bearing is continually flooded with oil. A small pipe is also tapped into the top of the thrust chamber, in which is placed an oil sight gage and a small discharge pipe. This bearing can be used where there is a thrust on a revolving shaft, no matter what the load or speed, and is manufactured by the S. Morgan Smith Co., York, Pennsylvania.

Miami Copper Co.

Annual Report Shows That Increase in Production Causes Larger Ore Depletion Charge, Resulting in Slight Decrease in Net Profits—Remodeling Mill

THE annual report of the Miami Copper Co. for the year ended Dec. 31, 1918, states that the production of refined copper was 58,407,563 lb. and resulted from the treatment of 2,132,941 tons of ore, comparing with 43,863,699 lb. recovered from the treatment of 1,640,206 tons of ore in 1917. The mill extraction was 71.15% and 95% of copper contained in concentrates was returned by the smelter in fine form.

The operating cost for the year, not including depletion of ore reserves or depreciation and obsolescence, was 14.833c. per lb. of refined copper. Depreciation and obsolescence were directly charged at \$573,973, and for mine depletion during the year, \$2,272,836 was set aside. Past and future development based on proved tonnage is figured at 31c. per ton of ore hoisted, which is credited to development account and charged to mining. Four dividends were paid during the year, totaling \$4.50 per share.

Mining was conducted by the top-slicing method in the main orebody and by an improved caving method in

the Captain orebody. Churn drilling on the low-grade orebody was continued, thirteen holes being completed to an aggregated depth of over 9,000 ft. Ore reserves on Jan. 1, 1919, were as follows: High-grade sulphide ore, 12,570,000 tons of 2.38 per cent copper; low-grade sulphide, 36,000,000 tons of 1.06 per cent and mixed sulphide and oxide, 6,000,000 tons of 2 per cent. Underground development work amounted to 14,872 ft., distributed as follows: Drifts, 10,888 ft.; raises, 3,102 ft. and shaft sinking 888 ft. By the end of March the new No. 5 shaft was sunk to a depth of 908 ft. and concreted to a depth of 670 ft. Mining cost was \$1.36051 per ton or \$0.04968 per lb. of copper.

Five sections of the mill have been remodeled and the efficiency is greatly increased. The cost of milling ore to the point of concentrate aboard cars was \$0.72232 per ton. There was produced 76,750 tons of concentrate averaging 40.147 per cent copper.

The profits for the year amounted to \$5,262,419, compared with \$4,952,136 in the preceding year, while depletion this year was charged at \$2,272,836 as compared with \$1,747,876 in 1917.

International Nickel Co.

Annual Report for Year Ended Mar. 31, 1919, Shows Decrease in Earnings—Diminished Demand for Products After Signing of Armistice

THE 17th annual report of the International Nickel Co. for the year ended Mar. 31, 1919, shows that the total income of all properties after deducting manufacturing, selling expense, ordinary repairs and maintenance, but before the deduction of foreign taxes, was \$11,186,304. Administrative and general office expense, including sum reserved for United States and foreign taxes, amounted to \$2,964,363, leaving a net income of \$8,247,158. Provision for depreciation of plants, mineral exhaustion and similar items is charged at \$2,324,528, thereby giving a profit of \$5,922,629. The dividends paid amounted to \$534,756 on the preferred stock and \$4,183,460 on the common.

During the fiscal year, \$3,480,210 was expended for additional property, construction and equipment. Recoveries for the period amounted to \$150,695. Inventories show \$9,692,421, distributed as follows: Ores, matte and metals in process, \$4,220,818; refined metals, \$2,629,240; general supplies, flux, fuel, \$2,842,362 valued at cost. During the first eight months the company operated at full capacity, but after the signing of the armistice production was cut to about one-third.

The plants, mines and ore reserves are in splendid physical condition. The Port Colborne refinery and additions to the Copper Cliff smeltery were completed, and extensive improvements, including a new dam on the Spanish River, which will furnish considerable additional hydro-electric power should it be required, were commenced. The absence of information on development work, grade and tonnage of ore produced and recoveries is noticeable. The noteworthy feature of the report is the increase in earnings and profits from the previous year. Total earnings for the previous fiscal year were \$16,181,500 after the usual deductions and including foreign taxes. Profits in the preceding year amounted to \$10,129,987. Common stock dividends were decreased to 2 per cent in March, and the June dividend was passed.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical
Industry Dealing With Pertinent
Subjects of Interest

Standard Buildings

The writer notes with interest the article in the *Journal* of May 31 on "Standard Buildings," with illustrations of a truss unit applied to different spans and heights. The economic value of the principle is high, but there are practical considerations which must be understood, to avoid inevitable and grave results. Standardized construction has been developed under war-time conditions to a point of useful service for specific needs, especially where much duplication is possible. Standard buildings may be all that is required for ground-floor storage purposes, but for "mill buildings," for the housing of mechanical operations, their disadvantages must be kept clearly in mind when purchasing or entering into contract for such work. This is true with particular force in the mining business. Efficiency consists not in buying as one would a favorite brand of explosive, or lubricant, or drills, but in placing the work of designing in proper hands.

Economy in design of steel buildings, taking all practical conditions into consideration, is as important to the buyer as is his selection of equipment for the work to be done therein. The designer should know of the industrial processes. The framework should fit the industrial needs. The loads of electric cranes, jib cranes, sheaves and shafting, launders, heavy piping, and other equipment must be provided for. The likelihood of need for future extensions must be considered. With optimistic forethought it is generally so arranged, and the use of standardized units permit extension without difficulty.

The machinery layout should be before the designer. To a certain extent he builds his frame around it, placing his columns to avoid interference with the movements of men and materials, and giving adequate headroom under the trusses and girders. The machinery layout is needed by the designer to achieve the maximum economic value of proper lighting, a detail which rewards careful, scientific study.

Being always in stock, standard buildings are clearly advantageous for quick delivery. However, when trade conditions are such as to involve delay in shipping structural steel work of individual design, the same conditions usually exist in equipment and machinery lines. As for permanently bolting steel framework, no specifications put forth by engineers of recognized standing, nor in the building codes of important cities, permit this practice. Vibration caused by wind loads and by machinery will cause bolted work to loosen, and to reach eventually, unless corrected, a condition of certain failure.

The illustration mentioned allows only radical variations in vertical clearances. The eave detail is considered entirely inadequate to safeguard against wind loads where these are as important as in most Western mining regions. There is nothing in the article or sketches to indicate a variation in size of members in

the standardized truss unit. Therefore, in the 20-ft. spans, the weight is excessive, or in the 40-ft. spans, with top-chord sections unchanged, there is a deficiency of metal which must be corrected by stiffening (lessening the unsupported distance between joints). No provision for same is indicated.

The writer does not condemn any type of standardized steel frame at present on the market. The study of possible standardization is most interesting and valuable. The work of the skilled designer along the lines suggested results in economy of time and capital investment in every type of steel mine, mill and smeltery structure, and the economy of standard structures is limited to those cases where the practical considerations mentioned are not important.

E. P. RANKIN, JR.,
El Paso Bridge and Iron Co.

El Paso, Tex., June 6, 1919

Latin and Greek

I am interested in your recent editorials about Latin and Greek and about the country boy versus the city boy. It seems to me that there have been two tendencies in education in this country that are not quite on the right track. The first is to assume that technical training is equivalent to the old liberal education. Innumerable graduates of technical schools are not educated in any other sense than a carpenter or a blacksmith is educated; they have merely learned certain processes for the sake of earning a living. The second tendency is to exaggerate the importance of school. People are not educated in schools except to a minor extent. They are educated mainly by the example of their parents and by their own activities. Witness the utter failure of public schools to teach good English. The children use precisely the language they hear at home or with other children and not at all what the teacher impresses upon them.

As to the use of Latin and Greek in the colleges, it is difficult to form a positive opinion, but on the question of the function that those studies are designed to fill it is impossible to be too positive. The assiduous study of some language other than one's own, which most of us apparently take for granted, appears to be the only way to develop accurate expression and clear thinking. To do this it is necessary to learn how to figure out exactly what the writer in another language means; why he means that and nothing else, and if by all tests there is still doubt of the meaning, the realization of the defects which cause doubt.

I believe the advantage of the country boy over the city boy comes from a superior education. His advantage is mental, not physical. He sees nature at first hand, he knows the processes of life, he learns to work in compliance with laws which he knows cannot be altered or tampered with. The city boy does not necessarily digest these things. He sees only the complicated mechanism

of society, and he may not realize how it all must be founded upon the resources and processes of nature.

With all our efforts at short-cuts and improvements, it seems impossible to get a better conception of education than its literal meaning—a leading out. He who is led to exercise his mental faculties skillfully is educated; he then creates his accomplishments himself. But this cannot be done by the mere force of convention or curriculum. There is nothing sacred or infallible about a course of study. To realize this it is only necessary to remember that the Athenians had no classics except their own.

J. R. FINLAY.

Pine Knot, Bear Valley, Cal., July 11, 1919

Mining in Venezuela

Permit us to call your attention to the following misstatements appearing in an article entitled "The Mining Industry in Venezuela" in the *Journal*, Vol. 107, No. 10, pp. 439 and 440:

On p. 439, in speaking of the South American Copper Syndicate, the author of the article says: "This company owns its own railway and wharves at the port of Tuscacas." The South American Copper Syndicate, Ltd., is not the owner of the railway and wharves at Tuscacas; they are the property of this company.

Again on p. 440 we find the following: "Last year J. C. Price, the manager of the Bolivar Ry. Co.," etc. We would point out that J. C. Prince is our traffic manager. Our general manager's name is as per signature appended hereto.

THE BOLIVAR RY. CO., LTD.

C. A. Hutching, General Manager.

Puerto Cabello, Venezuela, Apr. 19, 1919.

Successful Milling in South America

During a recent visit to the copper-mining district of Corocoro, in Bolivia, the local concentrating plants were observed to be using a successful milling practice which may be of interest to flotation operators who encounter similar conditions. Though Corocoro is supposed to be a district famous for its production of *charqui*, or native copper, the chief activity in the camp now centers in the flotation plants of the two companies that are the only ones of importance in operation there. One is the so-called "Chilean company," or *Cia. Corocoro de Bolivia* and the other is the "French company," or the Corocoro United Copper Mines, Ltd. Both companies possess modern flotation concentrators, which are producing chalcocite concentrates, these being marketed at Tacoma, Wash., in the case of one company, and in England by the other.

Though the mill ore is considered to be low in copper content, as compared with the native-copper ores that were the original production of the camp, it is really of good grade, and, according to the statements of the mill managers, the copper content varies between 8 and 12 per cent. This ore is being treated by each of the plants mentioned with a combination of modern mill and flotation equipment. In the case of the Chilean company, the mill is a reconstruction of an old jig and table mill; the French company has a new and well-built plant, less than two years old.

The latter mill grinds in Hardinge mills, and the Chilean plant uses Allis-Chalmers ball mills. Classifying and thickening is done by Dorr machinery in both plants. The flotation section in both plants employs generally

accepted equipment, and renders good service in recovery. Each plant uses an Oliver filter to dewater the concentrate product from the Dorr thickener, and the behavior of the latter machines is remarkably efficient. It must be recalled that Corocoro lies at 12,870 ft. above sea level, yet the filter cake being produced at the time of my inspection was extremely dry. The managers of both companies informed me that the work of the filters was always satisfactory, as the water content of the filter cake was often as low as 8 per cent. and almost never exceeded 14 per cent. The concentrate cannot be called coarse, as a typical mesh card from the French company shows 75 per cent of minus 200, and the remaining 25 per cent was minus 100.

Such an example of good practice would be hard to surpass in American flotation mills, and is interesting in itself, as showing the possibility, by intelligent operation, of using vacuum filtration as a means of dewatering fine pulp at extreme elevations above sea level.

Mollendo, Peru, June 5, 1919.

DONALD F. IRVIN.

The Volume of Gas in a Field

The Bow Island gas field, which supplies Calgary and district with natural gas for heating and illuminating purposes, is showing signs of exhaustion. The president of the gas company states that it will be necessary to cut off at least one-fourth of the customers. In the meantime, the company is pushing boring operations in the Barnwell field, in the hope of saving the situation, but, up to now, only one well has been brought in.

There is positively no excuse for springing an unpleasant surprise of this nature on the gas consumers. Given the initial average pressure of a field, and the pressure after a known volume of gas has been drawn off, it is possible by Boyle's law, enunciated 250 years ago, to calculate to a nicety the actual volume of gas contained in a field, and arrangements should be made accordingly for providing customers. Instead of doing this, however, when they strike gas, people often assume that they have struck an inexhaustible supply, and extend their pipe lines without thinking it necessary to ascertain the volume of gas contained in the field.

F. H. MASON.

Victoria, B. C., July 7, 1919.

Mosaic Maps Obtained by Photography from airplanes are not as accurate as desirable, says the U. S. Geological Survey. The principal object in an aerial survey is to obtain on a horizontal plate or film a picture of the area below the camera. If the area is itself a plane, the picture of it taken from an airplane on such a plate is a true map, but no apparatus has yet been devised that will maintain the plate in a truly horizontal position when the airplane is in motion; and as the earth's surface is almost nowhere plane, the photograph must be corrected to obtain a map free from distortion. The nearest approach to an aerial map so far made is the so-called "mosaic map," which is really not a map at all, but merely a patchwork of photographs. The pictures composing such a mosaic show distortions, due partly to the deviation of the plate from the horizontal position and partly to relief in the surface photographed, and these distortions render the picture useless for accurate map construction. Distorted photographs of an area that has been previously mapped can be laid down over a network of points whose positions are known, and, by distributing the errors due to distortion, a mosaic may be constructed that will present a good appearance.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Rebuilding the Steel Industry in France And Belgium

French ownership of iron ore, the coking coal preserves of Belgium, and the fact that they are advantageously situated as to the seaboard will give France and Belgium great assistance in entering the world market for iron and steel products. This is the opinion of A. H. Brooks, the chief geologist of the American Expeditionary Forces, who returned recently to this country. In this connection, Mr. Brooks authorizes the following statement:

The enormous development of the iron and steel industries of Continental Europe during the last two decades has in a large measure been the result of the best economic use of the Lorraine iron ore and the coking coal from the tributary fields. Though the ownership of the iron and coal was distributed among four countries, trade restrictions did not reduce to any important degree the free movement of raw material. As a consequence large iron and steel industries grew up at localities determined by geographic conditions rather than by political boundaries.

The iron mines of French Lorraine have been little damaged relatively, and, given the labor, could soon be restored to a pre-war productive capacity. A large part of the French and Belgian metallurgical plants using Lorraine ore have been destroyed, and it may take five years to restore them to their pre-war capacities. The inclusion by France of the iron and steel plants of Lorraine at Annexee and possibly of the Sarre district will afford little relief, as these will continue to be supplied from the mines on the German side of the pre-war frontier. Therefore, unless the ore be sent to the Westphalian and Rhineland furnaces, the Lorraine mines during the reconstruction period cannot be worked to their full capacities, which would be very desirable, for their product would give a quick asset to impoverished France. Without this outlet the French iron mines can find a market for only about half of the ore which they can produce. Furthermore, it is by no means certain that even after restoration the French and Belgian plants can consume all the iron production of the Lorraine mines. Therefore, however desirable it may be to limit Germany's iron and steel output, such action, certainly during the period of reconstruction, and probably after it, will curtail the output of the French Lorraine iron mines.

The rebuilding of the French and Belgian metallurgical plants will make it possible to install the most modern equipment, and thus will give them some advantage over competitors using pre-war plants. On the other hand, during this period of construction the French and Belgian steel and iron products, in an open market, will be more or less at the mercy of the undamaged, established industries of other countries. A whip hand can be held over Germany by refusing her the iron ore, but this will be to the disadvantage of the French mines and may increase the cost of iron and steel products in both France and Belgium.

The French ownership of iron ore, and the coking coal reserves of Belgium, and especially her geographic position, making the latter country the natural seaboard outlet for the Lorraine field, will give these two countries great advantages in competing in the world market for iron and steel products. These economic conditions will be further improved by a competitive use of Westphalian coking coal, which is favorably situated for cheap transportation into both countries.

Mineral Statistics and the League Of Nations

The organizations sent by the leading allied nations to the Peace Conference at Paris included groups of statistical specialists whose task it was to prepare for the use of the Peace Conference fundamental statistical data covering a variety of subjects, among which raw materials occupied a conspicuous place. It is inevitable that the permanent organization established under the League of Nations should be equipped with a statistical service capable of compiling for the use of the League fundamental data upon raw materials, including minerals. Such fundamental information will be essential for the study of the trade situation, as assistance in the negotiation and interpretation of trade agreements, and as an aid to the understanding and adjustment of territorial disputes.

It is only a step from the compilation of such data for the use of the League to making the information generally available in published form, and this could be accomplished at an expense almost negligible in comparison with the great usefulness of the information so contributed.

For many years there has existed at Rome an International Institute of Agriculture which has able statisticians on its staff, and it has published each year an International Statistical Review of raw products useful in agriculture, including a few mineral products such as sulphur, pyrites, and potash. The results have been of great usefulness to all who are interested in agriculture in its broad international aspects, and the success of this work is indicative of the usefulness which would accrue from the compilation of mineral statistics by some international organization. It is earnestly hoped by economists in Washington that in the formulation of detailed plans for the League of Nations the establishment of a department of mineral statistics will receive careful and favorable consideration.

The work of such an organization might well begin with the compilation of statistics entering into production and consumption, namely, production, imports, and exports, which constitute the fundamental data necessary to an understanding of the international situation. The work might well be broadened to include the recording of important developments, prices in the principal markets of the several countries, and information concerning special legislation affecting the mineral industries in their international aspects.

It is claimed that many benefits would accrue from such statistical work. Comprehensive mineral statistics expressed in a common scale would be a great help to all who are interested in the international movement of raw materials. It would tend to encourage the rational development of mineral deposits throughout the world, and would lessen the speculative element in world trade which rests upon the foundation of ignorance.

Such an international statistical service would also react favorably upon the countries which would contribute to its maintenance. The leading nations now maintain good statistical service, but the proposed organization would foster the establishment of improvement of similar services in other countries. Furthermore, the different countries would be encouraged to adopt classifications of commodities that can be better compared, as well as common units of measurement.

Through extraordinary efforts on the part of its founder, the International Institute of Agriculture was built up as an independent international organization, but a similar accomplishment for mineral statistics would be difficult unless merged with the League of Nations organization. Moreover, the League would be the most effective medium for making the statistics reliable. Figures for the various countries compiled by a central organization would afford many checks as to the accuracy of the statistics supplied by each country, and the nation issuing authentic and reliable statistics would not be at a disadvantage if compared with a country whose statistics were less carefully compiled. As a protection against war, such data would be of great value to the League in forecasting preparation for war by any particular nations, although it would not displace the statistical service rendered to individual governments by their consular officials and others.

Tariff Hearings Postponed

All hearings on the tariff bills covering war minerals have been postponed until September, Representative Fordney, chairman of the Ways and Means Committee, announced to the American Mining Congress on July 17. The removal of trade restrictions with Germany, the bulletin of the congress states, makes imperative the immediate passage of the emergency tariff legislation covering dyes, chemicals, glass, and potash, and the number of special bills covering substances which Mr. Fordney at first desired to include in the special emergency legislation appears to endanger an early decision. It is therefore thought advisable as a national policy to postpone all consideration of the substances which can as well be handled later and allow the committee to report to the House.

Mexico's Mining Code as Model

A new mining code has been prepared for the Republic of Santo Domingo. It was written by J. R. Jones, a law examiner of the U. S. Bureau of Mines, after a careful study, on the ground, of local conditions. The code does not follow that of the United States, which Mr. Jones regards as almost archaic, but follows to a great extent the mining code of Mexico.

Would Transfer Survey Office to West

Transfer of the offices of the U. S. Bureau of Mines and of the U. S. Geological Survey to a suitable place in one of the public land states west of the Mississippi River, to be designated by the President, is asked in House Bill 6,551, recently introduced by Congressman Mays, of Utah. The bill calls for the establishing of a branch of the Interior Department at the place to be selected, where are to be maintained not only the offices of the bureaus mentioned but also those of the Commissioner of the General Land Office, the Reclamation Service, the Commissioner of Indian Affairs, and

the National Park Service as presently constituted by law. This bill is not to be confused with the one recently introduced in both houses to establish a Department of Public Works, which was discussed on page 69 of the last issue of the *Journal*.

Manganese Producers Meet

A group of manganese producers representing several states met in the headquarters of the American Mining Congress, on July 18, and after discussing the tariff situation authorized the congress to prepare the data necessary to a thorough discussion of tariff legislation from the producers' standpoint. A standing committee consisting of A. J. Seligman, president of the Butte Copper & Zinc Co., as chairman and four members to be announced later by the secretary, was appointed to assist in organizing the industry for the campaign. It was decided that manganese producers should be asked to meet the expenses of organization.

Imperial Mineral Resources Bureau

New Body Will Gather Information on Production, Consumption and Requirements of Minerals and Advise on Development of Empire's Resources

CREATION of the Imperial Mining Resources Bureau has been announced from London, the charter of incorporation being dated June 12. The purposes of the bureau are given in the charter as follows:

To collect, coordinate and disseminate information as to the resources, production, treatment, consumption and requirements of every mineral and metal.

To ascertain the scope of existing agencies, with a view ultimately to avoid any unnecessary overlapping that may prevail.

To devise means whereby existing agencies can, if necessary, be assisted and improved in the accomplishment of their respective tasks.

To supplement these agencies, if necessary, in order to obtain any information not now collected which may be required for the purposes of the bureau.

To advise on the development of the mineral resources of the Empire or of particular parts thereof, in order that such resources may be made available for the purposes of imperial defense or industry or commerce.

The bureau is permitted to acquire property, real and personal, and to appoint such officers, servants and other persons as the work may require within the British Empire and abroad. The governors of the bureau are empowered to receive and administer all funds which may be appropriated.

The first president of the bureau is Earl Curzon, of Kedleston. The various parts of the Empire are represented in the bureau, each by a governor named as follows: Sir Richard A. S. Redmayne, chairman, for the United Kingdom; Willet G. Miller, for the Dominion of Canada; William S. Robinson, for Australia; Thomas H. Hamer, for New Zealand; William P. Schreiner, for South Africa; Edward Lord Morris, for Newfoundland; Richard D. Oldham, for India; John W. Evans, for the colonies. The following have also been appointed to serve as governors by the president: Westgarth F. Brown, Frederick H. Hatch, Sir Lionel Phillips, Edgar Taylor, Wallace Thornycroft, and Professor Thomas Turner. Each governor is to hold office for one year. Chairman and governors may receive such remuneration as the appointing authority may determine.

World's Iron and Steel Output*

The output of pig iron and steel by the principal producing countries of the world for the years 1900 to 1918, inclusive, according to the National Federation of Iron and Steel Manufacturers, was as follows:

Year	PIG IRON			
	United Kingdom Tons	United States Tons	Germany (a) Metric Tons	France Metric Tons
1900	8,960,000	13,789,000	8,521,000	2,714,000
1905	9,608,000	22,992,000	10,988,000	3,077,000
1910	10,012,000	27,304,000	14,793,000	4,032,000
1911	9,526,000	23,650,000	15,534,000	4,426,000
1912	8,751,000	29,727,000	17,735,000	4,939,000
1913	10,260,000	30,966,000	19,292,000	5,207,000
1914	8,924,000	23,332,000	14,392,000	(b)
1915	8,794,000	29,916,000	11,790,000	(b)
1916	9,048,000	39,455,000	15,285,000	1,447,000
1917	9,420,000	38,621,000	15,142,000	1,684,000
1918	9,066,000	39,052,000	(c) 11,590,000	1,297,000

Year	STEEL			
	United Kingdom Tons	United States Tons	Germany (a) Metric Tons	France Metric Tons
1900	4,901,000	10,188,000	6,646,000	1,565,000
1905	5,812,000	20,024,000	10,067,000	2,240,000
1910	6,374,000	26,095,000	13,699,000	3,390,000
1911	6,462,000	23,676,000	13,681,000	3,681,000
1912	6,796,000	31,251,000	17,302,000	4,428,000
1913	7,664,000	31,301,000	18,959,000	4,687,000
1914	7,865,000	23,513,000	14,973,000	(b)
1915	(c) 8,560,000	32,151,000	15,258,000	(b)
1916	(c) 9,196,000	42,774,000	16,185,000	1,952,000
1917	(c) 9,804,000	45,061,000	16,587,000	2,232,000
1918	(c) 9,591,000	45,073,000	(a) 14,874,000	1,912,000

(a) Including Luxembourg up to October, 1918. The returns for November and December, 1918, do not include the production of Luxembourg, Sarre district and the disannexed Lorraine province. (b) No returns. (c) Including steel castings.

A significant feature of these tables is the fall during the war in the output of iron and steel in both France and Germany, the figures in both cases reaching the lowest level in 1918. The United States, on the other hand, shows a great increase during the war, and in Great Britain the figures show a fairly constant output of pig iron and an increased output of steel.

Potash in Nebraska

At the recent hearing on potash before the Committee on Ways and Means, W. E. Richardson, a Nebraska producer, made some interesting observations as to the occurrence of potash in Nebraska.

"The richest brines are in the lake bed mud and sands, which vary from 15 to 40 ft. in depth," said Mr. Richardson. "These brines are easily obtained by pumping. The supply of brine appears to be inexhaustible, inasmuch as several of these lakes have been pumped dry, and after rains have again been filled by seepage from the surrounding hills, the brine collected being found as rich as that which had been previously pumped from the lakes. Undoubtedly the surrounding hills of sand and brule clay contain a tremendous amount of potash which is continually being released by the elements, and is leached out and washed into the lakes with each succeeding rain."

Drilling Progresses in Derbyshire

Drilling at Hardstoft, Derbyshire, England, where oil was discovered on Apr. 27, 1919, at 3,077 ft., has only reached the top of the oil-bearing sand, according to *Commerce Reports* of July 14. The oil reached the surface on June 7, flowing at the rate of 25-50 bbl. per day. Certain machinery is being installed, when further drilling will be undertaken. As the oil-bearing sand is penetrated the flow is expected to increase. No official analysis of the oil has been published.

Besides the wells at Hardstoft, six other borings are being made at different places in Derbyshire, the present depth of these wells ranging from 750 to 2,950 ft.

Two of them have already given favorable indications that oil will be found. Two wells are also being driven in Staffordshire, which have reached a depth of about 450 ft., and two are being sunk in Scotland in the vicinity of Edinburgh. One of these latter wells is ready to drill and the other to rig.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the U. S. Department of Commerce for May, 1919, and the figures for May, 1918, as finally revised, are as follows:

	IMPORTS, MAY, 1918 AND 1919	
	(In pounds, unless otherwise stated)	
	May, 1918	May, 1919
Metal and ore:		
Antimony ore, contents	72,845	58,880
Antimony matte, regulus or metal	1,975,456	526,400
Copper:		
Ore, contents	6,724,894	3,159,699
Concentrates, contents	2,827,000	1,870,957
Matte, regulus, etc., contents	1,534,399	2,195,904
Imported from (in part):		
Canada	3,116,993	2,342,065
Mexico	4,302,124	4,537,982
Cuba	1,638,965	795,632
Chile	1,314,214	Nil
Peru	137,709	94,781
Venezuela	214,529	Nil
Unrefined, black, blister, etc.	27,892,476	15,997,164
Refined, in bars, plates, etc.	8,878,337	853,436
Old, etc., for remanufacture	89,887	14,995
Composition metal, copper chief value	9,653	Nil
Lead:		
Ore, contents	3,312,494	2,565,390
Bullion, contents	17,983,448	6,831,268
Imported from (in part):		
Canada	2,124,370	801,786
Mexico	17,384,769	6,940,531
Pigs, bars and old	12,635	5,440
Manganese ore, long tons	29,837	19,644
Imported from (in part):		
Cuba, long tons	8,737	195
Brazil, long tons	13,460	12,212
Br. India, long tons	6,600	Nil
Ferrous pyrites, long tons	39,404	33,263
Imported from (in part):		
Spain, long tons	23,406	29,951
Canada, long tons	15,998	420
Tin ore, long tons	4,012	2
Tin bars, blocks, pigs, etc.	10,796,218	449,270
Imported from (in part):		
Straits Settlements	5,608,988	224,870
Dutch East India	796,498	Nil
United Kingdom	1,306,638	224,000
Australia	182,560	Nil
Hongkong	2,263,684	Nil
Tungsten ore, long tons	704	285
Zinc:		
Ore, contents	3,636,092	584,619
Imported from (in part):		
Canada	1,288,422	77,000
Mexico	2,227,470	507,199
Blocks, or pigs and old	7,430	66,898
EXPORTS OF COPPER, LEAD AND ZINC		
(In pounds)		
	May, 1918	May, 1919
Copper:		
Ore, contents	232,223	161,500
Concentrates, contents	134,200	Nil
Unrefined, black, blister, etc.	448,000	Nil
Refined, in long tons, bars, etc.	65,298,223	18,686,929
Exported to (in part):		
France	25,291,592	Nil
Italy	10,894,246	1,368,267
United Kingdom	2,628,116	10,053,311
Canada	2,507,810	1,854,318
Composition metal, copper chief value	1,250	21,249
Old and scrap	1,090	45,885
Pipes and tubes	310,429	433,908
Plates and sheets	2,169,993	856,089
Wire, except insulated	1,038,053	3,971,415
Lead:		
Pigs, bars, etc., produced from domestic ore	13,953,634	372,510
Pigs, bars, etc., produced from foreign ore	4,970,406	1,905,041
Exported to (in part):		
Canada	4,632,414	371,278
United Kingdom	9,893,433	3,568,146
Argentina	309,120	11,212
Japan	2,811,376	Nil
Brazil	239,534	133,907
Zinc:		
Dross	4,951,832	182,703
Spelter:		
Produced from domestic ore	6,752,809	11,076,264
Produced from foreign ore	5,957,576	176,000
Exported to (in part):		
France	7,455,412	1,666,392
Italy	3,132,557	756,758
United Kingdom	744,429	6,288,240
Canada	1,222,406	233,437
Mexico	149,998	2,222
In sheets, strips, etc.	1,928,715	1,336,244

*From the *Economist*, May 31, 1919.

Function of Securities Commissions

State Bureau's Method of Investigation Assures Evaluation of Property, and Secures Protection for The Investor—The Procedure in Minnesota

BY A. C. OBERG

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STATE securities commissions have been legally established in Illinois, Iowa, Kansas, Michigan, Minnesota, Oregon, Utah, Washington and Wisconsin for the purpose of regulating the sale of securities within the borders of the respective states, and the law is commonly known as the "Blue Sky Act." Before a corporation can market its securities a license must be obtained from the commission in the state in which the corporation wishes to operate and sell stock. In a few states securities can be sold without first obtaining a permit. Other states have limited regulation through banking departments or corporation commissions. In many instances these departments have proved inadequate, and laws are being amended to conform with a uniform standard adopted by the several states having such commissions. A national association of securities commissions has been formed for the purpose of standardizing methods of investigation, inspection, and reports.

The State Securities Commission of Minnesota has divided securities into three classes, financial, industrial, and mining. This article deals entirely with the method of investigating mining investments. There are three kinds of mining and oil stocks now covered by this commission, namely: (a) Sale of stock in regularly incorporated companies, whether organized in this or other states; (b) sale of lots in acreage controlled by so-called syndicates or trusts for the purpose of promoting oil lands held in fee or leaseholds; (c) sale of units in so-called trusts or syndicates where a number of persons try to dispose of leases in oil lands, or for the purpose of raising funds to carry on drilling operations on oil lands of doubtful value. (A) has been satisfactorily regulated by the commission since it was established; (b) and (c) have been evolved by promoters who desired to avoid investigation under (a), but the recent Minnesota Legislature amended the law so that the three propositions are now covered beyond question.

The initial step necessary in connection with securing a license is to file a statement of the company's business, officers, and financial standing on a blank furnished by the commission, with such additional information as is necessary, i. e. deeds, abstracts of titles, maps, plans, cross-sections of orebody, and other particulars. In some instances the commission finds that the applicant has not a clear title to the property claimed, and a perfect title must be secured before the application is given further consideration.

The second step consists of the analysis of the applicant's financial statement. In many instances records of receipts and expenditures are kept in a loose manner, and especially by some so-called trusts or syndicates developing oil lands when their field representatives neglect to make reports of expenditures or progress. Such matters must be remedied, or the application is refused.

With the foregoing measures satisfactorily disposed of, the commission's examining engineer is sent to the property and authorized to conduct a thorough investiga-

tion and examination of the geological features, mining conditions, mining methods, and, if necessary, make a complete survey of the property for the purpose of estimating the ore, coal, or oil reserves, as the case may be. What the commission desires is a complete evaluation of the property in dollars and cents, whenever possible. In making such evaluation, the following are considered: (1) Estimated tonnage of ore or coal reserves and oil production if well is pumping; (2) value of product based on the average price received in the open market during the last five or ten years, depending upon the possible life of the property investigated; (3) mining costs, royalty charges, transportation charges, general expense, taxes and amortization estimated on a five or ten year period, as the case may demand; (4) improvements, plant, and equipment.

The difference between (2) and (3) will give the profit or loss accruing from operations, and, together with (4), will give a fair index as to the merit of the property. It also affords a fair gage as to the amount of stock that should be issued against such a property, as well as giving the commission an opportunity to determine whether or not it will work a fraud on the purchaser of such a security. In other words, the investor should have a fair chance to gain by his investment.

Permits to sell stock are rarely issued for the full amount proposed by the applicant. Many companies are required to change their personnel, revise business methods and plans, escrow or cancel all promotion stock, and to refrain from publishing any advertisements with misleading statements.

In a few cases, development companies have been licensed to explore iron ore or other formations in Minnesota. The examining engineer's report tended to show the promotion somewhat speculative, but as the money was to be spent in developing the state's resources, licenses were granted. Under similar circumstances, for a promotion outside of the State of Minnesota, the permits would have been refused. The commission encourages development at home. No mining or oil company need fear investigation by the commission if its property or business methods are right. A license from the commission is an asset for clean and worthy enterprises.

The examining engineer is able to offer valuable suggestions to the applicant for the operation of its property, and many companies have profited thereby. Few if any oil companies are being licensed, as past experience has shown that they rarely "make good."

Those comprising the Minnesota Securities Commission are: Andrew E. Fritz, public accountant, chairman; John B. Sanborn, Insurance Commissioner; Montreville J. Brown, Assistant Attorney General; F. E. Pearson, Bank Examiner, and Charles J. Andre, executive officer.

Belgian Spelter Works' Report in the *Ironmonger*, May 31, 1919, shows that the Soc. Anon. de la Vieille Montagne made a net profit of 4,999,000 fr. in 1914 and 6,250,000 fr. in 1913. A dividend of 100 fr. will be distributed for all the years of war, of which 32 fr. falls to 1914 and 40 fr. to 1913. The directors state that they were able to secure large stocks of zinc and lead before the German confiscation. The French works of the company had executed army orders for 380,000,000 fr. The works at Baelen were confiscated and those at Hautmont destroyed.

BY THE WAY

Metallomania

A correspondent asks: "Have you ever seen ore so 'excited' that it jumped clean over the spitz, and, pursued by angry yelps of the beforementioned mongrel, dashed wildly through a laundry to be lost in the tails? (shirt tails, perhaps)."

Metallurgists should not let these details escape them. The solution of many an important problem has often pivoted on some apparently insignificant point, which, once mastered, has revealed the entire complex.

In the Limelight

"William F. Miller, who has had considerable experience in the oil fields in various parts of the country, was in Fallon recently," says the *Reno Evening Gazette*, and after looking over the oil fields east of there stated that the indications for oil are promising. He had some specimens of calcium rock which were taken from the foothills, and he said that this rock was found in every producing oil field in California, and that it was caused by the seepage of petroleum gas. Although many geologists, oil experts and men who have had experience in oil fields have examined the oil fields, none of them have made a discouraging or unfavorable report."

A Divinity Student

Belief in the divining rod or similar device apparently dies hard. From New Mexico comes a letter in which the writer says:

Can you give me any information as to where I can purchase any instruments for locating oil, gold, silver, and iron, or if there are any such things in existence? Some years ago I had an instrument that detected gold, silver, and iron, but I only used it to amuse friends with, by having them hide the article to be found, and never tried it in the field. While in New York this last winter I met a man who told me of a radium instrument of his invention that located both oil and mineral, but it sounded too much like "wind" to believe. I am interested in trying to find several tons of bullion in Mexico and should like to try out some instruments.

As for finding bullion in Mexico, our friend should ask Carranza.

The Wage Differential

That wages are lower in foreign countries does not necessarily mean that labor is cheaper there. In discussing the wage differential before the Committee on Ways and Means recently, George Otis Smith, Director of the U. S. Geological Survey, said: "We cannot over-emphasize the fact of the larger productivity of the American workman. Whether we compare him with the Burmese or the English or the best workmen anywhere on the Continent, the higher productivity is really the promise for the future; and it is not enough to compare just the wages. There came across my desk the other day a manuscript extract from a consular report on coal mining in South Africa, and I was interested to indulge in a simple mathematical calculation, and found that during the month of December last in South Africa, with South African and Asiatic labor, which constituted 90 per cent of the labor in those coal mines, only 10 per cent being white, the actual production per

man was 15 tons per month. That is only three-fifths of a ton a day. In other words, compared with a miner in the United States, they were producing in one day just about what one of our miners would produce in one hour. With those facts in mind, it is not enough simply to say they have cheaper labor in South Africa. It is cheaper because it is not worth as much."

A Matter of Principle

"I 'as 'eard a gert deal baout this 'ere shell-shock that 'as caused so much 'avoc with they chaps 'o went over to h'other side," said Cap'n Dick. "Dam-me, it do be a 'orrible thing. Min' you, m'son, unless a man 'as full control of 'is senses 'e can't do fair on 'is work, no matter w'ot it be. I remember 'ow Billy Broad h'acted one day w'en 'e got upset h'over a discovery 'e made. Not that I mean to say 'e wuz shell-shocked, but 'is mental h'attitude wuz h'affected, an', dam-me, 'e did'nt ac' right for 'ol bloody week. 'E come to me one day an' 'e says, 'Cap'n Dick, I 'as made a 'orrible discovery, an' I'm a daown'ear'ted man. Min' you, las' night I faoun' h'out that my feyther wuz one o' these 'ere bigamists.' 'Gos along,' says I, 'I nawed thy feyther for thirty year, an', dam-me, 'e 'ad but one woman.' 'Well, thee's wrong', says Billy; 'for did'nt I read, with my h'own h'eyes, on the church registry that the same year 'e married my mother, in h'eighteen h'eighty, 'e h'also married h'Annie Domminy.'" D. E. A. C.

Potash and Wooden Nutmegs

First prize for the best bunk is awarded to the Potash Patents Corporation, of Hartford, Conn. Its advertisement in the June 30 issue of the *Hartford Daily Courant* cannot be excelled, even by the writer of a circus poster. The company, if it be a company, makes "tonic fertilizers and other vivifying products" from Connecticut potash feldspar, by the "McA. Johnson" secret and patented process that can be carried on in any foundry. To quote from the ad:

"The product so made is remarkably biochemically active and plants can absorb it 5,000,000 times as fast as ordinary rock. It supplies potash and any special or general mineral necessary to the vegetable kingdom when and as needed by plants."

Actual production is going on, it is claimed, at a small brass foundry, and sales have been made even to China. The corporation is also to include among its assets a process for using the slag of smelters, ionized and made supersensitively active with the objectionable smelter smoke, and recovering potash, zinc, and manganese sulphates, to say nothing of gold, silver, copper, and alumina.

The company's premier brand is its "Chinese Special Sulpho-Argentated," containing silver and two other metals in ratios 7-11-13 as dominant chemico-botanic chords. "The brands are offered in the belief that tired people of financial breadth and *thickness* (the italics are ours) will receive a repurifying and revivifying influence from trying for new, fanciful, and fascinating effects and *effertilization* on come 7, come 11, come 13—Oriental and African emotionalized mathematics." (verbatim).

Why go further?—the company has bonds for sale. The ad. concludes: "The 'inventing' business is a lucrative one when rightly managed. Our aim is to cut the cost of food 60 per cent. We plan to employ sailors and soldiers in this work."

PERSONALS

JUDGE ELBERT H. GARY, as announced in the *Journal*, was recently honored by the trustees of the McKinley Memorial Building, at Niles, Ohio, who caused to be placed in the memorial a bronze bust of Judge Gary, as shown in the halftone reproduced from *Iron Age*. The inscription on the block is as follows: "Judge E. H. Gary, Jurist, Financier, Industrial Leader, Distinguished Citizen, Chairman United States Steel Corporation, President American Iron and Steel Institute. Born, October 8th, 1846." Plans are now being made to place a bust of Sir Henry Bessemer among the group, which includes Andrew Carnegie, David Tod, Henry W. Oliver and others, as a fitting recognition of his service in the promotion of the iron and steel industry.

F. R. Weekes has gone to Montana on professional business.

John D. Ryan is in Houghton spending the summer vacation with relatives.

D. C. Jackling left Seattle for the Yukon Gold property on a tour of inspection.

W. R. Doell has been appointed chief engineer for Clement K. Quinn & Co., at Crosby, Minn.

Theodore Schulze has been elected a director of Sinclair Oil and Refining Co. in place of K. Porter, resigned.

Thomas F. Cole, of Duluth, was in Houghton recently and inspected Seneca property in which he is interested.

E. V. Davaler, mill superintendent of the Butte & Superior, is spending the later part of July in San Francisco.

A. C. Oberg has returned to Duluth after an inspection tour through the Cobalt and Porcupine districts of Ontario, Canada.

W. O. Hotchkiss, State Geologist of Wisconsin, has a large field party doing detail geology on the western end of the Gogebic Range.

Major G. H. Morgau has returned from service in France. His present address is care of W. H. Weed, 29 Broadway, New York.

E. Cushing Moore, after three years in the Slocan district of British Columbia, has opened an office at 614 Mohawk Building, Spokane, Wash.

J. A. O. Preus, State Auditor, accompanied by F. A. Wildes, State Mine Inspector, has completed his annual tour of the Minnesota state-owned mines.

William E. Corey, chairman of the Midvale Steel & Ordnance Co., has been elected a director of the Sinclair Consolidated Oil Corporation.

Walter L. Reid recently made an inspection of the San Bernardo property in San Miguel County, Col., for the purpose of selecting a new mill site.

H. C. Cooke, of the Canadian Geological Survey, is making an examination of the area between Kezoami Lake and Swastika and the Matachewan district.

C. M. Weld, consulting mining engineer, has returned from war work in Washington and resumed practice with offices at 66 Broadway, New York. Telephone, Rector, 1421.

Major Lawrence T. Gavin, formerly superintendent of the Cuyuna-Mille Lacs mine, Cuyuna Range, has returned after a year's service overseas and will soon go to the iron range.

Algernon Del Mar, milling and flotation engineer, has opened an office at 1424 Alpha St., Los Angeles, Cal., and will conduct a business in the design and operation of milling plants.



BUST ERECTED TO ELBERT H. GARY

William C. Potter, of Guggenheim Brothers, is a member of the board of directors of the Mexican International Corporation recently organized to finance new enterprises in Mexico.

Captain J. Ellzey Hayden has returned from overseas service with the 310th Engineers, 86th Division, and will resume his engineering duties with the Cleveland-Cliffs Iron Co. on Aug. 1.

Captain Donald M. Liddell will resume the practice of chemical engineering, with offices in rooms 1800-2, 66 Broadway, New York, and laboratory, 961 to 965 Frelinghuysen Ave., Newark, N. J.

Thomas T. Read, formerly associate editor of the *Mining and Scientific Press*, has joined the staff of the Bureau of Mines and will investigate the work

of the Bureau in relation to public welfare.

Charles F. DeArmond, surveyor for Elko County, Nev., recently passed through San Francisco on his way to the Hetch Hetchy Valley, the purpose of his trip being to test a new tunneling machine.

Melvin Brugger has accepted a position as mining geologist and engineer for the Minas de Matahambres Mining Co., operating copper and silver properties in Cuba. Mr. Brugger has left for Havana.

Howard Reusswig, formerly with the engineering force of the Great Northern Iron Ore properties, has returned from overseas service with the 313th Engineers, and will continue to make his home on the Mesabi Range.

Richard A. Parker, of Denver, and R. C. Gemmel, of Salt Lake City, are chairmen of the state committee of Colorado and Utah, respectively, of the organization formed to promote the establishment of a national Department of Public Works.

Melville McDowell, secretary of the Engineers' Club of Northern Minnesota, and for the last two years private secretary to B. M. Conklin, chief engineer for the Great Northern Iron Ore properties, has resigned and will engage in business for himself.

S. J. Truscott will assume the chair of mining in the Royal School of Mines at South Kensington in September, succeeding Professor William Frecheville, who is retiring. Professor Truscott has been assistant professor of mining in this school for the last seven years.

Captain Richard H. Yail, who since the signing of the armistice has been serving with the Mines Section, Engineering Department, of the American Peace Commission, returned to New York on July 18 and expects to receive his discharge in the near future.

A. M. Alderson, newspaper man, has been elected secretary of the newly organized Montana Mining Association. State Senator Charles F. Muffy is president and Lieutenant-Governor W. W. McDowell is vice-president. George L. Ramsey, president of Banning Corporation of Montana, is treasurer.

James Underhill has been elected associate professor of mining at the Colorado School of Mines for the coming year. Mr. Underhill is a graduate of Harvard and of the School of Mines in Paris and has been engaged in engineering practice. Mr. Underhill will maintain his engineering offices in Idaho Springs, as heretofore.

W. A. McGonagle has been re-elected president of the Duluth & Iron Range R.R., also of the Spirit Lake Transfer Ry., which serves the Minnesota plant of the United States Steel Corporation. Directors of the Duluth & Iron Range R.R. are: W. A. McGonagle, J. H. McLean, J. H. Harding, George L. Reis, Thomas Murray, J. A. Farrell and W. J. Filbert.

OBITUARY

William Gibson Sharp, for the last thirteen years president of the United States Smelting, Refining & Mining Co., died recently, as was previously announced in the *Engineering and Mining Journal*. Mr. Sharp was born in Salt Lake City in 1857, and was graduated as a civil engineer from the Rensselaer Polytechnic Institute of Troy, N. Y., in 1879, and later as a mining engineer from Columbia University. He was afterward connected with the U. S. Geological Survey, and subsequently with the Pleasant Valley Coal Co., which ultimately became the Utah Fuel Co. In 1900 he came to New York as manager of the Consolidated Coal Co. of West Virginia, and in 1906 was elected president of the United States Smelting, Refining & Mining Co. Mr. Sharp is survived by his widow. His achievements in the mining and smelting industry were notable, and his financial ability is attested by the number of responsible positions that he had held.

SOCIETIES

American Electrochemical Society has issued a bulletin for July, containing names of recently elected members and a list of names of those making application for membership. The tentative program of the Chicago meeting on Sept. 23 to 26, inclusive, is appended.

The Mining Institute of Scotland has issued the annual report of the council, 1918-1919. The report states that 80 members were killed in the war. The following papers have been published in the transactions: "The Repair of a Circular Shaft of Small Diameter," by Stewart Chambers; "The Economy of Briquetting Small Coal," by John A. Yeadon; "Cooling of Electric Motors, With Special Reference to Totally Enclosed Motors," by P. A. Mossay; "The Electric Head Lamp," by James Cooper, and "Digest of the First Report of the Mines Rescue Committee."

INDUSTRIAL NEWS

Wheeler Condenser & Engineering Co., Carteret, N. J., held a meeting of the board of directors on July 8. J. J. Brown, formerly vice-president and general manager, was elected president, succeeding Charles W. Wheeler, recently deceased.

Chicago Pneumatic Tool Company announces the removal of the Minneapolis office from the Metropolitan Bank Building to Fifth Avenue and Fifth St., South, where a complete stock of pneumatic and electric tools, air

compressors, oil engines and rock drills and parts will be maintained.

Westinghouse Electric and Manufacturing Co. has issued a circular describing the company's achievements in the field of electrical precipitation. The process applies to copper, lead or zinc smelting, blast furnaces, and chemical, acid, and cement plants for the recovery of valuable material otherwise wasted. Water can be precipitated from oil, dust removed from ventilating systems, and similar results obtained with other material.

Smith-Booth-Usher Co., of Los Angeles, Cal., has opened offices at 433 Rialto Building, San Francisco, to give a larger service to central and northern California. The company is the California, Nevada, and Arizona agent for Bessemer Gas Engine Co., Foos Gas Engine Co., Lakewood Engineering Co., Clyde Iron Works, Barber-Greene Co., Ohio Locomotive Crane Co., J. D. Fate Co., Cincinnati Iron & Steel Co., Henry & Wright, C. & G. Cooper, Van Blerck Motor Co., and others.

The Electric Furnace Company, Alliance, Ohio, has just installed a battery of two Baily electric furnaces at the Capital Brass Works, Detroit, Mich. These furnaces are of the standard 105 kw. tilting type, with hearth capacities of 1,500 lb. each. They will be used for melting yellow brass scrap and borings in the foundry. The Buick Motor Co., Flint, Mich., has purchased a second Baily electric furnace of similar type, for melting phosphor bronze. The Akron Bronze & Aluminum Co., Akron, Ohio, has installed a 50 kw. rectangular tilting type with hearth capacity of 300 to 500 lb., to be used for a wide variety of compositions.

The Baldwin Locomotive Works has issued a pamphlet entitled "The Baldwin Locomotive Works War Industries," which is an account of the company's activities during the war, and of the rapid construction of locomotives for the Allies for use in Russia and on the Western Front, as well as the machining of a large number of shells from 4.7 to 12 in. and the formation of a new company, the Eddystone Munitions Co., for the manufacture of ammunition. Seven-inch "caterpillar" mounts for the U. S. Navy were also constructed. The aggregate value of war contracts executed and delivered by the Baldwin Locomotive Works and associated companies was about \$250,000,000.

Denver Engineering Works Co., at the annual meeting, elected the following officers: Frank E. Shepard, president; William W. Torrence, general manager; Edwin S. Kassler, Jr., vice-president and treasurer. A Tellam will continue as metallurgical engineer, Frank A. Lockwood, hoist engineer, and William A. Leddell as sales engineer. Joseph P. Ruth, Jr., inventor of the Ruth flotation machine, has been retained as flotation specialist. The interest in the company formerly owned by the Hardinge Conical Mill Co. has recently been purchased by the present officers and engineers.

MINING SCHOOLS

The Engineering Experiment Station, University of Illinois, has an opening for a Fellow in Mining Engineering to undertake research work, either in mining or metallurgy. Anyone interested should apply to the Department of Mining Engineering, University of Illinois, Urbana, Illinois.

NEW PATENTS

U. S. patent specifications may be obtained from the *Engineering and Mining Journal* at 25c each.

Alloy of Aluminum, Magnesium and Vanadium. William J. Reardon, Pittsburgh, Pa., assignor to Westinghouse Electric and Manufacturing Co. (U. S. No. 1,305,166; May 27, 1919.)

Blast Furnace. Julian Kennedy, Pittsburgh, Pa. (U. S. No. 1,303,914; May 20, 1919.)

Classifier—Mechanical Classifier. Frank E. Marcy, Salt Lake City, Utah. (U. S. No. 1,306,188; June 10, 1919.)

Concentrating—Ore-Concentrating Machine. Nathaniel A. Stratton, Boston, Mass., assignor to New American Ore Concentrator Co., Boston, Mass. (U. S. No. 1,306,450; June 10, 1919.)

Conveyor (Bucket). Joseph A. MacLennan, Philadelphia, Pa., assignor to Link-Belt Co., Chicago, Ill. (U. S. No. 1,300,438; Apr. 15, 1919.)

Crusher—Rock Crusher. Edward Henry Moyle, Los Angeles, Cal. (U. S. No. 1,304,355; May 20, 1919.)

Crushing—Gyratory Crusher Head. Chas. B. Andrews, High Bridge, N. J., assignor to Taylor Wharton Iron Steel Co., High Bridge, N. J. (U. S. No. 1,303,447; May 13, 1919.)

Dewatering, Classifying and Rabbling Apparatus for Ore Pulp. Cyrus W. McArthur, Denver, Col. (U. S. No. 1,304,077; May 20, 1919.)

Drill—Rock Drill. Albert Ball and Thomas Officer, Claremont, N. H., assignors to Sullivan Machinery Co., Claremont, N. H. (U. S. No. 1,304,523; May 29, 1919.)

Electrolytic Cell. Clinton Paul Townsend, Washington, D. C., assignor to Hooker Electrochemical Co., New York, N. Y. (U. S. No. 1,306,237; June 10, 1919.)

Manganese—Process of Extracting Manganese and Making Sulphuric Acid and Manganese Dioxide. George D. Van Arsdale and Charles G. Maier, New York, N. Y. (U. S. No. 1,304,222; May 20, 1919.)

Pump—Circulating Pump. Walther Zacharias, Pittsburgh, Pa. (U. S. No. 1,304,843; May 27, 1919.)

Rare Metals—Process of Making Compounds of the Rare Metals. Robert McKnight, Pittsburgh. (U. S. No. 1,306,070; June 10, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief
of Interest to Engineers
and Operators

SAN FRANCISCO, CAL.—July 17

The Mammoth Copper Co., of Kennett, Cal., has filed a formal notice with the supervisors asking a reduction of \$1,344,400 in value on which this year \$1,963,935, or to \$1,619,164. Included in the valuation are the Mammoth mine, the Keystone mine, the Mammoth smelter, and the zinc plant. In order to arrive at a fair adjustment of the assessment, the supervisors and the company agreed to appoint an advisory committee to go through the property and fix values. The committee, as named, consists of M. E. Dittmar, R. E. Hanley and Fletcher Hamilton.

ABERDEEN, WASH.—July 17

The Standard Oil Co. was in readiness to start drilling by July 15 at the site of its well No. 1 near McClips, it was announced on July 10. The Shell Oil company's geologists, after spending a few days at the end of June going over territory in the vicinity of Montesano twelve miles east of Aberdeen, in company with local timber cruisers, departed without announcing intentions of prospecting the Grays Harbor field, beyond the statement that they would return in a month.

The number of local and outside companies advertising oil stocks for sale and with growing if vague descriptions of grounds to be drilled, has not increased materially in the last few weeks. Office signs of these organizations appear here and there in the business center of Aberdeen, but in sufficient strength to indicate that much encouragement is being given to wildcatting. The attitude of local business concerns, and of the public generally, possibly accounts for the fact that the number of stock-selling concerns has increased but little since the first few weeks following the Standard company's start in installing machinery. There is a disposition, except among promoters, to wait upon developments undertaken by the big companies.

BOISE, IDAHO—July 18

The Empire Copper Co., at Mackay, Idaho, the chief copper producer of Idaho, has been operating for several months with a minimum crew, on company account, owing to adverse labor conditions and high operating costs, but has extended its former leasing system, which the extensive distribution of its ore lenses facilitates. The force engaged includes about 100 men, divided into thirty separate leases. The combined output is approximately 1,500 tons per month of crude shipping ore, which is treated at the Salt Lake Valley smelteries on a favorable freight and treatment charge basis completed. The ore carries 1 1/2 gold and silver to each unit of copper. The property is extensively developed with reserves of low-grade ore, a concentrator is set up to handle the sulphides in anticipation of this move, and to reduce the Shay railway haulage cost from the mine on White Knob Mountain to the Oregon Short Line American Steel & Wire Co., three miles long, with a maximum capacity of 100 tons per hour, has recently been completed. Shay railway equipment has been junked. John Flinn is manager and Morton Weber consulting engineer.

The Horseshoe and Kennedy mines embrace an extensive acre of mining claims adjoining the Empire Copper to the north. They were taken over a year ago by the United States S. P. & M. Co. of Salt Lake, and much valuable equipment has been disclosed some bodies of lead-silver ore. The most recent development on the Horseshoe group is a shoot of sand carbonate and crystallized ore 15 ft. long, which has a maximum width of 22 ft., which has been opened on the 200 level where there is a small gasoline hoist equipment. Recently a large piece of plant and electric generator of 100-hp. capacity has been installed on the surface and a crosscut tunnel extended to the orebody at this level, where a section has been cut for installing an electric hoist to explore the deposit at

depth. The ore mined runs about 30 per cent lead, and 20 to 25 oz. silver. Two cars a week have been shipped, with a small equipment for some time, and the output should be increased materially as soon as the new plant is completed. The Kennedy vein of this company has been developed 200 ft. deep and 700 ft. long, and shows a succession of pipe-like oreshoots, one of which is 50 ft. thick with about 3 per cent lead, 6 oz. silver, and a high excess of iron oxide. The formation is heavy-bedded blue limestone, traversed by pronounced dikes of rhyolite and granite por-



STANDARD OIL CO.'S OPERATIONS NEAR MCCLIPS, WASH., JULY 1919
Photo by A. C. Girard.

phy, the ores occurring at these contacts, of which there are fully a dozen on the property. Fine ashly breccia deposits and scattered carbonates of lead, with shrinkage open caves at the top of the best orebodies, are characteristic and closely resemble a condition at Tintic, Utah. In fact, the geology of the two districts is closely related in age. Thus an interesting new source of desirable lead ore, which seems to increase in silver tenor as development in depth progresses, is in prospect in this district. N. J. Churchill, formerly of the Tennessee mine in Arizona, is in charge. Several other promising discoveries in the district is mineralized over a large area and has bright prospects for future development in both copper and lead-silver ore.

BUTTE, MONT.—July 18

Anaconda Copper Mining Co.'s Decision to embark in the field of fertilizer manufacture follows a series of experiments made by the company's chemical engineers in connection with a method for the cheaper manufacture of sulphuric acid. These experiments have resulted satisfactorily, according to C. F. Kelley, president of the company, and at the Washoe Reduction Works, at Anaconda, a 25-ton plant has been installed, which is producing the acid at one-half the previous cost and with the plant occupying one-quarter of the usual plant area. The company has decided to spend \$75,000 to build an experimental fertilizer manufacturing plant at the Washoe works, where phosphate rock will be converted into soluble phosphate by the application of sulphuric acid. The company has two claims in the Canyon Creek country in southern Montana, near Maiden Rock on the Oregon Short Line R.R., showing a ledge of phosphate rock

averaging 23 ft. in width and carrying up to 30 per cent of phosphate. In addition, the company is said to have tied up by leases a considerable area of phosphate land elsewhere near Maiden Rock, which is about 45 miles from the Washoe works.

Restoration of Wartime Wages throughout the Butte district has brought to a culmination the controversies between the unions and the mine operators, and this, with the abolishing of the sliding wage scale based upon the price of copper, has served to promote a friendly feeling on the part of labor not observed before in this district in years. The leaders of the unions seemed possessed with a fear that to base wages upon the price of copper would be followed by a slump in the price, and when the companies, with C. F. Kelley, president of the Anaconda, the largest individual employer of labor in Butte, acting as spokesman, offered to abandon the sliding scale and have the companies take the risk of a slump in the metal quotations, the highest hurdle in the road of an agreement between the unions and the companies had been cleared. Jurisdictional disputes also were cleared up with the unions, and with the American Federation of Labor dominating throughout the district. The I. W. W. and its cohort organizations were entirely ignored. The metal crafts, consisting of the machinists, electricians, boiler-makers, and sheet-metal workers, known as the radical unions, have yet to negotiate a wage increase with the companies. Their request was refused. Strike talk on the part of the metal-crafts leaders has vanished, as a strike of these workers without the support of the conservative organizations would accomplish no object.

PHOENIX, ARIZ.—July 18

The 1919 Assessed Valuation of Mining Property in Arizona is \$47,704,615.64, as compared with the \$3,680,430 valuation of 1918. This covers mining property only, other operative property of mining companies being assessed at \$7,583,276.86. The same class of property was valued at \$1,861,131 in 1918. This year the State Tax Commission report contains a new class of property owned by mining companies, called non-operative property, consisting of townships, buildings, stores, supply depots and other similar property owned by the companies but not actually productive mining property. This group is assessed at \$7,916,833.94 for 1919. The grand total of all the assessed valuation of the properties, operative and non-operative, is \$48,184,526.44, which is about half the assessed value of all Arizona property.

The highest assessment against any company is \$80,782,134.30, the total valuation of the Phelps Dodge interests. This is a branch of \$65,200,000 for the Queen Mine, \$1,087,411 for producing mining property, \$3,495,927.59 for other operative property, and \$2,287,382.80 for non-operative property. The Phoenix Copper Co. has a total of \$27,040,407. \$8,731,726.50. The second highest is against the Inspiration Consolidated company, a total of \$79,990,063. The United Verde mine carries a third with \$50,273,788. Fourth is Ray Consolidated, with a valuation of \$48,504,837.83. Gila County leads, with a valuation of \$19,654,096.21. Coconino County is next with \$17,040,047 valuation of \$113,258,179.70. Yavapai County has a total of \$84,325,553.40. Pinal County, \$43,752,170.99; Greenlee, \$25,657,883.12; Pima, \$24,578,912.22; and Mohave, \$6,231,102.

SALT LAKE CITY, UTAH—July 18

The Formation of the Utah Steel Co. with a capitalization of \$2,500,000, comprising the Utah Iron & Steel Co. and the Utah Junk Co. will give impetus to the development of iron and other resources of the state. According to the articles of incorporation, the scope of the new company is wide, the purpose being to buy, sell and deal in iron, steel, copper, stone, ores, coal, coke, wood, lumber and other materials.

and to purchase, acquire, lease and operate lands containing these materials. C. W. Whitley, vice-president of the American Smelting & Refining Co., is president of the Utah Steel Co.; Nathan Rosenblatt, formerly president of the Utah Junk Co., vice-president; M. H. Sowles, treasurer; S. Rosenblatt, secretary. W. S. McClellan, Lawrence Green and M. S. Rosenblatt complete the directorate. There are 25,000 shares, par value \$100; 17,500 common stock and 7,500 preferred stock. There is paid up \$1,000,000 of the authorized common stock, representing 10,000 shares. The Utah Iron & Steel Co. and the Utah Junk Co. have been operating for some time. The capacity of the plants will be increased.

DENVER, COL.—July 19

A Bill To Encourage Production of Molybdenum was introduced in the House at Washington on July 13 by Representative Taylor, of Colorado. The bill (H.R. 7548) reads as follows: "Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That on and after the day following the passage of this act there shall be imposed, levied, collected, and paid upon the articles named herein when imported from any foreign country into the United States or into any of its possessions, the rates of duties which are herein prescribed, namely: First, Crude molybdenum ores and concentrates, 40c. per lb. metallic molybdenum therein contained. Second, Metallic molybdenum, molybdenum powder, ferromolybdenum (herein when imported), ferromolybdenum powder, commercial molybdic acid, calcium molybdate, sodium molybdate, and all other salts of molybdenum and other manufactured materials containing molybdenum, including high-speed molybdenum steel, all alloy steels containing molybdenum and all other compounds containing molybdenum not specifically provided for in this section, 6c. per lb. of molybdenum contained therein. Sec. 2. That the provisions of this act shall not be deemed to repeal any tariff now existing upon any substances or materials mentioned in this act."

EL PASO, TEX.—July 18

The State School of Mines has been given an appropriation of \$32,685 for operating and maintenance expenses during the next 1919-1920 term, and the same amount for the term 1920 and 1921. S. H. Worrell has been re-elected dean. J. W. Klidd will be professor of engineering next year, and R. J. Dwyer adjunct professor of engineering. In addition to being dean, Professor Worrell will have charge of the department of metallurgy.

A Party of Railroad Engineers headed by J. L. Jackson, construction engineer for the Southern Pacific R. Co. of Mexico, has just completed an inspection of the railroad through Sonora. The tour included the Tonichi branch in the Yaqui River Valley and was the first inspection trip through that district since 1913. The journey was made on burros. The road is dilapidated. Trees are growing in the middle of the track, the rails and ties having been blown up by Yaqui Indians and bandits. The trip was made as a basis of a report to the Mexican Government, asking for damages.

The Bill Providing a New Mining Law for Texas, that was drafted by mining men of El Paso, indorsed by the El Paso Chamber of Commerce, and presented by Senator R. M. Dudley of El Paso, has passed the Senate and is now awaiting only the signature of Governor W. P. Hobby, which it will doubtless receive. The bill is considered the most important measure affecting the mining industry ever adopted in Texas. It makes it necessary for persons and corporations holding mineral rights to develop them or pay the state an annual fee. This is expected to make railroads develop or pay a heavy tax upon their extensive mineral holdings or relinquish their right to them, so that others may develop them. It is intended to liberalize the present law authorizing the Land Commissioner to issue permits to prospectors for ore, minerals, oil, and gas. It extends the time from one to three months in which prospectors shall begin boring for oil or mining for minerals and also permits grouping of leases by one lessor.

AUSTIN, TEX.—July 10

U. S. Bureau of Mines has selected Wichita Falls as headquarters for branch offices to be established in Texas for purpose of studying conditions thoroughly, and to get into closer relationship with operators in the effort to institute conservation measures for oil and gas, and bring into operation more economic methods of production.

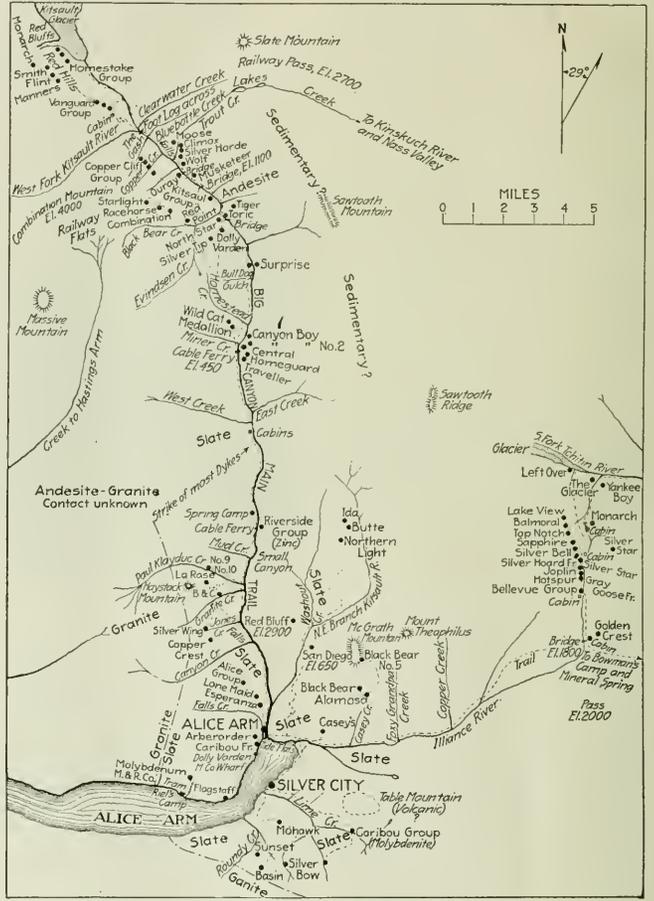
Shutdown of the Burkburnett Field in its northwest extension was ordered by the Railroad Commission for a period of five days, beginning July 12. At the same time a meeting was called to be held at Austin July 16 to give producers a chance to show reasons why the shutdown should not continue in effect for thirty days. During this five-day period there was to be no production, drilling or new wells started. Other drilling might be continued to the sand only, when the well must be cased and work discontinued. Production, it is stated, is far in excess of pipe-line capacity.

Pipe-Line Companies and producing companies have reached an agreement at a hearing before the State Railroad Commission on several contested points, others

JOPLIN, MO.—July 19

The Silver Fox Mining Co. lost its mill by fire on July 12, the plant being situated on the company's lease northwest of Treaco, Kan., in the extension of the Ficher camp field. The mill has been operated steadily for over a year, and has been a consistent producer. Origin of the fire is unknown. The company announces it will rebuild as soon as insurance claims have been settled. F. J. Childress, Galena, Kan., is manager.

Purchase of Several Zinc Mines of the old Commerce camp, four miles north of Miami, Okla., has taken place recently. Homer Seals, of Joplin, and John Newton, of Miami, have bought the Turkey Fat and placed it in operation once more. F. H.



ALICE ARM DISTRICT, BRITISH COLUMBIA. ALICE ARM AND HASTINGS ARM ARE BRANCHES OF FORTLAND CANALS. THE DOLLY VARDEN MINING MINE REFERRED TO IN THE OPPOSITE PAGE IS IN THIS DISTRICT
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being still under discussion. Those agreed upon are: South Texas oil is not to be taken into the pipe carrying more than 2 per cent of foreign sediment and oil, and North Texas oil 1 per cent, temperature of oil not to be higher than normal summer temperature; five days' free storage to be given oil at destination, after which demurrage charges will be made at the rate of one-tenth of 1 per cent per day for first ten days, two-tenths for second ten-day period, and three-tenths for third. Identical oil cannot be delivered through pipe lines, but line companies will deliver similar oil of equal market value. Gathering and delivery charges shall be made separate from those for transportation. The hearing is still being held.

Garung, W. S. Godfrey, and Joseph Ramsey, of Joplin, have bought the Emma Gordon mine, and have changed the name to Dorothy G. It also has been placed in operation. Mr. Seals some weeks ago bought the New State, also at Commerce, and is operating it.

Drainage of 730 Acres of Mining Land in the vicinity of Quapaw, Okla., is assured by the completion of the organization of the Quapaw Royalty & Pumping Co., effected July 17. Between fifteen and twenty companies are interested in the project, which is a co-operative effort, some of the most important including the Brinson-Kirtley, Muskogee, Imperial, Big Three, Wilson, Maubine, F. & F., Greening, Big Jim, True Blue, Red Rose, Burnett, and Springfield.

Lease owners have conceded on an average 2 per cent of their royalty to pay pumping expenses. Four pumping plants are being established, all to be operated by electric motors. A pump of 2,000 gal. per min. capacity will be placed at the Erinson Kirtley mine, a 10-in. Texas pump will be operated at the Muskogee shaft, three Pommas already have been placed at the Imperial, and a 2,000 gal. capacity will be placed at the Maurine. A total capacity of 7,500 gal. per min. will thus be provided, and if this is not sufficient more pumps will be installed. The draining company is capitalized at \$50,000, with \$30,000 paid up. C. H. Cleveland, of Skiatook, Okla., is general manager.

HOUGHTON, MICH.—July 18

The Resumption of the Wartime Wage Scale has resulted in a decided change in the situation, with men returning from the cities. The influx of labor is not to be compared with the outgo that prevailed in June, but the mines at Calumet now report that there is a steady average of fifteen underground men resuming work, all of them being returned miners or trammers.

BATESVILLE, ARK.—July 17

In the Batesville Manganese Field only two companies are working. The Independent Mining Co. is operating one steam shovel at the Polk-Southern mine, near Cushman, and the Cushman Manganese Co. is working on the Rogers & Snapp property. These companies are filling an old contract of 2,000 tons, delivery on which started April 1. One thousand tons have been delivered and the rest will be by Oct. 1. This contract calls for high-grade ore running 50 per cent and over. Letters from some of the largest consumers lead local operators to believe that there will be a market in the future for high-grade ore at a price at which it can be mined at a profit. Representatives of the War-Minerals Relief Commission are still at work investigating claims in the district, and expect to finish in about three weeks.

DULUTH, MINN.—July 19

Reduction of Ore-Carrying Rates is sought by producers of iron ore in the Lake Superior district who have joined forces and have retained Richard Jones, of Youngstown, Ohio, and Francis Sullivan, of Duluth, to carry the matter before the Interstate Commerce Commission. The rates complained of are \$1 per ton on Mesabi ores and 70 and 80c per ton on Old Range ores. These rates, plus the demurrage charge and the stockpile spotting charge, both recent innovations put on in conjunction with remarkable increases in rates, make the shipment of iron ore expensive, and are considered unfair. It was thought at one time that the matter would be dropped for the present season, but the situation has become so galling as to demand immediate attention.

ISHPEMING, MICH.—July 19

Iron-Ore Shipments from Lake Superior ports in June amounted to 7,980,839 tons.

as compared with 9,921,860 tons for June, 1918. The total movement to July 1 reached 16,008,419 tons, as against 18,949,730 tons for the same period of 1918. The difference is not great, owing to the fact that shipments were started earlier this year than last, but the independents are not moving ore at the rate that they should. The Steel Corporation, Fickands, Mather & Co. and the York, Hanna Co. being the only heavy shippers. Only small shipments of ore are going forward from the Marquette Range, and ore is still being placed in stock in some of the iron districts already crowded for stocking room. The situation is far from being what it should at this season of the year.

Below are compared the tonnages for June, 1918, and June, 1919:

Dock	June, 1918	June, 1919
C & N. W. Escanaba...	785,259	594,595
C. S. P., Escanaba.....	28,612	19,552
D. S. S. & A. Marquette...	114,342	89,821
L. S. & I. Marquette....	433,585	206,306
C. & N. W. Ashland.....	959,623	787,351
Soo Line, Ashland.....	178,238	85,936
Great Northern, Superior...	2,069,163	1,821,843
Soo Line, Superior.....	273,904	201,047
North Pacific, Superior...	167,907	66,404
D. M. & N. Duluth.....	2,162,966	2,947,653
D. & I. R., Two Harbors...	1,482,871	1,136,833

Total 9,921,860 7,980,839
Miners are being paid at the rate of \$5.10 a day, and surface laborers are receiving \$4.25. This is the same scale which was in effect during the war period, no reduction having taken place in the iron fields. Many miners working on contract are earning \$8 and \$10 a day, and some trammers are doing as well. It is difficult to state what action will be taken by the operators if it is necessary to cut expenses in the autumn or winter.

BIRMINGHAM, ALA.—July 19

A Steel Base Price in the Birmingham district is being sought and the matter is now before the Federal Trade Commission at Washington. The fourth keel has been laid at the plant of the Chickasaw Shipbuilding Co. The United States Steel Corporation is said to be planning the construction of ten 12,000-ton cargo carriers, and the Chickasaw company will probably build a number of these, drawing on the Fairfield and Ensley plants of the Tennessee Coal, Iron & Ry. Co. for the necessary fuel. The Stoss-Shield & Co. of Iron Co. is planning to blow in two of its North Birmingham furnaces. These are said to be in good condition, and little time in preparation should be lost before new operations to be financed by seven owners in which this company are in operation.

The company is also planning many improvements to all plants, including furnaces, by-product coke ovens, and the electrification of mines. The Woodward Iron Co. has begun operations at its No. 1 ore mine, which has been shut down for several months. During the shutdown some important repairs that had been held up during the press of war business were completed.

The workmen's compensation act, which will soon become a law, indicates a better understanding between capital and labor, as both sides were compelled to make many concessions in order that a satisfactory bill could be drafted. The struggle over the bill began in the previous session of the Legislature. A tax of 4c per ton on iron ore and 5c on coal is before the Alabama House Ways, Means, and Appropriation Committee. This, if it becomes law, will be a heavy blow to the two main industries of the state, and many representatives of the large operators are now in Montgomery attempting to prevent the passage of the bill. Such a tax would increase the cost of producing pig iron to such an extent that decrease in production would be sure to follow at the present selling price of about \$27 per ton and cost of \$34 to \$28.

VICTORIA, B. C.—July 19

The Molybdenum Mining & Reduction Co., whose mine and mill are situated in British Columbia on the branch of Fortland Canal known as Alice Arm, has been tied up in litigation over one of its claims from the end of 1916 until last month. In June, at Victoria, B. C., a court order was issued requiring that the property be placed at once on the market at a fixed price of \$150,000 for the entire molybdenum and silver-lead holdings. The property consists of twenty-one claims situated 4,200 ft. from salt water and 1,200 ft. above sea level on the north side of Alice Arm. The Dolly Varden mine, also in the Alice Arm district, it is expected, will soon be placed on a producing basis. A. J. Taylor, of the Taylor Engineering Co., and now manager of the Taylor Mining Co., was recently granted the necessary certificates to take possession of the property, which, as heretofore mentioned, has been involved in litigation.

TORONTO, ONTARIO—July 19

A National Conference to consider labor legislation has been arranged by the Canadian government to be held at Ottawa, beginning Sept. 11, in pursuance of a recommendation made by the Royal Commission on Industrial Relations. The conference will also deal with the proposals of the Royal Commission. The federal and provincial governments will be represented, and employers' and employees' organizations will each be invited to send about sixty representatives, bringing the total number of those participating in conference up to about 150. The sessions will probably continue for about one week and will be open to the press and the public.

THE MINING NEWS

Progress of Mining Operations Condensed and Classified for Easy Reference

ALASKA
ALASKA SHIPMENTS of domestic copper ore, matte, etc., to United States in June totaled 2,374,843 lb., valued at \$382.

ARIZONA

Gila County
INSPIRATION CONSOLIDATED (Inspiration)—Latest estimate indicated company had 17,500,000 tons of ore averaging 1.31 per cent copper, leaching of which will be tried in recently completed test plant.

Greenlee County

ARIZONA COPPER (Clifton)—Company does not expect to develop actively at present the recently purchased holdings of Shannon Copper Co., but will await development of a process by which the low-grade semi-oxidized ores contained may become sufficiently profitable.

Final County

ARIZONA HERCULES (Kelvin)—Flotation department to be remodeled in part.

One unit of Schimmin cells to be installed. Recent developments in present practice has made possible flotation of native copper, abundant in the ore.

RAY-ARIZONA (Kelvin)—Arranging to resume operations within six weeks. Silver vein which was slightly prospected in 1917 will be explored at depth. Modern hoist and compressor will be installed.

SOUTH RAY COPPER (Kelvin)—Sampling of old Ripsey or Norman group completed by South Ray Copper Co., headed by W. B. Duvoll. As soon as report can be completed, definite plans will be made. Work at mines in charge of A. Hoch.

SILVER BELL (Price)—Planning to reopen old Silver Bell, north of Price, which has been idle for years, except for short periods when worked by lessees. New operations to be financed by seven syndicate, which plans building substantial roads and equipping property with modern machinery.

Yavapai County

KAY COPPER (Canyon)—Property about fifty miles north of Phoenix operated by George W. Long, discoverer of United Eastern. Development and 1,000-ton mill expected to cost \$800,000, before any return is made. Property on line of projected Phoenix-Verde Valley railroad. Orebody partly developed over length of 7,500 ft. to 500 ft. depth. One lens demonstrated 80 ft. wide and 150 ft. long. Main development to be at 600-ft. depth.

HENRIETTA (Mayer)—New electric hoist being installed in main tunnel for sinking 500-ft. shaft.

ARKANSAS

Marion County

MINE 16 (Buffalo)—Development begun recently on Mine 16 in Cow Creek camp after short shutdown. Mine has about 1,500 ft. of tunnel showing good faces of zinc and carbonate.

PAULINE (Yelville)—Zinc mine in Buffalo River purchased by W. R. Jones

and J. F. Carson, of Yellville, from W. S. Teagarden, who developed it.

CALIFORNIA

Amador County

ARGONAUT (Jackson)—Fire broke out again, but was easily subdued.

CENTRAL EUREKA (Sutter Creek)—Shaft completed to 3,700 level and station being cut. Twenty-five stamps of 40-stamp mill dropping.

Calaveras County

CARSON HILL GOLD (Carson Hill)—Earned net profits in June of over \$61,000. Operations during first five months of 1919 mainly devoted to development work, 70 per cent of ore treated during this period being from development. Net earnings for first half of 1919 were about \$250,000. Average extraction in June from 6,843 tons ore was \$13.83 per ton, extraction recently running over 92 per cent. Operating expenses in June, \$413 per ton. During last three months all debts paid off incurred in early construction, except \$600,000 loan from American Zinc Co., of which \$50,000 will be paid off in July. On 875 level station completed, crosscut run to vein and drifting started. Indications promising on this lowest level. Company comparatively new organization which optioned mines of Calaveras Consolidated Syndicate at Melones and Carson Hill; also property owned by James G. Fair, including Morgan and Union mines.

Eldorado County

BLACKBURN (Placerville)—John E. Patterson, of Los Angeles, made substantial payment on Blackburn property comprising 40 acres.

MANZANITA (Placerville)—Six-foot vein assaying \$12 per ton free gold uncovered in old tunnel. Sacramento people owners.

YUKON JIM (Placerville)—Anthony Clifton has begun work to locate ancient channel under volcanic ash or lava running through Georgia Hill.

Nevada County

EMPIRE AND NORTH STAR (Grass Valley)—These two properties gradually getting back to normal conditions following strike. Unwatering about completed. Mills running normally.

GOLD POINT CONSOLIDATED (Grass Valley)—Instead of sinking new shaft company plans to unwater old Idaho-Maryland shaft and explore and determine ore shoots. Compressor being installed for this purpose.

SULTANA (Grass Valley)—Management decided to unwater workings, install new machinery, and proceed with deep exploration.

Plumas County

ENGELS COPPER (Encelmine)—Prospecting extensive areas of virgin ground by diamond drilling.

STANDARD (Johnsville)—Operating hydraulic property on Wilson Creek. Planning to add to height of dam to increase production next season.

KELSEY FRENCH HYDRAULIC (Johnsville)—Near Walker copper properties. Had successful season, and will be further developed. Owners will build wagon road to Genesee.

Sierra County

CLEVELAND (Downieville)—Additional ten stamps almost completed. Within a few weeks management expects to increase mine force and have twenty stamps dropping.

RAWKYARD (Downieville)—Cleaning out 2,500-foot tunnel level. Activity increased in Old Nigger Tent district.

Shasta County

AFTERTHOUGHT (Ingot)—Will resume operations in flotation plant and reverberatory furnace about July 20. Produces both zinc and lead.

COLORADO

Boulder County

BURLINGTON BOULDER (Boulder)—Officers re-elected at recent annual meeting. Properly being developed.

Mesa County

DE BEQUE SHALE OIL (De Beque)—Will build road to property, consisting of 1,720 acres of shale land at head of Gardner Gulch, with a view of erecting plant. Title acquired when company first located in Roan Creek-De Beque region. Has better transportation facilities.

Montrose County

CASHIN (Paradox)—James N. McBride, general manager, states mining interests

in district are ready to invest \$1,500,000 in an electric line from mines to some point on railroad. Various routes proposed.

Ouray County

TOM CRAWFORD (Ironton)—Mill near completion. Guadalupe mine in vicinity ready to install two-bucket tram to this mill, equipment being in transit.

IDAHO

Shoshone County

NATIONAL (Mullan)—Force reduced about half by labor shortage, making it necessary to stop development. Mill will probably shut down when present available ore is exhausted. Development will be pushed on levels above main tunnel where ore is of better grade than in shaft levels. Low-grade copper and silver.

ANCHOR (Murray)—Option held by Davis given up, after driving crosscut 700 ft. to vein 200 ft. below upper tunnel, in which there is considerable body of lead-silver ore. Drifting on vein below did not prove satisfactory. Work being continued by Mike Melley, owner.

SUCCESS (Wallace)—Two leases making regular shipments of lead. Gardiner lease shipping crude ore and Thompson lease concentrates, its ore containing zinc. About 500 tons zinc concentrates on hand at Success mill, management being unable to sell at profit.

MINNESOTA

Cuyuna Range

IDA MAE (Crosby)—Ownership passes from Franklin Merritt and associates to Cuyuna-Minneapolis Iron Co. Property reopened July 1. Shaft to be deepened 20 ft. and active development work conducted. P. C. Merrill local superintendent.

MEACHAM (Crosby)—Completes shipment of stockpile. Armour No. 2 stockpile also completed. Thomson and Cuyuna-Du-



RECEIVING SECTION OF NEW IRON ORE WASHERY, LEONIDAS MINE, EVELETH, MINN.

luth about half completed. Kennedy starts shipment from stock. All properties shipping from pocket.

MILLE LACS (Crosby)—Deepening main shaft to develop new level at 205 ft.

JOAN NO. 3 (Crosby)—Preparing to unwater property and deepen shaft for new development in anticipation of improved manganese market.

Mesabi Range

STUBLER (Buhl)—Prospect adjoining Grant, just out of extended litigation, to be explored at once. Osterberg & Johnson Co. drilling for Kenneth McDonald and H. O. Johnson, of Virginia.

BILLINGS (Chisholm)—Development work at new underground property of Tod-Stambaugh progressing, some ore being placed on stockpile. Conducting experiments with loading machines as applied to development work.

LEONIDAS (Eveleth)—Transmission line for operation of washery completed. Plant to have daily capacity of 1,000 tons when finished.

DAY (Hibbing)—Oliver Iron operating two drills on prospect adjoining its Burt-Sellers pit.

HULL-RUST (Hibbing)—Oliver Iron working on foundations for three steel bridges to serve stripping trains in crossing Great Northern and Duluth, Missabe & Northern railways and Hibbing-Morton highway.

LAMBERTON (Hibbing)—Rumored Butler Bros. will install drying plant at property, which has been opened up some time, but has so far shipped little, because of high moisture content.

SOUTH AGNEW (Hibbing)—Shaft bottomed in firm ground after many quicksand difficulties. Believed work will progress rapidly. When completely developed will be one of big underground mines of district. Interstate Iron Co. operators, Great Northern fee.

BENNETT (Kewatin)—Working fifty gangs of miners double shift underground and shipping heavily from open-pit section. Will probably divide honors with Dean pit, Buhl, as second largest independent shipper, Mahoning, at Hibbing, being largest, as usual.

HILL (Marble)—Installation completed of deep-well pump to furnish water for village.

MICHIGAN

Copper District

CHAMPION produced 36,000 tons of rock in June. Baltic, 19,000; Trimountain, 15,500; Wolverine, 21,800; Mohawk, 44,000; Michigan, 5,320; Mass Consolidated, 6,032; Osceola Consolidated, 46,000; Ahmeek, 8,000; Centennial, 4,000; Alouez, 8,700; and Isle Royal, 40,000.

MICHIGAN (Rockland)—Has been maintaining steady output and opened considerable good ground. Eighteen machines at work, four running laterals from E shaft to proposed location of new shaft. Production from E shaft will be doubled, possibly by November, when new shafthouse will go into operation.

Marquette Range

CLEVELAND-CLIFFS (Ishteping)—Five new electric driven compressors ordered for Ishteping-Negaunee district. Will replace machines in use for years.

CLIFFS SHAFTS (Negaunee)—Old headframes of wood and corrugated iron to be replaced by new ones of reinforced concrete. Will be 37 ft. square at base, where walls will be 2 ft. thick. Concrete to be drawn as work proceeds upward. Will be 85 ft. high. First all-concrete shaft houses in the country. Mine work will not be interfered with during construction.

KLOMAN (Republic)—Exploration work to start here by Felix A. Vogel, of New York, who has taken option. Mine idle for years.

Menominee Range

PEWABIC (Iron Mountain)—All work stopped. Workings depleted of ore. Was once a producer. Everything of value to be removed.

ARAGON (Norway)—Sinking completed. Station being cut at bottom. All machinery being electrified. New compressor recently installed.

RIVERTON (Stambaugh)—Work of concreting almost completed from collar to depth of 1,050 ft.

MONTANA

Deer Lodge County

SOUTHERN CROSS (Southern Cross)—Owned by Anaconda, but being sunk from 600 to 1,000 level with good orebody opened on 700. Runs well in gold and affords good fluxing material. Heavy water struck, which may be seepage from Georgetown Lake, a mile distant.

Jefferson County

JIB MINING (Basin)—Recently organized to operate old Hope and Katy mines. Machinery will be installed to unwater shafts. Properties adjoin and on same fissure.

Mineral County

TARBOT (Saltse)—Butte faction tried to set control at annual meeting of stockholders at Wallace on July 21. Richard Daxon, manager, returned from East. Says control is safe and that he closed deal for funds to build mill, subject to inspection of property.

Silver Bow County

ANACONDA (Butte)—Entered into agreement with International Union of Mine, Mill and Smelter Workers and branch of American Federation of Labor, and with carpenters' and engineers' unions, also affiliated with American Federation, whereby all union employees were granted advance of \$1 per day, effective from July 1, 1919. Under new contract, which will run until July 1, 1920, and thereafter unless terminated by either party for 30 days notice, miners will receive \$5.75 per day and common laborers \$5.

DAVIS-DALY (Butte)—Development under way to open zone below 2,500 and above 1,900 level. Expecting to resume work at capacity soon.

EAST BUTTE (Butte)—Capital stock increased from \$3,000,000 to \$6,000,000.

NORTH BUTTE (Butte)—Orebody cut on 900 level of Sarsfield property, in eastern section of Butte district, most important development since opening of famous Edith May body at Speculator mine in 1905. Opening 400, 600, 800, 1,000 and 1,200 levels of Speculator mine preparatory to increasing output.

TUOLUMNE (Butte)—Crosscutting well under way for Spread Delight vein on 1,000 level, with 100 ft. weekly being made. Expected to reach fissure within seven weeks. Sinbad shaft down more than 75 ft. below 1,000 level.

NEVADA

Nye County

TONOPAH SHIPMENTS for week ended July 12 totaled 6,370 tons, valued at \$108,290. Shippers were as follows: Tonopah Belmont, 193; Tonopah Mining, 65; Tonopah Extension, 1957; West End, 1024; Jim Butler, 109; Montana, 113; Tonopah Divide, 420; MacNamara, 210; Rescue, 60; Midway Leasers, 10; and miscellaneous, 84.

TONOPAH EXTENSION (Tonopah)—Diamond drilling on southerly end of Red Rock claim to prospect ground near western boundary of California claim of West End Consolidated, on which Ohio vein was discovered and developed within last two years.

White Pine County

CONSOLIDATED COPPER MINES (Kimberly)—Inclined diamond-drill hole put down from 1,300 level to explore formation in advance of sinking shaft. At 1,550 ft. below collar passed through 33 ft. of ore corresponding to horizontal width of 164 ft. averaging 8 per cent copper. New ore averaging about 9 per cent copper recently cut on 1,300 level in crosscut farthest east on level; also near western end of workings on 1,100 level south of any previously cut in that level. Six ft. of 5 per cent ore also recently cut at extreme west end of 1,000 level, being probably extension of ore previously met in crosscuts lying to east. At 1,400 level not yet reached ore-bearing zone. Station being cut on 1,400 level and sinking of shaft 400 ft. deeper will be started as early as possible, which will permit opening up mine to 1,800 level.

NEW MEXICO

Grant County

CO-OPERATIVE (Lordsburg)—Building mill. In market for sinking, station, boiler and sludge pumps. E. W. Walters, mill superintendent.

LAST CHANCE (Lordsburg)—Building pipe line three miles to Aberdeen shaft for water. Mill working half shift. B. Prescott, manager.

85 MINE (Lordsburg)—Rearranging machinery in mill, eliminating tables and cones. Expect to start mill half capacity on Aug. 1. M. Merry, mill superintendent.

NORTH CAROLINA

Rowan County

UNION COPPER MINES (Gold Hill)—Company plans to unwater No. 3 shaft to depth of 600 ft., preparatory to resuming development. Three 100-ft. shot-drill holes have been sunk in company's mineral zone northeast of No. 3 shaft, and assays indicate low-grade copper ore of promising value. Additional drill holes will be sunk as a guide to underground development under consideration.

OKLAHOMA

Joplin-Miami District

DEFENDER (Joplin)—Has purchased Wayland mill at Galena and will move to lease near Picher, Okla. J. H. Wright, Joplin, manager.

W. H. LOGAN (Miami)—Preparing operations at Onky shaft lease option on which was taken by Blue Mound company, but was not closed. Hand gigs being installed at mine.

BLACK HAWK (Picher)—Has taken over Farmington and Lucky Jack mines, near Hockerville, and will operate. Both mines have mills.

FOCH (Picher)—Has started up Sherida-Adams mine northwest of Picher, after several months of drifting to prospect ground.

ROYAL (Picher)—Starting operations after several months' shutdown on account of litigation.

OREGON

Baker County

IRON DIKE (Homestead)—Caving of railroad tunnel forces company to haul ore out by motor trucks.

TEXAS

Hardin County

RECENT COMPLETIONS AT SOUR LAKE: Texas Co. No. 240 Fee, pumping from 2,370 ft.; Saxon Oil, No. 4 Jackson well, pumping from 2,330 ft.; Youngslee Oil, No. 4 Martin, getting ready to pump.

Harris County

GOOSE CREEK COMPLETIONS: E. F. Simms Co. bailing No. 5 Schilling well at 3,000 ft.; Gulf Coast Oil Corporation, No. 20 Gaillard well, pumping at 3,380 ft., and testing No. 4 Gaillard at 3,015 ft.; Gulf Production, No. 15 Stalene well, bailing at 3,375 ft.; Humble Oil & Refining, No. 8 Gaillard Peninsula well, testing at 2,150 ft.

HUMBLE FIELD COMPLETIONS recently were: Southern Petroleum No. 7 Landslide well, pumping from 1,760 ft.; Crown Oil & Refining, No. 14 Hermans, abandoned at 1,260 ft.; Keystone Petroleum No. 4 Fuller well, arranging to pump at 760 ft.

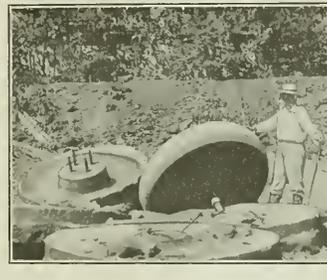
UTAH

Jaab County

TINTIC SHIPMENTS week ended July 12 were 84 cars.

SOUTH STANDARD (Eureka)—Stockholders to meet July 30 to ratify sale of claims to Tintic Drain Tunnel; purchase price \$35,000. Country rock on claims is porphyry. Tunnel will be extended through it. Money from sale to be used for sinking new shaft in limestone by South Standard.

TINTIC PAYMASTER (Eureka)—Electrically driven equipment installed, including double-drum hoist and five-drill compressor.



GRANITE MORTARS AND MULLERS OF CHILIAN MILLS USED IN ROWAN COUNTY, NORTH CAROLINA, ABOUT 1850

Salt Lake County

UNITED STATES (Bingham Canyon)—Strike started July 14 ended. Miners employed in upper workings granted privilege of being lowered through shaft to Niagara tunnel, from which point they walk home to lower Bingham.

VICTOR MINING (Salt Lake City)—Work resumed at this property in Big Cottonwood Canyon adjoining Cardiff and Tar Baby. Fissure encountered at 600 ft. in tunnel being followed.

WASHINGTON

Ferry County

ADDISON COPPER (Keller)—Following officers recently elected: George R. Hodges, president; R. B. Smith, vice-president; C. A. Gray, manager. Recently installed three-drill compressor and 40-hp. boiler. Contract pending for 220 ft. of tunnel.

Stevens County

GREAT BONANZA (Bossburg)—Being unwatered. Exploration work will be carried on. Good milling ore said to remain in old stopes. J. Verwacke in charge.

LOON LAKE COPPER (Chewelah)—W. L. Ziegler, superintendent, reports tailings from new mill contain less than 0.10 per cent copper. Mill feed runs 3 per cent copper; concentrates 0.5 oz. of silver to each per cent of copper. Ratio of concentration about 8 to 1.

UNITED SILVER-COPPER (Chewelah)—Hitherto known as United Copper Mining Co. New bunk house and twelve cottages under construction at mine. Will sink from 1,200 to 1,400 level and drift north to meet winze. Ten carsloads shipped in June. Miners' wages raised to \$5; muckers' to \$4.50.

LEAD TRUST (Northport)—Crosscutting to shoot of good-grade galena exposed in upper workings. Frank Scamson superintendent.

GIANT SILVER (Turk)—Operating Red Cloud group, installing boiler and four-drill compressor to crosscut and replace copper showing found in upper workings. A. H. Anderson superintendent.

CANADA

British Columbia

CROW'S NEST OIL CO. has struck gas at 1,825 ft. at property near Sage Creek. B. C. Gas ignited and burned derrick. Hole dry since 1,674 ft. level.

OLD SPORT GROUP, on west coast of Vancouver Island, has new plant, replacing one destroyed by fire. Two diamond drills at work on surface. Development on larger scale awaits more stable conditions.

SIR DONALD MANN, who, with Sir William Mackenzie, built Canadian Northern Railways, recently passed through Vancouver, B. C., to examine Big Mission prospect and other holdings in Portland Canal district.

CARIBOO (Camp McKinney)—Leo Mader and associates, of Grand Forks, B. C., installing, at installed level, flotation plants to work old Cariboo dump.

WILD HORSE DREDGING (Fort Steele)—Installing machinery to work bed of Foulder Creek.

MAPLE LEAF (Franklin Camp)—Compressor plant installed in steel shed on Grand Forks to facilitate development.

GRANITE - POORMAN (Nelson)—Kootenay Gold Co. sells property to Inland Mining Co. Inland stock held chiefly at Walla Walla, Wash.

RANBLER-CARIBOO (Slocan)—Deal consummated whereby company purchases two adjoining claims. New holdings said to contain 1,600 ft. of vein and valuable extralateral rights.

CONSOLIDATED M. & S. (Trail)—Ore received at Trail smelter in steel and June 30 as follows: Centre Star, Rossland, 1,262 tons; Florence, Princess Creek, 132; Josie, Rossland, 236; Molly Gibson, Kitto Landing, 25; Le Pas, 84; No. 1, Sandon, 46; North Star, Kimberley, 173; Sally, Beaverdell, 26; Sullivan (zinc), Kimberley, 4,241; and Sullivan (lead) Kimberley, 468; total, 6,705 tons.

Ontario

MONDEAU (Boston Creek)—Ogilvie interests of Montreal, have exercised option. Shaft will be sunk from 140 ft. to 200 level.

WICKSTEAD (Bourke's Siding)—Several veins uncovered from 2 to 4 ft. wide and carrying visible gold.

GENESE (Cobalt)—No. 6 vein at 500 level 4 in. wide and well mineralized with cobalt and nickel bloom.

LA ROSE CONSOLIDATED (Cobalt)—Main vein, lost by cave-in some time ago, found opening up old stopes on Princess property.

McKINLEY DARRAGH (Cobalt)—Statement of financial position of company as of June 23 shows cash in bank, \$25,371; ore in transit and at smelter, \$134,000; ore ready for shipment, \$75,700; total, \$30,071.

CAMPBELL-FAIRBARN (Gowganda)—Machinery being brought in.

PALMER-PAINE (Gowganda)—Vein about one ft. wide on surface being drifted on at 175 level.

DAVIDSON (Porcupine)—Clean - up made and gold bar valued at \$8,000 shipped to Toronto. New shaft down 575 ft.

CONSOLIDATED M. & S. (Toronto)—Shareholders have ratified bylaws removing head office to Montreal.

MEXICO

MEXICAN INTERNATIONAL CORP. has been organized in New York for development of Mexico and financing of corporations formed for business in that country. The board of directors is composed of Harold D. Gibson, president, Liberty National Bank; Grayson, M. P. Murphy, vice-president, Guaranty Trust Co.; William E. Potter, of Guggenheim Brothers; Charles S. Sargent, Jr., of Kidder, Peabody & Co., and Eugene B. Thayer, president of Chase National Bank. Company will have 10,000 shares of 7 per cent preferred stock of \$100 par and 25,000 shares of common stock at \$5.

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper production for June, 1,256, 6440 lb.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

July	Sterling Exchange	Silver		July	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
17	428	103 $\frac{1}{2}$	54 $\frac{1}{2}$	21	430	103 $\frac{3}{4}$	54 $\frac{1}{2}$
18	437	105 $\frac{1}{2}$	54 $\frac{1}{2}$	22	431	104 $\frac{1}{4}$	54 $\frac{1}{2}$
19	440	106 $\frac{1}{2}$	54 $\frac{1}{2}$	23	438	106 $\frac{1}{2}$	54 $\frac{1}{2}$

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

Daily Prices of Metals in New York

July	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.
17	21.85@22.40	68	5.50@5.60	5.30@5.40	7.65	@7.675	
18	22.35@22.85	68	5.75	5.50@5.55	7.70	@7.80	
19	22.35@23.90	68	5.75	5.50@5.55	7.75	@7.875	
21	22.35@22.85	68	5.75	5.50@5.60	7.875	@7.95	
22	22.85@23.90	68	5.75	5.50@5.60	7.95	@7.975	
23	22.85@23.35	58	5.75	5.50@5.60	7.95	@8.00	

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

July	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3M.	Spot	3 M.	Spot	3 M.
17	102 $\frac{1}{2}$	103 $\frac{1}{2}$	109	251	250 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	43 $\frac{1}{2}$	44 $\frac{1}{2}$
18	102 $\frac{1}{2}$	103 $\frac{1}{2}$	109	254 $\frac{1}{2}$	253 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	43 $\frac{1}{2}$	44 $\frac{1}{2}$
19	104 $\frac{1}{2}$	105 $\frac{1}{2}$	109	256	255 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	43 $\frac{1}{2}$	44 $\frac{1}{2}$
21	104 $\frac{1}{2}$	105 $\frac{1}{2}$	109	256 $\frac{1}{2}$	255 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	43 $\frac{1}{2}$	44 $\frac{1}{2}$
22	104 $\frac{1}{2}$	105 $\frac{1}{2}$	109	256 $\frac{1}{2}$	255 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	43 $\frac{1}{2}$	44 $\frac{1}{2}$
23	102 $\frac{1}{2}$	104 $\frac{1}{2}$	110	255 $\frac{1}{2}$	254 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	43 $\frac{1}{2}$	44 $\frac{1}{2}$

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

Metal Markets

New York—July 23, 1919

All of the major metals, except tin, advanced in price this week, and at the end were generally quiet and firm.

Sterling exchange fell to a new low level of 4.28 on July 17.

Freights to Hongkong and Kobe from San Francisco are unchanged at \$14 per ton. Transatlantic freight rates from New York to England are \$18; to Rotterdam, \$22; and to Hamburg, \$30. The rates to French ports are about the same as to England.

Copper

There has been free buying in copper, and at the close the market is very firm, although quiet. Some export business was done, Japan being a buyer in about the same volume as previously. At the close it is reported that

actual business is being done at 23c., including September deliveries, although one or two producers are asking more.

The Anaconda Copper Mining Co. last week entered into an agreement with the International Mine, Mill, and Smelter Workers, a branch of the American Federation of Labor, and with the carpenters' and engineers' unions, also affiliated with the American Federation of Labor, whereby all union employees were granted an advance of \$1 per day, effective from July 1, 1919. Under the new contract, which will run until July 1, 1920, and thereafter unless terminated by either party on thirty days' notice, miners will receive \$5.75 per day and common laborers \$5.

Copper Sheets—The base price of copper sheets is 33 $\frac{1}{2}$ c. per lb. Demand strong. Copper wire is quoted at 26 $\frac{1}{2}$

@27c. in carload lots, f.o.b. mill. Market strong. Heavy buying during last two months. Deliveries full. Most mills reported loaded with orders up to Oct. 1.

Tin

The price for tin of 99 per cent grade is unchanged at 68c. and high-grade tin remains at 70c. There was a fairly good business during the week, and the market is firm.

Straits tin for July shipment from Singapore is quoted at about 52c., August, 51 $\frac{1}{2}$ c., and September, 51 $\frac{1}{2}$ c.

The War Trade Board Section of the Department of State announces that on or after July 14, 1919, all shipments of tin ore and tin concentrates may be imported under the authority of General Import License PBF-37, thus eliminating the necessity of securing individual import licenses to cover importations of these commodities.

Imports of pig tin into the United States in May, 1919, were 449,270 lb., compared with 10,796,218 lb. in May, 1918. During the first five months of 1919, 23,972,564 lb. were imported.

Lead

The lead market continued very active from July 17 up to and including July 21. On July 18, the A. S. & R. Co. raised its price to 5 $\frac{1}{2}$ c., New York, and 5 $\frac{1}{2}$ c., St. Louis. Although the speculative demand was large, it was not as large as in the previous week. On the other hand, the consumers came into the market quite heavily, many of them making inquiry for the remainder of their 1919 requirements. Consequently, lead for shipment during the last quarter of the year sold at a considerable premium, while spot lead was freely offered at the A. S. & R. price. On Tuesday, July 22, the volume of the demand diminished considerably, and it seems probable that the heavy buying wave which began about July 7 has to a large degree spent itself. At the close of the week the market, though quiet, was still firm, and outside sellers were asking a premium over the A. S. & R. Co. price for August-September. The stocks of lead in the hands of producers have been materially reduced, and in some instances wiped out completely.

Lead imported into the United Kingdom in May, 1919, was 27,840 tons, and in May, 1918, 13,661 tons. For the first three months of the same years the figures were: 1919, 129,485; 1918, 99,333 tons.

Zinc

The market was firm throughout the week, and inquiry has grown steadily at advancing prices.

John A. Percival, president of the Consolidated Interstate-Callahan Mining Co., in a letter to stockholders under date of July 8, said: "The zinc market has strengthened considerably and is now over 7c. This price for our principal product justifies the resumption of ore shipments, and we have ordered our mine superintendent to resume shipments under our contracts as soon as the mill can be placed in operation."

French imports of zinc during the first four months of 1919 amounted to 40,744 tons, and in the corresponding period of 1918 and 1917, they were 10,795 and 29,944 tons, respectively.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—Demand strong, especially for export. Spot is quoted 9½@9¼. Some antimony has been sold for direct consumption in Germany.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.10 per lb. for wholesale lots—500 lb. and over. No change.

Cadmium—Quoted at \$1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, \$1.75 per lb. No business being transacted. No change.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Market quiet and steady at \$103. Higher prices are asked, but no sales reported above \$104@105. San Francisco reports \$98, steady.

Exports of quicksilver from the United States during May, 1919, amounted to 78,608 lb., practically all to the Orient. It is stated that the Oriental demand is temporary, due to inability to get European quicksilver. Exports for the first five months of 1919 amounted to 329,276 lb.

The Monte Amiata mines, of Italy, were controlled by German capital at the outbreak of the war and were seized by the Italian government on its entry into the conflict, according to the U. S. Bureau of Mines. The Idria mines, formerly belonging to Austria, will become the property of the same government with the annexation of former Austro-Hungarian territory. About half of the world's production of quicksilver is now assured to Italy, which is considering the establishment of a government monopoly of the metal.

Silver and Platinum

Silver—The market has ruled steady in London, with a higher tendency, closing at 54½d. The New York price has been seriously affected by the weakness and fluctuations in sterling exchange, but closes higher on recovery in exchange rates. The demand from China banks continues, and supplies offering are absorbed for shipment to the Far East via San Francisco. Shipments to London are consequently very small. The market closes firm.

Mexican dollars at New York: July 17, 79½; July 18, 81½; July 19, 82; July 21, 80½; July 22, 80½; July 23, 82½.

Platinum—Market steady. We quote \$105 for refined ingot.

Imports of platinum into the United States in May amounted to 7,291 troy oz., of which 3,368 oz. came from France and 3,878 oz. from Colombia. Imports of platinum for the first five months of 1919 amounted to 21,398 troy oz. In May 38 oz. of platinum was exported; in April, 17 oz.; and in March, 15 oz., making a total for the first five months of 1919 of 70 oz.

Palladium—Quiet at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., July 19—Zinc blende, per ton, high, \$56.60; basis 60 per cent zinc, premium, \$55; Prime Western, \$52.50@55; fines and slimes, \$50@47.50; calamine, basis 40 per cent zinc, \$32@30. Average settling prices: Blende, \$48.76; calamine, \$28.35; all zinc ores, \$48.09.

Lead, high, \$66.05; basis 80 per cent lead, \$65; average settling price, all grades of lead, \$63.93 per ton.

Shipments the week: Blende, 8,022; calamine, 270; lead, 1,170 tons. Value, all ores the week, \$473,560.

Every buyer is at odds with every other buyer, seemingly over the advance of \$10 per ton for zinc blende during the last two weeks. It began last week when buyers were "sitting easy" on offers of \$45 basis, waiting for sellers to accept, when in pips one buyer for 1,500 tons \$47.50 basis, and another for 1,200 tons on the week's market. Some other buyer decided he should pay \$50 for the 1,200 tons, and set that price, and all others had to follow. The \$55 price this week is said to be a "come-back." Sellers expected only \$52.50, and many of them sold on that basis, the \$55 coming late today.

Platteville, Wis., July 19—Blende, basis 60 per cent zinc, \$53 base for premium grade and \$50 base for high lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$62 per ton. Shipments reported for the week 1,974 tons blende, 162 tons galena, and 563 tons sulphur ore. For the year to date the totals are 55,731 tons blende, 3,201 tons galena, and 8,136 tons sulphur ore. During the week 3,632 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Business was reported at \$25 per ton, f.o.b. California point, for ore running 40 per cent and better.

Manganese Ore—At present buyers seem to be provided with ample stocks and have not advanced their offering prices. It is difficult to transact business on a large scale.

Imports of manganese ore into the United States during May, 1919, showed a big decrease from the preceding two months. The figures are as follows: May, 19,644 long tons; April, 59,470 long tons; March, 48,238 long tons. The total for the first five months of 1919 is 196,675 long tons.

Molybdenum Ore—Little if any actual business. Inquiries at 75c. but no buyers.

Tungsten Ore—Charles Hardy reports: "The market remains firm at \$7.25@7.50 for Chinese ore spot, \$6.75 for Chinese ore for shipment, and \$10 asked for Bolivian ores. Home producers of scheelite are adhering to the price of \$15 f.o.b. California or Nevada, freight payable by the buyer."

Other Minerals

Graphite—Conditions are reported as being practically unchanged from the previous week. Prices remain the same on all grades of Ceylon graphite, as follows: Lump, 13½@14¼c.; chip, 10½@11c.; dust, 7½@8c. All prices are c.i.f. New York, ex ship. Business in domestic grades is dull.

Nitrate—Business is reported as being quiet, with a little activity in spots. The amount remaining in Government control is not definitely known, but distribution continues. Quotations are given at \$2.95@3.00 per cwt., carload lots, for immediate shipment.

Pyrites—Spanish pyrites is quoted at 18c. per unit for furnace ore, c.i.f., New York or other Atlantic port, and 18½c. at Gulf ports. Market slow and unsettled; hand-to-mouth buying. Price will decrease with ocean freights.

Sulphur—Price is quoted at \$18 per ton for carload lots, domestic delivery, at mines in Freeport, Tex., and Sulphur Mine, La. One producer is quoting \$20, in cargo lots, for export, at mine, the difference in favor of domestic business being on account of its permanent character. Other producers quote for export, but only on terms c.i.f. port of delivery. Developments in the export business, which has been fairly brisk, are being awaited by producers. The basis of the foreign demand is largely the labor shortage at Sicily mines, and the outlook is not bright for obtaining relief from this difficulty. Domestic business is quiet, the regular deliveries being made on contracts, which take care of the usual trade requirements.

Iron Trade Review

Pittsburgh—July 22

Operations have increased somewhat at many steel plants, though at a few there have been slight decreases, and on the whole the change from the 70 per cent rate at the first of the month is slight. The total volume of business received by mills is increased somewhat, but as some departments have been receiving orders at a greater rate than their capacity, that fact has had little influence in swelling the production. Orders for rails, shapes, and plates are extremely light. Never in the history of the steel industry has there been such an unbalanced distribution of orders. This situation is doubtless due to the various lines of consumption recovering at different rates from the dislocations produced by the war.

There has been further improvement in the demand for tin plate, and when

Engineering and Mining Journal

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Volume 108

New York, Saturday, August 2, 1919

Number 5

Is the Light Beginning to Shine?

THAT there is a limit to the wages that can be paid to a man for working a shift in a coal mine is beginning to be realized by those who secured from the British government a rise of \$1.50 per ton in the price paid by the consumer. Now these miners are asking the government to wait a little while before taking such drastic action.

The theory upon which the English coal miner was working—and there are many others who support the same conviction—was this: "My food, clothing, and rent are now all very high, so I must have more money than I have been getting for my day's work. Also, there are a lot of my friends around here who have no work. If I do not work so many hours per day there will be work for them too, so I shall demand that there be fewer hours in a shift and that I get more money for the day's work. As my associates are well organized, I will get what I ask, or the plutocrat manufacturers who need the coal will get none."

This conclusion has had a hard jolt. It now looks to the miner as though the plutocrat manufacturer was not going to require any coal at all, and instead of having to work five days a week there is a fair prospect of having to rest seven days a week. Again, his union is hearing from unions in the manufacturing industries, to the effect that a coal shortage exists, because of which mills all over the country are closing and discharging their operators.

Here is a pretty kettle of fish. The miner has secured from the government the hours and the rate of pay demanded, but the mine has no orders for coal, and he is idle. Meanwhile, union brothers in other lines are urging him to get to work and get out coal so that the mills may run. Surely something is wrong.

There is a lesson in this that it may be well for our own miners to take to heart, without going through the school of experience to learn it. It is possible that the old law of supply and demand will ultimately have more to do with the fixing of the price of labor than will the members of the union. Just so long as there is a demand for the product at high prices, whether it be coal or metal, the miner can ask for high wages and the average-cost producer will pay them. When the demand slackens, one of two things will happen: the miner will either have to stop producing, or he will have to produce his raw material at a lower cost per unit. He cannot live long without producing; obviously, he will have to produce at less cost. This may be accomplished by one of two means, through charging less per hour for his labor, or by producing more units of the material in the day's shift.

From all of which one conclusion must be drawn, a conclusion from which it is hard to get away. To keep up wages and the standard of living that were brought

about through war conditions, labor must become more efficient, either through using its head more, or through making its hands do more work: otherwise wages will sooner or later fall to a figure where they will buy no more than they did before the war.

It is at this point, in the matter of increased efficiency and the maintenance of wages, that a union of employers and employees would be more logical and more useful than any union of the one acting independently of, or antagonistic to, the other.

It may be granted that all miners have some aims and objects in common, as also have all those who own or operate mining property, but the miners of copper, the miners of coal, and the miners of cinnabar have nothing like so much in common as each must have with the operator of his particular kind of a mine. The interests of the copper miner and the copper-mine owner are identical. When one is prosperous the other should be prosperous. When one is on the rocks it should only be because the other is also there.

A union of this kind, where perfect confidence exists between employer and employee, may appear, at first, idealistic, but it is not impossible or impracticable.

At the recent meeting of the Canadian Industrial Relations Commission, David Rees, organizer of the United Mine Workers of America, discussed the formation of a council on which both coal miners and coal operators should be represented. He believed that it would be both possible and practicable, and that much good would result from it. The plan would be equally feasible in each of the metal-mining industries, and the possibilities for good are unlimited.

Mutual confidence and respect among the members of such a body as was proposed would be as essential as in a partnership of two individuals. If doubt of good faith exists, if one party should continually mistrust the other, no good could come of such a union. Some of the larger mining companies are approaching this conception of better industrial co-operation in their industrial relations committees, and the officials are trying to secure, and are securing for themselves, the confidence that they have in their workmen. In this program the operators are, however, confronted by the possibility of opposition on the part of officials of the larger unions of which their men form only a small minority, but with which the men feel a stronger bond than they do with their employers. And some of the larger unions, with the object of strengthening their position, keep constantly presenting to the attention of their members the strong line of cleavage that is supposed to exist between the rapacious capitalist and the downtrodden laborer. If that cleavage plane is destroyed, if there is fusion and obliteration of this imaginary boundary, the blatant type of union labor leader will lose his job and be compelled to work for a living in a less congenial atmosphere.

Collective bargaining and the large unions are here to stay. Their power for good or evil will depend upon the activities of their membership. The opportunities of leaders for efficient service are tremendous, and their duties are onerous. One of their most important functions, neglected by some leaders and feared by others, is that of building up confidence between employer and employee. There are fearless leaders—men who are not holding their positions solely for the salary attached—who are big enough to show their fellows the advantages to be gained by trusting and co-operating with their employers, and some day we believe these leaders will undertake the task. Mutual confidence and a round table will take the place of disinterested arbitration boards, and wages will be “as high as the traffic will bear.”

Taking a Broad View

SOME of the resolutions adopted at the recent meeting of the American Federation of Labor were rather narrow and scarcely in accord with the principles of Americanism as we understand that doctrine, but, on the other hand, such a breadth of mind was shown in other instances that we can be sure that the American laborer of average intelligence thinks along right lines. The resolution in reference to scientific research indicates that the average intelligence of the American workman is high.

Recognizing that scientific research and the technical application of its results form the basis of industrial development—that productivity, gain, and health depend upon research and study—it was resolved by the Federation to favor “a broad program of scientific and technical research, as being of major importance to the national welfare, and such should be fostered in every way by the Federal Government; and that the activities of the Government itself in such research should be adequately and generally supported in order that the work may be strengthened and extended.”

When the workman has learned that the work in the laboratory is conducted for his welfare, and not for the purpose of depriving him of his daily bread, we have reasons to feel encouraged with what has been accomplished in our public schools, for it is to them that he owes a broader vision than his father had.

Research departments will appreciate the encouragement of this resolution, knowing that they are supported both by those who work with their hands as well as by those who work with their brains.

Imperial Mineral Resources Bureau

ON JUNE 12 a charter of incorporation was granted in London to the Imperial Mineral Resources Bureau, upon the petition of the Secretary of State for the Colonies. The bureau's chief purposes are to collect and disseminate information on the resources of every mineral and metal, and to advise on the development of such resources, that they may be made available for the purposes of the imperial defense, industry, or commerce. All parts of the British Empire are ably represented in the bureau, Dr. Willet G. Miller being appointed for Canada.

The study of our own mineral resources, so intensified during the war, should be vigorously pushed in time of peace. Mineral deposits will determine industrial supremacy in the future as they have decided the course of conquest in the past, as Dr. J. B. Umpleby, special

mineral adviser to the Peace Commission, recently stated. The United States today is the richest of all in mineral wealth. But as vast stretches of territory in other parts of the globe are opened, the comparison may become less and less in our favor.

The lament is often heard that the old-time prospector is fast disappearing. Would that he might remain! But, whether he goes or stays, let there be no slackening in organized effort to lay bare and develop our hidden resources.

Lest We Forget

THE Council of National Defense is to receive its unexpended balance for the fiscal year 1918 as its appropriation for 1919, under the Sundry Civil Bill, and is preparing to return to its peace-time function under the Congressional act creating it. It would have been a shame, indeed, had this product of the war been allowed to drop into oblivion. What the Allies learned from Germany under the pressure of great emergency, we, in turn, learned from them, largely through the medium and with the help of the council.

But the continuation of the council is not a matter of sentiment. There is need of an agency that will bring together and study all information bearing on the national defense. Defense, it is pointed out by the council, may not always mean war; it may mean any crisis in the life of the nation arising from unrest at home, from famine, pestilence, anarchy, or dangerous economic conditions. And with economic warfare on the horizon, industry, science, and labor must be mobilized.

Industrial Development Follows the Miner

FROM time immemorial the miner has been the pioneer in those countries fortunate enough to possess mineral resources. Throughout Europe, civilization has followed him. In Africa, industrial development is coming in his footsteps. The miner opened the treasure vaults of the Rocky Mountains from Alaska to Patagonia, and today prosperous cities dot the coast line on the eastern shore of the Pacific. May not mining do for China what it has done for the rest of the world?

Conservatism in China has long prevented anything like active development of its mineral resources, but gradually a change is creeping over her people, and the graves of ancestors are the subject of less respect than they were some years ago, if by chance they happened to be near deposits of ore.

C. W. Harvey in “Association Men” calls attention to 6,184 mining claims covering nearly 1,000,000 acres of land, a rather small area in a country of more than 4,000,000 square miles. Twenty-six mineral products are mentioned, but what is of special significance to China is the importance of her coal deposits, estimated to be large enough to furnish the world with its present annual demands for a thousand years.

With its coal mines developed, and cheap power and transportation available, the industrious Chinaman is awakening to a realization of what industrial activity lies latent in his country. If the miner is not the pioneer of industry in China, we may safely say that he will walk hand in hand with that pioneer through this latest of countries to become conscious of its mineral possibilities.

Business Training For the Engineer

THE practicing engineer appreciates the ever-increasing necessity for business training in conjunction with technical work. This fact was emphasized at the meeting of the Society for the Promotion of Engineering Education, held at Washington, on June 23 and 24. The curricula of many technical schools are deficient in all instruction save that which deals with technical subjects. Knowledge of business principles and ability to use the English language correctly are essential to the engineer. Some engineering students have the good fortune to enter their college work with adequate preparation in these fundamentals, acquired in good high schools or other preparatory institutions. However, the average engineer graduate is handicapped by a deficiency in the knowledge of business principles, and enters his commercial life at a disadvantage which has a tendency to confine his activities along narrow technical lines. Sometimes an engineer's practical experience will supply him with the training in which his university courses were deficient. Nevertheless, if the university would inculcate fundamentals of business along with technical knowledge, the engineer would be supplied with a better-balanced equipment, at a period when he could use it to the greatest advantage.

Evidence of the shortcomings of technical schools and colleges may be found in the popularity of business courses offered by numerous correspondence schools. No doubt more engineers avail themselves of these opportunities than pursue post-graduate courses in their own universities.

In these columns and elsewhere the *Journal* has referred to standardization as an important factor in efficiency, but not without the qualification that standards must sometimes be recast to meet changing conditions. In the past, colleges have prescribed standard courses of study designed to prepare the engineer for service in industry, but with the increasing and broader responsibilities of the engineer, technical schools must consider the need of a new standard.

International Exposition Of Mining Industries

MINING and metallurgical engineers, and buyers of mining and metallurgical equipment, will be interested in the International Exposition of Mining Industries, announcement of which appears elsewhere in this issue of the *Journal*. The exposition will fill a long-felt want in its own particular field, and will no doubt become an important factor in the development of both foreign and domestic trade. The project deserves the support of all manufacturers of machinery used in the production of raw mineral products and their subsequent treatment.

The success of such a project depends on competent management, supported by able advisors. Too much stress cannot be laid on the necessity for exercising care and discrimination in the selection of those who are to direct the destiny of such an organization. Membership on the advisory board should be no mere honorary appointment, but each member should be chosen because he is closely in touch with some important phase of the mineral industry, or in view of his appreciation of its needs, and with the understanding that he is willing to devote to the enterprise his serious attention.

A Letter From Mexico

On the morning of July 18, Mr. Theodore Patterson, manager of the Aranzazu copper mine of the Mazapil Copper Co., of this place, was murdered in the most brutal manner by about 200 workmen of the mine.

Mr. Patterson went out on the dump of the mine, as usual, about 8 o'clock in the morning, when he was set upon by about 200 men, who began throwing stones at him from several directions, showing it to have been a prearranged plan to murder him. Mr. Patterson began backing away for the purpose of not getting in direct contact with them, and to try to get to some house where he could better defend himself. They followed him, when he drew a small pocket pistol, hoping to hold them off until he could reach safety. At this juncture someone shot him with a Mauser rifle. He then took refuge in a small house and closed the door. The bandits tore off a sheet of the roof, and threw dynamite in on him, which is supposed to have killed him, as both jaws and spinal column were found to have been broken. After they had killed him they broke the door open, stabbed and cut his body in thirty-eight places, then tied a rope to his leg, and dragged him some distance.

Mr. Patterson was an English mining engineer of the highest standing, and was loved by everyone who knew him. We buried his body here on the 19th, and said goodbye to a good man.

While committing the murder, they cried, "Kill all the English and Gringos (Americans) and bury them like cats!" The writer heard two of them (presumably) say last night, "There are three more we are going to get," but we do not know which three they are.

The Mazapil Copper Co. has in its employ more Americans than English; therefore the three others may be Americans.

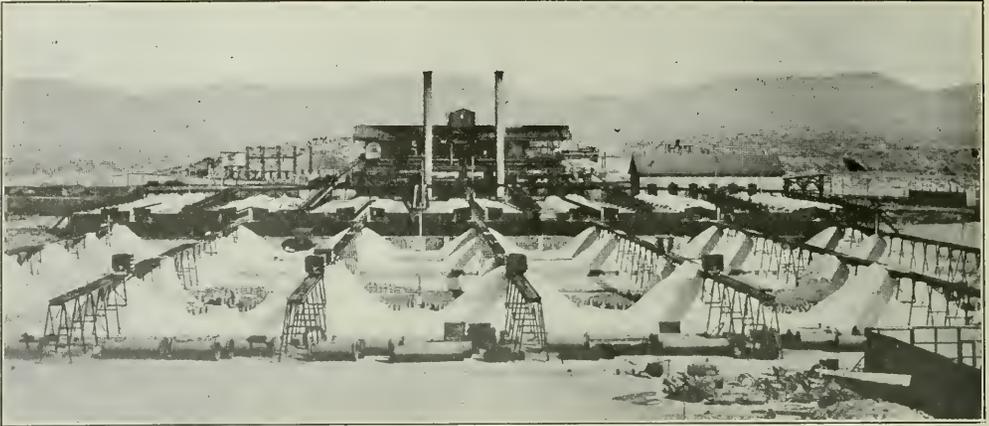
The men who murdered Mr. Patterson are all around here yet, and no apparent effort is being made to apprehend them.

I am an American citizen, have properties in the country, and I consider it my duty to call this matter to the attention of the general public.

You will do me a special favor if you will call the attention of the State Department to the facts I am giving you; they can be substantiated by all foreigners here, and by the English Consul of Saltillo, Coahuila.

It seems that the cause of the murder was that Mr. Patterson was preventing the stealing of rich ore, and for this reason they removed him.

[Signature deleted for obvious reasons. This matter has been laid before the State Department, the chairman of the Senate Committee on Foreign Relations, the chairman of the House Committee on Foreign Affairs, and the chairman of the House Committee on Rules, and all members of these committees have been provided with copies of the letter.—EDITOR.]



OFICINA "PAPOSO" AT LA NORIA (TARAPACA) CHILE. NITRATE PLANT BELONGING TO THE GRACE NITRATE CO. AND OPERATED BY NITRATE AGENCIES, LTD., IQUIQUE

The total production at this plant during March reached the unprecedented figure of 110,000 quintals of nitrate of soda. To produce this quantity of nitrate about 1,000,000 quintals of raw material is handled twice; first it is loaded into the tanks and then the refuse (about 89 per cent of the original load) is removed. This involves the handling of about 3,000 tons of material per day. (Reproduced from the "Grace Log.")

Photographs From the Field

RECENTLY COMPLETED HOIST HOUSE OF QUINCY MINING CO., HANCOCK, MICHIGAN

This building is to house the largest single-rope hoisting engine in the world. The scaffolding platform upon which will rest the hoisting engine parts as they are taken into the building shows in the foreground, the Quincy Library for employees may be seen in the distant background, and the hoisting plant now in use and handling ore from a distance of 3,300 ft. immediately adjoins the new plant on the left. The new building is 100 ft. high, 72 ft. wide and is provided with a 25-ft. solid concrete foundation, 76 by 72 ft. inside. The basement cannot be shown in the picture. The building is referred to by the management as a Michigan College of Mines structure, as it was designed, engineered and constructed by Michigan College of Mines men. Cost is \$75,000. A new hoisting engine built by the Nordberg Manufacturing Co., Milwaukee, Wis., will haul and hoist a distance of 14,000 ft.



The Rotary Method of Well Drilling

Widely Employed Process of Sinking Oil and Gas Wells in Unconsolidated Strata by Means of Bits Used in Alternating Hard and Soft Formations—Combining Rotary and Cable-Tool Methods

BY ALBERT G. WOLF
Mining Engineer, Gulf, Texas

IT HAS BEEN stated that rotary well drilling was invented in 1845. If so, its early development was slow, for the first oil well in this country was drilled by the percussion method in 1859, by Colonel E. L. Drake, at Titusville, Pa. In 1888, however, the rotary method was employed in a crude way in the Gulf Coast country. Two strings of pipe were used, the one to rotate the drill, and the other to wall up or case the hole as it progressed. During the next year it was discovered that thick mud, the more plastic the better, pumped into the hole through the drill stem, would support the walls until the drilling was finished, if the hole was not too deep, thus allowing the casing to be set afterward in one operation. The discovery, credited to B. Andrews, Sr., of New Orleans, La., is the most important in the development of the rotary method. From this time the process was further developed and improved in the oil fields of Louisiana and Texas, where, it is stated, in ten years more than 10,000 wells were successfully completed in formations in which it was impossible to drill and maintain a hole by any other system.

In 1900, Captain J. F. Lucas began drilling at Spindletop, near Beaumont, Tex., with a rotary rig, and in January, 1901, he brought in the first oil gusher drilled by the rotary method. This was after repeated failures had been made with cable- and pole-tool rigs. It may be, too, that the combination method was first used here, for I am informed that after this success the softer formations were drilled with rotary machines, and the hard cap-rock was penetrated by cable-tool rigs.

Another discovery of importance, and one which really made the rotary method a serious competitor of the cable-tool system in moderately hard rock, was that of the Hughes rotary rock bit. The bit was invented by Howard R. Hughes, and its manufacture started in 1909 at Houston, Tex. No other rotary bit is so effective in the harder strata, and its invention has assured the adaptability of the rotary method of drilling in fields where other than soft strata occur. In the years 1905, 1906, and 1907 its use spread all over the world, and during this period it was introduced into California. Here the requirements for drilling considerably deeper wells than the average depth in Louisiana and Texas necessitated the design and construction of heavier machines.

Each succeeding year has brought new improvements and a gradual development of still heavier machines, until now the weight of the rotary on the heaviest machines, for example, has increased nearly four-fold over that of the one used by Mr. Andrews in 1888. Even larger machines, it is thought, may be manufactured.

In the rotary method of drilling, the bit is suspended by means of a string of pipe called the "drill stem," and the bit and drill stem are rotated by the "rotary" in the center of the derrick floor. The drill stem varies in size, depending on the diameter of the hole being drilled, and is made of wrought iron and steel. The rotary

turntable is revolved by a gear wheel underneath, keyed to the rotary shaft, the shaft itself being driven by sprocket-and-chain drive from the draw-works line shaft, which, in turn, is also driven by sprocket and chain, from the engine crankshaft.

The drill stem is suspended while drilling, or when it is being raised or lowered, by a cable, passing from a drum on the drumshaft of the draw-works up over the sheaves of the crown block, on the top of the derrick, and down through the traveling block. This block system of suspension is necessary to make possible handling with ease and accuracy the great weight of a string of drill stem in a deep hole. The drumshaft is driven from the lineshaft by sprockets and chains, two sets of gears being provided for two speeds. The lowering is controlled by a brake on the drumshaft.

Either one or two brake bands are provided. From the traveling block is suspended the C-hook, which in turn engages the bail of the swivel. Onto the swivel is screwed the "grief stem," "groove stem" or "Kelly joint" (the latter being the drillers' field name for it), and this is screwed into the top joint of the drill stem. The grief stem is gripped in the rotary table by a special bushing or by a set of grip rings. By the use of the latter the grief stem can be dispensed with, the grip rings taking hold directly on the drill stem. This, however, results in the serious scarring and denting of the pipe, and, too, the grip rings are more inconvenient than the grief stem with bushing, and consume more time in the operations.

When raising or lowering the drill stem, the grief stem, with swivel attached, is unscrewed from the drill stem, and the latter is suspended by means of "elevators" which hang from the C-hook. While unscrewing a joint of drill stem, or two, three or four joints together, as the case may be (the words drill stem and drill pipe being used interchangeably), the stem in the hole is held by the "slips" in the rotary until the unscrewed length is set aside and the elevators are re-attached to the drill stem. The slips, it should be added, are triangular-shaped pieces of iron with corrugated steel faces, which wedge in between the drill stem and the rotary table. The driller stands at the right of the draw-works, facing the rotary, and controls all the operations, having at hand the brake lever, two levers for operating the two drum clutches, rotary drive-clutch lever, steam throttle, and engine reverse gear.

The swivel is so constructed that it will not only allow the drill pipe to revolve but will support the entire weight of the string of tools, permitting the drill stem to be raised or lowered while revolving. At the top of the swivel is a gooseneck, connected with the manifold between the pumps by means of a wire-wound hose. Through this connection and down through the swivel and grief stem, both being hollow, water or liquid mud is pumped. This passes down through the drill stem, out through two holes in the bit, and up the outside of the drill stem, carrying with it the cuttings. Another

purpose served by the mud pumped into the hole, which gives the rotary system its great advantage over the cable-tool method in loose ground, is that of sealing up the crumbling walls of the well in an unconsolidated formation.

In the general plan of a rotary drilling outfit, Fig. 1, the derrick is centered over the well location and the rotary is placed at about the center of the derrick floor, on a firm foundation of large timbers, with the center of

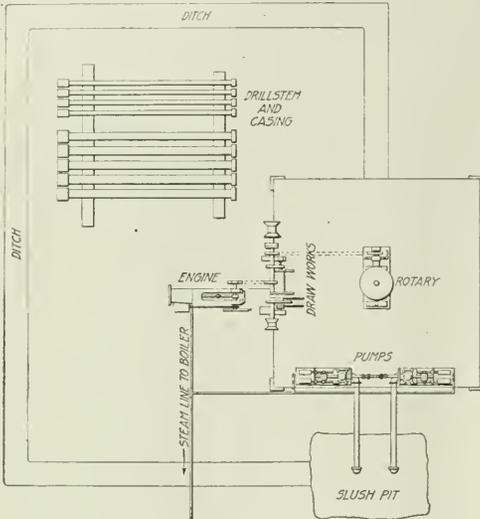


FIG. 1. PLAN OF ROTARY DRILLING RIG

the rotary table over the location point of the well. The draw-works are erected on one side of the derrick, with the engine, on a timber foundation, immediately back of them, outside the derrick floor.

The driller stands at the right side of the draw-works, facing the rotary; and the pumps, two in number, are placed on the side of the derrick floor to his right, at the edge of the floor. The pumps are duplex, and are placed end-on, with water cylinders facing. The discharges are connected by a manifold, which permits the operation of either pump. This is to make it possible to repair one pump while the other is in operation. The suction of the pumps are connected with the "slush pit" by suction pipes fitted with foot valves and strainers at their lower ends.

A ditch leads from the well, out on the opposite side of the derrick from the pit, surrounds half the derrick, usually on the engine side, and leads back to the slush pit. This arrangement returns the water or mud to the pit, thus conserving it; prevents its overflow onto adjacent lands, and gives its sand or shell cuttings a chance to settle out in the ditch before reaching the pit, for it is not desirable to pump sand or shell into the well.

On the opposite side of the derrick from the draw-works are piled the extra lengths of drill stem and casing, all parallel with each other, and with collar ends pointing toward the derrick, for convenience in pulling onto the derrick floor and hoisting into position. On this side of the derrick, up to the top of the second bent, the center one-third of the girts and braces is cut out

and the ends are joined together, leaving a high opening through which the lengths of drill stem and casing are raised and lowered as required.

The boiler is placed at any convenient distance from the rig, say 50 or 100 ft., unless natural gas in quantity is opened, when it is moved back a considerable distance to avoid the danger of fire. Usually the boiler is housed more or less roughly, according to the rigor of the climate, to conserve fuel. Fuel oil is the most commonly used fuel.

In adding to the drill stem already in the well the procedure is as follows: The string is pulled up until the lower end of the grief stem is three or four feet above the rotary, and this joint is then unscrewed. The grief stem and swivel together are then swung to one side, and the stem is lowered into a 20 or 30-ft. hole, already drilled and cased for this purpose, called the "rat hole." The bail of the swivel is released from the C-hook, and a pair of elevators of the correct size for the drill pipe substituted. A length of drill stem is pushed up onto the derrick floor, the elevators are clamped around it just below the collar, and the length of stem is swung into a vertical position just high enough for its lower end to clear the collar of the drill pipe held in the rotary. Some "dope" is put on the threads, and the new length lowered and screwed on. The entire string of drill stem is then lowered until the new piece has taken the previous place of the next lower one; the grief stem, with swivel attached, is replaced and lowered; the pump is started, and drilling resumed.

When a bit becomes dull, all the drill stem must be removed from the hole. The drill stem is hoisted and unscrewed, "broken down," in sections of one, two, three, of four pieces (called "singles," "doublets," "triplets," and "fourbles" by the crew) as the case may require and the height of the derrick permit, and set on one side of the derrick floor, standing up in the derrick. This unscrewing can be done either by hand, using chain tongs or patented tongs, or by means of the rotary and special tongs, the latter a much easier and more expeditious method.

PARTS OF DRILLING RIG

Engine—Drilling-rig engines are usually of the single-cylinder type, in cylinder sizes from 8 by 12 in., of 12 hp., to 12 by 12 in., of 30 hp. There are some as large as 16 by 16 in., of 70 hp., but they are exceptional, as is the use of more than a single cylinder engine. For rotary work the engines differ from those used in cable-tool work only in the substitution of a sprocket for the belt pulley on the crankshaft.

Draw-Works—The draw-works consist of two parallel shafts, the drum and the lineshaft. On the drum-shaft are the hoisting drum, either one or two brake bands, two sprockets, and two clutches for the two hoisting speeds. The lineshaft is above and a little behind the drumshaft, and on it are usually four sprockets, one for receiving the drive from the engine, two sprockets for driving the drumshaft at different speeds (called drum-drive and quick-hoist sprockets), and the rotary-drive sprocket. Sometimes a fifth sprocket is added to drive a mud mixer. In addition, there are two cat heads or winch heads, one at either end of the shaft. The drumshaft diameter varies with the size of the rig, 5 in. and 6 in. being used for the largest rigs, and approximately 4, 4½, and 5 in. for the smaller single brake-band draw-works. Lineshafts are approximately of 3½ to 3¾ in. diameter, and 11 to 12 ft. long. The total

weight of the draw-works varies from about 6,000 lb. to 9,500 lb., and sometimes reaches 11,000 lb. in extra heavy draw-works for export.

Rotary—The rotary consists of a circular table of semi-steel, called the table, turntable or gear table, resting on cone bearings, and under all a heavy cast-iron foundation resting on two skids. The table is driven from below by a pinion, the latter keyed to a shaft and driven by sprocket and chain from the draw-works. By means of a clutch between the sprocket and pinion the table can be thrown in and out of gear with the line-shaft, making it possible to turn the table around by hand when necessary. In the center of the table there is a circular opening through which the tools and pipe are passed, and into which fit the slips for holding the pipe when adding or removing joints or the bushing to hold the grip stem when drilling. When drilling with grip rings, this device rests on the table, with driving posts projecting down into holes in the table top.

Modern rotaries vary in size from 14 to 26 in., the number signifying the width of the largest size bit that will pass through the central opening. The largest size pipe is two inches less. In weight, corresponding to these sizes, they vary from 2,500 to 7,800 lb. complete, or 1,650 to 4,500 lb. without the grip-ring device. These sizes and dimensions are, of course, general, as they vary somewhat with different makes. The diameters of the tables corresponding to these sizes are from 38 to 58 in. Mechanical improvements have been made in rotaries during the last few years, the more important including inclosed cone bearings instead of open ones; a better oiling system, and the use of higher-grade materials throughout.

Pumps—The slush pumps used with the rotary rig are two in number, so that one can be in operation while the other is being repacked or repaired, as the wear and tear on the pumps is heavy. The type of pump is a duplex, steam driven, varying in size from 6 by 4 by 6 in. to 13 by 7 by 14 in. The 10 by 5½ by 12 in. size is a common one in use. Corresponding weights vary from 550 lb. for the smallest size, rarely used, to 7,100 lb. for the largest. The pumps are designed to operate against a high pressure, and have removable water-cylinder liners. Some also have changeable packing and metal valves on the water end.

Boiler—Horizontal, fire-tube boilers are generally used, and range from 20 to 50 hp., although for anything except the shallowest of holes less than 40 hp. is not serviceable. Corresponding heating surfaces are 276 to 620 sq.ft. Pressure rating is usually 100 lb., 125 lb., or 150 lb. Fuel oil or crude oil, wherever available, is the most commonly used fuel, and has several advantages over other fuels. Gas is also used to good advantage. Some of the boilers are mounted on trucks for portability, but with the larger-sized boilers these carriages break down, and are not an advantage. The boilers weigh from 5,700 lb. in the light 20-hp. size to 11,500 lb. for a 50-hp. boiler.

Derrick—The derricks for rotary drilling are not different from those used in cable-tool work. In height they vary from 66 to 130 ft., and in spread from 18 to 28 ft. The height used depends somewhat on the depth of the well to be drilled, although sometimes its size may be limited by the size of the tract of land controlled. The shorter derricks are for shallow holes, and necessitate breaking down the drill stem in doubles (two joints together). For work up to 1,200 ft., an

86-ft. derrick is sufficient, allowing lengths of three joints to be hoisted. For deeper work the higher derricks are used, although the 112-ft. derrick is sufficiently high for all but the deepest work. Derricks are built of either wood or steel, the former being by far the more common and preferred.

The building of derricks is a special branch of the carpenter's trade, and usually there are men in the field who will contract to do this work, and it usually pays to employ the contractor, for the construction of a derrick with labor unfamiliar with the work is a slow and costly job. The following is a list of contract prices for building derricks in a southeastern Texas field, the prices being for labor only, including doubling the legs and putting on double guy wires:

Size of Derrick, Ft.	Cost	Size of Derrick, Ft.	Cost
64	\$75.00	85	\$90.00
74	80.00	90	95.00
82	85.00	112	150.00

Derricks are usually torn down by contract also, and in this work it pays to employ skilled labor because of the greater saving of material.

Crown Block—Crown blocks are made of wood, either hard or soft, or steel I-beams, and steel pulleys. The principal members, four in number, are arranged parallel to each other, and are held apart by spacing blocks. The I-beams are 8, 10 or 12 in. high. The pulleys, five in number for rotary work, run vertically between these main members, and are arranged like the five-spots on a playing card. Pulley sizes vary, a diameter of 22 in. being common. The steel crown block is an improvement on the older wooden crown block.

Swivel—The rotary hydraulic swivel is so constructed that it can support the entire weight of the string, permit the stem to revolve, and allow water or mud to

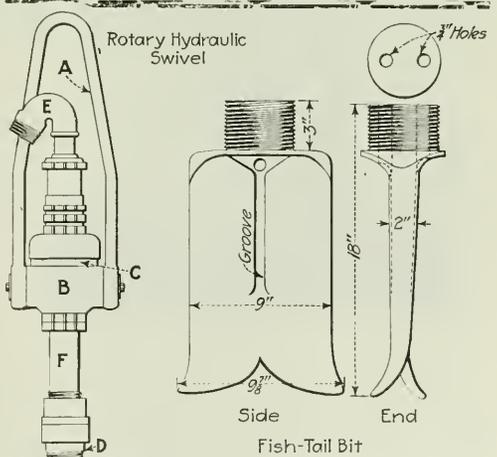


FIG. 2. HYDRAULIC SWIVEL USED IN ROTARY METHOD
FIG. 3. "FISH-TAIL" BIT

be pumped down through it under high pressure without leaking. Fig. 2 shows one form of swivel in use. It is suspended under the C-hook under the traveling block by the bail A, and this, in turn, supports the trunnion B.

On the trunnion is placed the bearing race (designed for ball or cone bearings in different makes), bearings

(inside at *C*, Fig. 2), and bearing seat. The bearings at this point must sustain the entire weight of the drill stem. Water or mud from the slush pit is pumped into the gooseneck *E*, from which it passes down through the standpipe *F*, into the grief stem at its point of connection *D*, and so into the drill stem.

The swivel is tightly held together by various lock collars, permitting the revolution of the standpipe, yet making a water-tight connection with the gooseneck, which, being connected to the hose from the manifold, cannot revolve. Swivels range in size from 3 to 6 in., the number indicating the size of the pipe connection at *D*. A 3-in. swivel weighs from 300 to 400 lb., a 4-in.



FIG. 4. DERRICK FOR ROTARY DRILLING 86 FT. IN HEIGHT

swivel from 600 to 700 lb., a 5-in. swivel from 850 to 1,200 lb., and a 6-in. from 1,350 to 1,800 lb.

Bits—The "fish-tail" bit, Fig. 3, is especially designed for rotary drilling, and though other shapes are used, it is the type most generally employed. It is made of common steel or some of the alloyed steels, but must not be brittle. All sizes, from 4- to 24-in. bits, measured across from tip to tip, can be readily procured, and smaller or larger ones may be had on special order. All dimensions vary with the width of the bit except the shank diameter, which is usually made in three or four standard sizes, for 2½-, 3-, 4- and 6-in. pipe fittings, the largest bits being obtainable only with the largest-

sized shank. Shanks are also made either straight, for pipe collars, or tapered, for special tool-joint connectors.

As a bit is revolved in the well, the two fins, or cutting edges, wear against the formation, cutting it like an auger. Water or mud pumped down through the drill stem passes out through the two holes in the bit, washing the cuttings aside and carrying them up with the current. At intervals of greater or less duration, depending on the hardness of the strata, the bit must be withdrawn from the well, sharpened and tempered. The tempering is of great importance, for on it depends to a large extent the speed of drilling. If the temper is too soft, frequent changes of bits will be necessary, and, if too hard, the bit will break. If the latter should happen in a hard stratum, considerable time will be lost in "wearing out" the piece of steel. Other shapes of bits sometimes used are the diamond point and the drag bit, which somewhat resembles the bottom end of a wood auger.

In hard rock the rotary rock bits, referred to previously, are most successful. These bits have two hard-steel cones on the lower end, each cone on a shaft, leaving them free to revolve separately. The conical surfaces are corrugated, each ridge being a cutting edge divided into teeth. As the bit revolves, the two cones roll around on the bottom of the well, and the great superincumbent weight of the drill stem, grief stem and swivel causes the teeth to wear away the rock. The cones can be resharpened unless too badly worn. An improvement on the original cone bit is the reaming cone bit. This has the same cones at the bottom, and, in addition, two cylindrical cutters of the same character as the cones set in the sides of the bit above the cones. These cylinders ream the hole out to the proper gage. In drilling interstratified hard and soft formations, the cone-roller bit is the deciding factor in favor of the rotary over the percussion method.

ADVANTAGES AND DISADVANTAGES OF THE ROTARY METHOD

In drilling soft strata or unconsolidated sediments, the rotary method has several advantages over the percussion. First, there is the better maintenance of wall of the hole. There is no jarring action, as with the cable or pole-tool methods, the effect of which is to loosen the material for a considerable radius around the hole, causing serious and costly caves. Pumping mud into the hole helps consolidate the soft and crumbling walls, and, where these walls are porous, the action of the water in running off through the formation carries mud with it, rapidly sealing the walls against further percolation. This prevents loss of water, and migration of water from one well to another, with the attendant troubles and damage. The mud consistency can be varied at all times to suit the character of the material being drilled. Less casing is needed, too, because of the better walls.

When drilling in soft material with the cable-tool method, casing must be carried along close to the point of drilling to maintain the well. As casing can be driven only a comparatively short distance before it is held by friction, a new and smaller string must be set every few hundred feet, extending from the top of the well, and drilling continued with a smaller bit. In the rotary system some wells have been completed to a depth of 3,000 ft. with one string of casing, and many wells to 2,000 ft., the hole diameter throughout being

maintained considerably larger than that of the casing, allowing the casing to be set with ease. This means a much lower cost per foot of well for casing, as well as a greater saving of time.

Faster time is made in soft and loose ground, because the method of cutting is more effective in this class of material; the bit is always free from cuttings, less time is consumed in setting casing, and chiefly because it is not necessary to withdraw the bit frequently and bail out the cuttings. It is claimed by advocates of the rotary method, especially manufacturers of rotary ma-

ventor can be fastened to the top of the casing, and thick mud under heavy pressure pumped in, sealing off the gas, and making it possible to resume drilling.

The rotary method gives way to the percussion process in fields where hard strata predominate, as the drilling speed attained by the rotary method is too low in such formations, and consequently the cost is too high. Also more men are required; an ordinary crew with a rotary rig consisting of a driller, three helpers, one of whom works in the derrick, and a fireman, whereas a cable-tool crew consists usually of two men, a drill-

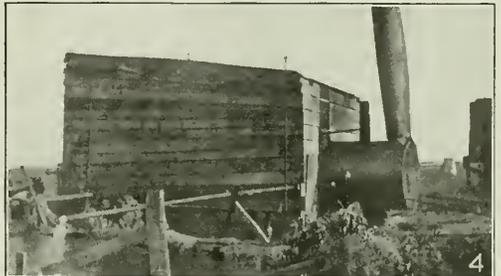
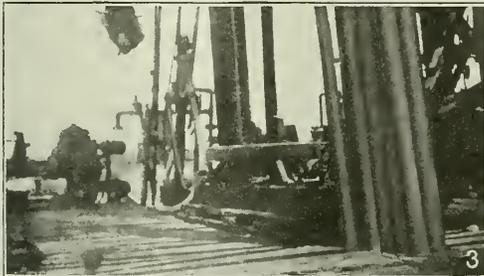
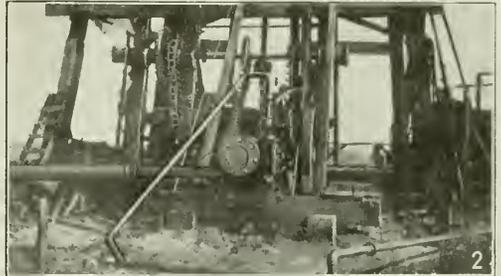
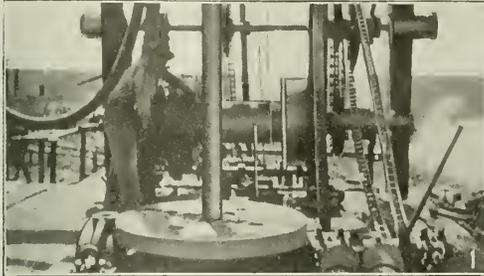


FIG. 5. (1) ROTARY IN FOREGROUND; DRAW-WORKS IN REAR; DRILLER AT HIS STATION. (2) REAR VIEW OF ENGINE AND DRAW-WORKS. (3) ROTARY IN CENTER, DRILL STEM STANDING IN DERRICK. (4) BOILER HOUSING IN GULF COAST COUNTRY

chinery, that as much as 100 ft. can be made in twenty-four hours' drilling. This is not an exaggeration. I have at hand the log of one well in which 200 ft. was made during one ten-hour shift, from 100 ft. to 300 ft. depth, in sand, shale, shell, gumbo and boulders. Another ten-hour days' work netted 120 ft. at a considerably greater depth. Where boulders are encountered in soft strata they offer no serious obstacle as a rule, because frequently they are pushed aside.

An additional advantage of the rotary system is that the driller is always informed of the exact nature of the stratum being drilled, as the cuttings are brought to the surface in a constant stream a few minutes after they are made. Thus it would be impossible for any but a slovenly driller to pass through an oil- or gas-bearing stratum without noting the fact. The cable method also is a good indicator of the strata. By the "feel" the driller can tell instantly when passing through cap-rock into a sand stratum.

In wells developing gas pressure, the hydraulic head of the mud column will often be sufficient to hold the pressure, preventing blowouts, regulating the gas flow, and permitting the drilling to be continued below this stratum. If the gas pressure is greater than the mud column will hold, a specially designed blow-out pre-

er and fireman. In districts having both hard rock and caving strata in quantity, a combination of the rotary and cable-tool methods is employed with great success, and will eventually be universally used under these conditions.

Colorado Mine Lien Law

By A. L. H. STREET

Attorney at Law, Minneapolis, Minn.

The Colorado statutes, providing for liens against mining property for services furnished in developing such property, are so worded as to entitle a mining superintendent to a lien on a mine whose working he has superintended, holds the Colorado Supreme Court in the case of *International Trust Co. vs. Lowe*, 180 *Pacific Reporter*, 579. But it was decided in the same case that the general manager of a mining company could not enforce a lien as against holders of bonds, where he aided in the issuance of such bonds as the company's general manager.

Spain's Export of Iron Ore during 1918 was 4,292,406 tons, as against 5,137,621 tons in 1917, according to *Revista Minera*. There were exported in 1918 a total of 1,035,701 tons of iron pyrites and 22,520 tons of manganese ore.

Experiments in Magnetizing Roasting

A Magnetic Film Coating Each Individual Particle the Objective of the Process—Experimental Results of Tests Made With Pyritic Concentrate—The Preferred Type of Furnace

By GEORGE J. YOUNG

THE separation of pyrite from blende can be effected by a magnetizing roast and the use of a magnetic separator. The minerals must be present in individual grains for complete separation, and the proportion in which they exist as separate grains will determine the degree of separation possible by magnetic means. The thoroughness of the magnetizing roast is an additional limitation.

The magnetic substances that are formed in magnetizing roasting are Fe_2O_3 , mixtures of Fe_2O_3 and Fe_3O_4 , Fe_3S_4 , and FeS . Zinc ferrate, $ZnOFe_2O_3$, forms at a temperature above 600 deg. C., and is magnetic. This compound is usually not present in the roast, or is present only in small amount as the roast is carried out at a lower temperature than 600 deg. C. The presence of zinc compounds and the use of excessive temperatures may produce this compound and result in much zinc being present in the magnetic product.

There is wide latitude in the degree of roasting, as can readily be appreciated in the cut, in which A indicates a particle coated with a thin film of magnetic sulphide; B, a particle that has been roasted to a greater extent and is characterized by a thin shell of ferric oxide over a thicker film of magnetic sulphide; and C, a particle that has been almost completely roasted, being characterized by a core of magnetic sulphide and oxide and a spongy shell of ferric oxide. All three particles would be attracted by a magnet, but B and C represent particles that have been subjected to an unnecessary amount of roasting.

An important objection to the presence of particles coated with a spongy shell of ferric oxide is that this shell is abraded to a greater or less extent when the particles are moved in a stream. When rubbed off, the ferric oxide cannot be removed by the magnet unless some magnetic oxide is attached to the particle of ferric oxide. The objective of the roaster is to form a magnetic film that will be as adherent to the particle as possible.

TIME, TEMPERATURE AND SIZE OF PARTICLES IMPORTANT FACTORS

The important factors in roasting are the size of the particles, the temperature, and the time of roasting. Coarse particles require an appreciably longer time to heat up to the ignition temperature than fine ones. A temperature at least equal to that at which pyrite ignites must be attained and maintained for a sufficient interval of time for a film to form. The time of roasting need not be prolonged beyond this point. A few moments suffice to form the film if the temperature is high enough.

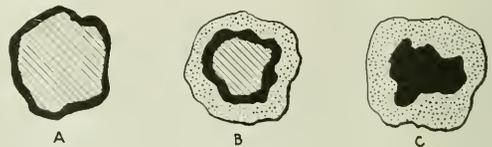
From a number of magnetizing roasting experiments that I made in the summer of 1917 I have summarized the results of three. In each experiment a 1,000 lb. lot of pyritic concentrate was taken and subjected to a roast with the object of magnetizing as much of the pyrite as possible. A rotary furnace was used,

No. 1 Roast—Clean pyrite middling, moderately coarse, 16 to 20 mesh. The maximum temperature reached in roasting was 375 deg. C. and the average 350 deg. C. One-half hour was allotted to the passage of the ore through the furnace. The actual time of roasting was much less, as the pyrite was subjected to a kindling temperature only while passing through the discharge hood of the furnace. The product was composed of particles only slightly filmed. The prevailing color was "light bronze." A 50-lb. sample, No. 1 lot, was passed through a Wetherill separator, and the division obtained was 75 per cent non-magnetic and 25 per cent magnetic. The analyses of the roasted and unroasted pyrite is given in Table I.

TABLE I. ANALYSES OF PYRITE CONCENTRATES, RAW AND ROASTED

	Insol. Per Cent.	Iron, Per Cent.	Sulphur, Per Cent.	FeS, Per Cent.	Calculated Fe ₂ O ₃ , Per Cent.	Insol. FeS, Plus Fe ₂ O ₃ , Per Cent.
No. 1 Lot:						
Raw pyrite.....	2.06	43.62	48.94	92.56		94.62
Roasted pyrite.....	2.66	43.31	47.73	89.49	2.20	94.35
No. 2 Lot:						
Raw pyrite.....	8.66	39.87	45.15	84.65	0.53	94.84
Roasted pyrite.....	8.52	41.29	43.77	82.07	4.27	94.86
No. 3 Lot:						
Raw pyrite.....	8.66	39.87	45.15	84.65	0.53	94.84
Roasted pyrite.....	8.12	44.02	40.35	75.66	12.44	96.22

No. 2 Roast—Pyrite concentrate, containing 8 to 10 per cent gangue minerals, both free and included in the pyrite particles. The maximum temperature reached in the roast was 440 deg. C. and the average about 400 deg. C. The time conditions were the same as on No. 1. The magnetized product obtained was distinctly brown in color. A 50-lb. sample was passed



MAGNIFIED CROSS-SECTION OF ORE PARTICLES,
ILLUSTRATING DIFFERENT DEGREES OF ROASTING

through the Wetherill separator, and the division showed 33.5 per cent non-magnetic and 6.5 per cent magnetic. Analyses are given in Table I. The results indicate about twice the thickness of film as compared with No. 1 lot.

No. 3 Roast—Pyrite concentrate from the same lot as used in No. 2 Roast. The maximum temperature was 500 deg. C. and the average about 450 deg. C. The pyrite was well ignited and was burning as it issued from the furnace. The roasting time was much shorter

than in the preceding experiment. The color of this product was dark brown, and practically no particles of brassy pyrite were visible. A 50-lb. sample was put through the Wetherill separator, and the division showed 7 per cent non-magnetic and 93 per cent magnetic. Analyses are given in Table I, and indicate the presence of a much thicker film than in either No. 1 or No. 2 roasts.

Five products were obtained from the Wetherill on each run, of which four were from the take-off belts and the remaining one was from the discharge of the feed belt. The products are designated 1A, 1B, 2A, 2B and non-magnetic. The numbering is in order of sequence of the take-off belts, beginning with the one nearest the feed-hopper. The front or leading pair of poles of a pair of magnets is designated A and the following pair B. Each product was examined, and the description of the products of the separation of each was as follows:

No. 1 ROAST

1 A—The particles are distinctly reddish brown; have a flat color, and are furry. No visible grains of pyrite. This product is the most responsive to the magnet.

1 B—The particles are darker than in 1 A, and are prevaingly reddish brown. In mass they present a slightly furry appearance. Some iridescent particles and a few particles of slightly bronzed pyrite.

2 A—The particles are brown in color. The mass of grains is characteristically granular and not furry. There is an increase in the number of iridescent particles, as well as a greater number of pyrite particles that are so lightly filmed as to present little difference from unroasted particles.

2 B—A general brownish color; less flat than in the others. Granular appearance; more iridescent and pyrite particles than in 2 A.

Non-Magnetic—Practically all pyrite grains. Some iridescent and some slightly bronzed; general appearance is like unroasted pyrite; some gangue particles noticeable.

No. 2 ROAST

1 A—Reddish brown; furry; flat color; no pyrite.

1 B—Brown, granular, flat color; some bronzed and some dark blue particles of pyrite.

2 A—Brown, granular, flat color; many blue and iridescent particles.

2 B—Lighter brown than 2 A; granular; many blue, iridescent and bronzed particles.

Non-magnetic—Light brown; some bronzed, blue and iridescent particles, but greater proportion consists of pyrite grains.

No. 3 ROAST

1 A—Dark purplish brown; furry; flat color.

1 B—Dark brown; granular; flat color; many particles like bornite; many dark red particles.

2 A—Brown; lighter in color than preceding; granular; many deeply bronzed and iridescent particles.

2 B—Brown; lighter in color than 2 A; granular; many iridescent particles.

Non-magnetic—Distinctly pyritic, although pyrite grains are coated with a brownish film, and the prevailing color is brown. Bright spots of light from pyrite faces; many clean grains of pyrite; many iridescent grains.

The physical appearance of the roasted product is a guide to the roaster. Good magnetizing roasting is in-

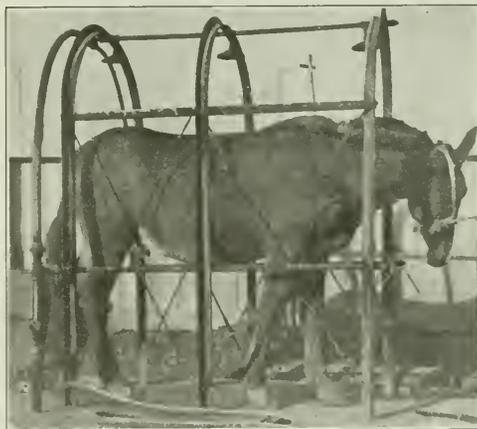
dicated by the absence of characteristic pyrite particles and by a flat or dead color, which ranges from a bronze, through shades of purplish brown, to black. Black is characteristic of a deficiency of air during roasting, or, in other words, of reducing atmosphere.

The color of the roasted product is also influenced by the amount and color of the other minerals present, which may or may not be altered in roasting. A high degree of magnetic susceptibility is shown by the product assuming a furry appearance after it has passed under the magnet. All of the leading pole products obtained from No. 2 and No. 3 roast presented this appearance.

Almost any type of roasting furnace can be used, providing the charge is passed through quickly enough. Furnaces of a type like the old White-Howell should give good service. In my opinion, the discarded Stetefeldt shaft furnace, or some modification of the Gerstenhofer kiln, would be suitable for magnetizing roasting.

Shower Bath for Mine Mules

A shower bath for mine mules has been installed in some of the properties of the U. S. Steel Corporation and some of its subsidiaries. This provides an efficient and easy method for the removal of dirt and perspiration from the mule, the accumulation of which



DETAIL OF APPARATUS FOR PROVIDING A SHOWER BATH FOR HORSES, MULES, OR CATTLE

is unavoidable. Humane treatment and attention to the physical wellbeing of these animals undoubtedly prolongs their life and increases their efficiency. The three perforated nozzles shown in the illustration are sufficient to spray the mule's entire body while the animal remains in the position shown. This illustration is reproduced from the Bureau of Safety, Sanitation and Welfare of the U. S. Steel Corporation.

The Amount of Water Remaining in Flotation Concentrate after passing the ordinary drum filter is subject to wide variation. Concentrate made from ores containing a great deal of colloidal matter gives the most trouble. At the Vindicator mill in the Cripple Creek district, for example, the moisture in the filter product is around 30 per cent. With clean ores and a liberal proportion of coarse table concentrate in the feed, the moisture in the filter cake is sometimes reduced to even less than 10 per cent.

Deep-Level Development in Aspen

Silver-Ore Deposits in Sedimentary Rocks—Concentration by Jigs and Tables—Flotation Applicable Separation From Barite—Cost of Pumping Prohibitive—Drainage Effected by Adits

BY FREDERICK W. FOOTE
Mining Engineer, New York City

ASPEN is one of the oldest mining camps in the State of Colorado. In 1879 prospectors and pioneers went over from Leadville and located several claims, among which were the Durant, Iron, Spar, Monarch, and Smuggler. At first, Ashcroft, 12 miles south of Aspen, was the larger camp, but in 1881, upon hearing of the continued strikes of ore, Ashcroft was moved house by house down the canyon of Castle Creek to Aspen.



TOWN OF ASPEN, COL.

Ashcroft is now deserted. At the height of its prosperity Aspen boasted a population of 14,000. The prosperity of the camp increased and the shipment of high-grade ore in pack trains became so great that both the Denver & Rio Grande R.R. and the Colorado Midland R.R. started spurs to reach Aspen, the former from Glenwood Springs and the latter from Basalt. The railroad building became a race to see which one would run the first train into Aspen. In spite of its greater length, the Denver & Rio Grande R.R. reached Aspen first, in 1887. The Midland arrived a short time afterward. Competition between these roads has always given Aspen the advantage of low freight rates for its products. As the camp came into prominence as the premier silver producer of Colorado, and the value of its deposits became better recognized, much litigation ensued between claimants under apex rights and those under side-line rights. Money was spent freely by both sides in development work to prove their theories.

ELEVATION OF ASPEN IS 8,000 FEET

Aspen is situated on the western slope of the Rockies in a basin formed by the junction of the valleys of Castle Creek with Hunters Creek and the Roaring Fork River. A broad, flat, alluvial plain at an elevation of 8,000 ft. affords an ideal site for a town. It is protected on three sides by mountains, the opening being on the west side down the Roaring Fork to Glenwood Springs. Recently, since the Government has controlled the railroads, the

service of the Colorado Midland R.R. has been suspended so that the daily "mixed" train of the Denver & Rio Grande is the only connection with main-trunk lines.

At an early date it was realized that the continued success of Aspen as a silver camp depended to a great extent upon a proper and comprehensive understanding and interpretation of the geology of the district, which was found to be complex. The Government intervened, and in the summer of 1895 sent J. E. Spurr and G. W. Tower, Jr., to Aspen for the Geological Survey. The report of their six-months' field work was published as "Monograph 31" of the U. S. Geological Survey.

The ore deposits occur in sedimentary rocks, the strata of which do not vary materially from those found in other parts of Colorado. In addition, certain igneous formations are found in definite relation to these sedimentaries. Porphyry, diorite, and granite are found in the region. These sedimentary and igneous rocks have been subjected to severe faulting both before and after mineralization. In addition to these are slips or faults along the bedding planes of certain of the strata. Of these bedding faults, the two most important are the silver and contact faults, along which perhaps 75 per cent of the ore in Aspen has been found, more particularly at the intersection of these faults with pre-mineral north and south faults. The surface ores consist of oxides, sulphates, and carbonates, and at lower depths the sulphides are found. The ores of Aspen are essentially silver ores, the principal deposit being argentiferous galena, but appreciable quantities of silver-bearing pyrites and chalcopyrite are found. Barite (heavy spar)



THE POWER PLANT AT HOPE TUNNEL

is found associated with polybasite, and showings of spar are consequently considered a good indication of ore.

At the height of its prosperity Aspen was producing 8,250,000 oz. of silver annually and 4,500,000 oz. at the time of the crash in 1893. The production had fallen to 575,000 oz. in 1916, this coming from 12 mines, among which were the Durant, Spar, and Smuggler, all of

which were located in 1879. Mining is conducted on the leasing system, on a variable basis of royalty. High-grade ore is shipped to the smeltery at Leadville or Pueblo, and the low-grade ore to the concentrating mill of the Smuggler Leasing Co. This has a capacity of 400 tons a day and is operated by direct-current motors of a total of 200 h.p., operating at 550 volts.

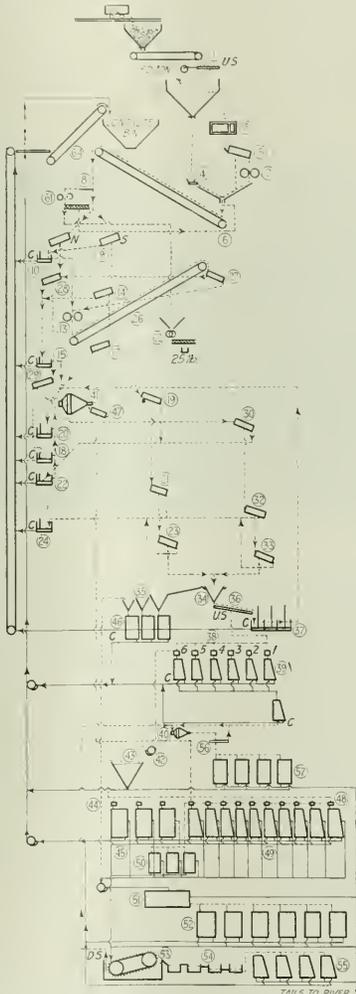
The mill is operated according to the following flow sheet, which is the result of many changes and re-designs by William Cornwall, mill superintendent for the Smuggler Leasing Co. It represents the best prac-

oversize from No. 1 goes to a 10 by 20 in. Farrell crusher. This operates at 300 r.p.m. and crushes to 1½ in. It is equipped with manganese-steel plates. The product from the Farrell crusher goes to a trommel conveyor. The oversize from this trommel goes to roughing rolls (No. 7) 36 by 16 in. set at ¾-in. opening. The product from this crusher goes to a bucket elevator (No. 6). Under the bin (No. 2), of 150 tons' capacity, is a 36-in. disk ore feeder (No. 4) operating at 15 r.p.m. This feeds into the bucket elevator. The first 40 in. of the trommel is made up of ¾-in. steel plate, followed by 30 in. of 25 mm. screen and then 29 in. more of ¾-in. steel plate. The undersize from this trommel goes to the bucket elevator. This is made up of 6 by 12 in. Salem buckets spaced 16 in. apart on a 14-in., 8-ply rubber belt. This elevator is operated at a speed of 375 ft. per min., with a vertical lift of 59 ft. The discharge from the elevator passes through an automatic sampler (No. 8), which takes four splits every five minutes, equivalent to about 10 tons per 24 hours.

JIGS USED ARE OF GERMAN MAKE

The ore is next trommeled and jigged (No. 9-29); 16 mm., 12 mm., and 8 mm. are the openings in the successive screens. The screens are all set at a 12° pitch and operated at 16 r.p.m. The jigs are of German make and were brought to Aspen in the early '80s. They are four-compartment, of the Harz type, and of massive construction. In this jiggling operation the length of stroke is shortened as the feed becomes finer, whereas the rate of stroke is increased. The concentrates from all jigs go, by means of a drag-chain conveyor (No. 12), to a loading bin. The jig tailings are treated in a 6-ft. Hardinge mill (No. 41). The pulp from this mill goes to a 20-mesh Callow screen, the oversize being returned to the mill, and the undersize is subsequently classified and tabled. The undersize from the final trommeling goes to a 4-ft. tank (No. 34). The slime overflow from this tank goes to a three-compartment spitzkasten, and the sands to a 30-mesh duplex Callow screen (No. 36). The oversize from the screen goes to a 3-compartment sand jig (No. 37). The undersize from the screen goes to six pocket classifiers (No. 38) feeding six Hallett tables (No. 39). The concentrates from these tables go to the concentrates bin, and the tailings are retabled and then reground in a 4½-ft. Hardinge mill (No. 40). The overflow from the last pocket of the classifiers is pumped by means of a centrifugal pump (No. 42) to a 12-ft. diameter cone tank (No. 43). The pulp from this tank is discharged through a siphon to a set of three pocket classifiers (No. 44) which feed one corrugated and two smooth-belt Frue vanners (No. 45). The overflow from the tank goes to a spitzkasten which feeds three smooth-belt Frue vanners (No. 46). The concentrates from all the tables are conveyed by shaking pans to common junction points, where they are elevated to the concentrates bin by Frenier pumps.

The undersize from the 6-ft. Hardinge mill is classified and tabled on nine Hallett and one Wilfley tables (No. 48). The slimes are treated on three 6-ft. Frue vanners. All the slime water in the mill is collected and pumped by means of a 5-in. centrifugal pump to a 30 by 12 ft. Dorr thickener (No. 51). The pulp is treated on Frue vanners. The mill tailings are all collected into a 5 by 18 ft. drag classifier (No. 53), the overflow from which is pumped to four 8-ft. settling tanks. The pulp from these tanks, 95% of which is minus 80 mesh, is treated



FLOW SHEET OF CONCENTRATOR—SMUGGLER LEASING CO.

tice for the concentration of Aspen ores: The ore is first dumped from cars on the railway track into an unloading bin, from which a traveling pan conveyor delivers it into a 24 by 48 in. crusher ore feeder (No. 1 in cut), bars set 1 in. apart. The feeder has a 6 in. stroke, 30 to the minute. The undersize from the crusher goes to an ore bin (No. 2) having a capacity of 150 tons. The

on four Hallett tables. The oversize from the classifier goes to the 4½-ft. Hardinge mill for finer grinding and thence through a 40-mesh Callow screen to three Hallett and one Deister Overstrom slime tables. This is the final treatment, the tailings from these tables being sluiced into the river.

The discharge from the automatic sampler is crushed and split until a 25-lb. sample is obtained, the remainder being returned to the mill feed. On a feed containing 2 oz. silver and 8% lead, this flow sheet accomplished an extraction of 68% of the silver contents and 94% of the lead. The method illustrates the advantage in close sizing and saving the metallic contents in as large particles as possible, and thus reducing slime losses to the minimum.

DEEP-LEVEL TUNNELS ARE CHARACTERISTIC OF COLORADO MINING

As the older mines in Aspen were worked down to a point where pumping costs became prohibitive, the question of deep-level tunnels was considered. Deep-level tunnels in Colorado have had a successful history. The Camp Bird, at Ouray; the Roosevelt, at Cripple Creek; the Yak, at Leadville, and the Newhouse, at Idaho Springs, have all rejuvenated their districts. The area to the south of Aspen along Castle Creek contained several paying mines that had been worked to shallow depths, but in which the work had been stopped by too much water and the low price of silver.

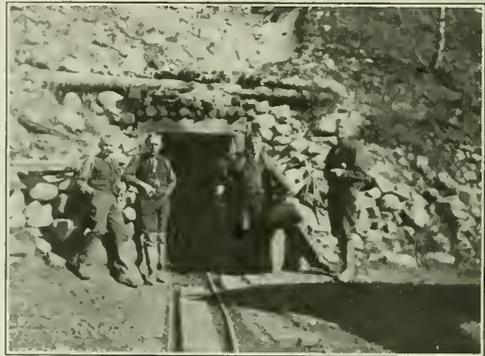
Seven miles from Aspen the Little Annie mine had been worked to a depth of 200 ft. and then discontinued after several hundred thousand dollars' worth of high-grade silver ore had been taken out. B. Clark Wheeler started a tunnel from the banks of Castle Creek to cut these workings at about 2,000 ft. depth, but after going 900 ft. the work on the tunnel was abandoned. The enterprise was too large for his resources. In 1911 a co-operative company was formed of citizens of Aspen, known as the Hope Mining, Milling and Leasing Co. This company took over the Little Annie mine, mill, and holdings and Wheeler's old tunnel, and continued the tunnel into the mountain without interruption. In March, 1919, this tunnel had attained a total length of 9,100 ft. Annual footages and costs are shown in Table I.

TABLE I. HOPE TUNNEL PERFORMANCE

Year	Footage	Cost per Foot
1911 (1 mo.)	15	
1912	715	\$12.89
1913	1724	10.20
1914	1340	10.91
1915	1138	11.89
1916	1252	12.91
1917	1047	14.58
1918	915	17.16
Total, Hope.....	8146	Average..... \$12.93
Famous.....	900	
	9046	

This record for a 4 by 7-ft. tunnel for seven consecutive years speaks well for the ability of the men who are driving it. Drilling is by machines, and tramping by hand. A steam-power plant of 80 h.p. is used to supply the power for the air compressor. A ventilating fan is used, driven by the waste water from the tunnel. When this tunnel has proceeded a few hundred feet further it will be 2,000 ft. under the Little Annie mine on the downward extension of the Little Annie vein. A geological examination made in 1917 showed no reason to anticipate any difficulty in finding the orebody at this depth, and connecting with the Little Annie mine.

Four miles south of Aspen the Midnight Mining Co. is driving a tunnel in from Queens Gulch (a tributary to Castle Creek) to connect with the Midnight shaft, which is on the extension of the Annie contact. When completed, the tunnel will be 5,200 ft. long and will cut the vein at a depth of 900 ft. about 800 ft. north of the shaft. From this point the tunnel will follow the vein to the shaft, thus opening up a block of ground 800 ft. long and 900 ft. deep. Three thousand feet of this tunnel has already been driven. The power plant at this tunnel consists of a crude-oil engine operating an air compressor. A comparison of power costs in 1917 showed that the steam generated by coal power used at the Hope tunnel was 1.46 times more costly than the fuel-oil power at the Midnight tunnel. Several good showings have been disclosed in both tunnels, but have not been developed, all funds being applied to the sole object of advancing the tunnels toward their objectives.



ENTRANCE TO HOPE TUNNEL

On Aspen Mountain, just south of Aspen, the Park Tunnel Mining and Milling Co. is driving a tunnel in a southeasterly direction to undercut the Tourtelotte Park properties. The tunnel portal is at an elevation of 9,500 ft. and, when finished, will be 3,000 ft. long and 800 ft. below the surface and 50 to 75 ft. below the lowest present workings in Tourtelotte Park. The tunnel is already driven to a distance of 735 ft. Electric d. c. current is used from the power plant of the Roaring Fork Electric Light and Power Co. for all power requirements. Data relative to these three tunnels is shown in Table II.

TABLE II. DATA ON ASPEN DEEP-LEVEL TUNNELS

	Hope	Midnight	Park
Length when completed, ft.	9500	5200	3000
Length completed to March, 1919	9100	3000	725
Length to be driven	400	2200	2265
Size of tunnel, ft.	4x7	4x7	5x8
Depth below surface, ft.	2000	900	800
Power.....	Coal-Steam	Crude Oil	Electric

Aspen ores have been tested by flotation, and a commercial process has been worked out whereby low-grade sulphide ores (which are found at depth) can be recovered. By a combination of flotation and gravity concentration, a concentrate free from barite is obtained.

Now that the Government restriction on the price of silver has been lifted, an impetus should be imparted to silver mining that will bring Aspen back to its former prominent position. The deep-level tunnels will open up many years' supply of available ore which has not yet been developed.

Water Rights in Mining

Legal Elements Defining Ownership in Water—Basic Decisions of Courts and Rulings of State Authorities

BY CHESLA C. SHERLOCK

THE courts have long recognized the fact that water is an important element in mining operations. The U. S. Supreme Court has said that the right to use water in mining operations is beyond dispute, but that the use of water in this sense is a public use within the legal meaning of the term. The California court has said that the water of streams in mining regions cannot be made the subject of private ownership so long as it continues to flow in its natural course, but that a right may be acquired to its use, which will be regarded and protected as property, although it does not carry with it any specific property in the water itself.

This view is general among the courts. The property is in use or the right of use, and not in the water itself. Although it may be difficult to draw the distinction in some cases, it is easy to do so in others. Water is a public commodity—something that is owned only by the sovereign or state. It belongs to all, with equal right; hence the property in it cannot pass to individuals so long as the water remains in its natural course, the property in it still being reserved to the state, although the right to use may be acquired by another.

No technical method is required by which the right to use is to be acquired. All that is necessary is the mere appropriation of the water to one's own purposes. One view which the courts take, and which is followed in a great number of jurisdictions, is that the right to use, when once acquired, is a franchise—"like that of digging gold, and is founded on a presumption of general grant from the sovereign and a license from the state."

The right to the use of water is subjected by the courts to a given test, which may be announced as a general rule of procedure. The first test is appropriation and the second test is the use of the water itself. If the water has been appropriated but not used, no right is acquired which can be recognized at law. If no appropriation has been made, but merely an intent to appropriate exists, no right of use is acquired in the water. The courts have likewise said that it is improper to say that the tests to follow are the method and place of the use, these not being sufficient to acquire legal rights in the water.

It is well to keep in mind that the right to use water as outlined above can be acquired only from water of the public domain, and cannot apply to water already under appropriation by another or to water exclusively owned by another.

The Utah court has said that percolating water, so long as it remains in an artificial tunnel or mining claim of the proprietor of land, is not open to the appropriation by another. The Revised Statutes of the United States provide that when rights for the use of water in mining operations have vested, or have been recognized by local custom, laws, or decisions of the courts, the right of way for the construction of ditches shall be confirmed. In Colorado it has been held that all patents are subject to such vested rights in the use of water, but though a vested right in the use of water may carry

with it an appurtenance to the right of way for the ditch through which the water is diverted, it does not carry a right to the land itself.

But mere appropriation will not operate to vest rights in each and every instance. It is effective only when (1) no riparian rights have intervened and (2) no prior rights are invaded. This is to say, if the access to the water is in the hands of a riparian owner at the time the appropriation is made, such appropriation will not vest any rights in the appropriator, and the same is true if such appropriation invades prior rights reposing in other individuals. In other words, appropriation itself is subjected to the rules of priority, and the first to exercise the right is the one to whom the fullest measure of protection is extended by the law.

It has been held that where an owner is entitled to divert water for his own use he may do so in any manner and may change the point of diversion, provided the rights of others are not injuriously affected. In Colorado and Nevada it has been held that the right of appropriation relates to the time when the first step is taken to secure it, and that a reasonable time will be allowed to do the necessary work.

This is a point of great importance to mine operators. If action is not taken within a reasonable time to do the necessary work, the right relates to the time of completion and not to the beginning of it. It is at once apparent that rights may be lost entirely by the intervening appropriation of another, if the work is not pursued diligently and completed within a reasonable time. The California court has said that possession and acts of ownership are conclusive evidence of the right to use water on the part of the appropriator. The right to use water may also be acquired under the rule of adverse possession by continued, uninterrupted and adverse possession or enjoyment of the water during the period limited under the statute of limitations for entry upon the land.

In general, it may be said that the usual rules of priority apply in the case of appropriation of water. The appropriator who was first in point of time has a superior right over all others. But the right acquired does not extend to an exclusive right, except under peculiar circumstances.

The rule is well recognized that the prior appropriator is entitled to water to the extent to which it was appropriated, to the exclusion of any subsequent appropriator for the same or any other use. This means that the appropriator acquires no greater right, by reason of his priority, than he exercised before subsequent appropriators came in. He cannot use half the volume of water and then decide to use it all after another appropriator begins to use some of the water. The rights acquired under appropriation are held to be as perfect and absolute as if they were acquired by prescription or by an express grant from a riparian owner. The extent of the appropriation and practically all questions arising under it have been held to be questions of fact to be determined solely by the decision of a jury, after all the evidence has been presented.

These principles form the settled rules as applied to the manner in which rights may be acquired for the use of water. They in no way apply to or affect instances where the land is already in the hands of individual owners, in which case the right to use is a matter of contract or of purchase.

Mills and Mines in California



FLOTATION PLANT OF THE AFTERTHOUGHT MINING CO., INGOT, SHASTA COUNTY, CAL.



ELECTROLYTIC ZINC PLANT, OF THE U. S. SMELTING, REFINING & MINING CO., KENNETT, SHASTA COUNTY, CAL.



THE MAMMOTH MINE, OF THE U. S. SMELTING, REFINING & MINING CO., KENNETT, SHASTA COUNTY, CAL.



LA GRANGE HYDRAULIC MINE, AT OREGON GULCH MOUNTAIN, TRINITY COUNTY, CAL.

The photograph was taken soon after the last sluicing had been done, and the mine is now closed. It will be noted that what is apparently a cleft is to be seen in the background. This is caused, however, by the gold-bearing gravel slipping down on the bedrock as the "giants" sluice it away.

Notes on Mill Fire Protection

General Arrangement of Fire-Fighting Equipment and Water Supply—Importance of Using Only Standard Fire Hose and Expanding-Ring Couplings

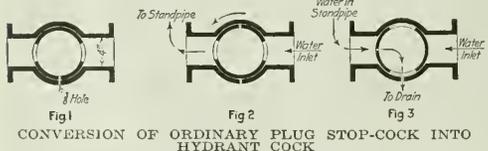
BY DOUGLAS LAY

Mining Engineer, Hawarden, England

ANY ordinary plug-cock can be readily converted into a serviceable hydrant cock, employing the "stop-and-waste" principle, and at trivial expense. With the plug of the cock in the "full-on" position, a hole is drilled through body of cock, and through walls of plug, in a position central to both, as shown in Fig. 1. The size of hole will depend upon the size of the plug cock, a 3/8-in. hole being about the right size for a 4-in. cock. The plug is now turned through 180°, when it will occupy the position shown in Fig. 2. This is the normal position of the converted cock, when delivering a full supply of water to hydrant. Turning the plug through 90° from this position, in the direction shown by circular arrow in Fig. 2, shuts off the water supply completely, and the water in the hydrant pipe is automatically drained through the ports drilled in the cock, thus giving a frost-proof hydrant.

Obviously, the travel of the plug must be confined to 90°, and the direction of rotation must be as indicated. This is readily effected by means of stops so placed that the plug cannot be turned the wrong way. These stops may be either small dowels placed in the body and plug of the cock, or the long tee handle attached to the plug may have at its upper end stops so placed that a turn in the wrong direction is impossible, and the travel is restricted to 90 degrees.

The general arrangement of a serviceable hydrant and hose house is shown in Fig. 4. The hydrant cock, above described, is buried about three feet below the surface of the ground, a wooden box being placed over the cock, to prevent soil from plugging the drainage port. Under and around the cock, coarse rock is packed to facilitate drainage. A long tee handle is rigidly attached to the plug, and extends upward, through a wooden box, through the floor of hydrant house. An indicator is placed over the top of the handle showing plainly the direction of rotation. This, of course, does not obviate the necessity of the stops previously referred to, but no hard thinking should be required in connection with fire appliances at a time of emergency.



CONVERSION OF ORDINARY PLUG STOP-COCK INTO HYDRANT COCK

Clamped to the standpipe is a swinging hose rack containing 50 ft. of 2½-in. standard fire hose, with nozzle attached, which is always coupled up and ready for instant use. Additional hose is hung on racks on the walls of the hydrant house. The 2½-in. gate valve shown gives additional control over the water supply. Such a yard hydrant should be at least 100 ft. distant from the nearest building.

Too little attention is frequently paid to the question of fire protection, in connection with mills. More often than not, the protection appliances are entirely

within buildings, and yard hydrants are conspicuous by their absence. Granted the importance of internal appliances, there should invariably be, in addition, a yard hydrant or several yard hydrants placed at strategic points. A fire may gain such headway that access to appliances within the building is impossible. Again, the menace may be a bush fire. Given a yard hydrant on the outskirts of the group of buildings, and, say, 500 ft. of hose, the surrounding area may be so drenched that all danger from this source may be averted.

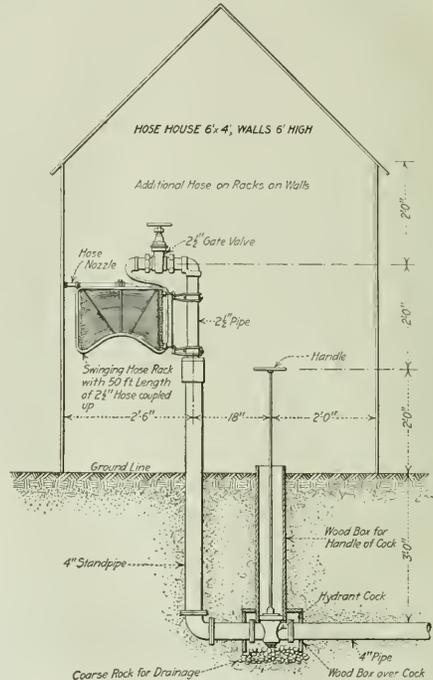


FIG. 4. GENERAL ARRANGEMENT OF YARD HYDRANT

No hose other than standard fire hose, with expanding-ring couplings, should be permitted in connection with fire-protection appliances. To employ any other kind of hose is to dwell in a fool's paradise. Hose couplings, other than expanding-ring couplings, are likely to come apart at a critical time, and render an abundant water supply of no avail.

Changes in Alaska Juneau Ball Mills

When the new Alaska Juneau mill began operating, in the spring of 1917, it was found that the ball mills would grind only a small fraction of what was expected. As the entire mill had been built on the assumption that the ball mills would operate at their rated capacity, the problem was a serious one. Considerable improvement was secured by reducing the size of the feed from 3 in. to 1½ in., but even then the capacity did not reach the desired figure.

According to the fourth annual report of the company, experiment has proved that a greater capacity and a reduced cost can be obtained by converting the ball mills into the closed-circuit, overflow type. The grinding

has heretofore been to approximately 10 mesh, the mill product passing through revolving screens, the oversize from which has been reground in tube mills. It has now been decided to remove the grates from the mills and also to grind all 10-mesh oversize in the ball mills themselves, thus dispensing with the tube mills entirely. For the purpose of returning this material, a bucket elevator is being installed for each two ball mills. During the transition to the new practice, however, the oversize from the overflow mills will be used for pebbles in the tube mills. It is hoped, by this change, to bring the mills more nearly up to the capacity for which the plant was designed.

A slight change has also been made in the flow sheet immediately preceding the ball mills. During 1917 the 50-stamp mill was used to grind the same class of ore that was handled by the ball mills, viz. about $1\frac{1}{2}$ in. Now, however, short grizzlies have been installed for the purpose of splitting the gyratory crusher discharge into plus 2 $\frac{1}{2}$ -in. material for the stamp mills and minus 2 $\frac{1}{2}$ in., or screenings, for the ball mills.

With these and other changes which have been announced, it is expected that the mill will be able to treat 8,000 tons of ore per day, at the same time rejecting an equal amount of waste.

New Method of Adding Water To Conical Mills

Larger Capacity and Reduction of Oversize Accomplished by the Use of a Water Spray in the Discharge Cone—Utility of Water Rheostat

IT IS THE present general practice in the operation of ball mills to add all of the water to the feed end of the mill. Experimentation and tests made by C. W. Dowsett, of the Bluestone Mining & Smelting Co., Yerington, Nev., have proved that, in his case, better results are secured in the Hardinge conical mill by adding a part of the water, or some additional water, just inside the discharge end of the mill. The assumption is that while the ore is coarse little or no water is required, excess water merely acting to break the fall of the balls and wash away the finer ore particles. As the ore passes to the discharge end of the cone, however, the surface area of the ore particles is considerably increased, so that the pulp becomes very thick. This prevents proper classification and results in large pieces of ore, $\frac{1}{2}$ to $\frac{3}{4}$ inches in diameter, discharging with the finer material. The dilution of the water spray allows the proper classifying action in the discharge cone to take place.

Mr. Dowsett has inserted a 1 $\frac{1}{2}$ -in. water pipe in the discharge trunnion of his mill, fitted with a $\frac{3}{4}$ -in. nozzle so directed that a spray impinges on the rising side of the pulp about 18 in. to 2 ft. inside of the mill. He has found that by shutting off this water spray for five minutes the amount of oversize is greatly increased.

While at the Dome, Mr. Dowsett also experimented with a water rheostat in connection with the motor used to drive the 8-ft. by 30-in. Hardinge mill at that plant, coming to the conclusion that a variable speed motor would possess certain advantages for a ball-mill drive. In these tests he found that with a slight variation in the hardness or size of the feed, a moderate increase or decrease in the speed of the mill, obtained by raising or lowering the plates of the water rheostat, was necessary to keep the capacity of the mill at a maximum. Some-

times a variation of $\frac{1}{2}$ to $\frac{1}{4}$ of a revolution per minute made a marked difference in the capacity. In view of this fact, he believes that the motor should be sufficiently oversize to prevent line surging, as this surging will cause considerable fluctuations in the speed of the mill.

Another aid to greater capacity which Mr. Dowsett claims is the use of a restricted throat in the feeder, with large diameter trunnions. In this way he gets more of the action of a Frenier sand pump and an actual hydrostatic head to force the feed into the mill.

Whether or not better results can be secured in ordinary mill practice by the above suggestions can be easily tested. An ammeter may be placed in the power circuit, and the water may also be metered when the spray in the discharge is tried, in order to determine the best conditions of operation. Under certain conditions, a thickening of the coarse ore pulp will result in an increase of both the power required and the grinding efficiency. If the pulp becomes too thick, more power is required but less grinding will be done, so that it devolves upon the operator to secure a critical medium.

Mine Labor Wages in Alsace-Lorraine*

There has been a noticeable increase in the average earnings of miners in the coal, iron and potash mines of Alsace-Lorraine, according to the *Bulletin du Ministère du Travail et de la Prévoyance Sociale*. The following table shows the number employed, shifts worked, and the average wages for specified periods, 1913 to 1918.

INDUSTRIAL DATA, ALSACE-LORRAINE MINES, 1913-1918

Period	No. of Persons Employed	No. of Shifts Worked	All Employees	Earnings		
				Per Shift	Per Quarter	Per Miner
Coal mines						
1913.....	16,333	(a)	(a)	\$1.07	(a)	\$1.27
1914, second quarter.....	15,445	79	\$1,329,577	1.09	\$86.08	1.50
1914, third quarter.....	9,512	76	752,700	1.03	78.17	1.24
1918, first quarter.....	11,229	85	1,816,709	1.88	161.93	2.48
Iron mines						
1913.....	16,975	(a)	(a)	1.41	(a)	1.60
1914, second quarter.....	14,939	74	1,534,350	1.37	102.87	1.59
1914, third quarter.....	8,307	63	691,519	1.32	83.38	1.54
1918, first quarter.....	8,581	77	1,373,388	2.09	160.00	2.85
Potash mines						
1913.....	1,175	(a)	(a)	1.06	(a)	1.19
1914, second quarter.....	1,879	74	145,206	1.03	76.24	1.15
1914, third quarter.....	692	75	52,496	1.04	76.04	1.14
1918, first quarter.....	1,060	78	130,468	1.57	122.94	2.12

(a) Not reported.

Quicksilver Orebodies, as is well known, are usually per quarter in 1918 compared with the nearest corresponding period of 1914 was 88.1 per cent in coal mines, 55.5 in iron mines, and 61.3 per cent in potash mines.

Quicksilver Orebodies, as is well known, are usually irregular in form, and probably for no other group of metalliferous deposits is prediction or quantitative estimation more difficult. By far the greater number of quicksilver orebodies that have been or are being worked in the United States, according to F. L. Ransome in *Bull. 666-FF*, U. S. Geological Survey, are irregular lenses, pipes, or pod-like masses with few or no definite surfaces of demarcation separating them from the enclosing rocks. Where several orebodies occur, they are usually arranged along a principal zone of fissuring, and may have one distinct wall, generally marked by a seam of claylike material, or gouge, produced by the crushing and grinding of the rock along one of the fissures. The ore masses may consist of porous rock through which the cinnabar or other quicksilver minerals are scattered in small crystal particles, or may be made up of rock that is traversed by many irregular veinlets or stringers, in which occur most of the valuable minerals.

*Extracted from *Monthly Labor Review*, June, 1919.

Mexico's New Mining Law

Decree Brings Together in One Measure All Mining-Tax Legislation—Property-Tax Rates The Same as Previously Levied—Owner Must Pay, Irrespective of Possession—Text of New Law Translated

WASHINGTON CORRESPONDENCE

BEFORE considering the substances of the New Mexican mining law, just enacted, two general observations are in order as to form. In the first place, the decree is issued under the blanket resolution of May 8, 1917, conferring upon the executive "extraordinary powers in the Department of Finance." The sole justification, if any there be, for this method of "legislating" lies in the abnormal conditions prevailing just after the Constitutionalist revolution triumphed. To continue to use this power after more than two years of a return to constitutional order denotes a complete overshadowing of the legislative branch of the government by the executive. In a word, it seems to be time to call a halt to "legislation by executive decrees." Secondly, the law is drafted in more legal language than has been the case recently. This clearly shows the hand of Cabrera.

The most important changes that have been introduced are as follows:

1. The decree in question brings together into a single measure the different mining tax decrees.

2. The property-tax rates (Art. 3) do not differ in any particular from those prescribed in the decree of Apr. 26, 1918. In this connection it should be noted that the heavier rates applied to larger properties will tend to discourage large mining holdings. Though there can be little question as to the benefit of the partition of large landed estates from the agricultural point of view, the expediency of discouraging large mining properties is certainly open to grave doubt, particularly where ores are low grade.

3. Art. 6 makes payment of the property tax compulsory, irrespective of possession by the owner.

4. In the matter of the production tax, the changes are few. They are as follows:

(a) With the exception of copper, the rates are the same as those prescribed in the decree of Apr. 26, 1918, with a reduction from 3 per cent to 2 per cent in the case of lead, tungsten, molybdenum, graphite, and mercury (Art. 7-D).

(b) A sliding scale, adjusted according to the New York quotations, from 60 per 1,000 when the price is 25c. or over to 1 per 1,000 when the price is under 10c., is provided for copper.

5. The mint is bound to receive only gold from individuals for coinage. The former decree (Apr. 26, 1918, Art. 2) provided for the coinage of gold, in unlimited amounts, and of silver, under special permission from the Department of Finance.

6. Facilities are offered to owners whose mining-tax payments are in arrears. These may be paid in the same number of installments as the number of periods of four months (*tercios*) that are owed. This privilege expires Sept. 30, 1919.

7. The obligation to re-import an equivalent amount of gold for all gold exported is left effective under the present law only as long as restrictions as to free

circulation of gold are in force in other countries.

The previous decree (Apr. 26, 1918) required in the case of silver that 50 per cent of the value thereof be re-imported in gold. This was later modified to 25 per cent in gold and 25 per cent in subsidiary coinage. The present decree abolishes this requirement entirely.

The complete text of the new statute, as translated, is reproduced as follows, without modification.

MINING TAX LAW

Issued under the extraordinary powers in the Department of Finance granted the executive by the resolution of Congress of May 8, 1917.

CHAPTER 1

ON THE TAX IN GENERAL

Art. 1. The mining industry shall pay the following taxes: A, property tax; B, production tax; C, smelter, coinage and assay dues.

CHAPTER 2

ON THE PROPERTY TAX

Art. 2. Mining patents (*titulos*) shall pay, at the time of issuance, a tax of ten pesos for each hectare covered by the patent, irrespective of the mineral substances whose development is authorized. This tax shall be payable in stamps affixed to the patent.

Art. 3. All mining properties shall pay an annual tax, according to the following rates:

A. Properties of one to five claims (*pertenencias*) at the rate of six pesos per claim, per annum; that is to say, two pesos payable every four months.

B. Properties of six to fifty claims at the rate of nine pesos per claim per annum; that is to say, three pesos payable every four months.

C. Properties of fifty-one to one hundred claims at the rate of twelve pesos per claim per annum; that is to say, four pesos payable every four months.

D. Properties of one hundred and one claims and upward at the rate of eighteen pesos per claim per annum; that is to say, six pesos payable every four months.

Art. 4. The progressive rates shall be applicable, provided the claims belong to a single owner and are located within the jurisdiction of the same mining agency.

Art. 5. The tax on mining claims shall be paid every four months in advance. Failure to make any payment when due shall work a forfeiture of the mining property, which shall be declared in accordance with the regulations on the subject.

Art. 6. The property tax shall be payable so long as the patent is in force, whether the property be developed or not, or whether or not effective possession of the property be had by the owner thereof.

CHAPTER 3

ON THE PRODUCTION TAX

Art. 7. Gold, silver, and industrial metals, whether produced within the republic or proceeding from abroad, shall be subject to a tax, according to the following schedule:

A. At the rate of 7 per cent on the value of the gold and silver presented to the mint for coinage.

B. At the rate of 8 per cent on the value of gold and silver for export purposes, when in the form of mineral rock or earth, concentrates, cyanides, or sulphides, smelter tailings, or in any other form in which the metals are com-

bined or blended with substances that are not metals, properly speaking.

C. At the rate of 7 per cent on the value of gold and silver for export purposes, provided they have been treated in the country to such a point as no longer to contain a mixture of other metals, irrespective of the fineness of the product.

D. At the rate of 2 per cent on the value of lead, tungsten, molybdenum, manganese, graphite, and mercury.

E. At the rate of 1 per cent on the value of zinc, antimony, and other metals and minerals not otherwise provided for in this article.

F. At the rates specified below on the value of copper for export purposes when presented in bars, bullion or concentrates, provided these substances contain more than 50 per cent copper and more than 300 grams silver or 5 grams gold per ton:

At the rate of 60 per 1,000 when the value of electrolytic copper, per lb., is 0.25c. U. S. currency or over in New York;

At the rate of 50 per 1,000 when the quotation is from 0.20c. to 0.25c. U. S. currency;

At the rate of 40 per 1,000 when the quotation is from 0.19c. to 0.20c. U. S. currency;

At the rate of 35 per 1,000 when the quotation is from 0.18c. to 0.19c. U. S. currency;

At the rate of 30 per 1,000 when the quotation is from 0.17c. to 0.18c. U. S. currency;

At the rate of 25 per 1,000 when the quotation is from 0.16c. to 0.17c. U. S. currency;

At the rate of 20 per 1,000 when the quotation is from 0.15c. to 0.16c. U. S. currency;

At the rate of 10 per 1,000 when the quotation is from 0.13c. to 0.15c. U. S. currency;

At the rate of 5 per 1,000 when the quotation is from 0.10c. to 0.13c. U. S. currency;

At the rate of 1 per 1,000 when the quotation is from 0 to 0.10c. U. S. currency.

G. At the rates specified below on the value of copper for export purposes when presented in bars, bullion, or concentrates, provided these products contain a fineness of more than 50 per cent copper, but of less than 300 grams silver or of 5 grams gold per ton:

At the rate of 60 per 1,000 when the value of electrolytic copper, per lb., is 0.25c. U. S. currency or over in New York;

At the rate of 30 per 1,000 when the quotation is from 0.20c. to 0.25c. U. S. currency;

At the rate of 25 per 1,000 when the quotation is from 0.19c. to 0.20c. U. S. currency;

At the rate of 20 per 1,000 when the quotation is from 0.18c. to 0.19c. U. S. currency;

At the rate of 18 per 1,000 when the quotation is from 0.17c. to 0.18c. U. S. currency;

At the rate of 15 per 1,000 when the quotation is from 0.16c. to 0.17c. U. S. currency;

At the rate of 13 per 1,000 when the quotation is from 0.15c. to 0.16c. U. S. currency;

At the rate of 10 per 1,000 when the quotation is from 0.13c. to 0.15c. U. S. currency;

At the rate of 5 per 1,000 when the quotation is from 0.10c. to 0.13c. U. S. currency;

At the rate of 1 per 1,000 when the quotation is from 0 to 0.10c. U. S. currency.

H. At the rates specified below on the value of copper for export purposes when presented in the form of natural ores or concentrates of a fineness of not over 50 per cent copper:

At the rate of 80 per 1,000 when the value of electrolytic copper, per lb., is 0.25c. U. S. currency or over in New York;

At the rate of 70 per 1,000 when the quotation is from 0.20c. to 0.25c. U. S. currency;

At the rate of 60 per 1,000 when the quotation is from 0.19c. to 0.20c. U. S. currency;

At the rate of 50 per 1,000 when the quotation is from 0.18c. to 0.19c. U. S. currency;

At the rate of 40 per 1,000 when the quotation is from 0.17c. to 0.18c. U. S. currency;

At the rate of 30 per 1,000 when the quotation is from 0.16c. to 0.17c. U. S. currency;

At the rate of 25 per 1,000 when the quotation is from 0.15c. to 0.16c. U. S. currency;

At the rate of 15 per 1,000 when the quotation is from 0.13c. to 0.15c. U. S. currency;

At the rate of 5 per 1,000 when the quotation is from 0.10c. to 0.13c. U. S. currency;

At the rate of 1 per 1,000 when the quotation is from 0 to 0.10c. U. S. currency.

Art. 8. The mint shall receive from individuals gold for coinage without any limitation as to amount at the rate of 1,333.13 pesos per kg. of pure gold; the same rate shall apply for the production tax and the coinage dues.

Art. 9. The right to mint silver coins pertains exclusively to the federal government, the right of individuals to send this metal to the mint for coinage hereby ceasing.

Art. 10. For the collection of the production tax on silver and industrial metals, the Department of Finance shall issue every month a schedule of rates applicable to the following month, taking as a basis the average of the prices prevailing in the two preceding months for metals and metallurgical products or for natural ores in New York, according to the special circumstances in each case.

Art. 11. In all such cases the rates prevailing on the day of the presentation of the metals to the mint, to federal assay offices or to the custom houses shall apply.

Art. 12. The production tax shall not be paid by:

A. Old Mexican and foreign gold coins presented to the mint for re-coinage; these shall only pay coinage assay, or smelter dues, as the case may be;

B. Gold, silver, copper, lead or zinc, when exported in the form of mineral stone, earth, or dust, whether in the form of sulphides, cyanides, or smelter tailings, provided these substances do not contain the following metals in these proportions: Gold, 2 grams per ton; silver, 250 grams per ton; copper, 3 per cent; lead, 8 per cent; zinc, 15 per cent.

C. Gold, silver, copper, lead, or zinc which, after having been imported into the republic in the form of mineral stone, earth or dust, or scientifically [metallurgically?] treated, are exported within the next four months in a metallic state, after having undergone metallurgical treatment in smelters or other like establishments existing in the country; provided the substances imported have a fineness greater than those specified in the foregoing section (B). The interested parties shall pay the assay dues and inspection charges on such minerals.

D. All metals used in the national industries. In order that gold and silver may be included in this privilege, the interested parties must prove to the satisfaction of the mint, or the federal assay office, that those metals have been put to industrial uses.

E. Samples of minerals exported in their natural state whose weight does not exceed 10 kilograms and whose intrinsic value is not over 10 pesos.

F. Iron ores.

Art. 13. Smelter, coinage and assay dues shall be paid according to the schedules of rates issued by the Department of Finance, or the basis of the cost of the respective operations.

Art. 14. Assay dues shall be paid whenever this operation is carried out by mandate of law, by administrative ruling, or at the request of the interested parties; smelter dues shall be paid when, because of the lack of uniform character of the bars or pieces, it becomes necessary to melt them for assay or coinage purposes; coinage dues shall be paid whenever the metals are coined.

Art. 15. Assay dues shall not be paid when, after the operation has been carried out by mandate of law or by administrative ruling, it is shown that there are only vestiges or traces of metals sought in the products assayed.

CHAPTER 4 ON GENERAL PROVISIONS

Art. 16. The states shall not levy on mining property,

or on the development or output of mines, more than a single tax, which tax shall not exceed 2 per cent of the value of the metal, in the case of gold or silver; nor of 50 per cent of the production tax hereby levied on other metals or minerals. States are accordingly expressly forbidden to levy any other tax, irrespective of its name, on the extraction, output, profit, or utility of mines, of smelters or metallurgical establishments of any kind, including coke factories, on the capital invested therein, or shares and mining stocks, on the transfer of ownership of mining properties or of metallurgical establishments, as well as on entries (*denuncios*), possession, constitution of mining or smelting companies, issuance of certificates or shares or on any operation relating thereto, and in general on all proceedings necessary to the establishment, acquisition, or development of mining or metallurgical properties.

Art. 17. Smelters and other metallurgical establishments of every kind, including coke factories, shall pay to the state government in which they are located, or to the governments of the federal district and territories, as the case may be, a single tax which shall not exceed (?) per 1,000 per annum on the value of the property and its equipment.

Art. 18. The federal tax shall not be paid on taxes paid under the laws and provisions enacted by the state governments within the limits presented in the foregoing articles.

Art. 19. The municipalities shall in no event levy any tax on mining, under any name or designation.

Art. 20. The export of gold ready for mining and of any kind of gold or silver coin of the Mexican currency system, as well as all kinds of foreign gold coins, is hereby prohibited, under penalty of seizure.

The Department of Finance may permit the export of solid silver pesos, provided that within a term of five days there be imported into the country for coinage by the mint an amount of gold equal to the value of the pesos exported.

Art. 21. The importation of Mexican and foreign gold coins is hereby exempted from the payment of consular dues, as well as from the requirement of a consular invoice.

Art. 22. No import duties shall be paid by the following substances provided they are introduced into the country to be used in the treatment of minerals: Zinc and aluminum in bars, fillings, etc. . . . ; sulphur; alkaline cyanides; hyposulphite of soda; lead acetate; and zinc in small perforated sheets.

TRANSITORY ARTICLES

Art. 1. This law shall go into effect from July 1 next (1919).

Art. 2. The decree of Apr. 26, 1918, and all former laws and provisions on mining taxes and privileges are hereby repealed.

Art. 3. All fines owed by reason of the annual tax on mining properties, including those due up to the date of the promulgation of this decree, are hereby canceled.

Art. 4. Persons liable to the tax on mining claims are hereby allowed the months of July and August in which to pay, without surcharge, the taxes due in the first and second periods of four months each of the present year.

Art. 5. Owners of mines that may be owing taxes prior to 1919 and who shall have paid the first two periods of the present year, as prescribed in the foregoing article, shall have the right to pay their arrears in as many installments as the number of periods of four months they are owing, amortizing the amount of one period of arrears each time they make payment of their regular taxes.

Art. 6. The patents of those persons who fail to take advantage of this privilege, or those who being entitled thereto do not make their payments on the dates of maturity, shall be declared forfeited, as provided by law, and such persons shall not have the right to resort to any other recourse.

Art. 7. Those persons who take advantage of the privilege allowed in Art. 5 (transitory) shall be required to file with the Department of Finance a statement (*manifestation*) containing the following data: Office where payment is made, number and date of patent, name of the property, name of the present owner, amount of the arrears, and receipt of the payment of the two periods of the present year. The term within which advantage may be taken

of the privilege granted under Art. 5 (transitory) will end Sept. 30, 1919.

Art. 8. Mining-property taxes and production taxes that may be owing on the date when the present law goes into effect shall be liquidated and paid according to the rates provided in the decree of Apr. 26, 1918, which is hereby repealed.

Art. 9. So long as the international restrictions on the free circulation of gold continue in force, exporters of mixed bars of gold minerals and concentrates of any kind, provided they have a fineness of gold greater than two grams per ton, shall re-import in gold bars ready for minting or in Mexican foreign gold coins an amount equivalent to the amount of gold contained in the bars, minerals, or concentrates exported.

Art. 10. The Department of Finance shall determine the procedure to be followed in guaranteeing the re-importation of gold to which the foregoing article refers.

Art. 11. Gold re-imported under the foregoing articles shall not be subject to the production tax, since the metal on being exported will have paid the said tax.

MEXICO CITY, JUNE 27, 1919.

Permanent Exhibit of Mining Machinery Planned

Will Occupy One Entire Floor of Grand Central Palace, New York—Coal and Oil Industry Included

A PERMANENT exhibit of all the latest and best machinery and supplies used in the mining and metallurgical industry is to occupy 50,000 sq. ft. of floor space in the Grand Central Palace, 46th St. and Lexington Ave., New York City. This announcement, recently made, will be of great interest to all mining men. Heretofore long and costly trips have often been necessary to compare the merits of the various machines used in the industry and actually to see the appliances which are used in the most up-to-date practice. Also, familiarity with the implements of one industry often leads to an appreciation of their applicability to another. Some of the standard machinery at present used in the milling of copper ores, for example, is borrowed from the gold and silver industry.

The International Exhibition of Mining Industries is only one part of the project, as the remaining floors of the building will be devoted to other kinds of business. The whole idea is fathered by the Nemours Trading Corporation, of which Alfred I. du Pont is president. It is represented in all of the leading cities of the world, with 19 branch offices and 3,000 foreign selling agencies, all of which will spread knowledge of the Grand Central Palace exhibits.

The exposition of mining industries will include the machinery and supplies used in the development and exploitation of metal and non-metal mines, coal mines and oil wells; the subsequent extraction, reduction, or refining of the raw products by concentration, leaching, cyanidation, flotation, smelting, distillation, and coking, and the handling and marketing of the products. Howard R. Ward, who will manage the project, is a mining engineer. He has practiced in the West for fifteen years and was for three years consulting mining engineer with the American International Corporation, where he was associated with the organization of its machinery export companies.

It is planned to have the exhibit open by Oct. 15, and remain open, as a permanent, continuous exposition.

Business Training for the Engineer*

Importance of Mastering Fundamental Commercial Principles—Results of Present Curricula Unsatisfactory—Suggestions Respecting Essential Technical Preparation and the Means of Acquiring a Broader Professional Equipment

BY ANSON MARSTON

Dean of Division of Engineering, Iowa State College, Ames, Iowa

I BELIEVE that the demand for business training for the engineer is widespread throughout the engineering profession. In part, it is a more or less unconscious revolt against the conception so common in the business world, that the engineer is merely a highly skilled mechanic, destined by fate and custom to serve only as an employee of some profit seeker. In 1907 the first precautionary measure taken by capitalists when the financial storm burst was to drop most of their engineers from the pay-rolls. Within a week the character of the letters reaching my desk changed from appeals by corporations for more engineers at any price, however high, to appeals by engineers for employment at any price, however low. Alumni who had just resigned permanent positions held for years to accept enticing offers found those offers repudiated while they were en route to their new stations. Moreover, our railways for a generation before the war met each new legislative restriction on rates by small economies, such as in lead pencils and in engineers.

The new thought is, why should not the engineer be his own employer in great industrial enterprises of an essentially engineering character? Why should he not be the organizer, the president, the manager of great industrial corporations rather than a mere hired expert?

PRESENT METHODS GIVING POOR RESULTS

Another cause for the present demand for business training for the engineer is the general dissatisfaction among employers of engineers with the product of our engineering courses of study. Methods of instruction have become standardized to such an extent that it is almost as great a sacrilege for any engineering college to deviate from the general practice as it was for the ancient Egyptian draftsman to vary a line from the orthodox in representing Pharaoh. Of engineering educators it truly may be said that we have looked upon our work and we find that it is good, but we have no inquisition at our command to put down the numerous latter-day heretics who keep on pointing out defects in the results we secure.

The engineer employer needs, above all, men who are qualified for successful executive responsibilities in great industrial undertakings, and he is not satisfied with the product which our engineering colleges are sending out.

Even before the war, then, engineers and engineer employers were demanding business training for the engineer. Since the close of the war comes Uncle Sam himself to tell us that the imperative post-war needs of the United States require great engineer

leaders, with sound business training, to develop our great mechanic arts, industries for economic and profitable production, transportation, sale and use, at home and abroad. Patriotic duty to the country now furnishes an additional reason for the introduction of business training into every engineering course as a fundamental part thereof.

BUSINESS TRAINING AN ADDED QUALIFICATION

I would call attention at this point to the fact that the subject of this paper is "Business Training for the Engineer," not "Engineering Training for the Business Man." The two topics should not be confused.

The schools of commerce are coming to call upon the colleges of engineering for some informational training of commerce students along engineering lines. This call should be heeded, but it is not believed that the great mechanic arts and trade needs of the country can be met adequately by superficial descriptive engineering training of business men to such extent only as to enable them to read with fairly intelligent understanding the reports of hired engineer experts. What we need are great engineer leaders, men who possess the highest engineering qualifications combined with great business ability, and who can conceive great mechanic arts, enterprises, design their engineering details, build their greatest constructions, organize and direct their operations, and who also can interest capital and deliver a fair profit to investors.

I take it that the principal object of all business training (speaking frankly) is financial profit. Public utilities, for example, are successful from the business point of view whenever they make money for their stockholders, although they may poison a city with polluted water, furnish unsatisfactory light and power, cause the traveling public all sorts of inconvenience, or ruin industries by insufficient or inequitable transportation facilities. Toleration of such shortcomings, it is true, might be unwise, but this would be because they might arouse antagonism, cause enactment of legal restrictions, decrease patronage, or otherwise operate to decrease profits.

PROFIT IN ENGINEERING ONLY ONE ESSENTIAL

In engineering, on the other hand, profit, though essential, is only one essential to be attained, and achievement in the successful utilization of the principles of the science of mechanics is the great object. The engineer has been trained to give primary attention to the scientific principles of design, to ingenuity in invention, to industrial organization for construction and production on the greatest scale and at the lowest cost.

In planning business training for the engineer we should not attempt to lower the great ideals of his

*Excerpted from an address delivered at the conference on "Business Training for Engineers and Engineering Training for Students of Business," Iowa State College, June 23, 1919.

profession. We should add business training to the engineer's equipment, not substitute it for engineering qualifications. We should qualify the engineer to take into account, with due weight in the solutions of his problems, the great questions of capital, labor, and profits as well as the scientific principles of engineering theory and experience. The engineer's remuneration should no longer be left to be considered as a mere item on the cost side of the books of the enterprise.

HOW TO PROVIDE SUCH BUSINESS TRAINING

There are those who believe that the problem of how to provide business training for the engineer can be solved best by creating a new branch of engineering to be called "Business Engineering," providing four-year business-engineering courses supplementary to the course in civil, mechanical, and electrical engineering. Some schools of commerce, on the other hand, offer four-year business courses in which a certain amount of engineering training is included in addition to their commerce courses.

Though not denying that they may serve useful purposes at some institutions, I do not believe that four-year combined courses of either type furnish an adequate solution of the general problem of business training for the engineer. Manifestly, only a small fraction of the engineering students, on the one hand, and the commerce students, on the other, can be expected to enroll in such courses. We already have too many special courses in engineering. The present tendency is toward broader rather than more specialized engineering training.

The only really adequate method for providing the business training now needed by engineers is to put it into the regular four-year courses, as required work, to approximately the same extent as chemistry or physics. I earnestly believe that this should be done.

The business subjects should be restricted to simple, fundamental business principles. Economic science, accountancy, business law, corporation finance, industrial organization, and business psychology are examples. These subjects may be taught wholly in the school of commerce or partly in the college of engineering, according to local conditions. If taught in the school of commerce, turning this instruction over to subordinates should not be tolerated.

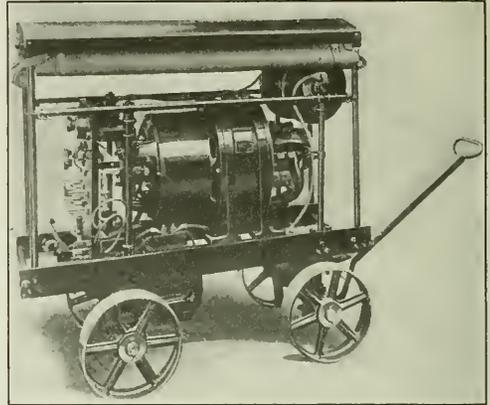
Electric Arc Welder for Portable And Stationary Use

Mounted on a Truck It Weighs 1,500 Pounds and Is
Suitable for Use Where Work Cannot Be Brought
Within 75 Feet of Apparatus

AN INVESTIGATION into the requirements of machine shops, railroads and shipyards has developed a line of electric arc welding machinery to meet the demands of various kinds of work. For use at shops where it is practicable to bring the parts to be welded to within 50 or 75 ft. of the welding apparatus, a stationary type is provided; also a light-weight portable machine is made which may be taken direct to the work.

With a rated capacity of 4 kw. the arc welder gives 200 amperes, direct current, or less, with an arc voltage of 17 to 22 volts and open-circuit voltage of 35 to 65. It is made in the form of a converter for use

on 100 to 125 volts d.c. circuits only, and in the form of a motor-generator for all other a.c. and d.c. circuits. Weighing 665 lb., the converter delivers current at the arc through the arc stabilizing reactor with an efficiency of 65 to 70 per cent. The motor-generator type consists of a $7\frac{1}{2}$ hp. a.c. or d.c. motor on the same shaft with a 4 kw. welding generator. This type is inferentially regulated, compound wound, self-excited, and with dropping voltage characteristic. Practically constant energy is produced in the arc and response is claimed to be instant when the electrode touches the work.



TRUCK USED FOR PORTABLE ARC WELDER

For portable use a truck equipped with motor-generator or converter, panel, reactor, cover and cable reel is supplied. The truck, which is 28 in. wide, 55 in. high over cover and 54 in. long, weighs with complete equipment about 1,500 lb. These welders are manufactured by the U. S. Light & Heat Corporation, of Niagara Falls, N. Y., and a catalog describing the USL electric arc welding machinery is available for distribution.

Mining in South Dakota and Wyoming

The Black Hills mining district of South Dakota produced \$6,565,209 in gold and 159,246 oz. of silver in 1918, according to the U. S. Geological Survey. From Jan. 1, 1918, to Oct. 27, 1918, the Homestake mine and mills were operated at full capacity, but during the rest of the year at only 71 per cent capacity. This property, which produces the bulk of the output of South Dakota, had not reached full capacity in June, 1919. The Golden Reward mines and mill, closed in 1918, have not resumed operations. The Trojan and the Mogul mills have both been operated in 1919. The production for the state in 1919 will apparently not equal the production in 1918.

Mines in Wyoming produced 7 oz. of gold, 253 oz. of silver, and 754,324 lb. of copper in 1918. The shipments of silver-copper ore from the Sunrise mine, near Hartville, the principal producing mine in Wyoming for several years, have not been continuous in 1919. A mill has been built to treat the dump ores of the old Ferris-Haggerty mines (long idle) at Encampment. The Rambler copper-platinum mine at Holmes has been idle in 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Suspension of Assessment Work

No suspension of annual assessment work on mining claims is to be granted to any one claimant for more than five claims, according to a resolution of Representative Hawley, of Oregon, which will be reported favorably by the House Committee on Mines and Mining. Mr. Hawley's resolution originally did not contain the limitation, but after extensive hearings the committee made the amendment referred to and also struck out the provision that the resolution is not to apply to oil placer claims.

The original resolution provided for the suspension of annual assessment work during 1919, as had been granted unanimously by Congress for the years 1917 and 1918. This called forth energetic opposition from Representative Taylor, of Colorado, who insisted that stagnation in prospecting is resulting from the suspension of assessment work. He attempted to show that there no longer is reason why it should be extended. He offered no objections to the exemption of two or three claims and is fairly well satisfied with the five-claim exemption, which the committee agreed upon.

Several members of Congress, and J. F. Callbreath, secretary of the American Mining Congress, and H. N. Laurie spoke in favor of the resolution. The main argument was that the scarcity of labor would interfere seriously with going operations if a large number of men were drawn out of the industry to perform assessment work. It also was argued that under existing conditions, and with present prices, an injustice would be done the holders of claims. Mr. Laurie emphasized the serious consequences that would come to the holders of chrome claims if they were obliged to do their assessment work. He also pointed to the world's need in keeping up gold production, which, even now, is being handicapped by lack of labor.

War-Minerals Work Proceeds Slowly

Complaints are being received to the effect that settlement of war-minerals claims is being prolonged unduly. Some point to the fact that the War Department already has completed its settlement of informal contracts. The cases are not comparable. Direct contact had been made between War Department officials and those with whom informal contracts had been negotiated. The only matters remaining unsettled were formalities. In the case of the war minerals, there had been no understanding as to the purchase of a definite amount of ore or the prices which were to be paid. In all but a few cases, the Government was not consulted as to the wisdom of investments. The War-Minerals Relief Act provides restrictions which require a careful examination of each claim. As 1,200 complicated and intricate claims have had to be examined and an opportunity offered for the claimants to be heard in person, it can be seen that considerable time is necessary.

Every effort is being made to speed up procedure

in the handling of claims. A year has been set as the extreme limit for disposing of the entire work of the commission. The task of that body has been made somewhat lighter as the result of the opinion of the Attorney General. It will eliminate a considerable portion of the claims from any consideration whatever.

An analysis of claims made by the American Mining Congress, which covers about 95 per cent of all claims filed, is as follows:

Alabama: 4 manganese, \$100,225.26; 4 pyrites, \$253,445.80; total, \$353,671.06. Alaska: 1 chrome, \$54,855.67. Arizona: 27 manganese, \$239,785.90; 8 tungsten, \$53,188.38; total, \$292,974.28. Arkansas: 100 manganese, \$1,017,855.52. California: 397 chrome, \$1,692,646.20; 94 manganese, \$523,747.54; 1 pyrites, \$6,894.34; 22 tungsten, \$710,963.57; total, \$2,934,251.65. Colorado: 65 tungsten, \$607,065.35; 21 manganese, \$129,962.79; 1 chrome, \$38,859.18; 7 pyrites, \$671,595.40; total, \$1,447,482.72. Delaware: 1 chrome, \$20,000. Georgia: 17 manganese, \$315,055.60; 11 pyrites, \$1,478,065.84; total, \$1,793,121.44. Idaho: 2 manganese, \$19,909.50; 1 pyrites, \$3,638.75; total, \$23,548.25. Kentucky: 1 chrome, \$19,597.89. Maryland: 1 chrome, \$55,049.04. Missouri: 1 pyrites, \$14,689.66. Montana: 35 manganese, \$426,273.53; 6 chrome, \$48,639.35; 3 pyrites, \$6,800; 1 tungsten, \$2,950.84; total, \$484,663.72. Minnesota: 10 manganese, \$1,417,629.42. New Mexico: 12 manganese, \$178,746.71. New York: 1 pyrites, \$500. Nevada: 32 tungsten, \$312,824.56; 24 manganese, \$140,892.56; total, \$453,717.12. North Carolina: 5 chrome, \$54,766; 4 manganese, \$2,540.34. Ohio: 1 pyrites, \$203,302.42. Oregon: 95 chrome, \$426,310.09; 16 manganese, \$276,591.72. Pennsylvania: 4 chrome, \$84,233.51; 2 tungsten, \$24,070.51; 1 manganese, \$482.40. South Dakota: 1 manganese, \$1,281; 1 tungsten, \$1,000. South Carolina: 2 manganese, \$22,697; 1 pyrites, \$114,011.07. Tennessee: 34 manganese, \$287,467.90; 1 pyrites, \$1,660.38. Texas: 2 manganese, \$6,377. Utah: 13 manganese, \$88,701.18; 3 tungsten, \$8,435.64; 1 pyrites, \$2,186.50; total, \$99,323.32. Virginia: 34 manganese, \$1,875,109.84; 3 pyrites, \$7,586.88; total, \$1,882,696.72. Vermont: 1 manganese, \$3,342.59. Washington: 5 chrome, \$22,948.45; 2 manganese, \$36,000; total, \$58,948.45. Wyoming: 2 manganese, \$38,828.60; 1 chrome, \$38,858.18; total, \$77,687.78.

There are claims from American producers operating outside of the United States as follows: Cuba: 4 manganese, \$765,983.70; 1 chrome, \$25,902.53; total, \$791,886.23. British Columbia: 2 manganese, \$22,736.32; 1 chrome, \$11,604.21; total, \$34,340.53. Mexico: 1 manganese, \$7,931.67. Total foreign claims, \$834,158.43.

All war relief claims may also be divided as follows according to the mineral involved: Pyrites, \$2,764,377.04; manganese, \$7,946,155.59; chrome, \$2,594,271.30; tungsten, \$1,720,498.85.

Freight Rates on Ore Shipments

The practice of stating rates on iron ore in short tons, instead of long tons, has been held by the Interstate Commerce Commission not to be unreasonable or otherwise unlawful.

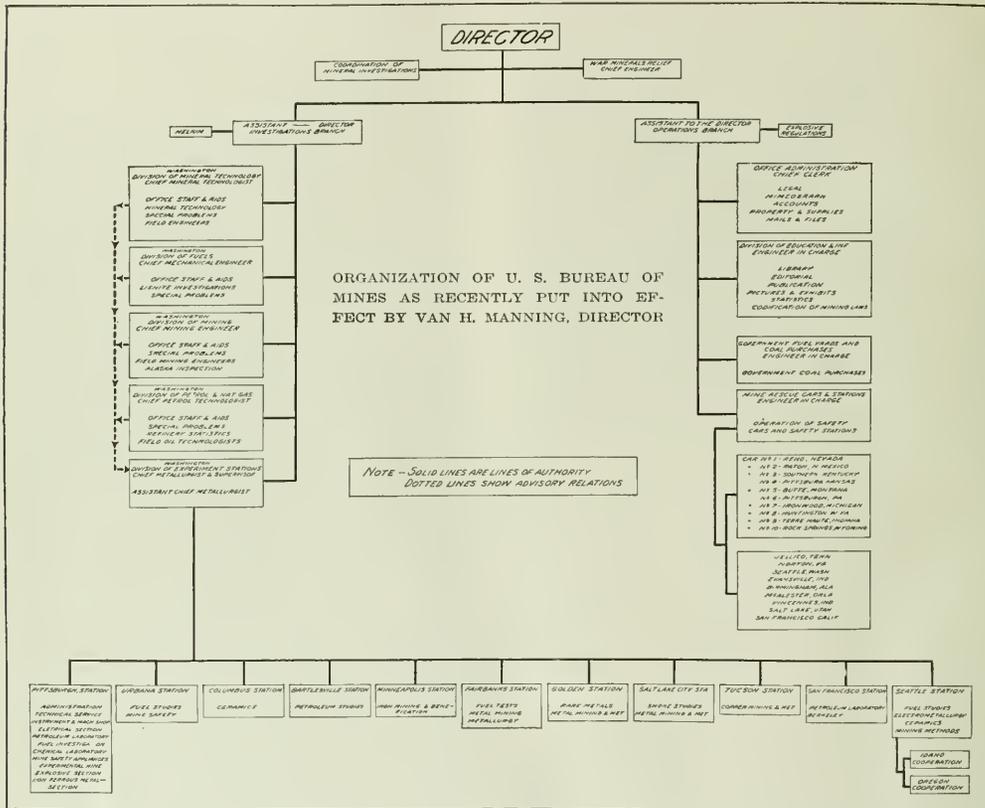
Application has been made to the commission for permission to cancel rates on ore and bullion, in carloads, from Butte, Mont., to Greenwood and Trail, B. C., and on ore and concentrates from Butte and Anaconda to Salida, Col. The reason given is that no shipments are made under these rates.

Bureau of Mines Reorganized

Taking advantage of the lessons in administrative organization which were taught by the war, Van. H. Manning, director of the U. S. Bureau of Mines, has put into effect a new form of organization in the Bureau. This has been divided into two branches, one the investigations branch and the other the operations branch. F. G. Cottrell, who has been chief metallurgist of the Bureau, has been promoted to the position of assistant director and will be in charge of the investigations branch. F. J. Bailey, who has been chief clerk of the

The operations branch has as its subdivisions the office of the chief clerk, which will be presided over by H. E. Meyer; the division of education and information, with T. T. Read in charge; Government fuel yards and coal purposes, with G. S. Pope in charge; mine rescue cars and stations, with D. J. Parker in charge.

One of the very important divisions is that of experiment stations. The stations under the direct charge of Mr. Lyon, with their respective directors, are as follows: Pittsburgh station, E. A. Holbrook; Urbana station, C. A. Herbert; Columbus station, R. T. Stull; Bartlesville



Bureau, has been placed in charge of the operations branch, with the title of assistant to the director.

All research and technical control will be exercised through the investigations branch. The non-technical work, administrative duties, and dissemination of the results of the Bureau's activities will be handled by the operations branch.

Under the investigations branch comes the division of mineral technology, in charge of Dr. C. L. Parsons; the division of fuels, under the chief mechanical engineer, O. P. Hood; the division of mining, under the direction of George S. Rice, the chief mining engineer; the division of petroleum and natural gas, under the direction of J. O. Lewis, the chief petroleum technologist, and the division of experiment stations, under the direction of Dorsey A. Lyon.

station, W. P. Dykema; Minneapolis station, C. E. Julihn; Fairbanks station, J. A. Davis; Golden station, R. B. Moore; Salt Lake City station, Thomas Varley; Tucson station, C. E. Van Barneveld; San Francisco station, L. H. Duschak; Seattle station, F. K. Ovitz. A. E. Wells has been made assistant supervisor of stations.

War Departments' Metal Sales

Sales of non-ferrous metals and scrap made by the War Department up to July 4 aggregated \$18,274,886. The original cost of materials which were sold for the above figures was \$23,680,256. Total sales up to July 4 of surplus supplies of chemicals, acids, and explosives amounted to \$31,861,853. The original cost of those commodities was \$33,043,432.

Meeting of the San Francisco Section of the A. I. M. E.

Members Hear an Important Address on the Creation of a National Department of Public Works by Philip N. Moore, at the Engineers' Club

ON THE evening of July 22, the San Francisco Section of the American Institute of Mining and Metallurgical Engineers held its regular monthly meeting at the Engineers' Club. The guest of the evening was Philip N. Moore, a member of the Minerals-Relief Commission, which completed its work in San Francisco on July 26. In the absence of F. W. Bradley, who is in Alaska, T. A. Rickard acted as chairman and introduced Mr. Moore.

The subject of the evening's address was "New Conditions and Opportunities Confronting the Engineer." Mr. Moore commented on engineering organizations and the tendency of such organizations to become narrow and self-centered. The need for a greater service and more direct contact with engineers on the part of the national engineering societies was emphasized. The formation of the Engineering Council and its rapid growth were described, as well as the work of the National Service Committee, which is keeping in touch with and informing engineers of all national legislation affecting their interests.

The present unsatisfactory condition of governmental engineering service, which is divided among many Government departments, with the result that there is much duplication of effort and consequent loss of efficiency, was brought to the attention of the members by Mr. Moore. Enumeration of the efforts to remedy this condition by the creation of a department of public works, a bill for that purpose having been introduced in both the Senate and the House, and a statement concerning the work of organizing the engineering societies in support of this bill, concluded the address, which was listened to with more than ordinary interest.

After a short discussion and the answering of a number of questions concerning the purpose of the department of public works, the following resolution was circulated and signed by the members present:

We, the undersigned engineers of San Francisco, having read the text of the bill for the creation of the department of public works, desire to express our hearty approval of the measure:

W. H. Shockley
Geo. J. Young
F. H. Probert
T. A. Rickard
W. Burns
Augustus Locke
Clifford F. Dennis
C. N. Schuette

D. H. Harroun
Arthur W. Jenks
Wilbur H. Grant
F. W. Varney
Albert A. Alslip
Fred Corkill
Arthur Jarman

Mr. Moore has recently delivered addresses on the need of organization to voice engineering opinion upon public questions, one of which, on "The Engineer in Civil Life," was delivered at the engineers' symposium held in New York City on Mar. 26.

The Journal Index

The Index for Volume 107 (January to June, 1919) of the *Engineering and Mining Journal* will be mailed with this issue. Any subscriber not receiving a copy of same should notify the Subscription Department at once.

Exposition of Chemical Industries

Recent Developments in Electric Furnaces, Measuring Instruments and Plant Installations—Meeting of the A. I. M. E.—Papers on Many Subjects

THE forthcoming National Exposition of Chemical Industries at the Coliseum and the First Regiment Armory, Chicago, during the week of Sept. 22 to 27, inclusive, will illustrate in a striking manner the recent developments in the metallurgical industry, principally the advances stimulated by the demand for production during the war.

A noteworthy feature of the exposition will be the number of electric-furnace exhibits. The activity of the war period produced an increased interest in metals, not only in new alloys and in treatment of metal but in the method of manufacture. On exhibit will be the Rennerfelt furnace, Hamilton & Hansell, American agents; the Baily Furnace, shown by the Electric Furnace Co.; the Taylor furnace, by the Industrial Electric Furnace Co.; the Detroit rocking furnace, by the Detroit Electric Furnace Co., and the furnace of Booth, Hall & Co. In the metal department there will be exhibits of acid- and alkali-proof bronzes that are prepared for specific purposes—bronze of sush hardness and strength that instruments made of it are used to cut chilled steel—and other metallic compositions the development of which could not properly be made known until now.

The advance of electrochemistry, particularly as related to electric steel, brass, bronzes, and the furnaces used, has created a broader interest than in the strictly electrochemical field, and the American Institute of Mining and Metallurgical Engineers will hold a joint meeting with the American Electrochemical Society on Sept. 24 to discuss electric steel and electric furnaces. In the evening after the meeting a program of motion pictures upon various phases of electric furnaces in their operation will be shown. On Sept. 26, a joint session on the subject of pyrometry will probably be held. The U. S. Bureau of Mines will have on exhibit about thirty metals, showing the complete course of extraction from their ores and the various materials used in each process.

The numerous instruments, devices, and apparatus that have been perfected during the intense war period for precise measurements of temperature, weights, volumes, velocities, flow of liquids, gases, solids, electric current, and any and all kinds of commodities that are to be measured will occupy a large amount of space. Prominent among plant exhibits will be those of conveying systems, elevating systems, weighing and measuring devices, tiering and stacking machinery, as well as hoists and cranes.

The interest of manufacturers and large companies in the health and welfare of workers in plant, factory, and mine has led to the introduction of numerous devices for the protection of parts of the body, for use in the chemical, gas, electric, metal-smelting, mining and manufacturing industries. The protection of the eyes by goggles and shields, the breathing apparatus by masks, hoods, and breathing pieces, and prevention of accidents by signals and devices will be illustrated. The U. S. Bureau of Mines will feature its safety work in

the plant and the mine, and in connection with this a special program is being arranged under the chairmanship of M. F. Leopold, safety engineer of the Bureau.

In addition to the technical papers, there is also being arranged a program of speakers and motion pictures by the exposition managers, which will include men of national prominence.

Many exhibitors will bring moving picture films now being prepared. The U. S. Government is making numerous technical subject films through the Bureau of Mines, embracing all of that Bureau's work, and these will be shown for the first time. The Bureau of Commercial Economics at Washington is again co-operating with the exposition in equipping it with some films now being made. The Bray Studios are preparing several films in which they will show drawings, taken in such rapid sequence as to seem in motion, that illustrate the manner and conduct of chemical action and reactions usually invisible to the eye and conceived only by the mind in abstract form. The showing of these films will be elaborated and discussed by James Handy, vice-president of Bray Studios.

The titles of some of the films are: "Continuous Motion Conveying, Stacking, Elevating, Loading, and Unloading by Brown Portable Handling Machines" (courtesy Brown Portable Conveying Machinery Co.). "Resistance Type Furnace for Melting Non-Ferrous Metals" and "Electric Furnaces in the Heat Treatment of Essential War Materials" (courtesy of Electric Furnace Co.). "The Detroit Rocking Electric Melting Furnace in Operation" (courtesy Detroit Electric Furnace Co.). "Shawinigan Power Development and the Shawinigan Industries" (courtesy Shawinigan Water & Power Co.). "The Manufacture of Zinc Oxide" (courtesy New Jersey Zinc Co.). "Operation of Koppers By-product Coke Plant" (courtesy The Koppers Co.). "Chemistry in Munitions," "Invisible Chemistry of the Electric Battery," "Invisible Phases of Crystallization," "Formation of Coal Made Visible," and "Chemistry of Gas Engines Made Visible."

The managers of the exposition, Charles F. Roth and Fred W. Payne, have established headquarters in the Chicago office at 417 South Dearborn St.

Chicago Meeting of the A. I. M. E.

Steamer To Be Chartered for Excursion to Gary, Ind.—
 Technical Session To Be Held While En Route—
 Entertainment Provided for the Ladies

THE Chicago meeting of the American Institute of Mining and Metallurgical Engineers will be held on Sept. 22 to 26, as previously announced. Among the subjects to receive particular attention will be the iron and steel industry, which has reached such importance in Chicago. It is planned during the meeting for the Institute to make an excursion in a body to Gary, Ind. Arrangements are being made to charter a steamer, which will convey the members and guests across the south end of Lake Michigan, directly to the steel works. A tour will be made through the various departments of the steel plant, and luncheon will be served at Gary. Technical sessions on subjects in ferrous metallurgy will be held on the boat.

The banquet has been scheduled for the evening of Wednesday, Sept. 24, at the Congress Hotel. By putting this function in the middle of the week, it is ex-

pected that a maximum attendance can be obtained. Members able to come for only a portion of the session can then be present at the banquet, whether they come for the first or latter part of the week. An elaborate program for the entertainment of the ladies is being prepared.

Legislation Affecting Mining

WASHINGTON CORRESPONDENCE

A duty of \$10 per unit on crude tungsten, ores and concentrates is provided in a bill reported favorably to the House July 28 by the Committee on Ways and Means. The bill also provides that metallic tungsten, tungsten powder, ferrotungsten, ferrotungsten powder, commercial tungsten acid, calcium tungstate, sodium tungstate and all other salts of tungsten and other manufactured materials containing tungsten shall pay \$1 per pound of tungsten contained therein.

The bill was reported out in exactly the same form as it was introduced by Representative Timberlake, of Colorado. The vote in committee was along party lines, with the exception of Representative Martin, Democrat, of Louisiana, who voted with the Republicans.

The bill providing high rates of duty on laboratory glass and porcelain ware, optical glass, scientific and surgical instruments was also reported favorably. The magnesite bill was discussed, but no agreement was reached by the committee. The potash bill was not taken up.

It has developed that the Tariff Commission is opposed to administering any licensing system. It came to the knowledge of the commission that it had been suggested as the proper body to administer the licensing machinery, and the result was that the commission not only reiterated its opposition to most of the licensing suggestions, but emphatically urged that it not be selected to administer any of the licenses.

Operations at Guanajuato, Mexico

GUANAJUATO CORRESPONDENCE

New capital appears to be interesting itself again in the Guanajuato district of Mexico. It seems safe to say that this camp, formerly one of the greatest producers of silver in the world, will experience another era of prosperity, whether or not intervention occurs. Much interest is being manifested in the coming gubernatorial election, there being two candidates for the office, one Antonio Madrazo, a mining engineer of Laon, Guanajuato, and the other General Frederico Montes, of Irapuato, who holds a commission in the Carranza army. The election promises to be close, as public favor seems to be rather evenly divided.

Owing to the heavy rains that have fallen incessantly during the last month, work has been greatly hampered in the district, the rainy season being the heaviest in ten years. New and more extensive operations are contemplated by the Guanajuato Development Co. at Guanajuato and in outlying districts. Change in the directorate of this company and its subsidiaries, the Peregrina Mining & Milling Co. and the Pinguico Mines Co., was effected on June 12. George W. McElhiney succeeds Willard P. Reid as president. The other officers are P. E. Sharpless, vice-president; Wright Johnson, vice-president and secretary, and W. H. Porter, treasurer. No change in the

management of the mines at Guanajuato will be effected, Keith A. Cunningham still acting as general manager. The New York office of this company is at 50 Broad St.

The Peregrina Mining & Milling Co. is planning to install rock drills, owing to the shortage of labor, which is caused by the natives leaving to plant corn and their reluctance to work in wet stopes caused by the heavy rains.

Construction work on the new 15-stamp mill being erected by the United Mines Co. at Melladito, in La Luz district, has been retarded by the inability to haul freight from Guanajuato as rapidly as heretofore. The road was recently put in fine condition, but wash-outs caused by the rains have made transportation difficult. It is expected that this mill will be operating in the very near future. Joseph MacDonald is general manager.

At Santa Rosa, the Cia. Metallurgica de Santa Rosa is erecting a 15-stamp mill at its Durazno mine, which is expected to be in operation soon. This company is owned and managed by Mexicans, Andre Villafañá being general manager.

The Coal Situation

No Investigation Likely Unless the Prices Jump—
Heavy Buying Expected in Fall—Delay in Ordering May Cause Inconvenience

WASHINGTON CORRESPONDENCE

AS IT IS too late for a coal investigation to do anything but harm, as far as next winter's situation is concerned, it is likely that the matter will be dropped. The Rules Committee of the House already has indicated that the charges made at its hearings are matters for the attention of the Department of Justice. The Senate committee will probably take the same view.

If, however, there should be a decided increase in the price over the present level, there may be a Congressional investigation. The principal influence which worked against a complete investigation at this time was the fear that the public would expect lower prices and would hold off buying.

Domestic stocks in the cities are normal, but in the Middle West and Northwest householders have not as yet laid in their supplies. Large consumers have been buying coal all summer on a hand-to-mouth basis. This includes the railroads. About the time the car shortage, exaggerated by grain movement, becomes most acute, the big consumers will start to buy. Exports will be somewhat heavier, and it is predicted that householders who wait until autumn will have difficulty in securing their supplies. Even in the cities there is a tendency on the part of the public to take chances on another mild winter. If the coming winter should be severe, there will be widespread inconvenience and suffering. If it is mild, there will be no difficulty in meeting coal demands.

Bituminous coal in the ground is plentiful and too widely distributed to make it possible for any group to dominate it. In anthracite the price has reflected the heavy interest and tax charges which must be met by the companies who are holding land for future development. It hardly seems fair that the consumer should pay for the expenses of carrying undeveloped

land—but that is another story. Anthracite will probably be available in practically normal amounts next winter. The bituminous situation may possibly not be as alarming as some may have assumed. However, the advertisements and warnings of the National Coal Association are justified and entirely legitimate. The increase in coal prices is not as great as it has been in the great bulk of commodities.

There is much confusion in the bituminous market, which is the cause of much disparity in prices. Railroad bids on the same coal at the same point of delivery vary from \$1.65 to \$2.50. The same grade of coal was sold in St. Louis week before last at prices varying from \$1.15 to \$2.65.

July Mining Dividends

Disbursements to stockholders in July, 1919, by eighteen United States mining and metallurgical companies making public reports amounted to \$5,705,274, compared with \$5,765,456 distributed by thirty companies in July, 1918. Canadian, Mexican, and Central American companies paid \$1,715,575, as compared with \$864,342 a year ago.

MINING DIVIDENDS

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Smelters, pfd. A.	U. S.-Mex.	\$1.50	\$146,071
Am. Smelters, pfd. B.	U. S.-Mex.	1.25	42,962
Caledonia, l. s.	Ida.	.01	26,050
Camp Bird, pfd.	Col.	.18	110,501
Cresson Cons., g.	Col.	.10	122,000
Daly, l. s.	Utah	.10	15,000
Golden Cycle, g.	Colo.	.03	45,000
Homestake, g.	S. D.	.50	125,580
Inspiration, c.	Ariz.	1.50	1,772,951
New Jersey Zinc.	U. S.	2.00	700,000
Phelps Dodge, pfd.	U. S.-Mex.	2.50	1,125,000
Plymouth Cons., g.	Cal.	.24	58,520
Portland, g.	Col.	.02	60,000
Shattuck Arizona, c.	Ariz.	.25	87,500
Tonopah Belmont, g. s.	Nev.	.10	150,000
Tonopah Ex., g.	Nev.	.10	128,280
United Eastern, g.	Ariz.	.07	95,410
U. S. Smelting, com.	U. S.-Mex.	1.25	438,894
U. S. Smelting, pfd.	U. S.-Mex.	.87½	425,555
Wolverine, c.	Mich.	.50	30,000
Canadian, Mexican and Central American Companies			
Asbestos Corp'n., com.	Que.	\$1.25	\$37,500
Asbestos Corp'n., pfd.	Que.	1.50	60,000
Belmont Surf Inlet, g. s.	B. C.	.05	125,000
Cons. Min. and Sm., c. z. l.	B. C.	.62½	261,936
Howe Sound, c.	B. C.	.05	99,208
McKinley-Darragh-Savage, s.	Ont.	.03	67,431
Nipissing, g. s.	Ont.	.50	600,000
Santa Gertrudis, g.	Mex.	.24	364,500
N. Y. & Honduras Rosario, g. s.	C. A.	.50	100,000

The totals for the first seven months of 1919 are as follows: the 1918 figures being given in parentheses: United States mining and metallurgical companies, \$55,745,066 (\$95,528,466); Canadian, Mexican, Central, and South American mines, \$9,775,856 (\$10,584,028); holding companies, \$900,005 (\$1,066,866).

Italian Imports in 1918

According to *La Metallurgia Italiana*, reprinted in the *Ironmonger*, imports of the principal ores and metals into Italy in 1917 and 1918 were as follows:

	1918, Metric Tons	1917, Metric Tons
Iron ore	1,951	313
Manganese ore	5,452	21,538
Lead ore	5,478	4,838
Copper ore	404	467
Pig iron	115,211	315,953
Steel ingots	5,411	42,894
Aluminum and alloys	5,008	3,996
Nickel and alloys	3,215	3,293
Lead and antimony	45,165	32,372
Copper, brass and bronze	80,533	93,640
Tin and tin alloys	2,241	3,266
Zinc	10,749	19,383

BY THE WAY

Pay Today, Trust Tomorrow

The Department of State has been advised by the American Embassy at Mexico City, as well as by the Mexican Ambassador to the United States, Mr. Bonillas, that the Mexican government will authorize the temporary boring of oil wells provided the interested parties apply to the Department of Industry and Commerce for such permits under the formal promise that they will be subject to legislative regulations that may be enacted in the future by the Mexican government. The Department of Industry and Commerce is to issue at once a circular "relative to this matter."

Pike's Peak Without Busting

Bucking snow drifts for the last two miles at an altitude above timber line, climbing steep grades and rough places where only Dr. Cook would feel perfectly safe, a five-ton caterpillar tractor gained the summit of Pike's Peak on June 16 and had its picture taken. Rather cold for most caterpillars to be out, but not for this one! Having seen what was on the other side of the mountain, like the bear of song and story, it went back to Denver on June 17, after running 235 miles.



A CATERPILLAR ON PIKE'S PEAK

The Origin of the Tank

The cause and origin of the tank was Hugh F. Marriott, president last year of the Institution of Mining and Metallurgy. So said Major General E. D. Swinton at the Institution's dinner on Apr. 10 last in London. General Swinton's remarks are reported in the society's *Bulletin* in part as follows:

In July, 1914, Mr. Marriott wrote to him from Antwerp—where his job at the moment was trying to find out some cheap and efficient form of transport across rough country for mining purposes. He knew all about rope railways, telpherage, narrow-gauge railways, and so on, and informed him that in Antwerp he had seen an American caterpillar tractor which would go over rough country and "climb like hell." This, it must be remembered, was before the war. He (General Swinton) was able to go to the War Office and the Admiralty and tell the people concerned that there was an American tractor in Antwerp which would, in the words of his friend, "climb like hell," and that it was up to them to investigate it for tractive purposes. The machine referred to was the Holt tractor. Shortly after that

he had gone out to the war, as a journalist, and his position gave him an opportunity of seeing and learning a lot. It was then that he became convinced that a machine which could "climb like hell" was a thing not to be lost sight of, and if it could be developed or improved into a bullet-proof machine that could climb "to beat hell" they had something which might meet the German machine guns.

Mr. Marriott replied that had it not been for General Swinton's initiative and determination in the face of inertness and opposition to push the idea of that caterpillar tractor, together with the details of construction which were essential for its success, he did not believe that the British would have had a tank in action.

"Speaking of Operations"

"I 'as mentioned tha fac' befor that this 'ere physical h'examination be a gert thing, m'son," said Cap'n Dick. "Dam-me, there be many o' tha minin' companies 'ave un naow, an' tha practus seems to work h'out 'andsome. There h'often be them 'ookem-snivey rascals 'o is lookin' for some chance to do tha company, an', dam-me, this 'ere seems to be one way to beat un. Then there be they chaps 'o look 'ale an' 'earty, an' in troth they be nothin' but a bloody shell, an' firs' thing tha super naws 'e's payin' h'out 'alf-time wages for sumthin' that's no bloody fault o' tha company's at all. Speakin' o' this physical h'examination reminds me o' tha story baout Jimmy Trebilcock. Jimmy, 'e decided some time h'ago that 'e would take h'out some life h'insurance, so h'up 'e gaws to see one o' they doctors an' 'ave un gaw h'over 'e. Tha doctor 'e geeks Jimmy from 'ead to foot, an' then 'e starts soundin' 'im with one o' these 'ere stethoscopes. After 'e gets h'all through, 'e says to Jimmy, 'Tha h'only thing I can fin' wrong is that thee seems to 'ave some h'organic trouble.' 'What's that?' says Jimmy. 'I says thee seems to 'ave some h'organic trouble,' repeated they doctor. 'Oh, gos along,' says Jimmy, 'thee mus' be wrong baout that. There's nothin' musical baout me.'" D. E. A. C.

Separations, Limited

"Aha, Bill," said the shift boss, as he retrieved his tobacco pouch; "so ye do not favor Separations Limited." "Thanks to recint decishuns av the coorts," replied the thick-skinned borrower, "this here siparayshun av the laborin' man an' his pleasure is goin' beyond the limit. Aftther the byes took to warin' thim buttons that sez 'may we not have our beer?' it looked like we might get to the root av things on a 'percentage decishun. Some fellies contind that with less than 2.75 percent av the necess'ry ingrejint, a good froth is had, and the gang is depressed accordin' to spificayshuns av the killjoys. On the other hand, the bluenoses contind that while a good froth may be had without elevatin' the spirits and that froth may be had at almost anny fraction av the stated percentage, nivertheless it is not the froth alone that is claimed to do the work; but rayther the idea av a percentage av admixture, av which idea the froth was a symbol and constituted, with the aid av the risin' bubbles of gas, a definite means av evadin' the patent fact that the whole object av the aminded process was to prevint anny elevayshun of the spirits; an' that the depresshun av the gang was merely incidental an' not to be regarded as anny fundamental part av the process an' not particularly desirable except as it contribbtyed to the reduction av conviviality, an' thus assisted the major function av the perfected process. An' now, Mister Clancy, I'll trouble ye for a match."

PERSONALS

J. LEONARD REPLOGLE, who was Steel Director of the United States and responsible for the allocation of steel supplies during the war, has been recently made a Chevalier of the Legion of Honor by the French government in recognition of his services.



J. LEONARD REPLOGLE

Photograph from Underwood and Underwood, N. Y.

Mark L. Requa is again in the East after an extended trip through the West.

W. Parsons Todd, vice-president of the Quincy company, visited the property last week.

Leon M. Hall has opened offices as a consulting engineer at 7434 Call Building, San Francisco.

M. O. Carlson, recently mining engineer with Burma Mines, Ltd., Burma, India, has returned to Denver, Col.

Kirby Thomas is making an examination of chrome and asbestos properties at Black Lake and Danville, Quebec.

H. E. Beauchamp, of Douglas, Ariz., is making examinations in the Virginia and Gold Hill districts, near Lordsburg, N. M.

W. Jacobson, of Toronto, Ontario, has taken charge of the developments on the Ross lot for asbestos and chrome at Black Lake, Quebec.

Ralph V. Davies has accepted a position in the technical control department of the Aluminum Co. of America, New Kensington, Pa.

Bennett Bates, representative of the Dorr Co., is visiting the principal mining districts of southern Mexico on business for the company.

Joseph S. Qualey, of New York, president and general manager of the Matachewan Gold Mines, of northern Ontario, is on a visit of inspection to the property.

F. G. Cottrell, who has been studying the mineral situation in Europe, will return to Washington about the middle of August to assume his new duties in connection with the Bureau of Mines.

Douglas D. Moffat, consulting engineer for the Jackling mills, is in Salt Lake City. Mr. Moffat was superintendent of the Ray Consolidated mill at Hayden, Ariz.

Hubert C. Field, one of the directors of the Guanajuato Development Co., is in Guanajuato investigating matters relative to new operations contemplated by his company.

W. R. Crane, of the mineral commission, Washington, has been making an examination of the chrome and manganese deposits in the vicinity of Black Lake and Coleraine.

John L. Church has returned to civil life after serving for 18 months as a captain in the engineer corps. Captain Church has opened an office in Kohrs Block, Helena, Mont.

Henry Leighton, professor of economic geology, University of Pittsburgh, has returned from a month's investigation of mica and feldspar mines in North Carolina and Georgia.

Robert Harvie, geologist, and **Eugene Pointin**, mineralogist, from the Department of Mines, Ottawa, are continuing their investigations of the serpentine belt in the Thedford district.

N. Palmer, formerly manager of the Worthington nickel mine, Sudbury, Ontario, has been appointed general superintendent of the Black Lake Asbestos and Chrome Co., of Black Lake, Quebec.

Adolph Lewisohn was presented with a large silk American flag by Mayor Hylan at one of the series of People's Concerts in Central Park, New York, in recognition of his musical gifts to the public.

L. W. Ledyard has resigned his position as manager of the Beaver Consolidated property in the Cobalt district and the Kirkland Lake gold mine, and will take up his residence in the Southern States.

A. G. Burrows and **Cyril Knight**, of the Ontario Bureau of Mines, are making geological surveys for a map embracing the Kirkland Lake, Boston Creek, Larder Lake, and Skead Township gold areas.

Henry P. Smith, general manager of the Guanajuato Reduction & Mines Co., Guanajuato, Mexico, is at the present time in Los Angeles, Cal. Mr. Smith will return to Guanajuato in the early part of August.

F. C. Wallower has returned to Joplin after attending the Rotary convention at Salt Lake City and visiting some of the larger mining properties in Idaho. Mr. Wallower is manager of the Golden Rod Mining & Smelting Co.

Arthur Thacher, western manager of the New Jersey Zinc Company, with headquarters at St. Louis, made his second visit to the Joplin-Miami district and attended the weekly meeting of the

Tri-State branch of the American Zinc Institute at Picher on July 23.

Arthur Lakes, Jr., mining engineer, has returned from service in France and rejoined his firm of Larson & Lakes at Spokane. Mr. Lakes was promoted to major while in charge of administration, transportation, and construction at Neufonateau.

F. J. Bailey, of the U. S. Bureau of Mines, has been promoted to assistant director of the Bureau of Mines, and **H. E. Meyer**, who has been secretary for the Minerals-Relief Commission, at present in San Francisco, has been promoted to chief clerk of the Bureau of Mines.

T. D. Jarvis, pathologist of the International Nickel Co., Copper Cliff, Ontario, left recently on an extended trip through the West to study the smeltery-smoke problem and its effect on vegetation. His itinerary includes Salt Lake, San Francisco, Anaconda, and Seattle.

N. O. Lawton, general superintendent of the Vermont Copper Co., South Strafford, Vt., is at Pilleys Island, Newfoundland, superintending diamond drilling at the old Pilleys Island mine to explore for the extension of the vein. Mr. Lawton was manager of this mine 13 years ago.

Zach Lamar Cobb, formerly collector of customs and agent of the Department of State at El Paso, Tex., and thereafter attached to the War Trade Board at Washington as adviser on Mexico, announces that he has resumed the practice of law, with offices in Anson Mills Building, El Paso, Tex.



HARRY J. WOLF

Harry J. Wolf, for a number of years a practicing mining engineer with headquarters in Colorado, and professor of mining in the Colorado School of Mines, has become associated with the *Engineering and Mining Journal*, as assistant editor. Mr. Wolf was formerly secretary of the Colorado Scientific Society and his report for the year ended Dec. 18, 1918, has just been published.

MINING SCHOOLS

Cambridge University has received the gift of \$1,050,000 from British oil interests which have united in a scheme for endowing a chemical school at this university. The *London Daily Mail* states that the donors are the Burmah Oil Co., the Anglo-Persian Oil Co., and the Anglo-Saxon Petroleum Co., which give \$250,000 each; Lord Cowdray and Clive Pearson, who give \$125,000 each, and Mr. Deterding, who personally contributes \$50,000.

INDUSTRIAL NEWS

Sprague Electric Works of the General Electric Co., New York, has issued a pamphlet descriptive of Sprague electric ozonators for cold-storage warehouses.

A. H. Simpson Co., dealers in used mining machinery, announce the removal of their salesroom and general offices to 129 Fremont St., San Francisco, Cal.

Chicago Pneumatic Tool Company announces the appointment of N. S. Thulin as special railroad representative on the staff of S. C. Sprague, manager of western railroad sales.

McKiernan-Terry Drill Co., 15 Park Row, New York, has published a bulletin describing three sizes of rotating hammer drills. Sizes F-2 and F-44 are furnished with a water-feed attachment for allaying the drill dust.

United Filters Corporation has recently established a sales office at 35 Montgomery St., San Francisco, Cal., under the direction of the Western Steel & Engineering Corporation. In addition to this office, the company's activities on the West Coast are also taken care of by Kennard & Bierce, of Los Angeles, and the United Iron Works, of Spokane, Wash.

International Motor Co. has distributed a five-page circular by R. E. Fulton, vice-president, in which a comparison is given of the cost of handling freight by motor trucks and railways. A table is included giving relative costs for each kind of transportation between New York and a number of important Eastern localities. A number of other details, including weight of moisture carried by boxes, delivery time and working days and miles per year, are discussed.

Armstrong Cork and Insulation Co., Pittsburgh, Pa., has issued a pamphlet with a circular insert entitled "Saving 63 per cent of the Drinking-Water Expense," and devoted to a discussion on modern drinking-water systems which maintain a palatable temperature, eliminates the use of the drinking cup, and claim a reduction in cost of supplying

drinking water to workmen from \$5 to \$1.82 per man per year, according to milling plant records. The company has published a 48-pp. book on the subject "Drinking-Water Systems," which will be sent free upon request.

Sullivan Machinery Co., Chicago, Ill., announces the resignation of Phillips F. Jarvis as sales manager for the territory controlled from its St. Louis office. The following appointments have been made: Marion C. Mitchell, sales manager in Indiana and Illinois, previously controlled from the St. Louis office, with temporary headquarters at Railway Exchange, St. Louis; Don M. Sutor, formerly manager of the El Paso office, sales manager for western Kentucky, western Tennessee, Missouri, Arkansas, Oklahoma and Kansas (except the oil territory), with headquarters at Railway Exchange, St. Louis; Daniel H. Hunter, sales manager for Louisiana, Texas (except the southwestern section), and the oil fields of Oklahoma and Kansas, with headquarters in Dallas, Texas.

Thompson Starrett Co. has published a brochure containing a number of pictures of the accomplishments of the company since its organization about eighteen years ago. This company organized the Chile Exploration Co.'s construction department, and, in the earlier stages of the construction of the reduction plant in South America, acted as advisory contractor. One illustration shows some parts of a larger construction program originally planned but temporarily restricted by the great war. The cost was \$20,000,000. The Thompson Starrett Co. has executed a total of over 400 contracts, involving a grand total of more than \$300,000,000, of which 52 were over one million dollars, 22 in excess of five millions, 7 in excess of ten millions, and one exceeding sixty-five millions of dollars.

TRADE CATALOGS

Texaco Petroleum Products. The Texas Co.; 9½ x 12; 46 pp.; illustrated. Descriptive of the lubricants manufactured by the company, and their uses.

Hammer Drills. Sullivan Machinery Co., Chicago. Pamphlet 118, 3½ x 5½; 32 pp.; illustrated. Descriptive of Sullivan hammer and rock drills, in which is shown and described a drill for every kind of rock excavation in mine, quarry or on public work. Various types of compressors manufactured by the company are also described.

Soot Cleaners. The Vulcan Soot Cleaner Co., Du Bois, Pa. Bulletin No. 541; 8½ x 11; 8 pp.; illustrated. Describes the Vulcan patented diagonal method for cleaning soot from tubes of horizontal water tube boilers. A discussion on "The Cost of Vulcan Cleaners and an Analysis of Their Value as Investments" is included.

Crushing Rolls. Allis-Chalmers Manufacturing Co. Bulletin 1,816; 8 x 10½; 15 pp.; illustrated. Descriptive of various designs of rolls which have been manufactured for many years. Tables of dimensions are included. Bulletin 1,817 is devoted to the care and upkeep of crushing rolls; also data for the determination of sizes of feed, speeds, and capacities.

Ruth Laboratory Testing Flotation Machine. The Mine & Smelter Supply Co., Bulletin 57; 6 x 9; 8 pp.; illustrated. Descriptive of a laboratory flotation machine which is manufactured in two sizes called Junior and Type "X," 6 in. The Junior will treat a charge of one kilo, and Type "X" will handle about 10 lb. The smaller type has a glass front and weighs, with stand, 115 lb.; the larger weighs, with stand, 165 lb. Both types are composed of a single cell having an anti-swirl plate, and are furnished either with or without a motor.

NEW PATENTS

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

Aluminum. Process for Securing Metals From Their Compounds. Victor M. Weaver, Harrisburg, Pa., assignor to Weaver Co. (U. S. No. 1,297,946; Mar. 18, 1919.)

Aluminum Alloy. Archibald O. Mason, Chicago, Ill. (U. S. No. 1,305,300; June 3, 1919.)

Aluminum Alloy. Henry C. Kirk, Roland Park, Md. (U. S. No. 1,305,551; June 3, 1919.)

Bins—Telltale and Means for Controlling the Feed of Material to Hoppers or Bins. Charles J. Gadd, Lebanon, Pa.; Anna Eyre Gadd, executrix of said Charles J. Gadd, deceased. (U. S. No. 1,304,553; May 27, 1919.)

Briquet Machine. Swan E. Moren, Biwabik, Minn. (U. S. No. 1,306,309; June 10, 1919.)

Cables—Composition for Protecting Wire Cables, Ropes and Other Bearing Surfaces. Ephraim J. Keith, Sikeston, Mo. (U. S. No. 1,305,222; May 27, 1919.)

Conveyor Cable. Hugh F. Ellard, Gilmore, Idaho. (U. S. No. 1,305,204; May 27, 1919.)

Drill—Mine Drill. Frank Kalata, Springfield, Ill. (U. S. No. 1,305,219; May 27, 1919.)

Fuel—Feed Regulator for Powdered Coal. Hanson Thomas and John Dahlstrom, Pittsburgh, Pa. (U. S. No. 1,304,407; May 20, 1919.)

Leaching—Apparatus for Treating Solid-Bearing Solutions. Lamartine C. Trent, Los Angeles, Cal. (U. S. No. 1,307,329; June 17, 1919.)

Placer-Gold Separator, Rotary. Otto V. Bauer, Alamosa, Col. (U. S. No. 1,303,233; May 13, 1919.)

Siliceous Ores, Method of Treating George H. Wigton, Eureka, Utah. (U. S. No. 1,305,327; June 3, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

PORTOLA, CAL.—July 24

At the Walker Mine considerable progress has been made in the erection of the aerial tramway for connecting the mine with the Western R.R. at St. Louis Garden. This tramway has the following principle features: Length, approximately nine miles; elevation loading terminal 6,000 ft.; elevation discharge terminal 4,000 ft.; elevation high point, 7,000 ft.; initial capacity, six tons concentrates per hour; ultimate capacity, twelve tons concentrates per hour. The tramway is of the Leschen heavy-duty friction-grip type. There will be eight tension stations and 104 towers. The track ropes are to be 13-in. and 1-in. diameter of locked-soil construction, and the traction rope will be 3-in. The carriers for handling the concentrates will be of 6-cu-ft. capacity, and there will be special carriers for handling merchandise and supplies from the railroad to the mine.

RENO, NEV.—July 24

The Old Tybo Mine, 60 miles northeast of Tonopah, will be unwatered at once and developed on a comprehensive scale, according to F. W. Draper, consulting engineer and general manager of the Louisiana Consolidated Mining Co. Plans for building a smelter on the ground are also being completed. The Tybo ores contain silver, gold, lead, and zinc, the silver running quite uniformly two ounces to one per cent of lead. During the 70's the Tybo mine was extensively operated and produced several million dollars' worth of ore, the most of it being smelted, but in 1876 a 29-stamp mill was erected and treated 12,000 tons, producing bullion containing 834,000 oz. of silver and 5,050 oz. of gold. Considerable ore is now opened up in the mine. A report made by John Farish in 1910 estimated the ore to average about 217 per ton, with silver at 52c. per oz. and lead at 4c. per lb. The present operations are being financed by the sale of bonds, most of which were taken by holders of stock in the Louisiana company.

BISHOP, ARIZ.—July 24

At Bishop, an increase of 50c. to \$1 a ton in wages is to date from July 16, has been announced for copper miners in the Warren district, and for smelter employees at Douglas. According to G. N. Powell, general manager of the Copper Queen, the new scale will be on the basis of 24c. copper because of the continued high cost of living.

EL PASO, TEX.—July 24

El Paso Chamber of Commerce, through its board of directors, recently passed a resolution endorsing the National Association for the Protection of American Rights in Mexico, at the same time other chambers of commerce in that section of the Southwest were urged to pass resolutions of a similar nature.

The War Camp Community Service at El Paso has received requests from the Arizona and New Mexico asking the service to send them discharged soldiers who are machinists, mechanics, boiler makers, carpenters, tinmiths, miners and muckers. They offer to furnish transportation.

A Study of Mining Laws of various states is being made by New Mexico mining men, aided by the state mine inspector and members of the faculty of the State College near Las Cruces. An attempt will be made to secure legislation to the end that the interests of the mining industry shall be in just proportion to taxes paid by other industries.

AUSTIN, TEX.—July 23

Small Refineries dependent upon daily production from the Burk Burnett field were taken care of by one of the largest producing companies during the enforced shutdown of the northwest extension of the field. Oil speculators were hard hit.

Burk Burnett Northwest Extension was reopened July 18 by order of the railroad commission after a five-day shutdown. Investigation showed that overproduction leading to a possible break in the price of light crude oil was more feared than wastage, and as former was not considered within commission's jurisdiction it was decided the shutdown would not continue. Orders were issued on July 18 to prevent further wastage by stopping all leaks and overflows of oil.

WALLACE, IDAHO—July 24

Forest Fires have destroyed large bodies of timber on the North Fork of the Coeur d'Alene River, and are still raging. The prolonged dry spell has been especially favorable to fires, and is also making water supply for mining purposes a serious problem. There has been no rain since about June 1. As the usual dry season opens up about this time and continues until September, the outlook for relief is not encouraging.

Wages Have Been Advanced 50c. per day, effective as from July 16, by Coeur d'Alene mine companies. This restores the war-time bonus, making the wages of underground men \$5.25 per day. This increase was one of the demands made several weeks ago by the miners' union. In making the advance, the companies explain that it is due to the recent rise of about half a cent in the price of lead. In a statement issued several weeks ago following the demand of the union, when lead was around 5c., it was stated that an increase of wages was impossible owing to the condition of the lead-mining industry, and that some of the companies were then operating at an actual loss.

Butte Stockholders in the Tarbox Mining Co. failed to oust Richard Daxon as manager at the annual meeting of stockholders held on Wallace on July 21. Daxon controlled in round figures 900,000 shares of the 1,600,000 issued, whereas the Butte faction could muster fewer than 500,000. Protesting against what they claimed was illegal proceedings in the organization of the meeting, the Butte faction withdrew and elected a board of directors, claiming to be a majority of the stock at the regular meeting directors were elected and Mr. Daxon was re-elected president. The Butte stockholders have announced that they will ask for the appointment of a receiver to take over the affairs of the company. The mine is developed to a depth of 1,000 ft., and a large body of lead-silver-zinc ore has been exposed, containing 40 to 50 oz. of silver and 1,000 levels. The mine is about three miles from Saltsee, Mont.

BUTTE, MONT.—July 25

Unprecedented Low Water in Montana may seriously affect the operations of the Washoe reedment works of the Anaconda company. At present the plant is working only 40 per cent capacity owing to industrial conditions at the Butte mines. Silver Lake, near Anaconda, the present source of water supply, will be exhausted within several months. Anaconda is planning to use the waters of Georgetown Lake. The latter is about three miles distant from Silver Lake, from which the water flows by gravity to the Washoe plant. Pumping will be necessary.

SALT LAKE CITY, UTAH—July 24

Underground Accidents in Metal Mines in Utah have thus far in 1919 been unusually few in number, according to the report of the inspector of mines for Utah. He has been able to clear up one case in six months, as compared with sixteen accidents for the twelve months of 1918, showing that the efforts of the mining companies to safeguard their employees, secondarily to the men themselves, are bearing fruit. For surface work the record is not so good, there having been three fatal accidents in 1919, as compared with eight in 1918 and four in 1917.

Wages in practically all of the camps of Utah are being restored to the high level reached during the war, in anticipation of

a better metal market, of which there are indications, and in view of the high cost of living for employees, which has shown no appreciable decline. The wage scale is: Machine men, \$5.25; machine men's helpers, \$5; miners, \$5; muckers, \$4.75; timbermen, \$5.25; laborers, \$4. With the metal market not yet stabilized, costs with few exceptions as high as ever, and both state and Federal taxes heavier than heretofore, the move made voluntarily by the operators is a lien on the future prosperity of the industry, and for the present will be felt by many companies as an added burden. The first relief has come in the rise in the price of silver, and with copper going up there is prospect that the mines—in a number of cases reduced to 50 per cent of their normal output—will soon be able to increase production.

In regard to the price of silver, Utah producers of that metal, through the local chapter of the American Mining Congress, are protesting the proposal of the Treasury Department to deliver 100,000,000 oz. of silver to England for coinage purposes at \$1 an oz. The industry, it is felt, should profit from the favorable price of silver. Price fixing was cheerfully accepted during the war as a measure for stabilizing the market, but it is now felt that peculiar conditions exist, and that the market should be open on equal terms to all buyers, whether foreign or domestic.

DENVER, COL.—July 24

New Freight Rates on ore and concentrates shipped from Boulder, Gilpin, Clear Creek, Summit, and Park counties, Colorado, to the Pueblo smelter became effective on July 21. The new rates are equivalent to a reduction of 20 to 25 per cent. It was announced on June 30 by the Denver district freight traffic committee that authority had been received from Washington to make new rates effective on thirty days' notice to the Interstate Commerce Commission. This action was taken upon application by the Colorado Metal Mining Association, supplemented by the efforts of the local mining organizations of the counties mentioned. The closing of the Globe plant of the American Smelting & Refining Co., at Denver, necessitated shipping to Pueblo at an additional freight cost of \$1.30 per ton.

JOPLIN, MO.—July 26

Labor Shortage has developed in the Joplin-Miami district but there is no semblance of labor troubles. Mine operators are paying \$1.50 per day more than they were three or four years ago, and recently raised wages approximately 25c. per day when the price of ore went above the \$50 mark. This is in accordance with an unwritten agreement entered into between operators and miners several years ago, whereby wages mount 25c. per day with every 10 increase in the base price of zinc ore. The shortage of shovelers, however, has caused a number of different mines, and a bonus is being paid at many properties.

Sale of the M. & M. Mine to the Niangua Mining Co. was recently completed, the consideration being \$150,000. The M. & M. mine is the west twenty acres of a forty-acre tract bought by the Niangua company two years ago from Charles Stricker, of Miami, Okla., for \$10,000. The Niangua company sold the 20-acre lease for \$40,000 to Hare Mining Co., about a year and a half ago. The Hare company developed the tract by drilling and built a concentrator. The Niangua company also built a mill, and both plants have turned out considerable ore, though the Hare plant was shut down on account of low ore prices last year. Seven weeks ago V. Grant, J. K. Moore, S. Walker, and J. W. Keys bought the mine from the Hare company, paying \$100,000. They developed some of the property and made a profit of \$10,000 in the seven weeks they operated, and were loath to close the option they had given for the property to the Niangua company soon after they com-

pleted their purchase from the Hare company. The property henceforth will be known as the Niangua No. 2.

Drainage of a Large Area of zinc and lead lands west of Baxter Springs, Kan. is under way through the Hare Co. which is a subsidiary of the American Metal Co. Pumping equipment includes two 10-in. Pomona pumps, an 8-in. and two 6-in. American two-stage pumps, and two additional Pomona's at another shaft. Water is being hoisted at the rate of 7,500 gal. per min. The drainage plan has been worked out differently than most schemes of the sort in this district, in that a shaft was sunk in solid lime to 100 ft. below the water level, and then 100 ft. to the way.

Before reaching the water a steel gate embedded in concrete was constructed 10 ft. from the shaft, and it is equipped with four 12-in. pipes to permit feeding the water to the shaft in any amount up to 5,000 gal. per min. The Chanute Spletter Co. has erected a big mill at the site of the principal pumping plant, with an intake on the E. side and west of the water, and also owns about 25,000 acres of leases in the same section, upon which no fewer than 20 mill sites have been drilled out. With this drainage work the laudable mines will be started toward full development.

DULUTH, MINN.—July 21

Contract Wages for Miners on the Minnesota iron ranges are averaging \$6.50 and \$7 a day, and the men are pleased with the system, as they are not working nearly as hard as they did four years ago at about half the money. Wages of skilled gangs of miners are running all the way up to \$10 and \$11 a day. In the open-pit mines, men on the trunk line are making \$4.84, and pit men \$5.25 a day. Locomotive firemen, running small mine engines, make \$5.30, and engineers nearly \$7 a day. A shovel crew makes \$7.48, and the runner, the real aristocrat in the mining field, \$10 and \$11 a day. The last named employee, with a little overtime, is able to check his check up to \$400 a month. Under these conditions labor agitators are finding small encouragement in the ranges territory. Meetings have, however, been held at several of the range towns recently, in which the speakers exhorted the men to strike for still higher pay, or for a six-hour day, or for recognition of the union, and incidentally to make liberal donations to the "Red" cause. The miner is asserted, however, to be too smart for the agitator, remembering the 1. W. V. strike of 1916, for which he paid heavily in losses of wages.

IRONWOOD, MICH.—July 26

Labor Situation on the Gogebic Range is satisfactory. The expected large surplus of labor due to demobilization and dullness of steel and copper markets did not appear, although for a time there was a moderate over-supply. Now, however, there is hardly more labor than the usual number of "drifters" looking for employment.

HOUGHTON, MICH.—July 30

Calumet & Hecla on July 30 presented gold medals to all employees who have served the corporation for a period of forty years, silver medals to those in the service thirty years and bronze medals to those who have worked for the company continuously for twenty years. In this the company was following a custom established in 1916, when it celebrated its semi-centennial.

Copper Production in the mines of northern Michigan will not get back to normal during 1919 unless there is a radical change in the labor situation. Though a reasonable number of Michigan miners are coming back from the automobile industries, there will not be enough in total to offset the number who left in the spring. Mine managers believe that the days of cheap production are gone for good. The limits of the metallurgical improvements, it is generally believed, have been pointed out and applied for by the conglomerate and the Pyrrhoidal formations. Other changes that may operate to offset the higher wages will have to come in the mining end.

BIRMINGHAM, ALA.—July 26

In the Bessemer District production is expected to be a big mark within the next few months. The operations on Red Mountain are resuming operations, and furnaces and mills in the city proper are starting up or increasing their output. The Woodward operations were resumed at Songo mines, near Bessemer, and ten cars of ore per day at first is expected, though this will be increased as labor becomes more plentiful. With four of its five fur-

naces going, the company is putting its mines to work on full time, and in some cases has night shifts in order to supply ore needed by the furnaces. This company is said to have sold considerable iron ahead, and with consumers asking for immediate delivery of orders, shipping is expected to be each day.

A strike at the Virginia mines of the Gulf States Steel Co., brought about by the refusal of the men to wear a new safety cap, has been ended by the men finally agreeing to its use.

A tax of 3c. per ton on iron ore and 5c. per ton on coal has been approved by the Ways, Means and Appropriation Committee of the Alabama State Legislature. This tax, should it pass, will be a staggering blow to the two main industries of the state and shows an intention to put an unfair burden of taxes on the coal and iron district of Alabama. It is particularly regretted at this time, when all branches of the iron industry are struggling with some hope of success, to offset the heavy losses of the first half of the year.

A bill has been passed, and is awaiting the Governor's signature, requiring that 100 per cent of the shunting men of the state to procure a \$2,500 state license, and giving the city and county the right to issue licenses also, not to exceed one per cent of the state license. In addition, the bill requires that a bond of \$5,000 be furnished by the labor agent. When it becomes law, the bill will stop the large influx of labor to the North, which has seriously crippled industries in this district, particularly the mining divisions of the larger companies. The labor situation is the slight improvement during the last week of July over the first week, but the shortage is still serious, particularly at Bessemer, the main point from which the labor has been shipped.

PACHUCA, MEXICO—July 23

The Aerial Tramway being installed by A. Leschen & Sons Rope Co., of St. Louis, for the Compañía Beneficadora de Pachuca, A., is being rapidly completed. This is one of the most notable aerial tramway installations in Mexico, the line being about 4 1/2 miles in length, built in two sections, with an angle station at the midway, which is a long series of rollers, and a loading station. The initial capacity of this tramway is 60 tons of ore per hour, with an ultimate capacity of 100 tons per hour. Loaded-car tracks are used, and a patent flattened-strand traction rope. The carriers are of 16-cuft. capacity.

TORONTO, ONTARIO—July 25

All Miners of the Cobalt Camp went out on strike on July 23. About 2,000 men are affected. No attempt is being made to operate, and, as power has been cut off, the mines will be allowed to flood. The company can generate their own power for pumping purposes. The strike in many respects was peculiar, as the men almost without exception stated they did not want to strike. They worked to the last where wanted, and made every effort to assist the management in getting out the pumps and machinery. Practically the only point involved was the recognition of the Western Federation of Miners, which the managers have consistently refused to grant. The wages paid are a few exceptions as high as any paid on the continent, and the working conditions are of the best. A bonus is paid according to the length of time the lowest paid surface men received \$4 a day and the rate underground was from \$4.25 for muckers to \$5 for drill runners. Shaft and winzeil men received \$5.50. The managers it is said have no objection to a union of miners for Northern Ontario which will take out an Ontario charter, and be absolutely dominated by the Western Federation, but would recognize and deal with such a union. The situation has been complicated by the attitude of the Minister of Labor for the Dominion Government.

The American Cyanamid Co., which has a plant at Niagara Falls, Ontario, has been endeavoring to find a market for its low-grade cyanide in northern Ontario. The Canadian contains only about 35 per cent NaCN, as compared with 76 per cent and 96-98 per cent NaCN contained in the imported article. The manufacturer claims that this is impractical for the consumer, who pays only for the actual cyanide present as determined by analysis, and that they can deliver actual cyanide in this form at a cost of from 10 to 20 per cent below the current price of imported high-grade cyanide. They also asserted that, in addition to its having equal efficiency on the basis of NaCN content,

it contains a certain amount of calcium chloride, which accelerates the filtering process in gold and silver extraction. Representations are being made to the effect that the Canadian-made cyanide in the re-treating laboratory of the Haliburton Mining School, under conditions practically identical with those existing at the Cobalt mills. The results will be compared with those of similar tests of high-grade cyanide manufactured in Scotland. The Cassel Cyanide Co. of Glasgow, Scotland, has been the cutting off of the German supply has furnished most of the cyanide used by the mining companies, will endeavor to strengthen its hold on the Canadian market by establishing a subsidiary company in Ontario, to be known as the Cassel Cyanide Co. of Canada, Ltd. This decision is the result of the recent visit to Canada of William Neill, managing director, who was strongly impressed with the opportunities presented for the expansion of the company's business in connection with the mining industry. Mr. Neill will be managing director of the Canadian company, and two of his colleagues, Sir George Bellby and Sir Edward Bellby, of Brotherton, will also be on the directorate.

THETFORD, QUEBEC—July 26

In the Asbestos District of Quebec the business boom still continues. The demand is steady with little if any drop from war prices for crude ore. The market for short grades there has been a decided slump in demand, but inasmuch as the profit lies mainly in the longer grades, generally business conditions have not been noticeably affected. Labor has been decidedly stable, owing largely to the system of piecework adopted last season. By this system the laborers average about an eight-hour day. The employees engaged in the concentrators are working on a varying scale of from \$3.10 to \$5 and are generally less inclined to labor agitation. Construction work on the new storage system of the B. C. Mines of the Asbestos Corporation of Canada is progressing and is expected to be in operation in this fall. The capacity will be about 20,000 tons. It is intended to overcome the difficulty of slackened tonnage resulting from inclement weather as well as to secure a higher rate of production by drying and curing. At the Jacob's mine considerable caving in has developed owing to the underground operations loosening up the sides of the mill. The new water and milling system is now practically complete, however, and is expected to afford a large production.

Beam-shovel mining has now been proved a success in the fibre-producing mines. At East Broughton this system of mining has been adopted at all the mines, and mining costs have been brought in line. In the mines, however, where crudes have to be separated from the milling ore, it has not been found feasible to use the steam shovel. At the Elsie Lake Asbestos mine, where the manager, J. H. Murphy has resigned, and Milton, Hersey & Co., of Montreal, are acting as consulting engineers for the property, E. N. Palmer is acting as mine manager. Maurice Bousseau, of Montminy, purchased the Interstate Asbestos Co., at East Broughton, at a sheriff's sale on July 8.

VICTORIA, B. C.—July 17

British Columbia's Mineral Production in 1918, according to the annual report of the Minister of Mines, just issued, was derived from 2,392,249 tons of ore shipped, which came from 6,118 mines. Crudes shipped over 100 tons each during the year. In all, 4,148 men were employed on surface and underground. The total tonnage of ore produced in British Columbia by districts of the province as follows: Cassiar-Omineca district, 963,260 tons; southern coast district, 745,169; Boundary-Yale district, 723,463; Stoean district, 142,743; East Kootenay district, 41,570; Train Creek district, 112,349; Ainsworth division, 44,937; Nelson division, 15,348, other mining divisions, 1,115, total 2,392,249 tons. Production of the various metals was as follows: Gold (lode), approximately \$3,403,312; gold (placer), approximately \$320,000; Slocan district, 142,743; East Kootenay division, 41,570; Train Creek division, 112,349; Ainsworth division, 44,937; Nelson division, 15,348, other mining divisions, 1,115, total 2,392,249 tons. Production of the various metals was as follows: Gold (lode), approximately \$3,403,312; gold (placer), approximately \$320,000; Slocan district, 142,743; East Kootenay division, 41,570; Train Creek division, 112,349; Ainsworth division, 44,937; Nelson division, 15,348, other mining divisions, 1,115, total 2,392,249 tons. Production of the various metals was as follows: Gold (lode), approximately \$3,403,312; gold (placer), approximately \$320,000; Slocan district, 142,743; East Kootenay division, 41,570; Train Creek division, 112,349; Ainsworth division, 44,937; Nelson division, 15,348, other mining divisions, 1,115, total 2,392,249 tons. 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has been well demonstrated that the gold output is in direct proportion to the number of days in which water is available for piling. The increase in the production of lode gold in 1918 is explained as largely due to the entry into the list of producers of the Surf Inlet property of the Belmont Surf Inlet Mines, which made an output of about 41,600 oz. The Slocan district led all other sections in the production of silver.

The production of lead increased in the Fort Steele, Slocan, and Windermere-Golden districts, and decreased in the Ainsworth and Nelson districts. The Sullivan mine of the Consolidated Mining & Smelting Co. of Canada is situated in the Fort Steele division. Usually it contributes nearly all of the division's output of lead, but in 1918 over 860,000 lb. came from the North Star mine. In regard to copper, the report mentions the large production of the Hidden Creek mines of the Granby Consolidated Mining, Smelting & Power Co. in the Skeena division, and of the Britannia mine in the southern coast district. The production of copper in 1918 according to districts was as follows: Skeena division, 30,190,606 lb.; southern coast district, 18,475,913; Boundary-Yale district, 9,340,125; Trail Creek district, 1,772,916 lb.; Omineca division, 643,843; all others, 578,811; total, 61,483,754 lb.

Zinc was produced in British Columbia in 1918 to the extent of 41,772,216 lb., compared with 41,845,513 lb. in 1917. The production of each district was as follows: Fort Steele, 26,704,806 lb.; Slocan 14,107,682; Omineca, 213,112; Ainsworth, 849,991; all others, 6,225; total, 41,772,916 lb. Thus an increase over 1917 is shown in the Fort Steele district of nearly 6,000,000 lb., which output came entirely from the Sullivan

mines, the ore being treated in the electrolytic zinc plant at Trail. In the Slocan district the heaviest shipper was the Standard mine, with a production of over 7,000,000 lb.

MELBOURNE, AUSTRALIA—June 11
To Aid Prospecting in New South Wales, the Minister of Mines, on the recommendation of the prospecting board, has approved of an amended scheme. Although indications of minerals are at present less numerous than in the early days of mining, it is still reasonable to believe that there are valuable deposits undiscovered. It is proposed to supersede the old method of depending on casual discoveries by the adoption of a more scientific system under the direction of the professional geologist. The granting of aid to promising sites under the present system has led to important discoveries, though in some instances the presence of minerals had been previously known. One notable result achieved under this system was the discovery of the value of the Mount Boppy mine, which to the end of 1918 had produced gold valued at £1,886,815. Equipping and supporting of prospecting parties has been tried in this and other states, but with unsatisfactory results. The new proposal provides for two members of the geological staff to undertake the detailed examination of separate areas, mapping them as far as it is possible, to assist prospectors. It is also intended that the geological surveyor shall be given power to employ labor to assist in detailed examination as the work may require. This would provide that geological surveys and prospecting may be carried out simultaneously, and in addition to the information being obtained for use in subsequent mining operations, it would be avail-

able locally for the guidance of prospectors in such cases assistance up to half the cost could be granted from the prospecting appropriation. Two areas which are considered to be suitable for work under these conditions include Eastern New England, in the northeast part of New South Wales, and the Gurlambone-Cobar-Nymacoe-Mount Hope district in the West. Parliament is being asked to increase the prospecting appropriation for the next financial year to £18,000. Consideration is also being given to the question of assisting in the erection of crushing plants and by moving batteries from worked-out fields and re-erecting them in other promising localities. This form of assistance has already been granted to a limited extent, and to provide for other renewals a grant of £2,000 is being sought.

WAIHI, NEW ZEALAND—June 8
The Waihi Grand Junction Co. has purchased the property of the Waihi Extended Co. Apart from the value of the latter in respect to ventilation, there is always the possibility that further development of the newly acquired area will add to the Junction company's ore reserves. The general manager, Mr. Leah, stated that though improvement in ventilation was the main reason that had weighed in with the management in making the purchase, the further exploration of the Extended mine would no doubt be made in due course. One of the first works in this direction to be undertaken would be on the Mary reef, which had yielded the Junction company a substantial tonnage of milling ore in two or three levels, and at one level had been worked close up to the old Extended company's boundary, with payable results.

THE MINING NEWS

Progress of Mining Operations
 Condensed and Classified
 for Easy Reference

ARIZONA

Cochise County

COPPER CHIEF (Johnson)—Overhauling machinery, cleaning up underground. When fuel arrives work will start under new management. Martin Fishback, manager.

JOHNSON DEVELOPMENT (Johnson)—All work stopped while retrimbering shaft.

Gila County

ARIZONA COMMERCIAL (Globe)—Produced 3,500,000 lb. copper in first six months of 1919, while operating at 60 per cent capacity. Development at depth progressing. Again sinking new shaft and opening up 15th and 16th levels. Ore for first half year averaged about 6 per cent copper. Company has practically continuous orebody from 7th to 15th level.

IRON CAP COPPER (Globe)—Superintendent reports mining in satisfactory condition. Shaft down to 1,300 level, drifting east on vein. Good grade of milling ore exposed. Company has accepted proposal of Inspiration Consolidated Copper Co. for concentrating and smelting Iron Cap ores as temporary measure. Construction program about complete, except for mill. No decision yet from Massachusetts Supreme Court whether it will retain jurisdiction in Arizona Commercial suit.

OLD DOMINION (Globe)—Development of eastern portion of property having satisfactory results. Running crosscuts every 200 ft. on some levels and every 100 ft. on others. Several promising orebodies cut, one being 80 ft. wide and 4-5 per cent copper. Company's mines producing about 1,800,000 lb. copper per month. Reserves increased in last few months by over 200,000 tons.

Graham County

GRAND REEF (Klondyke)—Shaft being unwatered to 3d level, where prospecting work will be done. Drifting and crosscutting on tunnel level with machine drills on contract. Property an old one recently taken over by Aravaipa Leasing Co., H. Hendrickson, superintendent.

SILVER COIN (Klondyke)—Old shaft retrimbered. Section cut at 200 level and sinking started.

TEN STRIKE (Klondyke)—Contract let by Aravaipa Leasing Co. for all drifting, crosscutting and sinking.

Pinal County

SILVER KING (Superior)—On July 22, new three-compartment shaft was down 170 ft., and being sunk at rate of 5 ft. per day. Mill treating 25 tons per day. During last week mill heads assayed from 16 to 23 oz. silver per ton; tailings assayed 1.0 to 2.2 oz. silver per ton, and assay value of flotation concentrates ranged from 1,000 to 1,980 oz. silver per ton. Last shipment of concentrates to smelter assayed 1,375.2 oz. silver, 20.4 per cent lead, and 7.34 per cent copper. John Powie, vice-president and general manager. Company considering erection of power plant surveys and prospecting in Pinal mine. Company has opened and partially developed three new orebodies, overlooked by former operators, that lie outside of main chimney.

Yavapai County

SWASTIKA (Mayer)—Carload of ore recently shipped to Denver, where Dorr Co. made treatment test. Will install cyanide plant. F. W. Giroux, superintendent.

CALIFORNIA

Butte County

DONDERO (Yankee Hill)—Bond on property secured by E. R. Healy. Testing ground by keystone drill followed by decision to install dredge.

Calaveras County

BLAIR CONSOLIDATED (Angels Camp)—Used to state several years ago for taxes and recently purchased from state by Burr Chambers at auction.

Kern County

RANDBURG DIVIDE (Randburg)—Owns twelve claims on which Williams and Kelly made rich silver discovery. Development continued to depth of 16 ft., with encouraging results. Some excitement in district.

Nevada County

EMPIRE (Great Valley)—Work started on addition of twenty stamps to mill.

Sierra County

CLEVELAND (Sierra City)—New 20-stamp mill now running on free gold ore. Vein 28 ft. wide, R. G. Gillespie, Pittsburg, Pa., owner; J. T. Kiel, manager; S. E. Montgomery, superintendent.

Yuba County

BLUE POINT (Smartville)—Gravel being worked by sluicing, as lack of tailings dam has made hydraulicking impracticable.

COLORADO

Boulder County

HUMBOLDT (Ward)—Being unwatered to 350 level, preparatory to resuming active development. Mine buildings under construction and new machinery will be installed. J. Walters, manager.

ROOK (Ward)—New shaft down 200 ft. A 7-ft. vein of silver-lead milling ore opened, containing stringers of high-grade silver ore. Property controlled by L. A. Ewing & Co. Ore will be treated at new White Raven mill, being constructed by Teal & Barr, of Boulder.

STRONG MILL (Ward)—Plant being re-modeled by M. W. Loomis, and receiving ore from Puzosi mine, and from Ward-Columbia dumps.

Clear Creek County

PRINCE ALBERT (Lawson)—An 18-in. vein of payable silver ore opened in east heading at point 275 ft. from crosscut, and about 250 ft. below surface. In west heading, 2-ft. vein of low-grade milling ore opened. Property being developed by Matrix Mines Co.

Montrose County

RADIUM ORE SMELTING (Montrose)—Recent shipment of 36 tons of radium ore assayed 3 per cent uranium oxide. Plant has received over twenty cars of radium ore since starting few months ago. Average assay of material received between 1.5 and 2.5 per cent uranium oxide. Most of ore comes from Paradox Valley. Plant is only commercial radium ore sampler in existence. Large and small shippers send ore to plant to be sampled, assayed, pulverized, and shipped to Eastern market.

San Miguel County

PRIMOS CHEMICAL (Vanadium)—New steel mill under construction, to replace plant recently destroyed by fire.

IDAHO

Boundary County

IDAHO CONTINENTAL (Porthill)—Hauling ore by trucks begun. Two shifts employed in mine and three in mill.

Shoshone County

RICHMOND (Adair)—Crosscut from winze sunk from No. 2 tunnel shows vein 12 ft. wide, with from 2-6 in. of high-grade copper. Will drift 1,000 ft. on this level, at depth of about 600 ft.

CARBONATE HILL (Mullan)—Crosscut from shaft at 400 ft. failed to uncover orebody. Ground being prospected with diamond drill.

NATIONAL (Mullan)—Mill shut down. Work in mine confined to development on and above main working tunnel. Ore copper, but crosscut being run that may uncover body of lead ore. Original discovery lead, combined with little copper. Indications that vein shifts at depth of 400 ft. and that present copper vein is offshoot from main fissure.

INTERSTATE-CALLAHAN (Wallace)—Putting on men as fast as they apply. Management expects to be in full operation soon after Aug. 1.

MICHIGAN

Copper District

COPPER RANGE (Painesdale)—Champion hoisting practically no waste rock to surface. Using it underground for back-filling. Sand-filling plan in vogue last year discontinued. Freight rates high, freight rates and labor costs. Rock for last three months averaged over 37 lb. copper per ton. Mine richest lode producer in district. Baltic second in point of richness. Trumountain improving, averaging 23 lb. per ton, compared with 26.52 in 1918. All mines short of underground men.

Gogebic Range

NEWPORT (Ironwood)—Twentieth level of Woodbury shaft now connected with Bonnie shaft. Ore can be hoisted at latter while engines at former are being leveled.

OLIVER IRON (Ironwood)—Planning erection of fifty houses for miners, twenty-five at Pirritan mine and twenty-five at Davis mine. Houses will be six-room, of frame construction, with full concrete foundation and half-basement, and about 20 x 27 ft.

TOWNSITE (Ironwood)—One stockpile of over 25,000 tons already shipped. Shovel now loading second-grade stockpile. Shipments for season expected to exceed 80,000 tons. Ore taken from ground which was worked over from Norrie shafts years ago.

MINNESOTA

Cuyuna Range

STRIPPING OPERATIONS progressing at Gordon and Sazanore pits at Gordon by Coates & Tweed. Will be ready for shipments this season. Two drag lines at work at Sazanore, being stripped under contract by Weston, Dear & Co. for John A. Savage & Co. Work hindered by water now under control. Expect to ship 100,000 tons manganese ore this season.

CROFT (Crosby)—Mining 800 tons per day. Heavily worked, never recorded. Will start soon to sink 150 ft. deeper. Steel shaft sets bought and at prop. riv.

NORTHLAND (Cuyuna)—Hoisting and stockpiling manganese ore from underground development.

ARKO (Ironton)—Working with reduced forces and developing underground. Grading for spur track. Reported to have sold 25,000 tons of manganese ore.

HILLCREST (Ironton)—Shipping ore from pit. Some hydraulic stripping being done as shown in photograph on this page. Property operated by Coates & Tweed, who are stripping Portsmouth mine by steam shovel. Wilbur Van Evera is manager.

HOPKINS (Ironton)—Bretlung & Co. property shipped 7,000-ton stockpile of manganese ore. Mine still closed down.

WHITMARSH (Ironton)—Developing Martin and Huntington mines and stockpiling manganese ore. Properties rapidly preparing for heavy production.

MISSOURI

Joplin-Miami District

CULBERT (Joplin)—Taken over by B. M. Inman and associates, who have dewatered and again put in operation.

MONTANA

Beaverhead County

BOSTON & MONTANA DEV. (Wise River)—Third raise from 1,000 level of Idanha to 900 level shows seven feet commercial ore. Montana Southern Ry., subsidiary, has steel laid beyond Wise River with about twelve miles of rail laying required to reach Elkhorn mines. Roadbed completed.

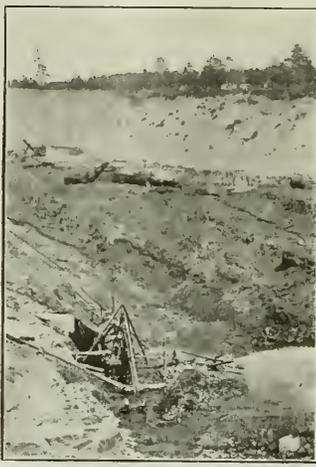
Missoula County

POTOMAC COPPER (Potomac)—Foundation laid for miners' boarding house. Will drive tunnel below old Copper Cliff to depth of 800 ft. below Cliff and 1,200 below Leonard claims. Ore zone 30 ft. wide indicated in Leonard property.

Silver Bow County

ANACONDA (Butte)—Engineers of Boston & Montana works at Great Falls have produced desirable carbide product in ferromanganese plant. Company has not investigated commercial feature of venture. Great Falls zinc plant shut down because of large stock of metal on hand. Ore production about 55 per cent normal, water scarcity interfering with return to capacity at Washoe Reduction Works. Twenty Cottrell smoke treaters now in operation at Washoe works. Last treater recently put in use.

BUTTE - BULLWACKER (Butte)—Operations resumed, and ore shipments will begin soon to leaching plant of Anacoda company.



PIT OF HILLCREST MINE, IRONTON, MINN., ON CUYUNA RANGE. HYDRAULIC STRIPPING OPERATIONS IN FOREGROUND.

BUTTE & SUPERIOR (Butte)—Sinking of No. 2 shaft to start soon. Hayden-Stone interests back of Butte Superior, have taken options on territory adjoining Davis-Daly on south and will sink two large shafts and develop ground traversed by fissures of latter. Planned to acquire about 200 acres.

DAVIS-DALY (Butte)—Orebody at Colorado mine opened for length of 1,200 ft., with ore still in evidence. One of longest shoots in district. Colorado shaft down more than 2,630 ft., with 2,700 as objective.

NORTH BUTTE (Butte)—Crosscut south 100 ft. on 900 level of Sarsfield shaft on east side shows ore zone around 40 ft. wide, with copper content unknown, local office refusing to disclose assays. Five old levels being opened at Speculator mine. Large tonnage of second class ore hooked out ready for mining. Copper production for July will show increase over June.

TUOLUMNE COPPER (Butte)—Fifteen-inch stringer of good grade of silver ore cut by crosscut being driven on 1,000 level for Spread Delight fissure. Shaft down about 1,060 ft., with 1,200 as objective.

NEVADA

Elko County

HOLDEN MINING (Tuscarora)—Fifty-ton mill being erected and will be running

soon, according to C. C. Griggs, general manager.

Mineral County

CANDELARIA MINES (Mina)—Charles D. Kaeding, vice-president and manager of Candelaria Mines Co., and R. C. Warriner, consulting engineer for Crown Mines in Canada and a director of Candelaria company, left Reno on July 22 for Candelaria. Plans for extensive operations being considered.

CONS. WEST EXT. SIMON (Mina)—Machinery installed and shaft being sunk on cropping 70 ft. wide, adjoining Simon Silver-Lead. Company well financed. G. F. Thompson, general manager.

SIMON SILVER-LEAD (Mina)—Drifts on vein at 400 level out 150 ft. each way from crosscut. New machinery en route to mine includes 60-hp. gasoline hoist, 100-hp. engine for generator, and 120-hp. duplex Western gas engine for 700-cu-ft. Sullivan compressor.

Pershing County

PLAINVIEW (Rochester)—Charles Moran, president of Nevada, California & Oregon Ry., has joined C. N. Miller in development of Plainview mine at Rochester. Former visited mine on June 19. Mine has 40,000 tons $\frac{1}{2}$ ore developed.

ROCHESTER NEVADA SILVER (Rochester)—Charles D. Kaeding, consulting engineer, C. A. Dennis, superintendent, have worked out system of faulting on 900 level. Gross output of mill about \$60,000 per month.

Nye County

FLORENCE DIVIDE (Divide)—Shipping seven carloads from lease on Florence at Goldfield, which management says will average \$100 per ton. Shipment of high-grade ore has also been made.

KNOX DIVIDE (Divide)—Opening up new vein which assayed 80c. on surface. At 8-ft. depth vein is 6 ft. wide and samples from \$30 to \$60 per ton.

REVERT DIVIDE (Divide)—New vein 2 ft. wide struck in crosscut on 300 level. Has widened to 4 ft. in drift.

SPANISH BELT (Manhattan)—Company has bought 10-stamp mill, which will be erected soon.

WHITE CAPS (Manhattan)—Changes being made in mill which are expected to result in much better saving.

WILLOW CREEK GOLD (Niyala)—Fred H. Vahrenkamp and Dr. Edward Howes have secured control of Willow Creek mine. High-grade free gold ore developed to 220-ft. depth.

DIVIDE EXTENSION (Tonopah)—Crosscut on 100 level, Caldwell shaft, in vein 21 ft. without reaching hanging wall. Officially announced that ore is all high-grade and that first 12 ft. averages \$197 per ton.

RESCUE EULA (Tonopah)—Opened up new orebody 14 ft. wide on 1,050 level. Ore averages better than \$20 per ton.

STONE CABIN (Tonopah)—Edmond B. Bronson, president Canada Copper Co. (Luning, Nev.) and Arizona Bagdad, (near Hillside, Ariz.), has bought Buckhorn group at Stone Cabin and is installing complete plant of machinery. Vein 35 ft. wide, with stringers of high grade.

TONOPAH BELMONT (Tonopah)—Net profits for June from 8,647 dry tons milled, \$54,194, as compared with \$56,408 for May.

TONOPAH DIVIDE (Tonopah)—Crosscut on 580 level shows ore 35 ft. wide. Face of southeast drift 80 ft. from crosscut in rich ore.

TONOPAH EXTENSION (Tonopah)—Clean-up of mill for first half of July valued at \$48,740.

TONOPAH MINING (Tonopah)—Net profits for June from 1,687 dry tons milled, \$39,000, as compared with \$29,200 for May.

NEW MEXICO

Grant County

EMPIRE ZINC (Hanover)—Doing development work only.

HANOVER-BESSEMER I. & C. (Hanover)—Shipping steadily, rearranging mill. E. Barnes, superintendent.

LAST CHANCE (Lordsburg)—Shipped car silver concentrates July 21 to El Paso smeltery. Value approximately \$25,000. B. Prescott, superintendent.

BLACK HAWK CON. (Silver City)—Increasing working force, as men can be secured. Will develop old shaft. C. B. Lidstone, superintendent.

KING & QUEEN (Steins Pass)—Pushing development. Sinking new shaft, building concrete warehouse and office building. F. H. Perry, superintendent.

BUIRO MOUNTAIN (Tyronne)—Putting new concrete floor in mill. Entire new equipment will be installed. Development work in progress.

LEACH-SNELLY-CASEY (Tyronne)—Have consolidated 32 claims around old Blackhawk-Hose and Albamora silver mines in Blackhawk district, working small force.

Otero County

ORO IRON (Ochays)—James H. Parker, manager, recently in El Paso, looking for Mexican miners.

Sierra County

MOFFITT CONSOLIDATED COPPER (Kingston)—Shipping silver ore to El Paso smelterly from old Virginia silver mine on North Percha Creek, in Black Range mining district. Company has acquired several copper claims west of Caballo Mountain, twenty miles south of Elephant Butte dam.

Socorro County

MOGOLON MINES (Mogolon)—Operating and shipping steadily. Sidney J. Kidder, manager.

SOCORRO M & M (Mogolon)—Property still shut down. Everything ready to start pending court decision. E. Scott, receiver.

OKLAHOMA

Joplin-Miami District

UNDERWRITERS (Donhat)—Starting two new shafts on Lucky Extension lease, which they have been testing by drilling.

HUTTIG (Joplin)—Planning removal of Inspiration mill, which it owns, from north of Blue Mountain mine, to Saturn mine, northwest of Picher.

LARSH (Picher)—Renewing operations after several months' shutdown because of low ore prices.

LEAD BOY (Sunnyside)—Taken over by W. R. Womack and C. M. Evans, of Picher, who have again started mill.

TEXAS

Brazoria County

WEST COLUMBIA PRODUCTION for week preceding July 17 was 22,250 bbl. oil per day. Producing companies: Humble Oil & Refining, 9,605 bbl.; Crown Oil & Refining, 5,600; Texas Co., 3,158; Gulf Production, 2,530; and Hanmecker, 45. Reported 24 wells in field producing and 5 shut off for various reasons; drilling on 3 new wells started.

CROWN OIL & REFINING (West Columbia)—No. 3 Olshewski well brought in recently increasing in flow. No. 3 Marmion, recently completed, good producer.

HUMBLE OIL & REFINING (West Columbia)—Started flowing oil through new pipe line to Lebeck tank farm, where 12 tanks of 5,000-bbl. capacity each are being built, three being completed. Pipe line being constructed from tank farm to Texas City, where docks from which 100,000-bbl. tank steamers can be loaded will be built.

Dallas County

LONE STAR GAS (Dallas)—Capitalization increased to \$10,000,000. Will engage in oil business on large scale. Construction of pipe line from West Texas fields to serve North Texas cities with gas begun; estimated cost \$5,000,000. Company controls 50,000 acres in producing fields of West Texas and 30,000 acres in Oklahoma fields. Now drilling 35 wells, and has four producing oil wells.

Harris County

GULF PRODUCTION (Goose Creek)—No. 16 Stateline well completed July 11 making good production of clear oil.

BRAZOS OIL & REFINING (Humble)—Small well brought in on Falvey lease.

GAMBLER OIL (Pierce Junction)—No. 1 Mowry well, which was being located on Cross Timbers.

Jefferson County

GULF CO. (Beaumont)—McFadden No. 2 well drilled at rate of 100 ft. a day for 23 days; now in hard rock and progress slow. This well of importance, being in Spindle Top section. Delayed on McGuffey No. 1 well, brought in several months ago, which began flowing at 2,900 ft.

TEXAS CO. (Beaumont)—No. 1 Fee well down 500 ft. Well within 100 ft. of McFadden No. 1 well, a producer of Gulf Co.

Liberty County

HOUSE CO. (Dayton)—No. 2 Zeiss & Pickett well south of Dayton started drilling. Interesting in that it is 1,000 ft. off salt dome.

SIMMS CO. (Dayton)—No. 1 Peterson well, northwest of town, abandoned at 1,010 ft.; rig moved and new well started.

REPUBLIC PRODUCTION (Dayton)—No. 20 Doublebar well brought in July 17 flowing strongly from 2,400 ft.

Limestone County

DEEP DRILLING will be done near Mexia, where four wells will be put down; drilling on two now under way. No drilling previously in old field below gas sand that averages 700 ft. deep. Leases in demand.

Runnets County

GULF PRODUCTION (Ballinger)—Russell No. 2 well spudded in, and drilling progressing satisfactorily. Gas from Russell No. 1 well used as fuel.

SINCLAIR GULF (Ballinger)—Down 2,300 ft. in dry hole one and one-half miles east of Russell No. 1 well. Log of latter showed oil in three pieces, but when shot, after drilling to 3,500 ft., no oil found.

UTAH

Juab County

TINTIC SHIPMENTS week ended July 19 amounted to 129 cars.

EUREKA BULLION (Eureka)—New compressor installed and water-line approaching completion. Raising and sinking on ore recently opened on 800 level. Will drift from raise. With new equipment shaft will be sunk below 800 level, 3,000,000 shares, par value \$1, looked for. Company has 20,000 shares in treasury, and \$12,000 cash on hand.

INDEPENDENCE (Eureka)—Stock of company to be listed. Claims east of Copeland, in East Tintic district. Shaft to be sunk. Alex. G. Matson interested.

PLUTUS (Eureka)—Connection being made with Chief Consolidated ground from 1,000 level. Face of drift about 370 ft. from new Chief Consolidated shaft, now down 600 ft. Winz 200 ft. below 1,000 level has cut mineralized quartz.

TINTIC STANDARD (Eureka)—Shipping about two cars daily. New hoist to go into operation soon.

ZITMA (Eureka)—Annual stockholders' meeting held and old officers re-elected. Property in East Tintic.

Salt Lake County

EMMA SILVER (Alta)—Articles of incorporation filed, indebtedness cleared off, and \$100,000 in treasury. Capitalization 1,000,000 shares, par value \$1, with 1,000,000 shares in treasury. Officers: C. S. Burton, president; John Dern, vice-president; F. B. Cook, secretary and treasurer; J. E. Gaigher, J. M. Hayes and H. Hopwood. Estimated to have machinery worth \$25,000. In early days produced \$2,637,227, and sold to English syndicate for large sum, soon after which ore lost through faulting. Large development campaign undertaken in 1915 by Eastern interests. A total of \$280,000 worth of ore was shipped. Company went into receivership, present receivership following, with Utah men interested.

MONTANA-BINGHAM (Bingham Canyon)—Annual stockholders' meeting held July 21 and board of directors elected: C. G. Ballantyne, president; E. A. Vail, J. E. Mossman, J. Benton Leggett, W. E. Hubbard, Imer Pent, Lewis B. McCormick. In future, annual meeting will be held first Tuesday in March. Producing two cars of ore weekly from development. Strike of higher-grade copper ore holding out.

UTAH COPPER (Bingham Canyon)—Understood there is prospect of mine and mill work being signed at full force in near future, owing to rising price of copper.

CARDIFF (Salt Lake City)—Employing about seventy miners. Ore being brought down Big Cottonwood Canyon in trucks at rate of 60 to 70 tons a day.

TAR BABY (Salt Lake City)—Six men working. A. A. Little, superintendent. Tunnel being driven to cut "Cardiff" contact.

Summit County

PARK CITY SHIPMENTS week ended July 19 totaled 2,393,710 lb., shippers being Silver King Consolidated, Judge Mining & Smelting, and the West.

Plute County

MINERAL PRODUCTS (Marysville)—Reported work resumed after shutdown of several months. Amunite property equipped with large mill producing potash.

Utah County

SILVER BELL (American Fork)—Leases at this property being re-approven shipped car of silver-lead ore from surface workings.

WASHINGTON

Ferry County

BEN TILLMAN (Republic)—Property leased and will be developed. Owned in London, England.

LONE PINNACLES-SURPRISE (Republic)—Shipping 50 tons daily from Last Chance mine.

QUILP (Republic)—Surprise shaft down 800 ft. and ore followed 200 ft. on that level. Quilp shaft will be unwatered and extended to 1,000 ft. corner with drift on 800 level. W. G. C. Iansalk, manager.

WISCONSIN

Zinc-Lead District

GEYER LAND (Cuba City)—Loeffelholz Bros. report good strike of zinc ore on Geyer land near Cuba City.

SMITH-RULE TRACT (Linden)—Joe Piquett and Sam Alteneberg developing this lease north of Optimo No. 4 at Linden. Property proved by dity drift holes and shaft showing high-grade disseminated blende. Foundations laid last autumn for 100-ton-mill. Negotiations now under way to provide equipment.

KISTLER & STEPHENS (Platteville)—Lease obtained on Rowe tract, adjoining Rodham mine, at Shullsburg. Property formerly known as Rowe, also as Milwaukee-Shullsburg, also as Brown-Coff. Appeared promising when mill was destroyed by fire four years ago.

ZINC HILL (Platteville)—Big Dick shaft down to ore on Harvey lease at Cuba City, and rich sheet blende encountered.

CANADA

British Columbia

CORK-PROVINCE (Slocan)—Reorganization decided upon at annual meeting. Total 1,250,000 shares of stock to be issued to take place of 8,500,000 shares of 10c stock. This will make some stock available for development. Will retire bonds of \$1,250,000. Extension of workings decided upon.

QUEEN (Slocan)—Examined and surveyed by Carl H. Hand, of Los Angeles, for A. W. McClune, of Salt Lake City.

Manitoba

BROOKLYN (Rice Lake)—Shaft down 70 ft. Drifting will be done when 100 level is reached. A. L. Anderson in charge.

Ontario

PETERSON LAKE (Cobalt)—Offering 400,000 shares of treasury stock to shareholders at 15c per share to raise \$50,000 for further development.

ALLIED GOLD MINES (Boston Creek)—Company, which was organized to take over O'Donald and Cullen-Renaud claims, and secured options on those properties, also owned the other undeveloped claims. Latter allowed to revert to government for non-performance of assessment work. Claims restaked by D. Belec. Litigation allowed, and machinery comprised by company paying Belec \$500 and having claims reinstated.

CHARITTE (Boston Creek)—Shaft down 60 ft. Vein 60 ft. wide showing low gold content being followed.

MURRAY-MOWGRIDGE (Bourkes Siding)—New vein 4 ft. wide encountered.

AGAUNICO (Bucke Township)—Large vein of cobalt mineral, explored some years ago for silver, on passing from conglomerate into Keweenaw formation found to contain high gold content.

BERRY (Kirkland Lake)—Claim L 1,535, one of group of five locations known as Berry claims, situated south of Burnside, purchased by Buffalo interests.

MATACHEWAN RAND (Matatchewan)—Large vein of chloritic schist and quartz uncovered. Contract for 15,000 ft. of diamond drilling placed.

CLIFTON (Porcupine)—Installation of mining plant completed. Drifting being carried on at 100 level on new extension of orebody showing on surface, which shows high-grade ore for 25 ft.

SULLIVAN (Seskinika)—Being explored by diamond drilling.

HOLLINGER CONSOLIDATED (Timmins)—Machinery being installed for addition to mill, which will increase capacity to daily tonnage of 3,500 tons.

Quebec

BLACK LAKE ASBESTOS & CHROME (Black Lake)—U. S. Steel Corporation has secured option until Aug. 22 on chrome iron ore lands of company. Steel company's engineer has made inspection of properties and reported to principals.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

July	Sterling Exchange	Silver		July	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
24	439	107 $\frac{1}{2}$	54 $\frac{1}{2}$	28	435 $\frac{1}{2}$	107	55 $\frac{3}{8}$
25	439 $\frac{1}{2}$	107 $\frac{1}{4}$	55 $\frac{1}{4}$	29	437	107 $\frac{1}{2}$	55 $\frac{1}{4}$
26	434 $\frac{1}{2}$	106 $\frac{1}{2}$	55 $\frac{1}{8}$	30	435	107	55 $\frac{1}{8}$

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

Daily Prices of Metals in New York

July	Copper		Tin	Lead		Zinc
	Electrolytic	Spot		N. Y.	St. L.	
24	22 85@23.35	68	5 $\frac{1}{4}$ @6	5 50@5.75	7 90 @7.95	
25	22 85@23.35	68	5 $\frac{1}{4}$ @6	5 $\frac{1}{4}$	7 80 @7.90	
26	22 85@23.35	68	5 $\frac{1}{4}$ @6	5 $\frac{1}{4}$	7 70 @7.80	
28	22 85@23.35	68	5 85@6	5.65@5.70	7 70 @7.80	
29	22 85@23.35	68	5 80@6	5.60@5.65	7 60 @7.65	
30	22 85@23.35	68	5 80@6	5.60@5.65	7 50 @7.60	

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

July	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
24	106	106 $\frac{1}{2}$	110	256 $\frac{1}{2}$	255 $\frac{1}{2}$	23 $\frac{3}{8}$	24 $\frac{1}{4}$	43 $\frac{1}{4}$	43 $\frac{3}{4}$
25	106	106 $\frac{1}{2}$	110	260	258 $\frac{1}{2}$	23 $\frac{3}{8}$	24 $\frac{3}{8}$	43 $\frac{1}{4}$	43 $\frac{3}{4}$
26									
28	107 $\frac{1}{4}$	107 $\frac{1}{2}$	110	268	266	24	24 $\frac{5}{8}$	42 $\frac{1}{2}$	43 $\frac{3}{4}$
29	107	107 $\frac{1}{2}$	110	270	267	24	24 $\frac{3}{8}$	42 $\frac{1}{2}$	43 $\frac{3}{4}$
30	105	110	110	268	266 $\frac{1}{2}$	24	24 $\frac{3}{8}$	41 $\frac{1}{2}$	42 $\frac{1}{2}$

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

Metal Markets

New York—July 30, 1919

The quotations for copper on July 19 and 22 were erroneously printed last week as 22.35@23.90 and 22.85@23.90, respectively. These figures are corrected to 22.35@22.85 for July 19, and 22.85@23.35 for July 22, which figures will be used in computing the July average.

During the last week the metal markets were very dull and were inclined to softness, which exhibited itself especially in zinc. For the moment, buying power seems to have exhausted itself. Japan, which has been so influential a factor, seems to have satisfied its immediate requirements. The Japanese buying during the last few months has run to large figures in the aggregate, not only for copper, but also for zinc and lead. Besides its pur-

chases in this country, Japan has also bought in England.

Transatlantic freight rates are \$18 to British ports and \$20 to French, Belgian and Dutch ports. Freights from San Francisco to Hongkong and Kobe declined to \$12.

On July 24 an agreement was signed in London by the Bank of England and representatives of South African gold-mining companies, removing the restrictions on the export of gold that prevailed during the war. Thus a free market for gold produced in the Transvaal is established, and it is now possible for gold to be purchased in England through the usual channels for shipment abroad, enabling the Transvaal producers to sell their gold in the best market, which will place them in a more advantageous position to meet the rising costs of production.

As an experimental sale, 50,000 oz.

of gold has been shipped to the United States at a price of about 85s. 6d. per standard ounce, which represents a premium of approximately 10 per cent compared with the 77s. 9d. obtained by these companies hitherto.

Copper

With the end of our last week of record the vigorous buying of copper ceased, and this week sales by producers were relatively small. The excitement of the previous week, during which extravagant prices were paid for some small lots of copper for forward delivery, passed away. With the absence of any strong demand, and the feeling in some quarters that the market might have topped, speculative interests undertook to realize, and there was rather free offering of copper for resale at concessions from $\frac{1}{4}$ to $\frac{1}{8}$ c. per lb. below the price—23 $\frac{1}{2}$ c., delivered, equivalent to 23.35c., cash, New York—that was firmly asked by the principal producers for August-September delivery.

Copper Sheets—The base price of copper sheets is 33 $\frac{1}{2}$ c. per lb. Demand strong. Copper wire is quoted at 26@26 $\frac{1}{2}$ c. in carload lots, f.o.b. mill. Market not very strong, but producers are holding firm. Considerable second-hand copper on the market is causing a sag in the price.

Tin

Prices for American tin remained unchanged at 70c. for electrolytic and 68c. for 99 per cent grade. Small business was done in Straits tin, on the spot, at 70c. July shipments from the Straits were quoted at 53 $\frac{1}{2}$ c. at the close. The War Trade Board Section of the Department of State announced under date of July 24 that WTB R-799, issued July 2, 1919, has been amended so as to advance from Sept. 1, 1919, to Aug. 15, 1919, the date on and after which pig tin and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, anti-friction metals, waste metals, and other metals containing tin may be imported from points other than points of origin and without reference to the date of shipment.

Pursuant to the above-mentioned amendment, on and after Aug. 15, 1919, pig tin, and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, anti-friction metals, waste metals, and other metals containing tin, will be permitted to be imported into the United States under General Import License PBF-37.

Lead

The big demand last week led the A. S. & R. Co. to advance its price to 6c. on July 24, sales having been made previously on that day by other producers at 5.75c. While the principal seller consummated transactions at the new price, the figure was regarded in other quarters as being excessive, and was shaded right from the start. As the week wore on and it became more and more difficult to make sales, the concessions that were offered became sharper, and at the close lead was easily obtainable at 5.80c., New York.

On the recent advance the producers of Mexican lead made good sales of their product and have put themselves in a comfortable position.

Zinc

On the way up from 7 $\frac{3}{4}$ @8c. some very large business was done, and apparently buyers were loaded with all that they could carry for a while. Anyhow, demand ceased sharply at the beginning of this week, and that, together with the news that the Government was going to dispose of its stock of zinc in its own way, threw a shadow over the market, and zinc immediately began to be offered at concessions, and declined sharply from day to day on small business.

During the advance to 8c. for Prime Western zinc, high-grade rose to 9c. The demand for high-grade during the last week, however, was insignificant. On the other hand, zinc dust was in good demand at 12@12 $\frac{1}{2}$ c. for high-grade, and at about 11c. for ordinary prolong dust.

The negotiations between the Government and the zinc smelters, acting through the American Zinc Institute, for the disposition of the Government's stock of zinc, have ended, the office of the Director of Sales of the War Department having decided to sell its holdings in its own way. On July 16 the following memorandum, covering the proposed terms, was issued:

The current market price of Prime Western at East St. Louis to be the base price, to which should be added the following amounts:

(a) Carload rate of freight from East St. Louis to point of delivery.
(b) Add for Grade A, 50c. per cwt. Add for Grade B, 3 $\frac{1}{2}$ c. per cwt. Add for Grade C, 10c. per cwt. Grade D, same as Prime Western.

Prices other than above shall first be approved by the Raw Materials and Scrap Section.

(c) Carload rate of freight will be allowed from present location to point of delivery, provided the delivery point is the nearest available to the Government stocks. Whenever possible, material shall be sold to the contractor at whose plant the material is located.

Material on which the Government is now paying storage or other charges shall be the first to be sold.

It is understood that the Government stocks have already been reduced materially, and what remains consists principally of high-grade zinc.

Our recent advices from Belgium are to the effect that a great scarcity of zinc ore exists, owing chiefly to the unfavorable conditions of freight. The smelters who possess their own mines will probably receive supplies and start smelting soon, but those smelters who

used to rely chiefly on Australian ore will be a long time in getting in operation upon any considerable scale. It is estimated that the present cost of production by Belgian smelters will be from 1,000 to 1,100 fr. per ton, while American sellers have intimated a price of about 850 fr. for their product. However, German producers who have accumulations of zinc to sell are endeavoring to export it, and that competition must be met.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet. Future outlook encouraging.

Antimony—The market continued strong. We quote at 91@91 $\frac{1}{2}$. Few offerings of futures were made.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.10 per lb. for wholesale lots—500 lb. and over. No change.

Cadmium—Quoted at \$1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, \$1.75 per lb. No business being transacted. No change.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Prompt supplies have become very scarce in this market, with the result of a further rise in price. We quote \$109. Prospect of a further advance is contemplated in the trade. San Francisco telegraphs \$103. strong.

Silver and Platinum

Silver—Silver has ruled steady in London, with an advancing tendency, closing at 55 $\frac{1}{4}$ d. The New York market has been fairly firm, depending on sterling exchange rates, which have been stronger the last week. The buying has been largely for China account, and the market closes firm on continued demand from this quarter.

Mexican dollars at New York: July 24, 83; July 25, 83 $\frac{1}{2}$; July 26, 82 $\frac{1}{2}$; July 28, 82 $\frac{1}{2}$; July 29, 83 $\frac{1}{2}$; July 30, 82 $\frac{1}{2}$.

Platinum—Market steady. We quote \$105 for refined ingot. No change.

Palladium—Quiet at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., July 26—Zinc blende, per ton, high, \$57.40; basis 60 per cent zinc, premium, \$55; Prime Western, \$55@ \$52.50; fines and slimes, \$50@ \$47.50; calamine, basis 40 per cent zinc, \$32@ \$30. Average settling prices: Blende, \$53.71; calamine, \$30.55; all zinc ores, \$53.20.

Lead, high, \$65.15; basis 80 per cent lead, \$65; average settling price, all grades of lead, \$53.48 per ton.

Shipments the week: Blende, 9,383; calamine, 210; lead, 1,352 tons. Value, all ores the week, \$582,650.

Shipments seven months: Blende, 303,226; calamine, 8,390; lead, 43,189 tons. Value, all ores seven months, \$15,094,200.

Owing to some low-grade lead being marketed, the average price was less

than last week. Though buying was tentatively \$55 basis, and one buyer secured a large tonnage on that base, other buyers received withdrawal orders this morning before contracting the week's orders. A few sellers were offering ore at \$52.50 tonight, and no takers.

Patteville, Wis., July 28—Blende, basis 60 per cent zinc, \$53.50 per ton base for premium grade, and \$51 base for high lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$67 per ton. Shipments reported for the week are 1,560 tons blende, 95 tons galena, and 381 tons sulphur ore. For the year to date the totals are 57,281 tons blende, 3,296 tons galena, and 8,517 tons sulphur ore. During the week 3,487 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Unchanged at \$25 per ton, f.o.b., California points, for ore running 40 per cent or better.

Manganese Ore—Sellers ask 60c. per unit, and buyers are willing to pay 50c. for metallurgical ore.

Molybdenum Ore—Small business was reported at 85c. per lb.

Other Minerals

Nitrate—Practically no change has occurred, except that the market in Chile has become firmer. The government is still liquidating its stocks. Price is quoted at \$2.95 per cwt., carload lots, for immediate shipment.

Pyrites—Spanish pyrites is quoted at 17 $\frac{1}{2}$ c. per unit for furnace ore, c.i.f., New York or other Atlantic port. Market slow and unsettled; hand-to-mouth buying. Price will decrease with ocean freights.

Sulphur—Conditions remain unchanged, price being quoted at \$18 per ton, carload lots, domestic delivery, and \$20 for export, at mines in Freeport, Tex., and Sulphur Mine, La. The basis of the foreign demand is the labor shortage in the Sicily mines, which, it is predicted, will not be able to attain a normal production for about one year's time; so the prospects of continuation of the present brisk export trade of the United States appear promising for that period. Domestic business is good.

Iron Trade Review

Pittsburgh—July 29

There has been a slight further increase in demand for some forms of steel production, but the demand continues to be poorly distributed as to products, and consequently the finishing departments, which are well filled with orders, are offered the most business, and departments that need business are getting no more than formerly. Easily the greatest gap in the market is that made by the absence of railroad buying. Though some observers are so sanguine that they refer to the possibility of the steel industry being filled to capacity with orders be-

THE MINING INDEX

Listing Special Articles of Interest
and Value to the Miner
and Metallurgist

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Number 6

Signs of the Times

IF THE handwriting on the wall can be read aright, public control of many utilities will be an accomplished fact within the next decade. Insofar as ownership and operation by Federal authority are concerned, we are further away from that than we were twenty years ago. With few if any exceptions, the public wishes to see no more of Federal mismanagement and extravagance. Whether justly or not, the people attribute many of their grievances, high costs, and inadequate service during and after the war to the Government, and ask that former relations be resumed.

On the other hand, the public has learned that the Government can control much of the business on which our lives and happiness depend, and it will demand that this control be exerted. Previous to the war and during it we have had the experience of several overdoses of control, where large quantities of the remedy brought about conditions worse for the public than was the original disease. The Interstate Commerce Commission has done some excellent work, but it has gravely impaired the credit of our transportation lines. The Federal Trade Commission, established as a guide and adviser to the business men of the country, has developed into a prosecutor of successful business enterprise.

Whether Federal control will be limited to public-service corporations or will extend to various types of industry, no one can tell. Today the public is not finding fault with the former, but feels more than unkindly toward the purveyor of the necessities of life.

It is of the highest importance to American business that the tendency of the times be recognized, so that men of business will co-operate with legislators to produce intelligent and reasonable regulations. Opposition to the principle or disregard of legislative action will lead to the enactment of oppressive control that will throttle business to suffocation.

Henry A. Wheeler, President of the Chamber of Commerce, in an address delivered in Chicago April 29, suggested that cordial acceptance by organized business of the principle of larger public regulation may tend to accomplish a number of desirable ends:

1. To set aside definitely all public thought of the necessity for Government ownership and operation of any of the instrumentalities of commerce so long as regulation can be assured to preserve the public from being exploited.

2. That opposition will be removed to the broad application of the rule of reason wherein agreements between business men made in the public interest would not be regarded as criminal acts.

3. That all business, whether it be manufacturing, mining, or farming, shall enjoy a clear interpretation of the measure of co-operation and combination permissible in the public interest, and thus remove one of

the most obstructive features of our pre-war period in which the business man found no authority from whom he could secure definite approval or disapproval of proposed agreements with his fellows.

4. That the larger responsibilities resting upon the Federal agencies charged with the guidance of business, and of safeguarding the public, would compel greater care in the selection of personnel, and would invite acceptance of Federal appointments by men who, in the past, have not felt inclined to separate themselves from their own interests for a service not recognized as constructive in any large degree.

The nationalization of coal mines has already been suggested. Some control of our fuel supply is sure to come, and in due course supervision and control of the production of metals may follow.

It will be well if miners heed the suggestion and take active part in the consideration of any regulatory legislation that is proposed.

Engineers, Politics, And Civic Activities

TECHNICAL societies all over the country have recently been discussing, individually and collectively, the lack of that intimate touch which should exist between engineers on the one hand and politics and civic activities on the other. Something is wrong somewhere, for it is true that the engineer is distinguished by his absence, and not on account of his leadership, in matters politic and civic.

At the conference called by Engineering Council in April to discuss the creation of a Department of Public Works, M. O. Leighton, of the National Service Committee, spoke some unpleasant truths that will bear repetition. Among other things he said:

"But I really think that unless a change comes over you engineers, the organization in Washington that attempts to guide you and keep you informed, and expects your help in return, is going to have a very hard row to hoe. I don't suppose that there is one engineer in a hundred who realizes how poorly engineers are regarded in Washington so far as potentiality in political affairs is concerned. You don't stand as high as the undertakers, and when you are compared with trade unions you are so far behind that no one knows you exist. I sometimes think the reason is that you don't care for anything better, and again it seems to me that you don't know the conditions. If you did you would remedy them yourselves as a result of personal pride.

"Some of us remember when a committee of most distinguished engineers went to Washington to give advice to a Senate committee on an important engineering matter. You would have supposed that the cream of the engineering profession of the United States would have secured a respectful hearing. They barely

got inside the door of the committee room. The Senate committee promptly adjourned. They wouldn't treat a plumbers' union like that, nor a committee from the American Bar Association, nor yet a conclave of Presbyterian ministers. They have fallen into the habit of discounting engineers. The facts are, you don't count at all, and it is simply and solely the result of your indifference as illustrated by the response to the invitation of Engineering Council to come to this conference.

"I realize that I am talking to the wrong people. Your societies came forward and you are here, but you are the exceptions that prove the rule."

Committees may be appointed having upon them the best men in the profession, and they may be given full power, yet they accomplish little or nothing. Names count for nothing in a campaign. Vital, active, aggressive force must be used to make an impression. Without these, and the individual interest that makes them possible, there will be no results.

Lack of influence of engineers as a body is essentially due to lack of organization for co-operation, and the latter does not exist because the individual members making up each body are not interested in those things that may be done through co-operation.

Mr. Leighton further pointed out that as a first step in co-operation it was necessary to record the existence, membership, and activities of American engineering societies. He had been working for three months upon this with the assistance of the best-informed associations, and had gathered a list of only about 180 out of 300 or 400 probably existing. In closing he used these words:

"Why don't you authorize that Washington committee to spend a little money to dig out these engineering societies and get them to work? In other words, my friends, why don't you use the intelligence of a carpenters' union or a plumbers' union or the American Federation of Labor? Sometimes it seems as though you are temperamentally unfit for that kind of a job. Perhaps you are not; but, believe me, gentlemen, you act as though you were. Influence can't be acquired without participation. I believe influence means influx. That is what the engineers lack—influx. You don't flow into things. You stand on the outside looking in."

And Mr. Leighton was most heartily applauded for the scolding that he had administered.

The Raw Material In College Work

TOO many discussions of educational matters fail to bring to bear upon the question of education the most vital element involved—the raw material with which the educator has to deal. In university work, the entering student is supposed to have passed the high school and to have acquired habits of study and application. He is presumed to have given some serious thought to the selection of a life work.

In addition, students fall into one of several groups—one group characterized by men who have no objective, and are indifferent to the work in which they have enrolled; another composed of those on pleasure bent, and who are willing to sacrifice their own and their neighbors' time to accomplish their objective, and the last, and by far the smallest group, consisting of men who have a definite object, who realize the value of their time and who desire to apply themselves

earnestly to the work in hand. The percentage proportion of entrants falling into each group varies in different institutions. Men do not necessarily permanently adhere to the group in which they start, although once a man starts in the preferred class, he usually remains in it.

Indifferent men sometimes develop and change radically for the better. In considering raw material one must never fail to remember that youth is in the plastic state and that the man is in process of development. Wretchedly poor material may suddenly change into better. A student who has been a trial throughout his college work, and who has just scraped through, may yet develop into a useful man. Sometimes a graduate finds himself only after some bitter experience which directs his attention to his own shortcomings and stimulates in him a desire to begin in a new and better way.

A high quality of finished metal requires good raw material as the starting point, else great skill and knowledge will be required in bringing it to the requisite standard. Similarly, a college may graduate a high-grade man if it starts with good raw material. But the unskillful handling of a high-grade iron ore may produce an indifferent steel. So it is in an educational institution. Not only must there be a careful selection of good raw material, but there must also be competent handling of it, else such material may be spoiled in the making. Thus the two essentials, good raw material and competent instructors, may be taken as the prime requirements for the production of high-grade men, whether they be mining, civil, electrical, or mechanical engineers.

In striving for large numbers of students educational institutions are prone to overlook the fact that by so doing they often increase their own difficulties in producing a high-grade or even a fairly satisfactory graduate. First-class men are submerged in the mass of indifferent ones. It is like mixing rich ore with poor ore. On the other hand, however, the presence of a few good men in a class benefits many of the less able and tends to sweeten the product, although at the expense of the more competent men. It is for this reason that any plan for the segregation of such men generally from the ordinary run of class work would meet with objection. Nevertheless, for the benefit of these men additional work under the direction of the best leaders of the educational staff should be provided in each institution, and they should be relieved from a corresponding proportion of less important work. Recognition in this way would have an excellent influence upon all of the students.

International Trade Conference

AN INTERNATIONAL TRADE CONFERENCE will be held in Atlantic City during the week of Sept. 29 under the auspices of the Chamber of Commerce of the United States. Great Britain, France, Italy, and Belgium have been asked to participate, and have accepted the invitation. After the conference, which will be attended by a large number of American business men, the foreign representatives will tour the United States for about a month under the guidance of the National Chamber.

The main purpose of the conference is to acquaint American business men with present conditions abroad and bring about closer relations with our European as-

sociates in the war. Unless European countries can soon begin production on a large scale, they will be faced with danger of being unable to pay for food and clothing and inability to reduce their war debts.

America must come to the aid of these countries, not only because of their unfortunate condition but to protect our own social and financial interests at home.

Satisfactory Work of the War-Minerals Relief Commission

THE selection of Philip N. Moore as a member of the War-Minerals Relief Commission was a particularly happy one. Mr. Moore is a well-known mining engineer, and has the esteem and confidence of his brother engineers. Having a thorough knowledge of mining operations, he was enabled to bring out the testimony of the miners and mining-company officials who presented their cases at the hearings which were held in San Francisco, July 5 to 25, and reported on page 238 of this issue of the *Journal*. More than this, those who presented their cases were immediately at their ease as soon as they recognized that here was a man who not only understood the language and technical terms which they used to describe their operations, but who also was sympathetic with them.

Mutual understanding breeds confidence, and we believe that Mr. Moore's presence upon the commission and the way that the commission has conducted its hearings have created a feeling that, whatever the decision may be, claimants have been fairly and squarely heard, and that every facility was given them to present their claims. The two other members of the commission, John F. Shafroth and M. D. Foster, served on the committees of Mines and Mining, the former on the Senate committee and the latter as chairman of the House committee. Both bring to the commission a full knowledge of mining legislation.

Service Rendered

WHEN the United States Government has paid all of its war bills and wiped the slate clean, there will still remain an obligation that will not appear of record. This liability is large, but it is not measurable in dollars and cents. We refer to the debt that the Government owes to hundreds of men connected with the business of mining and metallurgy. Other men have served equally well in their civilian capacities, but our knowledge of the work of miners and metallurgists is more intimate.

Literally thousands of men participated in the national service, held themselves subject to call without regard to personal inconvenience or business interests, and responded without hesitation when needed by the war agencies of the Government.

This form of patriotic service merits more than passing mention, because it was offered with no thought of public recognition or possibility of applause; it carried no Government commission, donned no uniform, nor hoped for inclusion in that long and honored list of Government appointees at a dollar a year.

The men of the mines and mills, privates behind the lines, have contributed as much to the making of history as those who went over the top at the front, and without their aid our first line might have had little more strength than was developed by the vast armies

on the Eastern front. They will not be cited, nor will they wear chevrons that the public may know of their services.

There may be no appropriate manner in which to give public recognition of such service, but it will not go unrewarded. The work of some is known to their fellows, and has already commanded an admiration and a respect deeper than can be created by the wearing of insignia; but of still greater moment is the fact that the worker has the consciousness that he saw an opportunity for service and rendered that service to the best of his ability. He alone knows the sacrifice involved. His citation will come from a higher source and be of greater value than honors from a department or generalissimo.

A Responsibility and An Opportunity

IN A LETTER to college and university officers in this country the Commissioner of Education writes: "The higher educational institutions of western Europe have been prostrated by the war. Large numbers of the leading scientists and of the younger men whose scientific careers were just beginning have been killed. Because the intellectual resources of the United States have not been similarly drained, the Western nations are looking to the United States to assume the responsibilities of leadership in education and in science."

Will the colleges, universities, and technical schools of the United States seize this opportunity to help build up the civilization of the future by opening wide their doors to students from all over the world? Will Germany be allowed to re-establish her educational prestige and draw students to her, first from the Near East, and later from other countries against whom she fought in the war? Are we willing to admit that there has been any justification for Germany's assumption of educational prestige at any time during the past quarter of a century?

These questions are put squarely up to our institutions of higher education. Will they appreciate their responsibility and opportunity? Some of our schools are giving the problem serious attention. All should do so. Students in foreign countries should be made familiar with educational opportunities in the United States.

A Letter From Mexico

OUR presentation of the facts in connection with the murder of Theodore Patterson, manager of the Aranzazu copper mine of the Mazapil Copper Co., as published in the *Journal* of Aug. 2, has been acknowledged by the Department of State and the chairmen of committees of the House of Representatives to whom the information was transmitted, and we are advised that the matter will receive proper attention.

We are informed that, on several recent occasions, the American Embassy at Mexico City, under instructions from the department, has urgently requested the Mexican Foreign Office to take action looking to the adequate protection of the property and employees of the Mazapil Copper Co. With regard to the murder of Mr. Patterson, who was a British subject, the department is advised by the American Consul at Saltillo that several persons have been arrested in connection with that crime.



PILING TIMBER NEAR TRACKS IS ADJUDGED BAD PRACTICE IN MINES

Although timber piled alongside of the track in haulageways may clear the train, the vibration caused by passing loads will often cause the pile to slip and slide toward the track, so that the train will strike it.—Courtesy of the *Anode*, June, 1919.

Photographs From the Field

FLEET OF ORE VESSELS IN ICE BLOCKADE, DULUTH HARBOR, MINN.
From Bulletin No. 7, Bureau of Safety, Sanitation and Welfare, United States Steel Corporation.



Mining in the Belgian Congo

Production During 1915 to 1918—Growing Importance of the Region—Output Principally Copper, but Gold, Tin, Diamonds, and Coal Are Produced—Transportation Facilities Inadequate, but Are Now Being Developed

By SYDNEY H. BALL* AND MILLARD K. SHALER†

MANY years ago, a pessimist asked Leopold, King of the Belgians, man of affairs and colony founder: "What will become of the Congo if the synthesis of rubber is discovered?" He replied: "One should not worry. The Congo has had its ivory period; it now has its rubber period. Tomorrow it will have that of its mineral wealth; eventually that of agricultural products." The "tomorrow" arrived during the period of the war, thirty-two years after the founding of the Congo Free States and nine years after the annexation of the colony by Belgium.

It is natural to expect that the economic life of European colonial possessions in Africa sustained a marked setback during the war. That the mining industry of the Belgian Congo weathered the stormy period satisfactorily is shown by the following annual gross value of its mineral production:

TABLE I. VALUE OF BELGIAN CONGO MINERAL PRODUCTION, 1913-1918

1913.....	\$3,000,000	1916.....	\$13,107,000
1914.....	3,850,000	1917.....	18,232,000
1915.....	7,420,000	1918.....	14,110,000

The Katanga copper accounts for about three-fourths of the production; the gold produced is worth about double that of the diamonds. The gold and diamond production has increased steadily during the period under consideration, although the increase in diamonds has been relatively more rapid. The copper production increased notably until 1918, when a shortage of native labor and of coke and other supplies, as well as of freight cars, together with an acute influenza epidemic, cut down the output. As to the future, no great increase is to be expected for a year or two years, after which time, however, a largely increased mineral output can be looked for confidently. At present the Belgian Congo's yearly mineral production is about half that of Alaska. The betterment in the financial status of the colony is indicated by the fact that the colonial deficit of \$4,000,000 in 1913 had decreased to \$1,400,000 in 1918.

The Great War naturally did not stimulate mining, and in reality was responsible for many vexatious and costly delays in the receipt of supplies, and the conditions created by the abnormal situation resulted in operation with insufficient white staffs and native labor, and in delays in programs of expansion. The most serious effect of the war, namely, restriction of investments in much-needed means of transportation, may only be fully realized later.

Although perhaps scarcely in place here, a few words upon the warfare waged in Central Africa will serve to remind the American reader that the war was bitterly fought, not only in Europe and Asia but in Central Africa as well. When the war broke out, the Belgian Colonial Government held that the Berlin treaty of 1885, entitled "General Act Relating to Civilization in Africa,"

prohibiting warfare in the Congo Basin, should be enforced. Germany, however, on Aug. 22, 1914, attacked Lukuga, and the Belgian Congo was forced into the war. About 20,000 troops were mobilized and took part in campaigns in Rhodesia, British East Africa, German East Africa, and the Cameroons. The most important campaign in which Belgian Congo troops were engaged was that in the former German colony of East Africa. Native Congo troops, officered by whites, conquered all of the northwestern part of that colony. As a result, a Belgian now administers, from Tabora, a territory, once German, of about 77,000 square miles, or six times the area of the Belgian homeland. By Dec. 1, 1917, practically the last German had been cleared from East Africa. With the previously lost colonies of Togoland, the Cameroons, and German Southwest Africa, the German flag disappeared from over 930,000 square miles of African territory.

Counterbalancing in part the ill effects of the war in Central Africa are certain advantages, which may be enumerated as follows: (1) the war demonstrated the practicability of the use of airplanes in the tropics; they will undoubtedly be used there for commercial purposes. (2) Some of the 700 miles of telegraph laid, the roads made and wireless installed are of permanent value. (3) The greatest benefit will doubtless be the reluctance of many soldiers—formerly city dwellers—to return to city life, and the consequent gain to the Belgian Congo of many virile and intelligent colonists.

That the Peace Conference is not apparently to add to the Belgian Congo that part of German East Africa conquered by the Belgian Congo troops seems unfortunate. This appears to be the most highly mineralized part of the former Teuton colony. With the defeat of Germany in Europe, the fear that the Belgian Congo might form part of a German "Mittel-Afrika" passed. Great Britain and France had as early as September, 1914, assured to the Belgian Government the integrity of the Belgian Congo, and on April 29, 1916, this engagement was not only repeated by France and Great Britain, but the foreign offices of Italy, Japan, and Russia joined them, promising, in addition, a special indemnity for the losses suffered by the colony.

Germany's desire for the Belgian Congo, as a step toward her ambition to found a vast "Mittel-Afrika," dates back at least twenty years. "Mittel-Afrika" was to include, besides Germany's old colonies, the Belgian Congo, Angola, the north half of Portuguese East Africa, Rhodesia north of the Zambesi, and all Africa south of the Sahara, to say nothing of the Azores, Madeira, Cape Verde Islands, Prince's Island, St. Thomas, and Zanzibar. Even more generous was the German who made the map captured by the South Africans at Windhoek, then capital of German Southwest Africa, which showed all of Africa German, except the Orange Free State and Southern Transvaal (the Rand was German), which were marked "Boer Reserves"! Here she was to obtain raw tropical prod-

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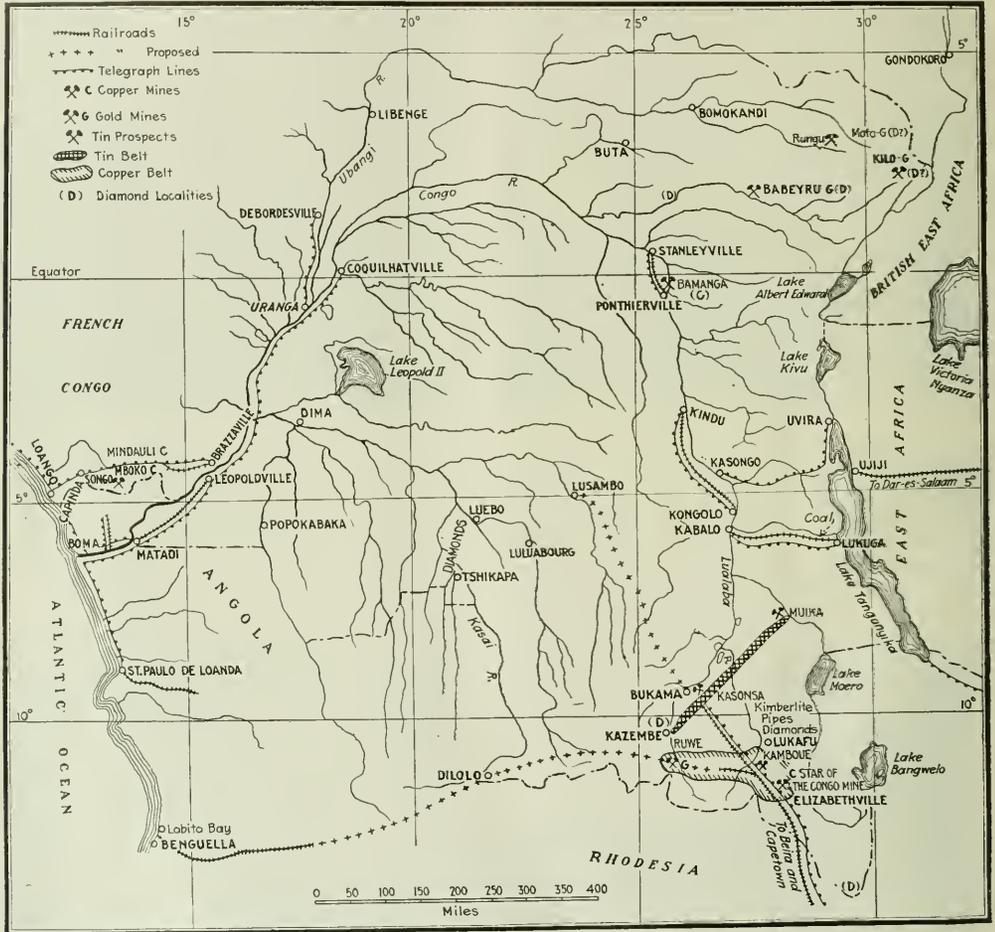
†Mining engineer, 5 Montague du Parc, Brussels, Belgium.

ucts, here she was to train millions of black soldiers for a future war, and from Africa harbors she was to strike at the trade of Africa, India, Australia, and South America.

One of the mildest indictments against Germany's colonization methods, so far as the natives are concerned, is to quote the statement made in 1888 by the German East African Company: "The aim of colonization is to enrich without scruple and with decision our own people at the expense of people more feeble."

its tributaries, non-navigable stretches being paralleled by railroads. In all, there are within the colony over 9,000 miles of rivers navigable to steamers of light draft. More than 100 steamers, of which about one-half are the property of the state, ply upon these waters. The service on the whole is slow and costly, the chief necessity being larger and more modern river steamers, although river improvements are required locally.

There are within the colony about 1,020 miles of



MAP OF THE BELGIAN CONGO REGION, SOUTH CENTRAL AFRICA

The Belgian Congo has an area of 908,000 square miles. It has a population variously estimated at from 9,000,000 to 15,000,000, the true figure probably being about 10,000,000. The white population in 1916 was 5,364, of whom over 10 per cent were engaged in mining. The colony, in normal times, is linked with Europe by an adequate steamer service, but U-boat depredations and more pressing need of shipping elsewhere made the service distinctly unsatisfactory in 1917 and 1918. It is hoped that this shipping shortage will soon be remedied. Interior transport follows the Congo and

railroad, or about four times the Alaskan railroad mileage. During the war railroad building was delayed, but the links between the Congo River (Kabalo) and Lake Tanganyika (Albertville) and between Elizabethville and Bukama were finished. The trip by rail and water from the Congo mouth to Elizabethville now takes about six weeks of actual travel, as opposed to an equal number of months ten years ago. Further, the first-named link completed an all-steamer-train trans-African route between Matadi and Dar-es-Salaam. From Ujiji to Dar-es-Salaam about 600 miles of railroad, once Ger-

man, is now operated by the Belgians. The Elizabethville-Bukama railroad similarly completes the Matadi-to-Capetown route.

Present transportation facilities are good in comparison with many colonies, but are unsatisfactory provided products less valuable than copper, gold, and diamonds are to be exported in quantity. Betterment of the Lower Congo-Katanga railroad around Livingstone Falls is imperative, as is also the construction of the Lower Congo-Katanga railroad which will not only connect the Katanga copper belt with a Congo seaport, but also pass through a country rich in minerals and forest products. Further, auto routes or other feeders to the principal railroads are essential.

The Benguela railroad, in Portuguese Angola, with the Katanga copper belt as its objective, is completed for a distance of 325 miles and has been graded for a further 75 miles. Construction was stopped during the war. A motor road exists from Buta to Bambilii, and that from Aba to Refaj (130 miles) is presumably completed. There is a wagon road between Stanleyville and Kilo. The length of these and other auto roads, about 650 miles, must be increased many times properly to serve as feeders for the present railroads and steamer routes.

A direct cable links the colony with Ostend, Belgium, and in the colony an excellent wireless service has been installed. There are also about 1,660 miles of telegraph lines. The pipe line from Ango Ango, near Matadi, to Kinchasa, near Leopoldville, furnished fuel oil for the river steamers until it was impossible to get deliveries of oil from Europe. Prior to the war, two hydroplanes were sent to the colony, and it is probable that in the future these and others may eventually find a certain use in carrying passengers, mails, and light express. The rivers are excellent landing places, and in addition a landing ground for airplanes has been established at M'Toa, on Lake Tanganyika. The Banque du Congo Belge, the colonial bank of issue, had seventeen branches last spring and eight more were to be established.

The Union Minière du Haut Katanga is expanding operations in its copper belt, in the southeast portion of the Belgian Congo, which contains many large high-grade mines. The publication of digests of yearly reports of the Tanganyika Concession Co. (which owns a little less than 40 per cent of the stock of the operating company) in the mining journals the last three years renders details unnecessary here.

The production of copper in metric tons by the Union Minière is given in Table II.

TABLE II. COPPER PRODUCTION OF THE UNION MINIERE

1911	Matte and Black Copper		1915	Matte and Black Copper	
	Matte	Black Copper		Matte	Black Copper
1912	86	2,492	1916	300	14,054
1913	162	7,407	1917	562	22,149
1914	259	10,772	1918	1,021	27,463
			(a) 1000	(a) 19,000	

(a) Approximate.

As before mentioned, the decrease in output in 1918 was due to transportation difficulties and labor shortage, and to an unusually severe influenza epidemic. In 1917 and 1918 only sixteen companies were large copper producers. The staff, including a number of Americans in the more important of positions, consisted in 1915 of about 250 whites, and in 1918 of approximately 450. A profit-sharing system, based on tonnage handled, is in operation among the white employees. The black laborers for the same years numbered respectively 3,500 and

7,000. During the war the Star of the Congo and the Kambove mines continued to furnish practically all of the ore, the Kambove mine being by far the larger producer in 1916-17-18. The Luishia mine and the Likasi produced a small amount, and the Chituru mine is now connected with the railroad and is being opened up. The Chituru and Likasi mines are on the railroad twenty-five miles from Elizabethville.

The quantity of ore in the belt, which is about 200 miles long, is unknown, but it is probably great. P. K. Horner, in May, 1916, estimated that there were positively developed at the Kambove and Star of Congo mines ore containing 304,000 tons of copper, and, in addition, "probable ore" containing 376,000 tons of copper (H. Foster Bain, *Mining Magazine*, March, 1917, p. 145). Such figures are sufficient to indicate that this is a most important copper region, as these are but two of the more important deposits. An extensive diamond-drilling campaign was carried on in 1915 and 1916. In 1916 and 1918 from 20,000 to 22,000 tons of ore per month was mined and treated.

The siliceous oxidized-copper ore requires much limestone and iron-ore flux and is smelted in blast furnaces to a black copper, containing 96 to 97 per cent copper. At the end of 1914 three furnaces were in operation, and two were completed in 1916. Nos. 6 and 7 were blown in in 1918. The daily capacity of these seven furnaces should be about 1,000 tons of ore, or 30,000 to 40,000 tons of copper per year. For various reasons only two to three of these furnaces were in operation during the last few months of 1918.

Experiments carried on at Elizabethville in concentrating and leaching in 1915-16 evidently were favorable to the latter process. A. E. Wheeler has now planned a large leaching plant, for which bids are being received. The plant is to have a capacity of about 55,000 tons of copper per year, and is to be operated by electricity generated by a 60,000-hp. hydro-electric power plant. As practically all the ores are oxidized, sulphide ores or sulphuric acid must be brought in from South Africa.

Costs, as given in the annual reports, do not include debenture or amortization charges. In 1914, mining, smelting, freight, and marketing cost about 10c. per lb.; in 1915, 9c.; in 1916, 8.41c. in the new furnaces and 9.51c. in the old furnaces, and in 1917, 11.8c. In 1918, owing to war conditions, the costs were 13.4c. In 1916, an average of 22.1c. per lb. was received for the copper and in 1917, 25.3c. Prior to the war, the copper was sold in Germany, but since then it has been shipped to England, although at least one small shipment reached the United States.

The Belgian Congo produced, to the end of 1918, from its gold placers, about \$14,600,000. Recent exports of gold from the colony follow:

TABLE III. BELGIAN CONGO GOLD PRODUCTION 1911-1916

Kilos		Kiloes	
1911	908	1914	930
1912	967	1915 (a)	3,955
1913	1,476	1916	2,852

(a) Owing to war conditions, the greater part of 1914 output was exported in 1915.

Most of this gold is carried by porters from the placers, which are in the northeast part of the colony, to the Uganda railroad, and thence shipped to Europe via Mombasa. In 1918 the gold, however, was shipped via Elizabethville and the Cape-to-Cairo railroad. Recent productions have been as follows: 1915, \$1,667,700;

1916, \$1,944,000 (3,240,212 kg.); 1917, \$2,215,500 (3,692,551 kg.); 1918, \$2,308,100 (3,846,786 kg.).

The colony operates the two more important gold placers—Kilo and Moto. Until 1918, these placers were operated by a single management, but in that year the mines were placed under separate managements. From 8,000 to 10,000 negroes are employed. Kilo, early in 1915, was seriously hampered by a shortage of white staffs, and in 1918 by a meningitis epidemic. In 1915 it produced 1,623,259 kg.; in 1916, 1,637,651 kg.; in 1917, 1,793,159 kg., and in 1918 about 2,213 kg. In 1916 it was stated that 14,000 kg. of gold was contained in reserves, so that the placer presumably has a life of three years at the present rate of production. In 1915 approximately forty sluices were in operation. Costs are reported to be about \$1.25 per cu.yd.

The Moto placer produced in 1915 a total of 999,519 kg. of gold; in 1916, 1,360,561 kg.; in 1917, 1,759,352 kg.; and in 1918 about 1,503 kg. The Babeyru placer, operated by the Société Internationale Forestière et Minière du Congo, in 1915 produced 164,306 kg.; in 1916, 241,914 kg.; in 1917, 137,609 kg., and in 1918, about 130 kg. In 1918 it was worked out. Costs were from 85 to 90c. per cu.yd. In the same general region several new gold prospects are reported, but none of these appears to be important. The Geomines has done nothing with its gold placers in the Katanga region.

DIAMOND PRODUCTION

The Kasai diamond field, owned by the Société Internationale Forestière et Minière du Congo, had produced to the end of 1918 somewhat over 400,000 carats of diamonds. Recent productions follow:

TABLE IV. BELGIAN CONGO DIAMOND OUTPUT, 1915-1918

	Carats		Carats
1915.....	48,935	1917.....	100,000
1916.....	53,940	1918.....	164,200

Thirty white men and about 3,800 blacks are employed. The Kasai company has found a number of diamondiferous areas to the northeast of the Forminière's ground, and the Lower Congo-Katanga R. R. Co. has made discoveries still further northeast. The Kundelungu Exploitation Co., which owns a number of slightly diamondiferous kimberlite pipes in the Katanga region, has done no work since the war began. In the same region the Simkat, which owns about seventeen pipes, carried on rather extensive washing tests. Diamonds occur in at least certain of the pipes, although none are exploitable. Scattered diamonds continue to be picked from the placer sluices in the northeastern part of the Belgian Congo.

TIN PRODUCTION

The Geomines is exploiting its tin placer at Kiambi by monitors and sluices. About ten white men and from 500 to 600 blacks are employed. It is understood that approximately \$4,000,000 worth of gravel of low grade (from 1/10 to 1/100 per cent) has been blocked out. In 1917, approximately 300 tons of concentrate containing about 50 per cent metallic tin was produced. Its other tin placer at Naulonga-Kikondja is not being worked.

The Union Minière du Haut Katanga has done little at Busango since the war began. In 1917 the railroad reached a point within thirty-eight miles of the mine, and exploitation on a small scale was resumed. The

Simkat, it is understood, is to again begin exploitation at Muika in the near future.

The Geomines has been opening up coal at Kilometer 262, on the Kabalo-Lukuga railroad. The company has sunk 40 m., cutting four seams of coal from 1.2 to 1.8 m. (4 to 6 ft.) thick, and it has drifted 100 m. on the best seam. This coal field has been described in detail by P. Fourmarier.¹ The coal occurs in a series of rocks of Karoo age, which are also coal bearing in South Africa. The principal coal outcrops are in the Valley of Nikuha and Kaseke creeks, and also at Kakuiga. The beds vary from horizontal to almost vertical. There are five coal seams, the most important in places being almost six feet thick. The weathered coal contains 61.9 per cent of carbon and 13.25 per cent ash and produces 5,891 B.t.u. It clinkers badly, but doubtless can be used locally on the railroad.

General prospecting, particularly in the Katanga, has been greatly curtailed by the war. The Kasai company has had men prospecting for gold in the northeast part of the colony, without, however, marked success. The various parties sent out by the Grand Lakes railroad into the country to the west and northwest of the northern part of Lake Tanganyika have all returned. A small gold placer, probably not exploitable, was located, and gem corundum deposits are said to have been found about 200 miles northeast of Kasongo. The rubies of these placer deposits are, however, small and the larger sapphires are off-color.

The law of Jan. 21, 1915, permits areas exploited for precious metals and precious stones to be closed to protect the products from theft. In the Katanga, because of the war, the period of legality of both general prospecting and mining permits has been extended. The period of validity of prospecting concessions in other parts of the colony will presumably also be extended.

OREBODIES IN NORTHWESTERN EAST AFRICA

That part of East Africa conquered by the Belgians and now administered by them is the best mineralized part of the former colony of German East Africa. It is a gold region of considerable importance, and a number of promising gold prospects are known. The Senkenke mine, owned by the Kironda Goldminengesellschaft, is the most important producer. The mine, opened in 1906, produced from 1909 to 1913 gold to the value of about \$642,000. Iron, copper and other metals and non-metals of value occur within the area.

Immediately north of the Belgian Congo border, near the Atlantic Ocean, is the M'Boko Songo-Mindouli copper belt, in the French Congo. A small amount of rich ore, said to contain 45 per cent copper, is shipped annually from the Mindouli mine to France. Ore shipments have been as follows:

TABLE V. FRENCH CONGO COPPER-ORE SHIPMENTS, 1913-1916

	Tons		Tons
1913.....	1,271	1915.....	463
1914.....	1,451	1916.....	600

The decrease in production in 1915 and 1916 was due to transportation difficulties, all ore being shipped over a light railroad to Brazzaville, thence by boat across Stanley Pool, and from there to the coast by the Lower Congo railroad. With proper transportation, the output could be considerably increased, but scarcely tenfold, as some French engineers claim.

¹"Annales de la Soc. Geol. de Belgique"; Pub. Rel. au Congo.

Pump Troubles

Repairs and Renewals—Slime and Tailings Pumps, and Plunger Pumps—Equipment and Tools Needed To Effect Replacements and Readjustments—Care and Conservation of Parts

BY CHARLES LABBE

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A PUMP is a simple machine when in good working order and operated under favorable conditions, and is one of the most reliable and important adjuncts to be found in mill or plant. To maintain the condition known as good working order requires a knowledge of the fundamental principles of operation and construction. Considerable study and foresight are required to maintain conditions under which pumps will run effectively. Many persons consider a pump too simple a device to justify much thought and attention, and the result is that considerable work will be required sooner or later if the pump is to be kept in effective condition. The smaller the pump the less attention will be given to it; and, as with many other things, so long as it runs, no care is thought needed. But the pump may not give any warning. It may run today and quit tomorrow. Whatever the trouble, it appears slight at first view, but it often takes a good deal of experience to remedy it.

If only clear water is handled, little difficulty may be expected, but in many mills and cyanide plants the pulp and tailings must be pumped. In pulp and tailings pumps there is much scouring, and operating difficulties are limited mostly to repairs and renewals of worn-out parts. With water and clear solution more mechanical troubles are experienced, because pumps handling these materials are more complicated and must fill two functions—suction and pressure. With slime pumps the function is principally pressure.

Even if the simplicity of a pump is generally known, it will not be out of place to go over the fundamental principles. Suction may mean vacuum, but vacuum will not raise water. Pressure is needed to force water up. This pressure, the atmospheric pressure, must be applied on the water to force it into the vacuum created by the pump. It is known that at sea level the atmospheric pressure will force water up 33.83 ft. into a vacuum. The best pump in the world will not suck water an inch higher. Theoretically and practically, the suction depends on the elevation above sea level, less the mechanical losses, and it must be remembered that no pump reaches for water, but water must come to the pump after the vacuum is created. Whatever the pump, plunger, centrifugal or rotary, the suction troubles are nearly the same, and under this head can be classified three-fourths of all difficulties encountered in the operation of pumps.

LOCATION OF PUMPS

A pump must be placed where sufficient room can be provided. Accessibility from all sides is of prime importance. It is difficult at best to correct pump troubles, without fighting for room in cramping positions. The foundation must be of ample size to prevent vibration, which would tend to loosen or break pipe joints. Light, natural or artificial, must be a little more than sufficient. Drainage must be provided for every cir-

cumstance, and the pump must be placed where it will be a pleasure to work on it. The pump must be as near water as possible, and the suction pipe must be as short and as straight as the place will permit. Avoid long suction pipes where a high vacuum must be maintained, as a small leak will cause much trouble. Avoid air traps. They have caused the failure of many a pump to start. If the pump is not already provided with flanged connections, it will save future troubles and time lost in repairs to put them in. To make the change, plain, straight flanges with bolts are the best. Unions are good, but in the larger sizes, from 2 in. up, they are unhandy. The pipe must be pushed back to join, the nut may start cross-threaded, and most of the piping and pipe lines can be moved sidewise, but hardly lengthwise. Reduce to the strictest minimum the number of fittings used. They are expensive in first cost and in running, on account of the friction they cause.

HORSEPOWER AND PIPE SIZES

The formula for horsepower necessary to raise water is very simple: *Weight of water in pounds* \times *feet friction* = *hp.* \div 33,000.

In every case friction is the hardest to ascertain. It varies with the size of the pipe and the number of elbows. In the following formula, *Gal. per minute* \times *total lift* \times 0.00034 = *hp.*, the friction is included. The size of the suction pipe may have to be figured out. Remember that the velocity of 200 ft. per min. in the suction pipe gives the best results, from which the formula is obtainable: *Area of plunger* \times *plunger speed in ft. per min.* = *area of suction pipe* \div 200.

The size of the suction pipe is commonly the same as the flange connection. The principal reason why the suction pipe is larger than the discharge is because water must travel at a rate of 200 ft. per min. for the best results. Any extra friction lowers the efficiency of the pump considerably; whereas, in the discharge pipe, a speed of 350 ft. per min. is most satisfactory. The water moves faster and a smaller pipe is sufficient.

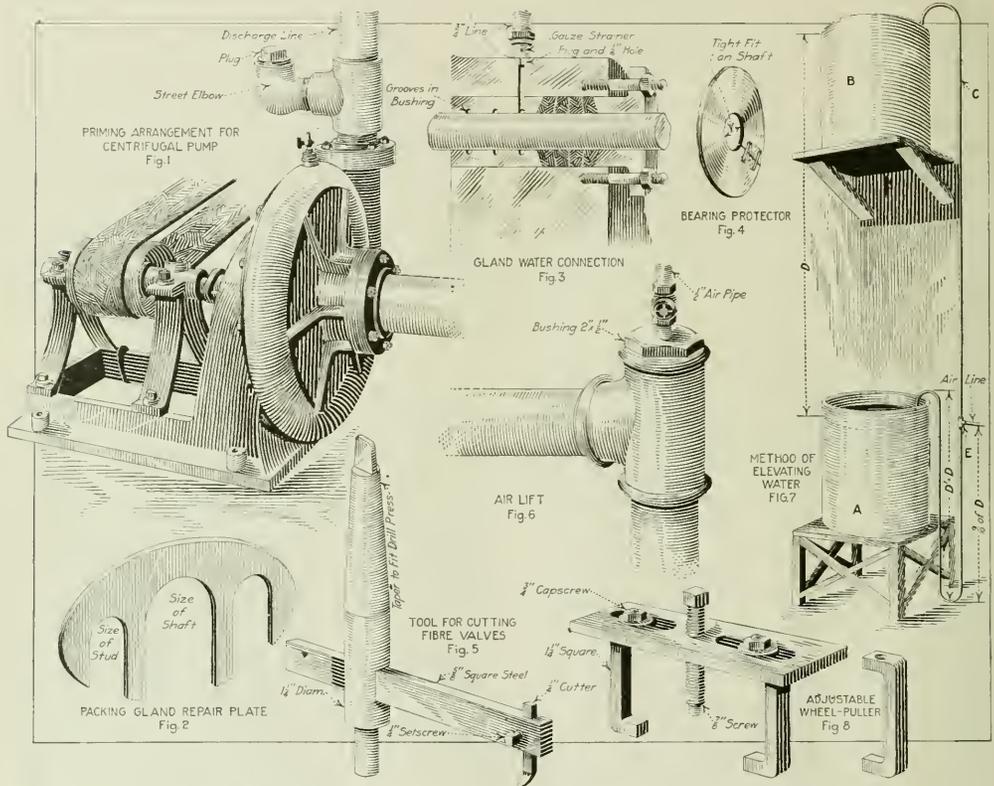
CENTRIFUGAL PUMP TROUBLES

Trouble can often be avoided by making a thorough inspection at regular intervals, five times a year as a minimum, but this is seldom done, as few like to disturb a centrifugal pump so long as it is pumping well. A slight change in conditions will stop the pumping, and trouble will come at the most unexpected moment. Nearly all centrifugal pumps taking water from below the level of the pump, if stopped and started often, must have a foot valve. All pumps with double suction runner make good vacuum, but most pumps with a one-sided runner do not. The operator may learn when a pump needs a foot valve, by holding his hand (if this can be done) at or near the end of the suction pipe. He can feel the water go into the pipe a foot or so,

and then come back. This may happen about twenty times a minute. A vacuum gage on the suction line will show the same thing—a vacuum of an inch or so, then back to zero.

All centrifugal pumps must be primed before starting. The intake pipe and the pump must be filled with water. There are many ways of priming pumps, the simplest being with bucket and funnel, but any other way is as reliable. It is advisable, to facilitate priming, and to help in finding the cause of later troubles, to put at the discharge a *T* with a street *L* and plug (Fig. 1.) By taking the plug off, one can pour water into the pump or connect priming water from an independent

will be experienced. When renewing it, be sure to take all the old packing out and at the same time notice the condition of the shaft. If badly worn or rough, or out of center of the gland, do not expect the best packing to last. Square flax packing of the exact size of the stuffing box must be used. Most of the square packing will stand slight hammering (up to $\frac{1}{2}$ in. out of size) to make a good fit. Rubber packing does not give satisfactory service in the stuffing boxes of centrifugals. There is not enough room for the elasticity of rubber to act, and it soon burns if in contact with the shaft. Always use plenty of flake graphite and oil when packing pumps.



MECHANICAL KINKS IN PUMP INSTALLATION AND OPERATION

line. Large pumps are primed with a steam ejector or a water ejector. Whichever way the pump is primed, the water must come to a point above the pump to avoid air pockets. Many a time small centrifugals have been started by holding the intake pipe level with the top of the pump, filling it with water, starting the pump, and at the same time dropping the pipe in the water. This may do with a small pump, with temperature above 32 deg., and if not attempted too many times, but a leak will soon occur in the suction line, which will prove annoying.

The packing gland must be tight, but not so as to make the shaft heat and burn the packing. The packing must be renewed when it has lost its elasticity. Do not wait until it gets as hard as wood, or trouble

Do not coil packing in one piece until it fills the stuffing box, and then cut the end off. The best way is to cut rings that will fit the shaft exactly. Place one ring in at a time, pushing it squarely into the stuffing box with the packing gland. See that the joint of the next ring is opposite the one just put in. Mark on a convenient place the exact size and length of packing it takes to make a ring, so that it will be an easy matter to make another good-fitting ring when needed. If in packing the pump the shaft is not in the center of the stuffing box, it is probable that the bearings are worn, and consequently it will be hard to make the packing hold, as one side is too loose and the other too tight.

Unusual wear of the shaft may be caused by the belt being too tight or the motor out of line. Either con-

dition will cause the bearings to heat, but if the shaft vibrates, and the wear is all on one side, the runner is out of balance. Fill the stuffing box nearly full with packing, but do not screw up the nuts on the gland too tight. Do not tighten the nut on one side more than on the other, or the gland will break or be cramped and score the shaft. The purpose of the packing gland is to prevent leakage, so keep it just tight enough. Any extra tightening will only increase friction and cause the shaft to heat. Sometimes, on account of chemicals in water, the oil or grease in the packing does not last, and in a short time the packing is lifeless. Under such conditions, before putting the packing in next time soak it in a mixture of white lead and graphite.

REPAIRING GLANDS

Whatever may cause a packing gland to break, the commonest repair is to fit a plate of stout sheet iron to slip over studs and shaft (Fig. 2) without taking anything apart. Such a plate may be kept on hand.

Broken studs are more troublesome. To hold the gland a bolt and nut can be so set that the end of the threaded part goes into the hole of the gland with the head against the closest part of the pump (as nearly in line as possible), and the adjustments made with the nut. Later on, the broken part will have to be drilled out and a new stud made. If the stud has stripped the thread in the casting, the hole must be tapped out to the next larger size, but sometimes the next larger size cannot be used. Then the hole must be tapped with the nearest pipe tap, and one end of the new stud must have the same pipe thread. Never replace a stud by a capscrew, because if the screw is taken out often it soon wears the threads off the casting, and before long the hole will have to be tapped out for a larger size.

TROUBLES IN RUNNING

If, when the pump is properly primed and started, the water does not come in quantity "as it used to," it is possible that the impeller is worn. The speed may be increased. If the priming is lost after the pump has started, there is probably a leak in the suction, or the packing is loose. From 5 to 10 drops of water per minute dripping off the gland lubricates the packing and helps to keep it soft and airtight, but more is not advisable.

If the shaft goes back and forth, the pump needs priming. There is air in the intake line, or possibly the runner is off the shaft or the shaft itself may be broken. Should the pump pull hard and overload the motor, the runner will be found to be rubbing against the casing on the suction side. Either the balancing device is broken or the thrust collar has moved on the shaft.

After running a while the casing of a centrifugal pump may get hot, sometimes nearly to the temperature of boiling water. This is a sure sign that the pump is not working. The runner keeps on churning the same water. Probably nothing is coming to the pump. A valve on the intake line may be closed or the pipe clogged. The pump casing will heat and the packing gland will leak badly, and tightening will not improve matters. In case of the pump casing heating, a pressure gage will prove useful. Connect it to the pump casing. If there is excess pressure the discharge line is closed, but if the pressure is a few pounds, or lacking, the trouble is with the intake.

Sand pumps are made only in the centrifugal, volute, and turbine types. All are made with renewable liners and impellers, to allow for wear. To keep the sand off the bearing and packing gland, water of higher pressure than that generated by the pump is introduced on the bearing side. In action and construction they are all centrifugal pumps, and subject to the same operating difficulties.

On account of the weight of the material to be pumped, the slime pump does not work well on suction. In nearly every case the pump must be set below the supply. The pulp must come to the pump. The only exception is the dredging pump, in which the impact of the water carries the gravel, but this is not a slime pump proper. The intake line must be as straight as possible. Elbows here are out of place, on account of foreign matter—wood, rags, and like substances present in pulp—which usually stop at the elbow and finally clog the pipe, and also on account of the friction, which soon wears a hole through the elbow.

GLAND WATER

The gland water must come from an unfailing supply, and the pressure must be at least a pound for every foot of pulp elevation. The best practice is to have a special tank of clear water (or clear barren solution, if the lime percentage is not high) placed in the highest part of the plant. To get the benefit at the gland, of the true pressure, the water is brought in a $\frac{3}{4}$ -in. or $\frac{1}{2}$ -in. pipe, and the last nipple on the pump is reduced to $\frac{1}{16}$ in. by plugging the nipple and drilling a hole (Fig. 3).

There will be no chance of clogging if, in the union just before this nipple, a metallic gauze screen of conical shape has been placed. Inspection will be an easy matter. In some pumps the gland water is connected to a loose gland-water ring, which is placed about the middle of the stuffing box when packing the pump; but the best practice is to connect the water to the bearing close to the packing. If grooves have been provided, connected together, the bearings last longer. If the gland water stops, shut down the pump at once, as if allowed to run the sand will enter between the shaft and bearing, and in a few minutes the shaft bearing, packing, and gland may be worn so as to make their renewal imperative.

To protect the next bearing from water or even from pulp, on the shaft, next to the packing gland, put a washer made of 4- or 6-ply rubber belting about 3 to 6 in. in diameter, fitting tightly on the shaft. If not put on when putting the pump together, the washer may be put on afterward by making a cut into one side and tightening it with wire (Fig. 4). The washer will revolve with the shaft, and any leakage will be thrown out sidewise, instead of following the shaft.

Pressure gages used on tailings pumps must be protected by a siphon having at least two coils; and before being put in operation must be filled with water. They are used only for a few minutes at a time, because if left in circuit with the pump the pulp will soon take the place of the water and the gage will be filled tight and rendered useless.

The material used in pump liners is usually chilled iron and manganese steel. Impellers are made of the same substances. The open runner may not be as efficient as the closed type, but the preference is decidedly in favor of the former. When the liners are worn

down to a safe limit they must be replaced, as, if they wear through, the outer shell, being soft, will not last long.

In replacing liners, the ground parts must join exactly without gaskets. After the casing bolts have been tightened, the setscrews holding the liners in place are made fast. Even if the ground joints of the liners are as good as can be made, some pump men take the extra precaution of pouring cement (one part cement and two parts sand) between shell and liner to avoid eddies or leaks, as eddies will wear holes in the liners or through the shell.

Liners must be handled with some care, as they break easily, and repair on them is out of the question. They are so hard that they cannot be drilled. Holes have been filled and small runners rebuilt, but their brittle character prevents large repairs from being successful.

In setting the thrust bearing of the runner shaft, bring it against the liner on the suction side; then bring the shaft back $\frac{1}{8}$ in. This is a safe margin, because when the pump runs, the force of the suction will bring the impeller a trifle closer still.

Multi-stage slime pumps have not been used extensively, for the reason that a sand pump must be as simple as possible. Two-stage or compound pumps are often made with two centrifugal pumps of the same size in series (one right hand, one left hand), the outlet of the first one being through a number of elbows discharging in the intake of the second pump, and both driven by a common shaft with pulley or motor in the center. Such an arrangement is common, but is of low efficiency. The principle of the series pump is to have the water delivered to the next one, with pressure but no speed. Two things that are positively worthless on a slime pump are foot valves and globe valves. The best valves are those of the quick-opening gate type.

In direct-connected pumps, flexible couplings are always used, and much wear takes place in them. They are made in many styles, the multiple-leather links being about the best. Rubber wears out too quickly. Iron to iron wears also surprisingly fast and is noisy. When iron to iron is used on the studs or bolts, I slip on a lead bushing about $\frac{1}{4}$ in. thick. To make the bushings as needed pour a bushing about 12 in. long and saw off required lengths. A supply can be kept on hand, and, when necessary, old ones may be replaced. Their cost is slight. They are noiseless, and do not wear into the flanges.

In making the regular pump inspection see that the pump shaft is in line with that of the driver. This may be done by putting a straight-edge on the coupling flanges, trying in two or three places, making sure, also, that the foundation and base bolts are tight. Never run a pump without water, as damage may result. All parts have but little clearance and will bind and heat. Do not use a check valve on the discharge line of a slime pump, as when the pump is stopped all the sand or slime will settle on top of the valve.

Single- or double-acting plunger pumps have a piston or plunger made either entirely of metal or with leather cups. The suction and discharge valves are part of the pump. The troubles of suction are the same in all pumps, but as these pumps have valves to hold the water they are somewhat more complicated than centrifugals, though they have a greater centrifugal. Having

more working parts, they require more attention. They must be inspected regularly, the valves at least once a month. The packing, being placed around the plunger, requires a larger quantity, having also to hold the water from passing outside.

VALVES ON PUMPS

Valves are one of the main wearing parts of a pump. In handling clear water they are expected to last well, but with any grit in the water, valves and valve seats will not last long. They must be replaced and the seat refaced. Under normal conditions the iron valve seat and the hard-rubber valve are the most economical and give the best service. They form an ideal combination for the cyanide plant, where brass is out of place. Red fiber also gives good service and is to be recommended where odd sizes are used. Fiber valves can be cut on the drill press as well as on the lathe. They are traced on the sheet, the stud holes drilled first, and the outside cut to size with the tool shown in Fig. 5. The valve seats are faced on the lathe. Often the grooves worn in the seats are rebuilt with the oxyweld, and then either dressed on the smooth side of the emery wheel or turned down. In out-of-the-way places, where supplies do not always come when expected, flat valves made of pieces of boiler plate have given surprisingly good service. They were made of the same thickness as the original rubber valves. When slightly worn, they were turned over and later refaced on the lathe. No springs were used in connection with them, and they did not wear any harder on the studs than either the hard rubber or the fiber.

Valve seats are removed by unscrewing them from the pump, or, if driven, by pulling them out with the wheel puller. Studs wear mostly on one side and must be replaced when in bad order. New studs must not have over $\frac{1}{4}$ in. clearance between the end and the plate cover, so that if the stud works loose it cannot fail. The yoke holding the valve cover must be made of cast iron, and must not be replaced by a solid bar of iron or steel. It works as a safety in case the pump be started against a closed valve in the discharge line, and its breaking releases the valve cover. The cost is moderate, and if anything else should break serious damage would result. To prevent breakage, a relief valve is installed on the by-pass line, but to be reliable it must always be kept in good condition and tried often.

PACKING FOR PUMPS

For the packing, the same conditions prevail as in the centrifugals. Each ring of packing must fit exactly, and the joints must be opposite or staggered. It is of little importance whether the ends are cut square or 45 degrees.

Plungers must be trued up when grooved, although the worst condition is when they are not parallel. After they have been turned down, it is good practice to put a turned ring of iron in the bottom of the packing box to make up for the difference in size and to prevent the packing from extending too far past the casting.

In packing plungers, an alternation of square flax and rubber fabric lasts longer than if packing is entirely of the same material. Use flake graphite freely, and about once a day oil the wearing surface of the plunger. When the service of a pump requires the packing to be changed every month, or more frequently, the flax packing can be used again by turning it over,

putting the inside worn face outside. Large packing glands which have stood much wear may be slightly bored out on the lathe and babbitted.

BEARINGS

Bearings must not be allowed to become loose, as the lost motion will crystallize the bolts, and they will snap off. A bad practice is to cut down bearing caps when the shims have all been taken out. When a bearing is worn out, a new one should be put in. Bad bearings and worn gears make noise and require more power. It is economy to make good permanent repairs.

AIR CHAMBERS

To take up the shocks and fluctuations of the plunger, and to form a steady flow, an air chamber is attached to the discharge pipe. It is usually made of cast iron, but can be made with a piece of pipe with a cap at one end. In some cases the action of the water, and also of cyanide solution, makes it porous, and in a day or two all the air will be out of the air chamber. The result is a steady pounding in the pipe. The air chamber must be taken out and treated, about once a year: dried, filled with paint and left under air pressure for about forty-eight hours. Some of the paint will fill the pores and leave a good coating inside, leaving the air chamber tight. Some air chambers are provided with a glass gage, but too often the glass is broken, or most of the air leaks out through the fittings, and as gages require much care they are not in high favor.

Pounding in a reciprocating pump may be due to the piston striking against casting, to loose bearing, unscrewed rod, air chamber full of water or discharge valve out of order. To find the cause, a good way is to follow the action of every plunger and notice exactly at what part of the stroke the pounding occurs. When running with a closed or nearly closed valve on the suction line, the pump runs light, and every bearing makes a noise from lost motion that is never heard when the pump is under load. The gears also are noisy.

Priming of a reciprocating pump is recommended, although not always necessary if the packing and valves are air-tight and the lift is not too high. If the pump takes air from any source, it is likely that it will pound, and operate as though all the plungers were striking regularly on something hard. The pump must be stopped and filled with water, after opening all vents to let the air out, and the leaks must be attended to.

A pressure gage connected to the discharge line of a pump will show whether the plungers are doing the same amount of work. In a triplex pump, the gage hand will show three even fluctuations per revolution. If one is weaker than the other, it either leaks at the packing or something is wrong with the intake valve. A valve may stick on the stud and stay open; the spring may be broken and may have worked in between the stud and the valve; the gage will show an irregular pulsation, and the valves must be inspected. By listening, a pump man can soon tell that something is wrong.

Sharp pounding in the pipe indicates that an air chamber is full of water, and the hand of the gage will work up and down quickly. An extra air chamber placed about half way in the line may help considerably. Insufficient water supply will cause a jerking of the plungers and a pound, indicating failure of the supply or that the intake valve or line is partly stopped. A plunger loose on the rod will produce the same effect. Too

quick seating of the valves may cause a pound, or the springs may be too tight. In fast-running pumps, a pound may be heard in the intake line as the intake valves close too quickly, but this is of rare occurrence. The remedy is to put a vacuum chamber on the intake line close to the pump.

DIAPHRAGM PUMPS

In many mills diaphragm pumps are used as sump pumps for transferring pulp from one tank to another. They are simple in operation, but their range of work is limited. The rubber diaphragm acts as plunger with a valve which is part of it. There are no other adjustments but the stroke, which, when once set, is seldom changed. The repairs are mostly limited to the renewal of worn-out parts. The valve seats can be either rebuilt with the oxyweld or faced down on the shaper or on the emery wheel. Being only rough castings, they are discarded when worn down too far. Nearly all the troubles are caused by worn parts. The pulp may be so thick that the pump will not handle it, but the pump is not to blame. Diaphragm pumps must be primed before started, and often the diaphragm must be covered with water to make it airtight. When not in use the diaphragm is taken out, wrapped in paper, and stored in a cool place; otherwise it may be so dried out and cracked as to be worthless.

AIR LIFTS

Where compressed air is available, air lifts are the cheapest and most simple pumps; and they should be mentioned in any discussion of pumping practice. They may not be the most economical when crudely made. In most cases they are made only when needed, of fittings on hand. Fig. 6 shows a type which can be made in a short time with a 2-in. T, one reducing bushing, one length of 2-in. pipe, one $\frac{1}{2}$ -in. valve, one length of $\frac{1}{2}$ -in. pipe, a foot or so shorter than the 2-in. pipe, with about a dozen $\frac{1}{8}$ -in. holes drilled near the end. The one drawback is the depth of submergence that air lifts must have. The footpiece in rough-and-ready mill work is not important, small holes drilled around the bottom of the air pipe being the best. For a large and steady amount of water, specially designed and ready-made footpieces are used, and in many cases the costs for pumping are less than with any other kind of pump.

Solution in tank A (Fig. 7) is to be lifted to tank B, without cutting any holes in the tanks. The pipe C will be connected so as to form a siphon over the rim of tank A (priming valve on top of siphon) and extended down to a distance equal to D. The air pressure will be connected through a tee at E, a point nine-tenths of the distance D on the up pipe.

Dirty and gritty mill pulps cause pump trouble as a rule, and tanks should be made 5 or 10 ft. deeper in the first instance and an air lift used.

USEFUL TOOLS

Besides the usual set of tools and wrenches, the repair man must have one set of pipe wrenches, chain tongs for the large sizes, two small crowbars, with one end chisel-bit and the other round and pointed; three or four punches not over 12 in. long, the smallest size being $\frac{3}{8}$ in. and the largest 1 in. They are specially useful when connecting large flanges. First, the round end of the crowbar is placed through two holes of the

flanges. This will hold the pipe line in place. Next the gasket is slipped in, one hole of the gasket facing any hole in the flange. There a punch is driven fairly tight, the crowbar taken out, the gasket holes brought into place, and the second punch is driven in any hole about opposite, thus bringing all the flange holes in their exact place. The bolts are then put in the other holes without the slightest trouble, whatever size the flanges may be, and, when well tightened, the two punches are hammered out and bolts put in their places.

Packing hooks are of all sizes. The most commonly used are made of $\frac{1}{16}$ -in. steel wire, one end with a ring handle, the other end corkscrew. An adjustable wheel puller for replacing pinions and gears, pulling out bushings and valve seats—a strong one and easy to make—is shown in Fig. 8. A small automobile screw-jack which can be handled with one hand where crow-bars cannot be used is likewise essential, as are also several chisels of different shapes for cutting gaskets, and a vacuum and a pressure gage for testing pumps. Scrapers made of old files for cleaning flanges and a fine wire brush for cleaning threads should be provided.

On pipe joints use a mixture of graphite and linsed oil. If in narrow places and high pressure there is trouble in holding gaskets, use soft sheet zinc about $\frac{3}{32}$ in. thick in one or two thicknesses. If taken out often, the zinc sheets must be annealed.

Advantage of Washing From a Flowing Stream

The illustrations show the application of the shower to the ordinary type of faucet for washing purposes



APPLICATION OF THE FLOWING STREAM

in change houses. This improved method of washing from a flowing stream permits a workman to perform his ablutions in a more thorough manner than is allowed by the usual method. The advantages are ap-

parent, as the upper part of the body can be easily reached by the stream, much to the satisfaction of the workman. The sanitary feature of the installation is a distinct advantage, as the operation is claimed to be absolutely germless.



WASHING VARIOUS PARTS OF THE BODY

This installation is used by the United States Steel Corporation and the photographs are reproduced from Bulletin No. 7 of the Bureau of Safety, Sanitation and Welfare of that corporation.

Transvaal Gold Output

Output of gold at Transvaal mines during the first six months of 1919 amounted to 4,147,484 oz., valued at £17,617,391. This compares with 4,256,334 oz. in the same period of 1918. The following table shows the monthly figures for the last four years, in fine ounces:

	1919	1918	1917	1916
Jan.....	676,959	714,182	782,634	787,467
Feb.....	636,728	659,759	721,321	753,594
March.....	712,379	696,81	787,094	796,689
April.....	694,944	717,099	742,778	754,672
May.....	724,995	741,317	779,385	777,681
June.....	702,379	727,696	759,724	761,764
July.....		736,199	757,839	761,087
Aug.....		740,210	756,658	781,150
Sept.....		708,206	738,231	771,567
Oct.....		679,764	751,290	792,339
Nov.....		658,701	722,839	783,066
Dec.....		641,245	722,419	774,462
Totals.....	4,147,484	8,420,659	9,022,212	9,295,538

Output of gold at Transvaal mines during the first from January, 1916, to the present time:

	1919	1918	1917	1916
Jan.....	£2,871,718	£3,033,653	£3,324,418	£3,344,948
Feb.....	2,704,647	2,802,477	3,063,976	3,201,063
March.....	3,025,992	2,957,614	3,343,363	3,388,121
April.....	2,951,936	3,046,045	3,155,121	3,205,643
May.....	3,079,583	3,148,915	3,310,618	3,303,377
June.....	2,983,515	3,091,058	3,227,101	3,235,767
July.....		3,127,174	3,219,094	3,233,991
Aug.....		3,144,211	3,210,079	3,318,116
Sept.....		3,008,267	3,135,807	3,277,408
Oct.....		2,887,455	3,191,279	3,365,642
Nov.....		2,797,983	3,070,426	3,326,253
Dec.....		2,723,836	3,068,639	3,289,705
Totals.....	£17,617,391	£35,768,688	£38,323,921	£39,484,934

Schedule C, Now in Effect at Trail Smeltery

Consolidated Mining & Smelting Co. Issues New Schedule in Place of Schedule B—Action Follows Recent Investigation of Smelting Rates

VICTORIA CORRESPONDENCE

THERE has been dissatisfaction on the part of independent shippers of British Columbia with the treatment charges of the Consolidated Mining & Smelting Co. of Canada at its Trail smeltery as set forth in what is known as Schedule B. This, it will be recalled, led to an investigation by a special committee having authority from the dominion government, the report of which was issued a short time ago. The matter was discussed at a recent mining convention at Nelson, when it was announced by J. J. Warren, general manager of the Consolidated company, that a new schedule was being prepared and would be issued soon. This schedule, Schedule C, has now been published and is effective. It provides the promised reduction in ore-treatment rates and more especially affects those ores containing zinc and sulphur. The schedule is as follows, the introductory table being the basis of payment for silver and lead:

SCHEDULE C ISSUED BY CONSOLIDATED MINING & SMELTING CO. OF CANADA

SHOWING BASIS OF PAYMENT FOR SILVER AND LEAD

	Silver Payment, Per Cent.	Lead Payment, Per Cent.
10% zinc or under	95	90
Over 10% and including 11%	94	89
Over 11% and including 12%	94	88
Over 12% and including 13%	93	87
Over 13% and including 14%	93	86
Over 14% and including 15%	92	85
Over 15% and including 16%	92	84
Over 16% and including 17%	91	83
Over 17% and including 18%	91	82
Over 18% and including 19%	90	81
Over 19% and including 20%	90	80
Over 20% and including 21%	89	79
Over 21% and including 22%	89	78
Over 22% and including 23%	88	77
Over 23% and including 24%	88	76
Over 24% and including 25%	87	75

Silver: Will be paid for to the extent shown by the above schedule on the fire assay at the average of the *Engineering and Mining Journal*, New York, quotations for the second calendar month succeeding the date of sampling at Tadanac, B. C. In no case will the deduction from the silver assay be less than one-half (0.5) oz. per ton.

Lead: The lead contents will be determined by the wet method of analysis, deducting one and one-half units to arrive at the dry lead assay. Lead will be accounted for on the dry lead assay to the extent shown by the above schedule; provided, however, that in no case will the deduction from the said dry lead assay be less than one unit or twenty pounds per dry ton of ore.

The price for lead to be used in settlement will be our sales price delivered at destination in Canada less one and one-half cents per pound for refining and marketing as now in effect under the existing pooling scheme, which will be continued. There will be deducted also from the delivered sales price, \$2.30 per ton on sales at Toronto and common points and \$4.50 at Montreal and common points and similar differentials to other points. This freight adjustment is to cover actual increases in freights, e.g., should sales in any month be 2,000 tons and say 1,200 tons for delivery at Toronto and 800 tons at Montreal, the freight adjustment would be three-fifths at \$2.30 and two-fifths at \$4.50, or \$3.18 per ton of lead.

The pooling scheme is outlined as follows:

(a) Settlement is based upon sales price as above provided and only to the extent of actual sales from month to month.

(b) Whenever sales are sufficient to settle for a full month's lead receipts, this is done promptly.

(c) Lead from our own mines is pooled with that purchased from others and is treated in exactly the same way.

(d) Each month a statement is issued showing the condition of the pool. All shippers have been sent a copy of the last one issued.

DEDUCTIONS

Smelting per dry ton of material, \$9.50 as a base rate, which will be modified in accordance with the following formula:

(1) Add to the base rate per ton, 60c. per unit for all zinc contained.

(2) Deduct from this result the total units of silica, iron, manganese, lime and magnesia at 9c. per unit.

Provided that in no case shall said base rate be reduced more than \$4 per ton as the net result of the said additions and deductions.

Provided, also, that in making the above computation, iron, silica and lime if 1 per cent or under, and manganese and magnesia if 3 per cent or under, will be disregarded.

Sulphur: A charge will be made in addition to the above for all sulphur contained in excess of 2 per cent, at 30c. per unit per dry ton of material, provided that such charge shall not exceed \$3 per ton in any case.

Moisture: A minimum moisture deduction of 1 to 4 per cent will be made. The following penalty for moisture will apply to fine concentrates and clayey ore only: If over five per cent, charge for all contents at 10c. per dry ton per unit.

Size: Coarse and fine concentrates and ores should be shipped separately. If mixed so that over 30 per cent will pass through a ¼-in. screen, an extra charge of 50c. per ton will be made.

Sampling: If the shipment is less than a car lot or contains more than one lot per car, a deduction may be made for extra sampling, assaying, etc., of \$10 per lot.

Weights and Samples: Those used in settlement shall be those made at the smeltery.

Representation: Shippers are expected to notify us as to who will represent them while their shipments are being weighed and sampled. Failure to do so will be construed as meaning that the smelter will have authority to appoint one of the local mine representatives at the shipper's expense unless the local shipper notifies us that a representative is not required.

Assays: Shippers will supply the smelter with their assays on smelter pulps shortly after sampling. In case of difference in assays requiring it, the umpire pulp will be referred to an umpire mutually agreeable. The party whose result is furthest from the umpire's result will pay his fee.

Settlement: (a) Shortly after sampling, an advance payment of 90 per cent of the apparent value is made. The prices used in estimating the apparent value will be the New York price for silver and the Montreal price for lead at the date of sampling.

(b) When final settlement is rendered possible by silver quotations being available for the second calendar month after sampling and by all of the lead received during the calendar month in which the ore is sampled having been sold, the final value will be computed and any adjustment necessary will be made between the smelter and mine.

(c) Advances made on account will be carried by the smelter without interest until the last day of the second calendar month in which the ore arrives. Interest at 6 per cent will be charged on advances upon lead after that date.

The above rates will be effective on shipments received here on July 1, 1919, and are subject to change without notice.

THE CONSOLIDATED MINING & SMELTING CO.
OF CANADA, LTD.

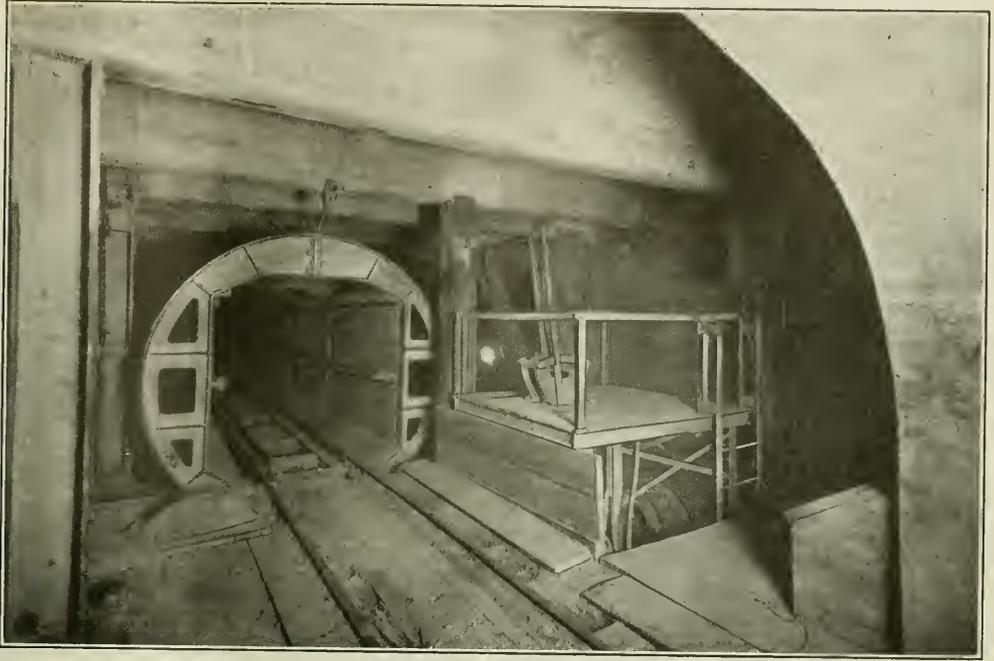
Views Underground at the Ray Consolidated



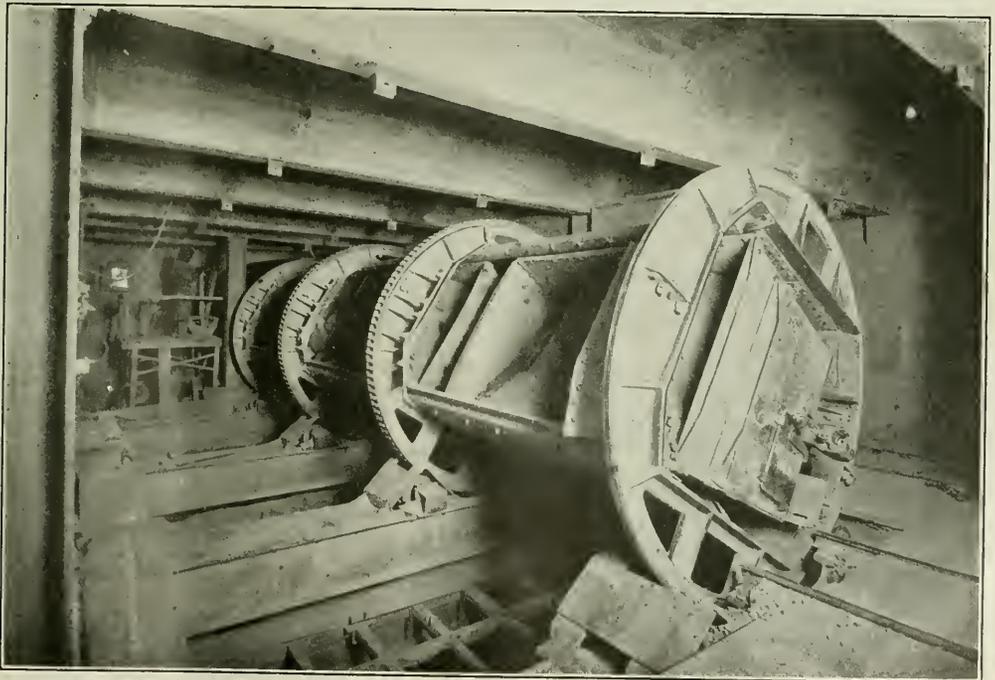
REINFORCED-CONCRETE SUPPORT OF DRIFT, NO. 3 LEVEL, RAY CONSOLIDATED COPPER CO., RAY, ARIZ.



UNDERGROUND BLACKSMITH SHOP AND TOOL-SHARPENING PLANT



CAR-DUMPING DEVICE ON THIRD LEVEL, RAY CONSOLIDATED COPPER CO.



TIPPLE IN POSITION OF DUMPING, RAY CONSOLIDATED COPPER CO.,

The Work of Accident Prevention*

A Consistent Decrease in Accident Percentage Not To Be Expected—Low Accident Rates Dependent in Large Measure on the Overcoming of Carelessness When Miners Work at High Speed

BY WILLIAM CONIBEAR

Safety Inspector, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

THE work of accident prevention in the mining industry in the United States has been in progress for about eight years. Its necessity and value in the economic life of the country may not be recognized and appreciated by all mine managements, although the movement is gaining momentum, and most operators are putting forth laudable efforts to eliminate personal injury to their employees. The entire country is awakening to the fact that this work is desirable not only from a humane standpoint but also as a business proposition. The voluntary aid which the Government has rendered through the Bureau of Mines cannot be overestimated, and those familiar with the situation and without prejudice must acknowledge that the responsibility of the operator of an iron or coal mine is lessened because of the assistance which is offered by the men whom the Bureau has stationed in the principal mining districts of the country.

An eight-year period is relatively short to use as a basis for a comparison from which may be deduced the results required to analyze the big problem of accident prevention. Safety experts of foreign countries state that it requires from ten to fifteen years to stop the natural tendency toward an increase in the percentage of accidents. It has been stated by men familiar with American industrial conditions that more than one-half of all accidents here are preventable. In support of this statement bulletins have been issued which cite figures to prove that certain operators have succeeded in reducing accidents in their mines or plants by 50 per cent or more during the first year or two of special safety activity. The publication of instances of this kind may be of value as a means of attracting the non-interested employer, but credit for such reductions may not be due entirely to a brief campaign of safety work. The annual fatality rates of the mining industry of the country may not show rapid fluctuations from year to year, but the rates of individual operators rise and fall and frequently a minimum annual rate may be followed by a maximum rate, or vice versa.

RESULTS OBTAINED BY SAFETY CAMPAIGNS VARY FROM YEAR TO YEAR

In 1911 one of the large mining companies organized a safety department, which was accepted wholeheartedly by all of its officers. Low fatality rates were obtained during 1911 and 1912; in fact rates that compared favorably with the low percentages prevailing in many foreign countries. A zealous safety inspector might appropriate this reduction and credit it to his department, but under these circumstances it would not be unreasonable to ask him to continue to produce similar results if he desired to retain his position; a most difficult task. The annual

fatality rates of this country prior to 1911 show a fluctuation which varies as much as 150 per cent, and since 1912 the low rates of the first two years of the safety department have been reached but once. There has been no relaxation in safety precautions, but considerable effort and money have been expended to maintain as low an accident rate as possible. It is therefore evident that the rates of 1911 and 1912 were the result of the special safety precautions during the years when the swinging of the pendulum, which periodically has characterized the history of every mining company having a long life, had reached its lowest point.

EDUCATION OF EMPLOYEES AND INSTALLATION OF MECHANICAL DEVICES

It is not intended to minimize the value of safety work, but the fact should be recognized that, despite every effort to prevent personal injury, there is a fluctuation in the number of accidents which occur from year to year that is beyond control. This fluctuation may indicate that 50 per cent of the accidents about mines are preventable, and on the other hand, it may be advanced as an argument that, regardless of the best efforts, accidents are inevitable and it is useless to spend time and money in endeavoring to prevent them.

Two special features of accident-prevention work which have been emphasized in this country are safety devices and education of employees. There has been ample time in which to devise and install safety guards for the elimination of danger that is self-evident and preventable, but the problem of training men to be always on guard against personal injury appears to be more difficult to solve. If the miner of the United States is more careless of the first law of nature than the workman of other countries, I have failed to read or hear of a satisfactory explanation. The Director of the Bureau of Mines recently stated that the foreigner unable to speak English and working in the mines of this country was most liable to injury. Rules and regulations are printed in foreign languages, and as a general rule non-English speaking men associate with fellow countrymen who speak English more or less, so in a comparatively short time a miner is capable of understanding the habits and customs that prevail in the mine where he works. Hazards of coal or iron-ore mining are similar the world over, and the foreigner is not entirely ignorant of the danger that follows his trade. However, the number of those who do not understand English is so comparatively small that this phase of the problem may be considered negligible in the attempt to find a solution of the task that is offered by accident prevention.

The average fatality rate in the coal industry of the United States from 1911 to 1918, representing years during which time safety work was carried on,

*Paper read at the Lake Superior Metal Mine Safety Conference, Duluth, Minn., June 19-20, 1919.

was 3.37 per 1,000 men employed. For the eight years prior to 1911 the figure was 3.78, a reduction of 11 per cent. The average rate in the metal mines from 1911 to 1916 was 3.59 per 1,000, but there appear to be no figures available for the years prior to 1911. The death rate from various causes of accidents in and about all the mines of Great Britain has not reached three per 1,000 men employed since 1873, and the average rate since 1889 has been approximately 1.35. The history of mining in other countries also shows low fatality rates. Is the American miner, native born or foreigner, less skillful or more careless than the miner of foreign lands, or is he working under less favorable conditions, to account for this disparity in fatality rates?

The early history of coal mining in this country was characterized by low annual death rates; from 1875 to 1889 there were but three years in which the rate reached three per 1,000 men employed. Since 1898 there has not been a year when a rate less than three per 1,000 men employed has been attained. Why should a long record of low fatality rates be followed by so many years of much higher rates?

A comparison of the seven principal causes of accidents reveals slight fluctuation covering the two periods designated, namely, 1873 to 1898 and 1898 to 1918. Falls of coal and like occurrences were responsible for 46.68 to 48.81 per cent; mine cars and locomotives caused 12.59 to 13.48 per cent; gas and dust explosions, 9.82 to 14.95 per cent; explosions, 7.29 to 7.96 per cent; accidents in shaft accounted for 3 to 7.96 per cent; those on the surface, 7.10 to 8.70 per cent, and miscellaneous causes were responsible for 7.63 to 8.39 per cent. It is evident from these figures that no one or two principal causes can be designated and charged with the responsibility of the high fatality rate prevailing in the coal mines, and the same may be said of the iron-ore mines.

INDUSTRIAL DEVELOPMENT HAS DEMANDED INCREASED PRODUCTION

The development of this country has been rapid and extensive, and the demand for coal and iron has been so imperative that operators have been compelled to produce annually an exceedingly large tonnage. Rich resources have made possible the wonderful advancement which has marked the growth of industrial organization, but skill and efficiency in operation have not been neglected. The annual average production per man employed in coal mining from 1875 to 1898 was 458 tons, and from 1898 to 1918 it was 687 tons, a gain of 50 per cent. In 1873 it was 543 tons, and in 1879 it was 501 tons, whereas since 1899 there were but two years during which the annual production per man fell below 600 tons. This increase in production has been possible because large deposits of coal have been discovered, because invention of improved machinery has facilitated the handling of large outputs, and because the American miner applies himself more intensely and constantly to the daily discharge of his work than does the foreign miner.

In 1916 the iron-ore mines of Minnesota and Michigan shipped 66,748,466 tons of ore. Fatalities totaled 113, or an average production of 599,560 tons per each death. The same year Great Britain produced 14,845,734 tons of metal ore and suffered a loss of twenty-five employees, or an average of 593,821 tons

per each death. When the risks involved in mining iron ore from the open pits of Minnesota are compared with those involved in deep underground mining, it must be admitted that the hazards of mining in this country should not be greater than those existing in distant lands.

The American mine operator is to be commended for the high degree of efficiency that he has produced in his profession. Nobody enjoys the benefits resulting thereby more than the American miner, whose mode of living is in keeping with the high ideals of American life. But the fact must be faced that no matter how intelligent or skillful one may be, he is more liable to injury when he works at a high rate of speed than when he works slowly.

During 1916, 174 men were killed in the copper and iron-ore mines of the Lake Superior district, and of this number 56, or approximately 33 per cent, were killed by falls of rock or ore from roof or wall. Methods of extracting ore are not responsible, because the best methods known to the profession have been applied. Is the miner, then, occupied so intensely in his work that he pays less attention to his personal safety than the miner in foreign lands? This would seem to be the fundamental question that is presented in the endeavor to find a solution to the problem of accident prevention.

Sicilian Sulphur Exports

According to the International Institute of Agriculture, which takes its information from official sources, exports of crude and refined sulphur from Sicily in 1918 were 230,769 metric tons, compared with 162,971 in 1917, 396,035 in 1916, 359,806 in 1915, and 338,308 in 1914. In January and February, 1919, there was exported 13,615 and 13,303 metric tons, respectively.

Stocks of sulphur on hand at the ports in Sicily were as follows, according to the same source of information:

Dec. 31	Metric Tons
1918	112,050
1917	156,801
1916	155,376
1915	323,391
1914	369,001

Automatic Tuyère Punching

The problem of punching converter tuyères automatically has to an increasing degree engaged the attention of engineers in recent years. Up to the present, however, none of the methods devised has found practical application. One reason for this is the fact that the tuyères do not always stay in the same place, gradually getting out of alignment, owing to the shifting of the lining of the shell.

The latest device for automatic punching to be patented¹ is the invention of C. J. Arch, of Douglas, Ariz. Each punch bar forms the piston of a motor actuated by compressed air or steam to give the necessary punch. When the punch bar of the first tuyère nears the end of the stroke, it automatically opens a valve admitting air to the second cylinder, and so on, the tuyères being punched successively. Apparatus is provided for cleaning and cooling the punch bars; also for cutting out any which it is not desired to operate.

¹U. S. Patent No. 1,302,753, dated May 13, 1919.

California's State Mining Bureau

Present Organization Had Its Beginning in 1880, but Much Exploration Work Had Been Done in California in the Forty Years Preceding—Reports Cover All Phases of Mining Activities

BY WILSON T. LUNDY
Mining Engineer, San Francisco, Cal.

MINING has been the fundamental industry of California from the beginning, and it is therefore natural that questions relating to geology and mining should have received early official recognition. The present California State Mining Bureau was started in 1880, but prior to that time many steps had been taken leading up to its establishment. It may be of interest to recall some of the events that preceded the organization of the Bureau.

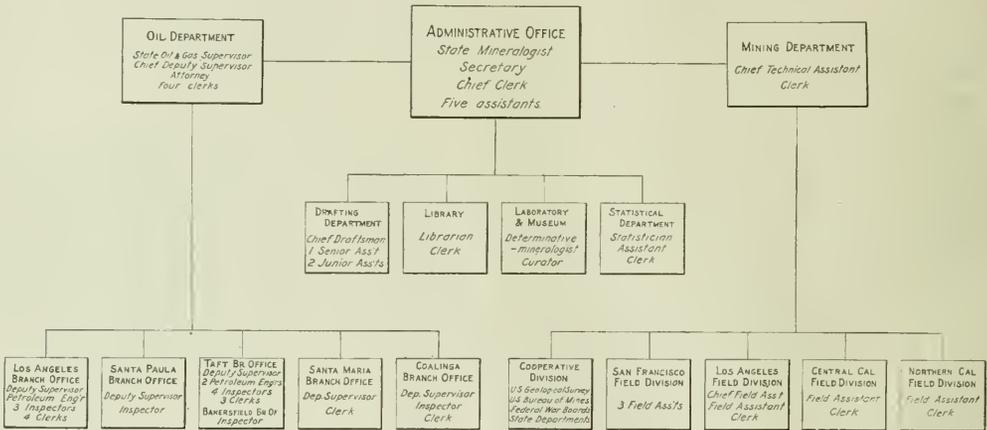
The U. S. Exploring Expedition, under command of Captain Charles Wilkes, U. S. N., visited California during the years 1838-1842 with James D. Dana

with the State University, and while there wrote several valuable books on California's geology and mineral resources.

OFFICE OF STATE GEOLOGIST CREATED IN 1853

On May 6, 1853, the office of State Geologist was first authorized, Dr. John B. Trask being appointed to the position. His first report was published that year, followed by others in 1854, 1855, and 1856.

The beginning of the present organization dates from Apr. 16, 1880, when the State Mining Bureau and the office of State Mineralogist were created, with



ORGANIZATION OF CALIFORNIA STATE MINING BUREAU

as geologist. Mr. Dana's report represents the first official publication relative to the geology of the Pacific Coast region which was ever issued.

John C. Fremont explored California and Oregon during 1843-1844 with James Hall, of New York, the former's report being published in 1845. In 1849, Bayard Taylor undertook a reconnaissance survey of the state at the direction of Congress. In the same year T. Butler King and Philip T. Tyson were sent to California by the Federal Government, and a report on the geology and topography of the state from Benicia to the American and Calaveras rivers was published by the Senate of the Thirty-first Congress, as Executive Document No. 47.

In 1853-1854, under the direction of the War Department, an expedition was sent out to explore a route for a railway from the Mississippi River to the Coast. Twelve large volumes, known as the Pacific Railroads Reports, were printed as the result of this work. W. P. Blake was chief mineralogist and geologist of the expedition. Professor Blake, who later became State Geologist, was subsequently connected

Henry G. Hanks as first executive head of the department. Although since then there have been periods when the financial condition of the Bureau has been poor, nevertheless the office has operated continuously with the constant purpose of assisting the California miner to develop the resources of the state.

During the last few years the scope of the Bureau's activities has been considerably broadened. Previous to 1913 the department staff consisted of the secretary, determinative mineralogist, statistician, librarian and one geologist, the latter devoting his time to petroleum. At present there are under the State Mineralogist, the state oil and gas supervisor, secretary of the Bureau, mining engineer, chief field assistant, statistician, determinative mineralogist, four field assistants in mining, and five deputy oil and gas supervisors, together with assistants and clerks at headquarters in the Ferry Building, San Francisco, and at the branch offices, which are situated at 512 Union League Building, Los Angeles, and at Santa Maria, Santa Paula, Taft, Bakersfield, Coalinga, Auburn, and Redding.

The department of petroleum and gas was established by law Aug. 9, 1915. It is under the general jurisdiction of the State Mineralogist, who is authorized to appoint as supervisor an engineer or geologist experienced in the development of petroleum. This officer has supervision over the drilling, operation, maintenance, and abandonment of oil and gas wells, so as to prevent damage from infiltrating water and other causes.

OIL AND GAS WASTE LESSENED BY BUREAU'S WORK

It is of vital interest to the general public that waste of the natural supply of petroleum and gas in California be prevented, and much good has resulted in the short time which has elapsed since the work of this department was inaugurated. Much of the damage caused in the past has been owing to lack of knowledge of underground conditions. Information in this regard is being constantly gathered and systematized by the Bureau and the results placed at the disposal of all interested parties.

Since 1914 a detailed survey of the mineral and other industrial material resources of the state has been completed and the result published. The annual statistical bulletin showing mineral production has grown from merely a single tabulated sheet to a volume, and the information thus presented has proved to be of considerable aid to prospective investors and buyers of ores, as well as to the producers in the state. Many other reports covering the mining laws, detailed occurrences of useful minerals, production and transportation of petroleum, as well as geological maps, have been made available for the mining public.

BUREAU'S HEADQUARTERS CONVENIENTLY SITUATED

The Bureau maintains a technical reference library of more than 5,000 volumes at the main office in the Ferry Building, San Francisco, which is consulted by scores of mining men daily. Copies of all the leading mining and trade journals, as well as newspapers from most of the mining camps, are also on file in the reading room.

The museum, which occupies a floor space of 7,500 sq.ft. in the same building, is a valuable asset of the Bureau. Twenty thousand mineral specimens, a large proportion being from California, are on display and have been so arranged that a study of the minerals and rocks may be easily undertaken.

A laboratory is available where determinations are made, free of charge, on samples which any one in the state may send in. Advantage is constantly being taken of this service by hundreds of prospectors, who send their samples to the State Mineralogist, at the Ferry Building, accompanied by a letter, giving the locality where the minerals were found and the nature of the information desired.

A general mining information bureau is a well established feature of the State Mineralogist's office, and numberless inquiries, both written and personal, are answered daily relating to every phase of the industry. The chief object of the entire organization is to keep in touch with the practical side of mining in California, whether it be prospecting for, developing, producing, marketing or buying mineral substances. Technical and scientific problems are naturally important and also receive due attention.

Fletcher Hamilton is State Mineralogist, and the executive officers of the Bureau acting under his supervision are: W. W. Thayer, secretary; R. P. McLaughlin, oil and gas supervisor; E. S. Boalich, mining engineer and chief technical assistant in the mining department; and W. B. Tucker, chief field assistant. The accompanying chart shows the present organization of the Bureau in detail.

Mining in New Mexico in 1918 and 1919

During 1918 mines in New Mexico produced \$681,000 in gold, 782,000 oz. of silver, 8,235,000 lb. of lead, 98,300,000 lb. of copper, and 24,100,000 lb. of zinc, according to the U. S. Geological Survey. The statistics for 1919 will show a considerable decrease in the output of all metals except gold. The Chino Copper Co., which in 1918 produced 79,340,372 lb. of copper and \$39,732 in gold and silver, produced only 11,512,133 lb. of copper during the first quarter of 1919, owing to curtailment of operations. This company hopes to be able to continue operations at 50 per cent capacity. The Burro Mountain branch of the Phelps Dodge Corporation, which in 1918 produced 53,146 tons of concentrates averaging 14.9 per cent copper, has been so seriously affected by the drop in the price of copper that it has suspended operations. The Santa Fe Gold & Copper Co. has also ceased operations at San Pedro.

During the first five months of 1919 the 85 Mining Co., at Lordsburg, shipped a quantity of siliceous copper-silver-gold ore almost equal to that shipped by it during the entire year 1918. Development at Mogollon may maintain an output of silver equal to that of 1918, when the Fanny mill was operated only five months. The combined gold districts of Nogal, White Oaks, and Baldy have so far produced ore at an increased rate.

The decreased shipments of lead and lead-zinc ores from Magdalena and the discontinuance of the shipments of lead from the Organ Mountains district will greatly reduce the output of lead from the state. The suspension of operations at Pinos Altos and the curtailment of operations at Hanover and Kelly will naturally result in a greatly decreased output of zinc.

St. John Del Rey Mining Co., Ltd.

The eighty-eighth annual report of the Morro Velho mine for the year ended Feb. 28, 1919, shows that the mine yielded 167,854 tons, of which 4,312 tons, or 2.57 per cent, was rejected as waste. The total tonnage stamped was 165,000. The assay value of this in fine gold, after taking into consideration the value of the tonnage at the beginning and the end of the year, is 5,724 oitavas per ton, or 2,793 pounds sterling per ton, or a total value of £460,839. Of this there was extracted by the first process £312,000, and by the second process £111,000, or an extraction of 67.71 per cent and 24.09 per cent, respectively. The total yield was £423,000, or a total extraction of 91.80 per cent. There is, however, an unavoidable discrepancy in this, inasmuch as 310 tons of rusty concentrates, purchased in the vicinity, had to be run through the process, giving an estimated yield of £2,300, thus reducing the total yield from ore stamped to £420,700, and the extraction to 91.29 per cent, against a yield of £465,206 for the year previous, a falling off of £44,500, attributable to

the lower tonnage stamped and lower percentage of extraction.

The output from the mine was seriously affected by the epidemic of influenza, which reached Morro Velho at the end of October and continued with great virulence throughout November, during which month it was possible to raise only about half the normal tonnage of ore. The company's operations were also hampered by floods during the exceptionally heavy rainy season.

The profit for the year, £124,338, compares with £153,649 in the preceding year, and makes, with the balance of £21,135 brought forward, a total of £145,473, as compared with £157,736. The directors propose that the usual final dividend of 1s. 3d. a share should be paid, and that £35,000 should be transferred to capital works account, the balance of £19,255 being carried forward.

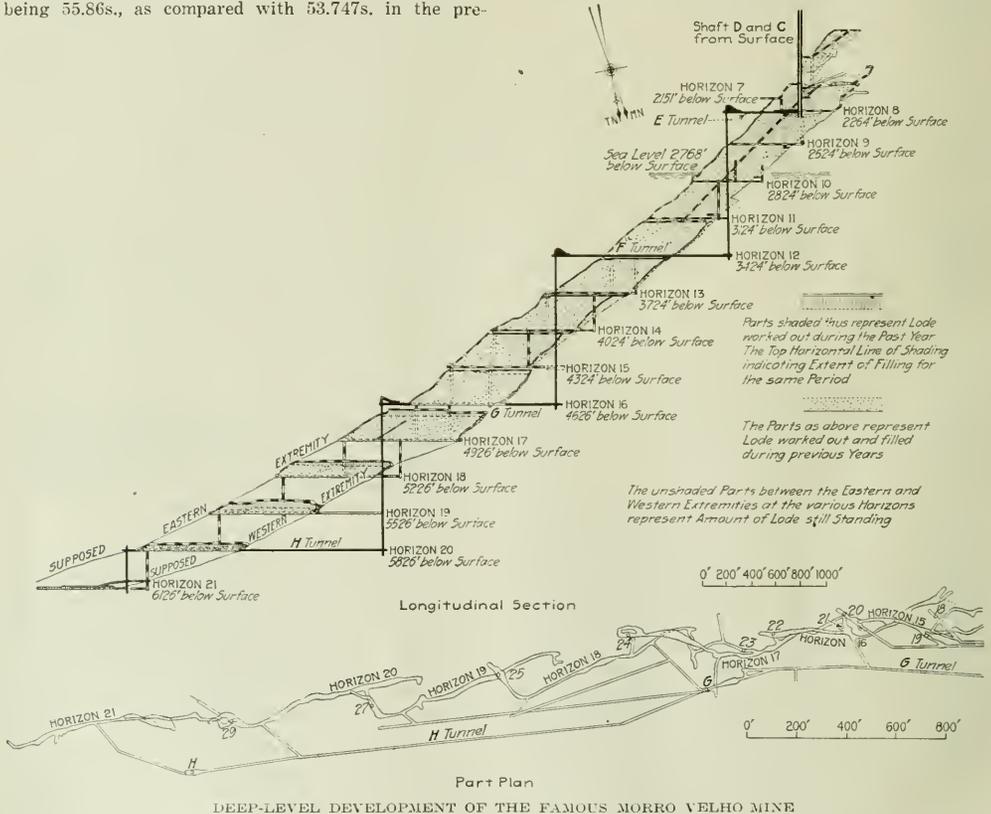
The increase in the size of the lode which has taken place in the lower horizons is a satisfactory feature. An improvement is shown in the ore, the assay value being 55.86s., as compared with 53.747s. in the pre-

Mining in Venezuelan Guiana

Large Bodies of Low-Grade Ore Amenable to Cyaniding Await Capital—Changes in Mining Code—Hematite Mines Near Mouth of Orinoco

CIUDAD BOLIVAR CORRESPONDENCE

IN VENEZUELAN Guiana gold is found over a large area, extending from the Caroni River, an affluent of the Orinoco, to British Guiana, the greater part of which has not been systematically prospected. Even in the long-known Yuruary district, of which Callao, where the Callao mine is situated, may be called the center, the ground has never been proved below 1,000 ft. and then only before the days of the cyanide process. The quartz mines, with a few exceptions, are all within forty miles of this center. During the war, most of them closed down, partly owing to the heavy increase



vious year. The reserve at the end of the year is estimated at 1,209,104 tons. This reserve, if consumed at the full possible output of 192,000 tons per annum, will last 6.3 years.

To illustrate the method of operating this famous property, the above extract from the annual report is accompanied by a longitudinal section and plan of part of the lower levels.

in costs and machinery and stores, wages having remained the same, but also to want of efficient administration, the usual fault in Venezuela. In 1914, there were six companies crushing ore, and at the end of 1918 only one, the latter on a very reduced scale. The output of gold, however, in 1915 and 1916 trebled that of 1914, owing to the production of alluvial gold from the upper Cuyuni River. In 1917 the output, according

to government returns, was 30,800 oz. That for 1918 is not yet published, but is certainly less.

The alluvial goldfields on the upper Cuyuni are situated about eighty miles south of El Callao, and were first discovered in 1913. Since then concessions covering an area of approximately 35 by 55 km. have been taken up, chiefly by two syndicates, one of which shipped over 30,000 oz. in 1916 and 1917. The gold being recovered by means of bateas, toms, and rough sluices, the loss is considerable, and costs are excessive. Diamonds are also found in the same district, in the alluvial formation, mostly small but of good quality. They also occur in the Caroni and Paragua rivers in alluvial formations. The Paragua River lies west of the Caroni, of which it is an affluent.

LACK OF PROPER ROADS RETARDS GOLD MINING

At present the outlook for gold mining is not favorable, owing to the higher cost caused by the war and the want of good roads. There are, however, great possibilities in the district, as there are large bodies of low-grade ore, which requires only sufficient capital for opening and working on a scale large enough to reduce costs. The ore is easily amenable to treatment by the cyanide process. It is also probable that conditions of transport may soon be improved, as a private company is trying to arrange with the government for building a new road to the mines for motor transport.

During the last few years there have been several new quartz reefs located and worked within forty miles of El Callao, one of which shows considerable promise. They have, however, not yet passed the stage of prospects.

STIPULATIONS INCLUDED IN NEW MINING CODE

A new mine code was passed by Congress in 1918, which came into force at the end of the year. The principal alterations are: 1. Increase of surface tax from one to two bolivars per hectare on quartz concessions, and from one-half to one bolivar on alluvial concessions, 2. It is no longer necessary to keep ten men employed on a concession after it has been declared in exploitation. 3. A concessionaire may at any time reduce the area of his concession, should part of it be of no value. 4. Concessionaires under previous laws have the option of adopting the new one. Concessions on quartz reefs can be obtained in blocks up to 200 hectares, and alluvial concessions up to 2,500 hectares. Both have to be either in squares or rectangles. The gold tax is the only other tax imposed and amounts to one-tenth bolivar. Under the mine code all machinery and mine stores can be imported free of duty, but in every case a permit to obtain the rebate has to be applied for. This does not cover explosives, to import which a special permit must be obtained from the government.

The Imataca iron mines are situated near the mouth of the Orinoco. They were opened and worked on a large scale by a Canadian corporation for a time, but closed down a few years ago, owing to the supply of ore being inadequate. This area is also worthy of further investigation, as the ore is hematite of excellent quality, and cargo boats can load at the mines. Gold has also been found in the same area.

It may be added that a large part of the country lying between the Caroni and Cuyuni rivers is suitable for raising cattle, the latter being easy to export via the Orinoco.

Alaska Juneau Gold Mining Co.

Increase in Bullion Production—Proposed Changes in Mill Construction—Deficit for the Year Ended Dec. 31, 1918, Amounted to \$325,499

THE fourth annual report of the Alaska Juneau Gold Mining Co. for the year ended Dec. 31, 1918, shows the bullion produced amounted to 18,773 oz., valued at \$334,255, compared with 12,923 oz., valued at \$229,465, during the previous year. Production of concentrator amounted to 640 tons, valued at \$125,188, compared with 1,419 tons, valued at \$231,199, during 1917. Recovery of gold, silver, and lead averaged \$0.80 per ton. The crude ore assayed \$0.94 per ton.

The amount of development work done was only 5,501 ft., most of which was performed on Nos. 3 and 4 levels, making the total amount of development 81,564 ft. On the No. 4 level, in addition to 3,192 ft. of development, an area of 50,662 sq. ft. (slope measurement) was undercut. From this area and the development work, 1,339 muck samples showed an average of \$1.49. The preparatory work necessary for this stope was about 95 per cent completed at the end of the year. The east half of the stope was completed in October, and four pillars and two powder drifts were blasted, about 40,000 tons being broken.

Gloryhole mining was conducted on the surface of the south orebody during the summer, and 47,934 tons averaging \$1.73 was mined. The gold assay value for the entire mine as shown by 6,921 muck samples was \$1,041. Tonnage sent to mill was 592,218, of which 540,757 tons was crushed in the new mill, 33,528 tons was stamped to $\frac{1}{2}$ -in. mesh in the 50-stamp mill, 16,230 tons was rejected as waste, and 1,703 tons remained in the bins.

No radical change was made in the mill from the year before, but the attempt to force the ball mills to a duty that would give the entire mill its promised capacity was abandoned. A definite program was adopted for waste rejection on a large scale, and also for introducing refinements into the milling practice, which will increase capacity and avoid extremes in labor and supply costs. The estimated cost of carrying out these changes is \$500,000, and upon completion the new equipment is expected to tram 16,000 tons per twenty-four hours, reject 8,000 tons as waste, and mill 8,000 tons of ore.

Unusually heavy rains in September caused a debris slide, resulting in damages amounting to \$26,919 to the new mill and railroad. The company expended \$166,973 upon construction work. Of this amount \$104,674 was spent in the new mill, \$30,508 in the power plant, and \$10,805 in the 50-stamp mill.

The sum of \$785,822 is debited on the profit-and-loss account, which includes mining, milling, and handling costs, plus marketing expenses, including storm damage. Bullion and concentrate production, plus other miscellaneous revenue, is credited with the sum of \$460,322. The excess operating costs over revenue for the year amounted to \$325,499.

Manganese Exports From Brazil during the first two months of 1919, according to a recent consular report, amounted to 59,270 metric tons, compared with 71,101 metric tons in the corresponding period of 1918.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical
Industry Dealing With Pertinent
Subjects of Interest

A Silverless Islet

I am interested in your article on "A Silverless Islet," which appeared on the "By the Way" page in the issue of July 19. On Aug. 17, 1897, I visited Silver Islet in company with a representative of the owners and was shown the maps of the property.

Mr. Winchell's description of the geology is correct. The country consists of a series of dark slates and other sedimentary rocks lying roughly in a horizontal position. Running east and west through the island is a dike of basalt standing nearly vertically. Running north and south through the island and cutting this dike at right angles is a vein which has a slight dip, in which direction I do not remember. The vein presumably continues north from the island and may be seen on the mainland cutting through the slates. The peculiarity of the vein is that where it cuts through the basalt dike the filling is calcite; but as soon as it leaves the dike and enters the slate the filling is quartz and the vein narrows up both to the north and to the south.

The story of the discovery of the island is well known, and the history of the exploitation of the mine is to be found in mining literature. After going down a certain distance the silver played out, and an attempt was made to prove its continuation at depth by a series of diamond-drill holes paralleling the dip of the vein. As I remember it, the result of this drilling was negative, but Captain Frue, the manager, was not satisfied, and sunk the shaft further, and discovered another body of silver ore, one of the drill holes passing within a few inches of it. When this second body played out I believe the shaft was sunk about 300 or 400 ft. deeper, and drifting done the full length of the dike, but no appreciable amount of silver was found.

One theory advanced is that the precipitation of the silver in the vein was due to the character of the slates, and that, where the vein was rich, the slates probably contained carbon, which acted as a precipitant for the silver. Carbonaceous slates are found in the country, and the report is that these were the conditions which obtained in Rabbit Mountain, a district where silver had been found previous to the discovery of Silver Islet. This theory is borne out by a statement made to me in Butte about ten years ago by a foreman in the Silver Bow mine who had formerly worked at Silver Islet. He told me that in driving a drift they had encountered inflammable gas, the phenomenon being similar to that found in coal mines. This would lend color to the theory of the carbonaceous slates.

The islet, however, is not silverless. There still exists (or at least in 1897 there existed) the "silver roof." This was the top portion of the vein which was left as

a pillar, or floor, to protect the mine from the waters of Lake Superior, and it was claimed that there was in this roof probably 100,000 oz. of silver. The owners of the property hesitated to take this out, having a lingering hope that, perhaps, some day the mine might be unwatered and explorations continued at depth.

Silver Islet, itself, when originally discovered, had but a few square feet of surface, but it was built up to quite a respectable area. The collar of the shaft had been carefully cemented in with asphaltum, so that presumably it was, and is, safe from the waters of Lake Superior.

Captain Frue, who managed the Silver Islet property, was the inventor of the Frue vanner, and designed it to fit the particular case of the low-grade ores from Silver Islet, which were concentrated on the mainland. At the time of my visit I was shown in an old barn a wooden vanner which, I was told, was the first machine that Frue had built. The belt was gone, and I presume by this time the vanner, as well as the barn itself, must have rotted away. Another relic on the shore was a clinker-built Mackinaw boat with a brass plate on it showing that it belonged to the British expedition led, I think, by Sir Garnet Wolseley against Riel in his rebellion.

The scenery on the shore of Lake Superior at that point is most impressive, Thunder Cape standing out boldly into the lake, the only evidences of civilization being the shafthouse on Silver Islet and a few of the old buildings on the mainland.

Most of the above is simply from memory, and if I have made errors I must be given credit for the lapse of twenty-two years.

J. PARKE CHANNING.

New York, July 24, 1919.

Technical Ability and General Culture

Several years ago you published a diagram contributed by Mark R. Lamb, the purpose of which was to assist a mining engineer to gage his rank in the profession. As I recall it, the locality where the subject had worked was an important factor (Boston, the North, Latin America, and various other districts, being criteria as to his standing), and other curious considerations affected the distinction supposed to be due him. Although Mr. Lamb obviously had devised the diagram with his tongue in his cheek, someone took it seriously enough to remonstrate at the idea of incidental and external circumstances having so much weight in the appraisal of an engineer, and wrote to you, stating that in his opinion an engineer should be judged as to whether or not he could do efficient work at a mine.

Of course, efficient workmanship should be the principal basis on which a technical man is judged, and undoubtedly such is the practice of employers. Is it not possible, however, that the principle has been carried too far, and that men in modern industry have been

[Mr. Winchell is not responsible for the title "A Silverless Islet" used over the article referred to, although the title is justified by the text.—EDITOR.]

judged on too narrow a basis? The papers lately have recorded the extraordinary ignorance of a very successful technical man, Henry Ford, as shown in the testimony at his suit against the *Chicago Tribune*. In one narrow field Mr. Ford has shone brilliantly; of most other matters he is astonishingly unlearned.

His case very likely is an exceptional one, just as his financial gain has been exceptional. But is it not likely that many exceedingly unbalanced technical men have been given preference in industry over their broader-minded fellows for the sake of temporary results?

And has not the promotion of highly specialized but narrow-minded men into responsible executive positions made for unrest and discontent among the workers under them? Is it not possible also that in the long run a company loses by permitting a narrow-minded or ignorant man to represent it, for instance in contact with outsiders?

I am not arguing against high specialization. I am merely suggesting that technical men should know something about fields of knowledge other than their own, and that in the long run it pays a company to encourage men of wider outlook and more liberal culture than perhaps has been the case in the past. If I may be permitted to say so, nothing is more distressing than a "highbrow," as that term is commonly understood, and I am not advocating "high-browism" for engineers. A mine manager or superintendent, however, may be a man of liberal culture without being a "highbrow." The point is that he should not be a technical man exclusively, as Mr. Ford apparently is, and that Mr. Lamb possibly made a serious point after all.

P. B. McDONALD.

North Adams, Mass., July 25, 1919.

As a Miner Sees It

I have just read with a great deal of interest an editorial in the *New York Times* of July 16 entitled "Making Work by Stopping Work," and as the *Journal* is often read by working men I wish you would call their attention to that article.

As a working man I confess that I want to secure for my labor all that I can get for it. Through our union here and co-operating mine managers we have been receiving wages respecting which no one can justly complain, but yet there is some grievance, and it seems to come from two causes: First, many of us are afraid that the mine owners are at times making too much money and not dividing profits properly with us; and, second, we nearly all desire to secure just a little bit more for our day's work, with an equal desire to have that day shortened just a little.

Not being a professor of logic, I doubt if I could show a brother miner how he is thinking wrong, but I can tell how these matters appear to me.

It is my idea that about all of the earthly goods that we receive come as the result of work, and the harder we work the more of these goods we get. Some labor with their brains and some with their hands; generally they do it honestly and earn their living. A few brain workers and a few hand workers are dishonest and do not earn what they get, but these are in the minority and need not be considered.

We are told that labor receives from 60 to 75 per cent of the money paid out for producing copper, but it seems to me that it must be even more than this, for every one of the supplies, such as rails, timber, powder,

and tools, is made by labor, and according to that view nearly 100 per cent of the money must go to labor.

I suppose there are some dollars paid for interest on borrowed money and things of that kind which figure in the cost of copper, but, getting down to brass tacks, it would seem that labor is getting pretty nearly all of the cost of the metal.

Between the producing cost and the selling price of the metal there is sometimes nothing, but generally the difference amounts to a few cents per pound, and it is the distribution of this margin that worries some of us. Personally I would like to see those few cents become many cents and know that they went to the men who had the nerve and good judgment to put their money into a business from which I make my living. "But it's unearned," my neighbor says; "and the fellow who buys copper isn't paying the price all to labor." Wrong. It is earned, and much more is earned that he never gets when you take into consideration the blanks that the capitalist draws while he is paying good wages for prospecting and developing.

As to these few cents' difference not going to labor, here again my neighbor is wrong. It goes to pay labor that has been stored up for the very purpose of helping us fellows over the rough places. This capital is simply stored up labor. Like the energy in a big flywheel, it runs pretty low sometimes, while we are getting ours right along, and we must give it a chance to build up when the building is good, so that there will be something behind us when another low-price day comes along. "But that's not labor," my neighbor insists.

I own a house that cost me \$3,500, and I hold somewhat over fifty shares of Anaconda that cost me about as much. Every dollar that these two things cost me I got for working, and by working fairly hard I have put away about \$7,000—half of it to work for me—and now my nest egg of \$3,500 is just as much of a laborer as I am; better too, for it ought not to wear out and get stale.

As to wanting a little more money per shift and rather shorter shifts, it looks to me as though the unions, if they include most everybody, can keep on for quite a while, getting what we want a little at a time. But a fellow don't have to be a philosopher to see that some time the limit will be reached, and if all miners' unions are standing together we will wake up some day to find that the companies are getting no orders for copper. At about the same time we are going to hear from those unions that are using copper to the effect that their jobs are gone, that their employers can't buy copper, and they will be asking us to get to work, just as the users of coal in England are asking the coal miners to get busy now, according to the article quoted.

It may be that I view this thing all wrong, but it strikes me that the more copper we can get out the more jobs there will be in manufacturing plants where they use copper. This condition will cut down idle labor, make less idleness in this camp, raise the demand for labor and with it keep up the price or raise the price of labor here without anyone demanding it. Personally I know that the harder I work the more fun I get out of living. I know it is the case with some other men, and I wish I could prove it to some of my neighbors who spend a lot of time thinking how they can work less and earn more money at it.

BUTTE MINER.

Butte, Mont., July 21, 1919.

ORE DRESSING AND METALLURGY

Practical Suggestions and Progress
in Invention and Use of
Mechanical Appliances

An Improved Copper-Casting Machine

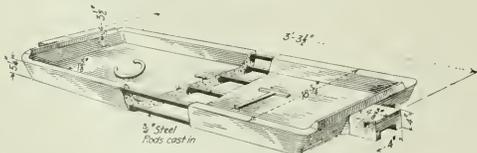
By T. W. CAVERS

A simple and efficient copper-casting machine, suitable for plants producing from 15 to 30 tons of copper daily, has been installed at the smeltery of the Tennessee Copper Co. It was designed and manufactured by the engineering and mechanical staffs of the company.

The device consists of three long trucks, each carrying 14 molds, operated on a straight track by a small slow-speed electric locomotive; a cradle car on a track at right angles to that carrying the trucks; and a pouring ladle which is tilted by a small electric hoist. One man operates the ladle and both cars by means of two controllers placed close to the point at which the copper is poured. The pouring ladle is made of cast steel, and will hold about nine tons of copper when properly lined with a slag hull. It is provided with lugs so that it may be handled by the traveling crane. Below the lugs are brackets to support the ladle when set in the cradle car. Just beneath the lip is a bearing which rests on two cast-iron brackets attached to the car, and about which the ladle turns when copper is being poured. The ladle, lugs, supporting brackets, and bearings are one solid casting.

The cradle car is short and of heavy construction. Two cast-iron guides engage the brackets of the ladle when it is lowered into the car by the crane. The end of the car, opposite that from which the copper is poured, is weighted with heavy castings bolted to the frame to prevent up-ending. The mold car consists of a frame of 8-in. I-beams, riveted together, and set on two pairs of wheels provided with suitable bearings. Each car accommodates 14 molds; and three cars with the locomotive attached are operated on 165 ft. of track.

The locomotive is small but massive. Two pairs of wheels support a heavy cast-iron frame, to which additional castings may be bolted if greater weight is found necessary. The axle of one pair of wheels is geared to a 7½-hp. direct-current motor rated at 760 r.p.m. A worm gear provides the necessary reduction of speed.



CONVERTER-COPPER MOLD

At one end of the locomotive is a frame which carries three trolley wheels, and these provide connection between the three trolleys overhead and the motor. The motor is operated by a controller situated at the pouring stand. Three different speeds are permitted by means of the trolley system which has been mentioned.

Above the junction of the two tracks carrying the mold cars and the cradle car is a small electric hoist by means of which the ladle in the cradle car is tilted. The cable connecting the hoist with the ladle passes

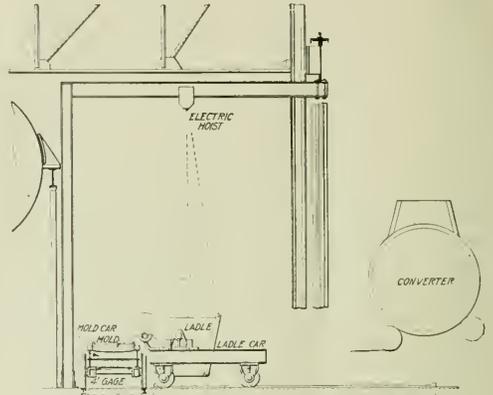
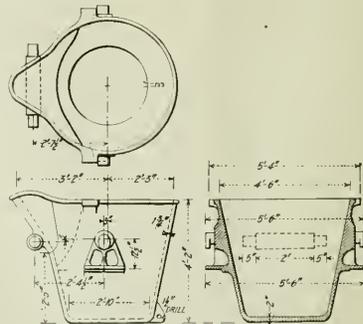


DIAGRAM SHOWING DETAILS OF OPERATION

through a set of triple blocks, and the copper is poured as slowly as desired. The controller by which the tilting of the ladle is effected is situated beside the one used for moving the mold car, so that only one man is necessary for casting the copper.

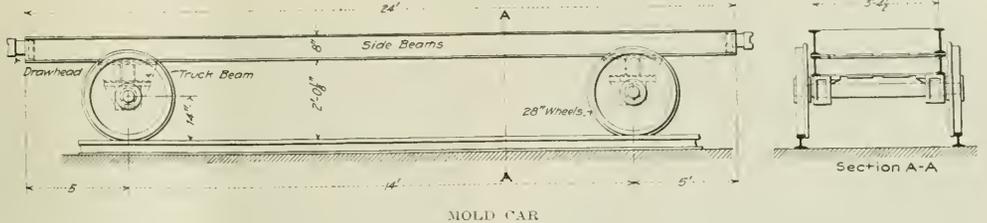


COPPER-POURING LADLE

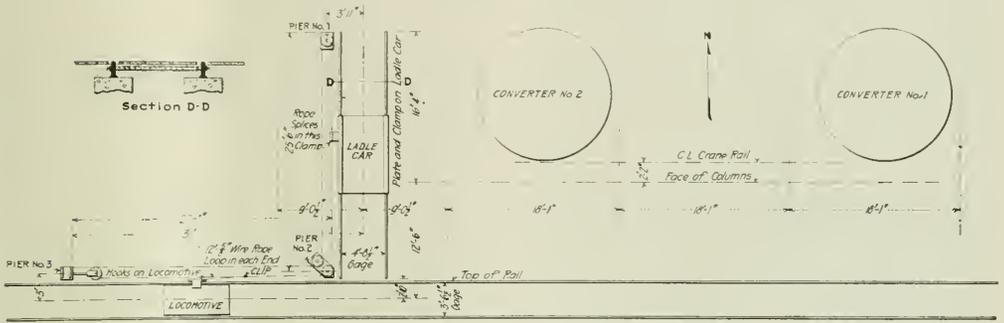
Before a charge is finished, a ladle is prepared by filling with converter slag and allowing a hull about 1½ in. thick to form before pouring off the remaining molten portion. When the copper has been poured from the converter, the traveling crane transfers the ladle to the cradle car, which is then run out to the pouring position. The car is attached permanently to an endless cable and may be run in and out by "hooking up" to the

mold-car locomotive. When the hook at the end of the chain attached to the hoisting blocks has been slipped into the clevis of the ladle, the copper is ready for pouring.

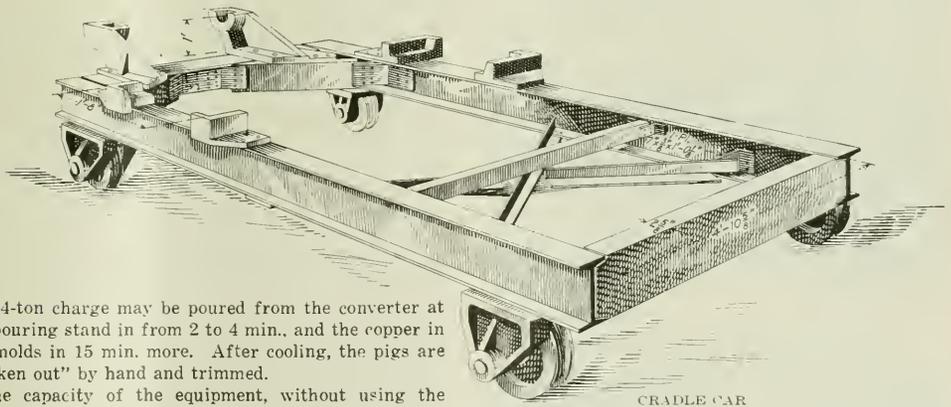
2. The advantage of leather over all the substitute belts persists at all speeds up to at least 5000 ft. per min., and at all tensions within the range practicable for power transmission.



MOLD CAR



GENERAL LAYOUT OF PLANT



CRADLE CAR

A 4-ton charge may be poured from the converter at the pouring stand in from 2 to 4 min., and the copper in the molds in 15 min. more. After cooling, the pigs are "broken out" by hand and trimmed.

The capacity of the equipment, without using the molds a second time, is over six tons. For handling a larger output, another mold car would be put in service. No difficulty is experienced with a copper skull in the ladle; and the slag lining is removed after each pour.

Features of Leather Belting

Tests to determine the characteristics of leather belting were recently conducted by Ernest A. Wilson at the Mellon Institute of Industrial Research of the University of Pittsburgh. The conclusions reached were as follows:

1. Leather belting possesses a much greater power transmitting capacity than fabric.

3. The relative capacities of the various belts remain the same on various kinds of pulleys.

4. Leather belting, at its rated horsepower, possesses a big overload capacity, whereas fabric belts at much lower horsepower possess no overload capacity whatever.

5. Leather belting improves with age, though the fabric belts are at their best when new.

6. Wherever a fabric belt of a given width is carrying its load with some degree of success, a suitable leather belt three-quarters as wide will do better work than the fabric.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War-Minerals Relief for the Small Producer

Liberalization of the statute providing for the relief of producers of certain of the war minerals is the object of a joint resolution introduced by Senator Henderson. Senator Henderson explains the purpose of the resolution as follows:

When the relief measure was originally introduced it was as a separate bill, but, with time pressing for adjournment, and so many matters before Congress, it had to be made an amendment to the Informal Contracts Bill to secure passage at that session. It was our original intention to take good care of the smaller producer and miner, as the larger operations were always in touch with the Government bureaus, and had undoubtedly received specific requests. But there were many small and practically unknown operators which the Government wanted to reach, and as chairman of the Mines Committee, I knew that Government agencies had given widest publicity to the war need for chrome, manganese, tungsten, and pyrite, and that their interviews, articles, and advertisements had appeared in probably every mining paper in the United States. Now, the Attorney General has so construed this act as to eliminate many of the smaller operators who relied upon this widely disseminated information. I am sorry that the act is so worded as to cause him to do this. It would seem to the prospector and miner, not knowing or caring about the finer legal technicalities, that such construction would imply that though a private concern can advertise its wants, the Government can not. I hope my resolution will remedy this situation. As a matter of domestic policy, it would be most unfortunate and unwise to so administer the relief act as to lose to the Bureau of Mines and the Geological Survey the confidence of the miner and prospector. For years these two bureaus have been the chief reliance of these men as to their country's wants. Their bulletins and publications have been accepted as the last word by the prospector, and if we do not now endorse and back up their late activities in stimulating the production of manganese, chrome, pyrite, and tungsten, we will destroy the structure of confidence and reliance in them which the Bureau of Mines and Geological Survey have been so long and so carefully building up.

A similar bill has been introduced in the House by Representative Garland, chairman of the Committee on Mines and Mining.

The Foreign Potash Situation

H. S. Gale, of the U. S. Geological Survey, who has returned recently from a painstaking personal investigation in Germany, France, and Spain, expresses the conclusion that though there are no large supplies of potash in either Germany or Alsace to be dumped into the United States, considerable supplies of fertilizer salts will soon be available and the amount of potash exported may increase rapidly.

Labor troubles, lack of fuel, inability to secure railroad transportation, the run-down condition of refining plants, and the general disorganization which prevails in Germany are responsible for a condition which will not permit the German mines to produce a great amount of potash in excess of domestic requirements.

Among the other important facts established by Mr.

Gale in his personal investigation in Germany is that no appreciable surplus of potash was accumulated in Germany during the war. As a maximum, Mr. Gale does not anticipate that Germany will be able to furnish more than 50,000 tons of K_2O material for export to the United States. A similar amount probably will be available in Alsace. When these are added to the 30,000 tons which will be produced in the United States, the aggregate will be considerably below the amount needed for the coming crop season.

Mr. Gale encountered no reticence on the part of the Germans as to the giving out of information pertaining to their potash industry. They are anxious to restore normal conditions, as they recognize that potash in the future must be the cornerstone of their export trade. In addition to the actual physical difficulties of production, the Germans are facing the uncertainty as to national policy. Heavy taxes are certain to be levied, and as much of the burden as possible will be placed on exported commodities. This, combined with the increased wages which must be paid and higher costs generally, leads Mr. Gale to think that prices under \$1.50 a unit for German potash need hardly be expected. In the course of Mr. Gale's investigation he discussed the situation exhaustively with Herr Schüddekopf, the general director of the Kalisyndikat.

Difficulty is being experienced in moving such potash as is available for importation into this country, on account of the fact that few ships can be prevailed upon to delay sufficiently to load potash. The high rate being paid for handling eastbound cargo makes it much more profitable for the vessel to turn around quickly and make the west-bound passage without cargo, or at least without a cargo requiring the amount of labor and time to load that are necessary with potash. As the east-bound rate falls, there will be an increasing inducement to load potash for ballast on the return trip.

In Alsace, Mr. Gale found that the seventeen shafts in that field had produced 40,000 tons of K_2O in 1913. The capacity for production, however, was greater and had been limited to that amount by the syndicate. That capacity can readily be attained again, as no malicious damage was done to any of the potash shafts. One of the mines is in a dangerous condition, owing to the fact that it was worked in an ignorant and careless manner during the war period, but it is believed that it can be put in good condition in a short time. Most of the lower galleries of the mine were flooded during the war, but, other than dissolving the salt faces back a few inches and making necessary some renovations of a minor nature, no damage was done.

Almost immediately after the armistice, the French took over the operation of the shafts. They were placed under military control, and technical men were assigned to the work. They are bringing the properties back into production very successfully. One property in the district is being operated privately, as it had been French owned prior to the war and is continuing to be operated by its owner. The other properties are

under the supervision of the Sequestre, the French organization exercising the function similar to that of the Alien Property Custodian in this country.

The total production from the Alsatian shafts in 1919 will reach 150,000 tons of K_2O , Mr. Gale estimates. Despite the urgent need on the part of the French to overcome the adverse trade balance, it will be impossible for them to export more than 50,000 tons.

As a result of his personal examination of the Spanish deposit which is forty miles north of Barcelona, Mr. Gale regards it as nothing more than a good prospect. It is the same type of deposit as are those of Germany. Boring has developed that it is extensive in area, but not comparable to the German deposits in thickness. A shaft is being sunk, but it has not reached the bed, which at that point is about 200 ft. beneath the surface. The working of the deposit will probably involve great practical difficulties. It lies in a valley through which runs a river, and the formation is such as to make the water problem a most serious one. A former shaft had to be abandoned because of inability to handle the great volume of water which is made.

Though Mr. Gale did not visit the African deposits, his information is that the prospect of important production is slight.

Tariff on Tungsten Ore

A tariff of \$10 per unit on tungsten would fix the price of American mined tungsten at \$18 to \$20, in the opinion of the majority members in the Committee on Ways and Means. The establishment of a domestic tungsten industry is held to be of vital national importance, especially in view of the fact that cheap sources of supply in all parts of the world are disappearing, with the probability that this country may find it necessary to supply all of its needs from domestic mines. Extracts from the report of the committee, which was written by Representative Timberlake, of Colorado, are as follows:

Competent witnesses stated that, under normal conditions and the protection asked for, the domestic mines could produce 50 to 60% of the amount consumed in ordinary domestic manufacture and the remaining 40 to 50% would of necessity be imported. Eventually, however, the percentage of imports would be greatly reduced and the domestic demand almost wholly met by domestic production.

The evidence of the U. S. Tariff Commission shows that about 50% of the domestic output is produced at a cost of \$10 to \$15 per unit and 50% at a cost of \$15 to \$25 per unit, averaging \$20.

The evidence shows that the present added cost of tungsten production in the United States is not based entirely upon increased labor cost or on that of supplies. It is in part a physical condition due to the fact that the surface deposits, which were mined very cheaply, averaged up to 60 and 65% tungstic trioxide. Operators who testified explained that as mining operations extend downward into the ground the percentages of tungstic trioxide are gradually reduced from 65 to as low as 4 and 5%, and these ores then have to be concentrated by the miner to a high-grade product, analyzing about 60% tungstic trioxide. To illustrate the point, it would take about 15 tons of 5% ore to concentrate into 1 ton of 60% ore, after making due allowance for the loss occurring in the process of concentration. The necessity of making this concentration compels the installation, equipment, management, and maintenance of large, costly mills and concentration plants, as an entire new element of cost in addition to the cost of development and extraction of the ore. Because of these facts the protection asked for is not due solely to the difference in labor cost between the countries.

A careful analysis of mining conditions in the Orient furnished ample evidence that 60% ores may readily be delivered to our seaboard from southern China at \$6 or \$7 per unit and still afford the Asiatic miner a fair profit. The labor employed in mining Asiatic tungsten ore is coolie labor, which is reported as being paid approximately 50 cents per day for men and 20 cents per day for women and children. Most of the deposits of South America are mined by native Indian laborers, who are paid somewhat better than the coolie labor of China. In Portugal women and boys are used in the sorting of ore at a daily wage of from 16 cents to 20 cents. Mine labor, recruited from the peasant classes, is paid from 50 cents to 60 cents per day.

Suspension of Assessment Work

Only one vote was registered in the House of Representatives against the bill providing for the suspension of requirements of annual assessment work during 1919. An attempt was made to amend the measure so that no suspension would be granted to any one claimant for more than three claims. This was disapproved, however, and the committee amendment limiting the suspension to five claims carried. Objection was made to the committee amendment allowing the bill to apply to oil-placer locations. This was explained by Representative Taylor as follows:

The Mines and Mining Committee has never been in favor of making any discrimination in annual assessment work between oil-placer claims and any other kind of placer or lode claims, and there is no reason now why one should be exempt and another not. The last time this bill was passed by the House, in 1917, the gentleman from Wyoming (Mr. Mondell) inadvertently, I think, made the motion on the floor of the House to amend the bill to exempt oil-placer claims for the suspension, and his amendment was adopted, and so the oil-placer claims have been required to do the annual work during the past two years that all others have been relieved from.

Validity of Public-Land Locations

Representative Vaile, of Colorado, has introduced a bill providing "that where public lands containing deposits of gold or iron ore have heretofore been located in good faith under the placer-mining laws of the United States, and assessment work has been annually performed thereon, such locations shall be valid and may be perfected under the provisions of said placer-mining laws, and patents, whether heretofore or hereafter issued thereon, shall give title to and possession of such deposits."

War Department To Sell Chemicals

Bids have been requested by the War Department for the purchase of 46,000 lb. of aluminum trichloride and 900,000 lb. of white arsenic. These lots of chemicals are offered f.o.b., Ben Hur Plant, Willoughby, Ohio, and the bids will be opened at 10 a.m. on Aug. 22 at the Zone Supply Office, 1819 W. 39th St., Chicago, Ill. No bid for less than a carload lot of the white arsenic will be considered. No minimum is established for the offering of aluminum trichloride.

An investigation of the oil-shale resources of the United States is provided in a bill introduced recently by Senator Henderson, of Nevada. The bill carries an appropriation of \$140,000 and specifies that the work is to be done by the Bureau of Mines.

Work of the War-Minerals Relief Commission

Satisfaction Expressed at Open and Fair-Minded Attitude of Commissioners at the Hearings Conducted in Western States—Number, Character and Amount of Claims—Further Action By Congress Needed To Protect Producers Excluded Under Recent Ruling

SAN FRANCISCO CORRESPONDENCE

THE shortage of shipping during the latter part of 1917 and throughout 1918 caused general attention to be directed to the problem of maintaining the supply of minerals and ores critically needed in the manufacture of war materials. Pronounced decreases in the available supply of manganese, chrome, pyrites, and tungsten, as well as some minor minerals, were expected to result, and to anticipate such a condition active steps were undertaken to stimulate domestic sources of supply. The War-Minerals Act, by which it was proposed to make about \$50,000,000 available for the development of and production from domestic mines of the needed minerals, was introduced in Congress, and, after considerable discussion and change, the measure received the signature of the President on Oct. 5, 1918, and became a law.

Practically no expenditures were made under the new law, as oversupplies of some of the important minerals began to appear, and by December, 1918, the Department of the Interior officials realized that the War-Minerals Act was a white elephant, as the signing of the armistice on Nov. 11, 1918, removed the necessity for further intensive development of domestic sources of minerals. The statute was so worded that the appropriation could not be used to defray expenses incurred by private individuals and corporations in anticipation of its passage.

Prior to the passage of the War-Minerals Act, concerted efforts were undertaken to start domestic production of manganese, chrome, pyrite, and tungsten. The price for manganese was fixed by the War Industries Board on June 1, 1918, and was sufficiently high to attract the attention of mining men and others, which fact, taken in conjunction with the appeals that were made on the score of patriotism and war needs by various Government organizations, resulted in widespread and successful effort in opening up manganese deposits in many states.

Financial assistance loomed up as it became apparent that the War-Minerals Act had possibilities of passage. So successful were the efforts of the producers that by Nov. 2, 1918, a surplus of manganese ore had been developed, and with the signing of the armistice the market for metallurgical ore disappeared and remained in this condition for a number of months.

The market for chrome ores was high during the greater part of 1918, and this was in itself a sufficient inducement to stimulate production from sources already producing or from producers who were already operating. The appeal to patriotism and the energetic efforts of the same Government agencies were all that was necessary to cause a great number of individuals and companies to enter the field and to find and develop new deposits. On July 13, 1918, the ruling price for chrome was \$1.50 per unit for 40 per cent ore, but in the latter part of September an oversupply began to appear and the price of chrome ore became weaker and reached a nominal condition. With the signing

of the armistice, the market disappeared completely. Chrome ore is now offered in California at 50c. per unit.

A similar condition ruled in the tungsten industry, although this industry had been established in the United States for several years in a stable condition. Nevertheless, under the same stimulation new producers came into the field and new deposits were developed. With the signing of the armistice the market for tungsten ores became sharply depressed; and the price declined from \$24 per unit to the present nominal quotation of \$10. A similar state of affairs, although to a lesser degree, perhaps, than in the case of the before-mentioned minerals, prevailed in the pyrites industry.

The disappearance or practical curtailment of the market for these minerals left many projects in a state of uncertainty, and many of those interested faced large financial losses, owing to their energetic efforts to assist the Government in its prosecution of the war. It was realized that a moral responsibility rested with the Government to straighten out the situation for the producers and potential producers, and it is a matter of satisfaction to record that there was no tendency on the part of officials to dodge this obligation. Nevertheless, it is probable that little would have been done had it not been for the efforts of the Pacific Coast Chrome Producers' Association, the American Mining Congress, and others. Because of their energetic representations before Congress, the War-Minerals Relief Act was passed as the best solution of the difficulty.

Under the provisions of the War-Minerals Relief Act, the sum of \$8,500,000 was appropriated for the expense required and for the settlement of the claims arising out of the stimulation of the production of manganese, chrome, tungsten, and pyrites. The Secretary of the Interior was required under the act to adjudicate the claims and appointed a commissioner to undertake the settlement of the claims by recommending to him such sums in the case of each claimant under the act as the commission considered just.

ORGANIZATION OF THE WORK OF THE COMMISSION

The commission as organized consists of the chairman, John F. Shafroth, former Senator from Colorado; M. D. Foster, former Representative in Congress from Illinois, and Philip N. Moore, former president of the American Institute of Mining and Metallurgical Engineers. H. E. Meyer is secretary of the commission and Paul S. Black, counsel. In addition, there are clerks and stenographers.

The following engineers, under the direction of J. E. Spurr, of the U. S. Bureau of Mines, are engaged in making field investigations of claims where requested by either the commission or claimants: Fred P. Williams, of Batesville, Ark.; Curtis B. Locklin, of Los Angeles, Cal.; R. Clyde Cameron, of Berkeley, Cal.; Harry J. Sheafe, of Saratoga, Cal.; Bidney L. Shonts, of Prairie City, Ore., and Stanley C. Sears, of Salt Lake City,

Utah. The auditors, whose function is to examine and determine the accuracy of the accounts kept by the claimants, are as follows: William H. Dunn and R. C. Evans, of Batesville, Ark.; Guy L. Langron, of Los Angeles, Cal.; Arthur S. Trelawney, of Prairie City, Ore.; P. F. Roosa, of Phillipsbury, Mont., and E. L. Fleming, of San Francisco, Cal.

After the organization of the commission, a questionnaire was sent out, which was to be filled by each claimant and filed with the commission at Washington not later than June 2, 1919. By law, no claim filed later than June 2 could be considered under the Minerals-Relief Act. The questionnaires contained questions designed to bring out the principal facts forming the basis of the claim made by the claimant. In addition, each claimant was allowed to file such supplementary information as was deemed necessary more fully to substantiate his claim. In some instances maps and photographs of operations were included.

Under the act the Secretary of the Interior was authorized to adjust, liquidate, and pay such net losses as have been suffered by any person, firm, or corporation, by reason of producing or of preparing to produce manganese, chrome, pyrites, or tungsten in compliance with the request or demand of the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation. The Secretary of the Interior delegated to the commission the task of investigating the claims and of making specific recommendations to him for their proper adjustment. Under this authority the commission began holding hearings of important claimants and such claimants as desired to be heard. These hearings have taken place in Washington, St. Louis, Mo.; Little Rock, Ark.; Tucson, Ariz.; Los Angeles, Cal., and San Francisco, Cal. Additional hearings are to be held in Medford, Portland, and Baker City, Ore.; Spokane, Wash.; Butte, Mont.; Salt Lake City, Utah; Denver, Col., and a final hearing in Washington, D. C.

Classification of the claims, the work of the field engineers and auditors, and all clerical work necessary to the advancement of the investigation toward completion are proceeding simultaneously with the hearings. It is expected that the work of the commission will be completed in the autumn of this year.

The commission has applied itself diligently to a task which is recognized by all as being extremely difficult. The first case, the claim of the Chestate Pyrite Chemical Corporation, was heard in Washington during April and May, and has already been reported in the columns of the *Journal*. In all, 1,287 claims, totaling \$18,000,000, have been filed.

At the hearings in San Francisco, July 5 to 25, a representative of the *Journal* was in attendance for a part of the time and had an excellent opportunity of observing the work of the commission. Though the burden of proof rests with the claimant, it was evident that the commission approached each case with an open mind and made every endeavor fairly to determine the pertinent facts surrounding each claim. The principals in each case heard were asked to appear, and, though they were permitted to have an attorney present, the commission obviously preferred to have the claimant state his own case. In some of the hearings the claimant's attorney conducted the examination, assisted by the commissioners whenever it was necessary to go deeper into particulars.

Maps and any additional papers that were required to substantiate or make clear the replies in the questionnaire were presented and were filed along with the original claim. In general, the questions asked by the commissioners were along the lines of establishing the chronological sequence of the events leading up to the claimant's entry into the business of mining the particular mineral in question, the amount of actual development done, and the ore produced and sold, as well as the road, trail, mill, or other construction necessary for access or operation. The statements of costs were inquired into, and explanations were asked of such items as were not clear. The ownership of the property and the way in which it was acquired were brought out. Claimants were asked whether they considered the project a commercial one at the time of beginning work and also at the time of discontinuing operations. Such facts as the thickness of the vein of mineral, its grade, royalties to be paid, and wages and salaries allowed were ascertained where pertinent.

The hearings were conducted with rather less formality than is customarily found in a court of law. In fact, the commissioners endeavored to get around the table with claimants and secure a free and frank discussion of the merits of each case. How much patriotism and how much the desire to make money were motives for taking up a project were fully and pleasantly discussed. Both claimants and commissioners recognized the difficulties of the situation, and each met the other, with few exceptions, in a broad spirit of mutuality.

IMPORTANT CLAIMS IN CALIFORNIA

There were about 290 California claimants, of which over 233 were for chrome, 34 for manganese, 8 for chrome and manganese, and 5 for tungsten, and there was one claim for tungsten and chrome projects. Among some of the more important claims presented to the Minerals-Relief Commission at its San Francisco sessions were the following:

Claim No.	Name	Amount of Claim
1018	Pacific Tungsten Co.	\$44,880.00
1180	Plecer Chrome Co.	205,867.60
71	Steele Chrome Co.	138,929.31
1020	F. M. Neely	133,470.26
648	C. S. Maltby	77,500.00
55	St. Anthony Lasing Co.	75,000.00
684	Holbrook & McGuire	11,850.00
955	Holbrook & McGuire	33,193.00
1163	Holbrook & McGuire	8,851.00
697	Noble Electric Co.	67,355.81
807	Western Rock Properties	39,353.00
274	Whitney & Loss	54,855.00
680	Tedco Co.	49,607.00
760	Sawyer Tanning Co.	7,662.76
761	Sawyer Tanning Co.	20,192.53
762	Sawyer Tanning Co.	10,129.71
1178	H. H. Noble	35,114.00
970	S. L. Schwartz	12,976.00
971	S. L. Schwartz	10,145.00
917	Santa Margarita Chrome Co.	31,714.83
1113	Dickey, Druebeck & Murry	30,836.60
136	Sulphur Gulch Mining Co.	29,370.00
170	J. F. Barnabee	20,693.00
691	F. W. McNear	20,149.00
961	Western Ore Co.	19,380.00
1059	Daisy Chrome Co.	19,135.81
933	Hillside Mine	16,921.80
156	Wells Chrome Co.	15,868.00
410	Samuel Dolbear	15,493.69
133	Hymer and Rufener	14,266.47
937	Frank W. Griffin	14,250.00
864	G. Howard Garrison	13,733.40
48	J. Bouse	13,000.00
771	A. H. Jarmon	13,929.00
750	Holter & Faucher	14,172.00
1107	J. T. Geisendorfer	10,912.00
44	K. G. McLoughlin	15,000.00

At San Francisco about 180 claimants were heard. At St. Louis, out of 25 claimants, 16 were given hearings. At Little Rock, out of 63, 11 claimants were heard. At Tucson, out of 33, 11 were heard; and at Los Angeles, out of 79, 35 were heard. As only

a small percentage of the questionnaires were fully and adequately prepared, the necessity for hearing as many cases as possible was recognized by the commission early in the inquiry, and every effort was made to have claimants attend the hearings.

The most important claim presented at the San Francisco hearing was that of the Pacific Tungsten Co. The amount of this claim was \$444,880. The ownership of the Pacific Tungsten Co. is vested in W. J. Loring, of the firm of Bewick, Moering & Co., San Francisco, Cal.; Charles H. Sergerstrom, of the First National Bank, of Sonora, Cal., and Edward A. Clark, of Boston, Mass., as well as other stockholders. W. J. Loring was the principal witness, and the examination was conducted by Judge John F. Davis. The mines of this company are situated eight miles from Mill City, Nev. The company operated two groups of claims, totaling 76 mining claims, covering an area of 1,850 acres. The first claims were acquired March 6, 1918, and it was then proposed to start operations with a mill of from thirty to forty tons' capacity.

Upon representations made by Government agents of the great need for tungsten production, the first plans were enlarged, additional mining ground was acquired, refinancing undertaken, and a mill of 125 to 150 tons' capacity erected. The mill was finished on Nov. 15, 1918. Buildings, a four-mile narrow-gauge railroad, and power lines were constructed. An extensive water system was installed, and preparations for the rapid production of a large tonnage of tungsten ore were made. The failure of the tungsten market left the company in financial difficulties.

The recent interpretation of the War-Minerals Relief Act by the U. S. Attorney General, which was given in full on page 107 in the *Journal* of July 19, will materially reduce the number of claims which will be allowed by the commission. Under this ruling only those claimants who received a request from the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board or the Emergency Fleet Corporation stand a possibility of securing a return of their expenditures. Undoubtedly there are many claimants who responded to the widely spread requests which emanated from official sources and who did not receive a specific request either by letter or from an authorized agent. This is a greatly to be regretted outcome, and it would seem that the commission should take active steps to determine the justice of such claims and recommend them for further action by Congress, as that course appears to be the only solution of the present difficulty.

Water Jack-Hammer Contest At Tonopah

Exciting Tests in Which Individual Skill and Quickness, as Well as Judgment in Selecting Sharp Drills, Win Decision

By J. A. CARPENTER
Consulting Engineer, Tonopah, Nevada

THE big event of Tonopah's Fourth of July contest this year was the water jack-hammer contest, which was carried out on a large block of granite placed at the intersection of the main streets of the

town. The published conditions covering the contest were as follows:

Open to miners of Nye, Esmeralda, and Mineral counties.
Purses—\$1,000, the money to be divided as follows: \$400, first; \$300, second; \$200, third; \$100, fourth.

Entrance Fee—\$10 per man. Entrance fee must accompany application. All contestants must be vouched for by superintendent of mine employed.

Rock—California Rockland granite.

Kind of Drills—Jack-hammer class, with piston of not over 2½-in. diameter. Drill not to weigh over 50 lb. Either new or old machines from stock.

Time—Seven minutes, including connecting up air and water.

Holes—Vertical holes, water jack-hammer held by hand. All holes to be blown before measuring.

Bit—Any style. No bit to be less than 1½-in. gage.

Steel—¾-in. hexagon.

Water Pressure—From Tonopah water mains. Standard pipe fittings for air and water will be used. Each contestant to make his own air and water connections.

Conditions—Each contestant must have his machine fitted with standard ¾-in. nipples for air and water. Contestants must point hole so as to avoid holes previously drilled. Failure to do so loses contest. Each contestant will be allowed one trial connection for air and water prior to drilling. Each contestant must be ready to drill within five minutes after being warned by judges. Each contestant will be allowed one coach on the rock, coach not to touch any equipment or the driller. Violations of this rule forfeit contest. Each contestant will be allowed to have representative from the company manufacturing the machine as a time inspector, to be governed by the judges' watch only. The representative will not be allowed to make any decisions nor to pass on any of the equipment.

Allotment Space—Granite block will be marked in squares and numbered, and contestants will draw for time and place on rock.

Place—Main St., Tonopah, Nev.

Entries Close—At 5 p.m., July 1. Drawing for place to be held at 7:30 p.m., July 1, at Justice of Peace Court.

Special—Any conditions arising not covered by above rules will be left to a decision of the judges of this contest.

The large purses offered, and the confidence in their ability shown by the miners, brought out thirty-nine contestants. Each of these men depended on his favorite blacksmith to sharpen his steel, and each had to decide upon the type of bit he thought would be best suited to the rock. In addition, he had to choose between the many makes of machines offered him. For days the men practiced out on the surface or underground, and each had his throng of admirers.

At the contest each man in his turn laid his steel at the side of his drill, put both air and water hoses close to the machine and pipe connections, and at the word "Go!" connected up his machine first, sprang to his pipe connections, connected them, using hand-pressure only; turned on air and water, jumped back to his machine, put in his starter, stuck it between his toes, and, leaning over the machine, turned on the air.

A few of the contestants used longer steel and kept their machines up nearly breast high, but the best drillers used short steel, rode their machines, and drilled down to the shank on each steel. A few used only three steels, but the winners used four, ranging from a short starter to a final 6-ft. steel. Two or three men used the steel holder on each steel, but most of the drillers used it only in an emergency. A few left it off the drill entirely, assuming that if a steel stuck they would lose anyway.

The favorite bit was the single bit, ranging from the Carr bit to many variations, which applied to the cutting angle, cutting edge, and the position of the

water hole. The choice of machine was influenced a great deal by the agents of the drills, some of whom, it is said, paid the entrance fees and even offered additional rewards to purse winners. This action is to be regretted, as it places too much emphasis on the make of the drill and not enough on the men behind the drill.

The contest is essentially a test of skill between miners. The depth of hole drilled in the 7 minutes by the men varied from $27\frac{5}{16}$ in. to $56\frac{3}{8}$ in., with one man entirely out of the race because he stuck a drill beyond recovery; another because a steel broke in the hole; another because his coach touched the water valve, another because his blacksmith forgot to temper one of his drills. Two other drillers were making excellent records, when, in one case, a drill shank broke, and, in another, the machine-water hose broke. An-

drove each steel down to the collar and made his changes of steel in from 6 to 8 seconds. His record for the 7 minutes was $56\frac{1}{8}$ in., which gave for the actual drilling time of $6\frac{1}{4}$ minutes a drilling speed of 9.07 in. per minute.

The average time to get started was about 40 seconds, with a maximum of over a minute. The average time to change a steel was 10 seconds, with a maximum of 18 seconds. Boyd exceeded the average man by 18 seconds in getting started to drill, and in his drill changes, or a drilling equivalent of $3\frac{3}{8}$ in. He exceeded George Lynch, the winner of second money, by over this amount, showing that his drilling time was also the fastest. The winners of the purses were:

First—Dan Boyd, of the Divide Consolidated, $56\frac{1}{8}$ in., Cochise machine, crossbit.

Second—George Lynch, of the MacNamara Crescent, $52\frac{7}{8}$ in., Cochise machine, crossbit.

Third—Adam Ogi, of the Montana Tonopah, $49\frac{1}{8}$ in., Sullivan machine, single bit.

Fourth—Ed Yender, of the Gypsy Queen, $48\frac{1}{8}$ in., Sullivan machine, single bit.

Many of the spectators complained that the contest was not as interesting as the old double-hand contests. There is not the spell that binds one in watching a powerful man striking rapid accurate blows upon the head of a small steel that another man grips and churns without a blink of an eye at the flashing hammer. However, the day of the double-jack is gone in modern mining, and it is no longer a representative contest between the miners of the district. The jack-hammer contest brings out contestants from nearly every mine, and is a contest that appeals to every miner and mucker in the district. The excited comments of "Change your drill!" "Ride it hard!" "More water!" and "Blast it out!" show the spirit that surrounds the drilling platform.

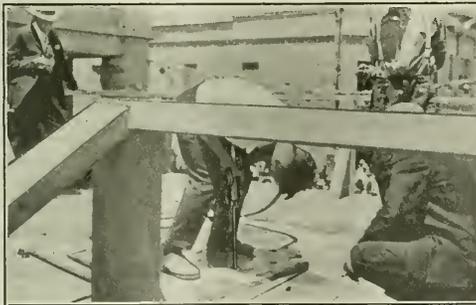
INTENSE INTEREST DISPLAYED BY SPECTATORS

The betting spirit of the miners was manifest. Odds of thirty to one were posted at first against any single entry, but gradually the odds grew less on the favorites. The interest toward the end of the contest resembled the finish of an exciting race. In this contest the last man to drill won the contest.

The man who won the first contest two years ago was a Finn, who used the same Ingersoll machine that the others used, but, for his steel, just picked his pieces from those ready to go down in the Belmont mine. He drilled 61 in. in the 8 minutes given. This year, to keep from drilling through the rock, the time was cut to 7 minutes. If this year's winner had been given 8 minutes, he would have considerably exceeded the 1917 record.

The contest was in every way a success, and it greatly stimulates the interest of the miners in the work and knowledge of drilling with jack-hammers. Fourth of July and Labor Day celebrations in mining camps should always have contests to try out the skill of the miners in their own line of work. It causes much useful discussion of drilling for months afterward, both in the bunkhouse and down in the mine while "taking five."

This article has dealt at length with the conditions governing the jack-hammer contest at Tonopah, with details of the contest, in order to give information of value to celebration committees in other camps.



SCENES AT TONOPAH DRILLING CONTEST

other twisted himself and his hoses up in a bad tangle trying to get his long drill to rotate.

That the records with the same drill varied greatly is shown by the fact that the high and low record made with one type was $45\frac{5}{16}$ in. and $27\frac{5}{16}$ in.; with another $56\frac{3}{8}$ in. and $32\frac{3}{8}$ in.; with a third $47\frac{5}{8}$ in. and $28\frac{3}{8}$ in.; with a fourth $49\frac{1}{8}$ in. and $36\frac{1}{8}$ in.; and with a fifth $44\frac{1}{8}$ in. and $44\frac{3}{8}$ in. The highest two records were made with the Cochise No. 39 drill. This drill had an advantage, as it has a $2\frac{1}{16}$ -in. piston bore, compared with the $2\frac{1}{4}$ in. of all the other makes, except the Chicago Pneumatic, which is $2\frac{3}{16}$ in. The other firms had jack-hammers with over $2\frac{1}{4}$ -in. bore, but they weighed over the 50 lb. maximum of the contest. The lightest drill was the Sullivan, with a weight of 38 lb.

The winner of the contest was Dan Boyd, an experienced miner employed in shaft sinking at the Divide Consolidated, in the Divide district. It took him only 22 seconds to connect his hoses and start drilling. He

To Drill Gold-Placer Ground in Dutch And French Guiana

Further Investigation To Be Made of Property Along The Moroni River Held Under Concession From the French Government

AN EXPEDITION sailed on July 30 on the S. S. "Prince der Nederlander," of the Royal Dutch West India Mail S. S. Co., for Dutch Guiana, to prospect gold-placer ground, held under concession from the French government, along the Moroni River, the boundary line between French and Dutch Guiana. It is reported that the deposit is 200 miles inland, and the river is not navigable by steamer for that distance.

A preliminary inspection of the ground was made about one year ago by W. S. Gage, and the present party expects to drill the ground in order to block out sufficient yardage for dredging operations. The work will be performed with an Empire drill. One 85-ft. motor-driven yacht, formerly a submarine chaser, to be used for navigating the shallow river, is a part of the equipment.

The party was in charge of Perry Tiffany, with M. J. I. Page as assistant. The remaining personnel consisted of Edmund V. Gillespie, E. Barnett, James W. Coulter, F. J. Canavan, and William Adams, a topographical surveyor. J. F. Van Name, of R. T. Wilson & Co., 120 Broadway, New York, is one of the officers of the company, which is known as the Liberty Development Co. The headquarters of the party will be at Paramaribo, one of the principal ports of Dutch Guiana.

Opportunities for the Marketing Of Manganese Ores

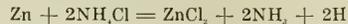
Those of High Grade Find Application in Several Lines Other Than Steel Making—Dry-Cell Manufacture of Importance

NOW that manganese is happily no longer required for war purposes, domestic producers of ores of this metal must find other outlets for their product. The U. S. Bureau of Mines is preparing a bulletin on manganese, a part of which, devoted to the uses of this metal other than for steel making, has already been published in mimeographed form.

The market absorbs about 50,000 tons of manganese ore per annum in addition to that used in steel. Most of this ore is the highest grade of pyrolusite, generally spoken of as chemical manganese ore, and so commands a much higher price than the lower grades used for metallurgical purposes. Before the war, most of it was imported from Russia, Saxony, Japan, and Nova Scotia, but in the last few years some excellent domestic properties have been developed. Some of the more important uses discussed are:

Dry Cells—The modern dry cell consists of a sheet-zinc container forming the negative pole, lined with absorbent paper to keep the zinc moistened with the electrolyte, while preventing contact with any solid particles. A carbon electrode forms the center of the cell. The space between the paper and the carbon rod is then filled with the depolarizing mass called "mix." This consists of ammonium chloride, which is the electrolyte; ground graphite and coke, to render the "mix"

more conductive; zinc chloride, to combine with the ammonia liberated when the cell is in use; and manganese ore, to furnish oxygen for the hydrogen produced; the reaction being



The manganese ore for this purpose should preferably contain 80 to 85 per cent MnO₂ and less than 1 per cent iron, with practically no copper, nickel, cobalt, or arsenic. Lower-grade ores have been used during the war, with good results, however, so that any ore running over 70 per cent MnO₂ may possibly find a market for the purpose named. The higher grades are still required for the manufacture of flashlight batteries.

Ceramics—A slight amount of iron in the form of ferrous silicate gives a green tint to glass. This is most commonly neutralized by the addition of a small amount of manganese ore, the quality required being about the same as for dry-cell manufacture. From two to fifteen pounds of ore is required per 1,000 pounds of sand. The addition of more manganese results in an amethyst tint, and if as much as 3 per cent is added, a black glass, such as is used for ornamental purposes, is produced.

Paint—Manganese dioxide and salts prepared therefrom are extensively used as driers in mixtures of linseed or other oils. The action is probably catalytic.

Miscellaneous Chemicals—Manganese chloride is used for dyeing cloth a brown or bronze. The sulphate finds a market for calico printing, porcelain painting, and as a drier. The persulphate is an oxidizing agent in the manufacture of organic products. Permanganate of potash is used in treating wood, for bleaching textile fibers, for disinfecting, and for purifying various gases.

Manganese Bronze—This term is somewhat a misnomer, as the alloy does not contain more than 0.05 per cent of manganese, and the consumption of manganese for this purpose is, in consequence, small.

Chronology of Mining, July, 1919

July 1—Cornerstone laid for new U. S. Assay Office, New York.—War Trade Board transferred to Department of State.—Consolidated Mining & Smelting Co. of Canada put Schedule C in effect at Trail, B. C.—New Mexican mining law went into effect.

July 6—Downtown pay office of Anaconda company dynamited in Butte, Mont.

July 7—Calumet & Hecla and subsidiaries announced that all underground men will be re-employed.

July 8—Conference took place in Butte, Mont., between mining-company officials and union representatives.

July 10—New suits brought at Bisbee, Ariz., for deportations on July 12, 1917.

July 12—Northwest extension Burkburnett oil field shut down for five days by Texas Railroad Commission to avoid overproduction.—Steel workers' unions at Washington meeting recommend that strike vote be taken.

July 14—Weimar dispatch stated German potash syndicate had asked permission of government to raise price of potash 100 per cent, owing to increased production cost.

July 15—War Trade Board announced that nitrates of soda and potash, also tin ore and tin concentrates

may be imported freely under general import license.—Calumet & Hecla and Mohawk-Volverine mining companies raised wages 15 per cent.

July 16—Wages increased in Warren district, Arizona, for copper miners, also for smeltery employees at Douglas.—War-time wage scale restored at mines in Coeur d'Alenes, Idaho.

July 17—Hearings on war-mineral tariff bills postponed until September by House Committee on Ways and Means.—C. E. Lescher, of U. S. Geological Survey, told Rules Committee of House that big coal shortage confronts Eastern and Northwestern sections of United States.

July 21—New freight rates effective on ore and concentrates shipped from Boulder and adjoining counties, Colorado, to Pueblo smeltery.

July 23—Miners struck at Cobalt for recognition of union.—Anaconda abolished sliding scale and raised wages of union employees \$1 per day, effective for year beginning July 1, 1919.—Announced that Mexican government will permit temporary boring of oil wells provided companies will submit to possible future legislation.

July 23.—Tungsten tariff bill reported favorably to House.

July 30—Calumet & Hecla presented medals to employees for long service.

Bauxite Lands in British and Dutch Guiana

The restrictions on taking up bauxite lands in British and Dutch Guiana have not been removed in either colony, according to a recent consular report. In British Guiana prospecting licenses are still issued and persons are allowed to prospect for bauxite and enter applications for the lease of crown lands, but there is no certainty that leases will be granted for the lands prospected. Acting under instructions of the British government, the colonial government has granted no leases for bauxite lands during the last two years, and at present it is impossible to obtain any information as to the British government's intention.

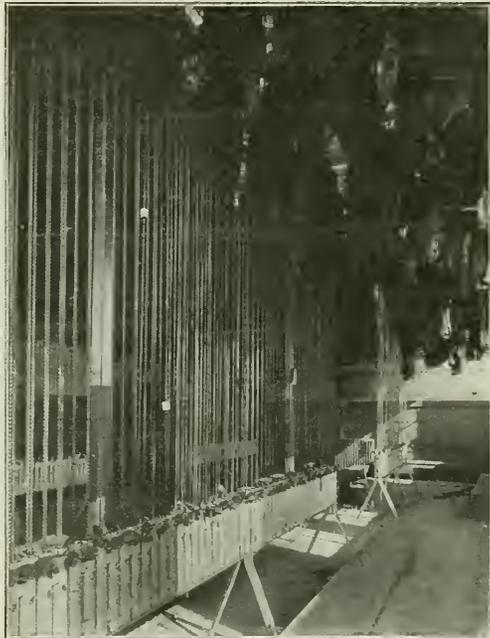
The Demerara Bauxite Co., Ltd., an American concern with offices in Philadelphia, Pa., purchased private lands containing bauxite, and in addition to these tracts secured leases from the government for about 2,500 acres of crown land containing bauxite. This occurred more than two years ago, or before the British government directed that no more leases be granted, and it is believed comprises all bauxite lands leased up to the present time.

In Dutch Guiana leases have been granted for about 125,000 acres of bauxite lands. These leases were granted under the old mining laws, but in March, 1918, a bauxite ordinance was passed by the Dutch Guiana government and the issuing of licenses under the old law discontinued. This new ordinance has not yet been approved by the Dutch government in its original form, but it is understood that the colonial government has been advised recently that it has been approved with certain changes. Pending the passing and approval of this ordinance, all prospecting for bauxite was stopped, and no leases were granted, and it is not now known when the restrictions will be removed.

There is no information available as to the estimated area of bauxite lands in either colony, as all prospecting has been done by private interests.

Overhead Hanging Arrangement For Clothes

A simple and sanitary arrangement possessing special advantages in the solution of the clothing problem in change houses is illustrated herewith. In the upper part of the picture the clothes are shown hanging suspended by a light chain, which passes over a series of pulleys and is fastened below. The arrangement also provides a convenient means for taking care of the loose chain, shown in the lower left-hand corner. The cylindrical containers are numbered so that no confusion will arise when the workman wishes to obtain his clothing. A particular feature of the installation is the provision made for the individual locking of the chains, which provides ample security against theft or other interference with the clothing during the absence of the men.



OVERHEAD HANGING ARRANGEMENT FOR CLOTHES

The advantage of having working clothes exposed to the free circulation of air which is obtained by the above method will be realized by operators who have had experience with the defects of the ordinary change house.

This illustration is reproduced from the "Bulletin" of the Bureau of Safety, Sanitation, and Welfare of the U. S. Steel Corporation, and shows the arrangement as installed by the Tennessee Coal, Iron & Railroad Co.

Mexico's New Mining Law

The last clause of Art. 17 of the new mining law of Mexico, the text of which was given in the issue of Aug. 2, should read "a single tax which shall not exceed 5 per 1,000 per annum, on the value of the property and its equipment."

BY THE WAY

An Item in the Cost of Tin

Transportation charges on six bundles of picks and handles sent during the war from New York to Jos, in the Nigerian tin fields, amounted to about \$275, figuring exchange at \$4.61. Jos is practically at railhead and 700 miles inland from the port of Lagos. The Railroad Administration cannot be blamed for this.

Smoke Farming

Some of our British friends are not alive to the possibilities of smoke farming. The *Ironmonger* recently called attention to protests voiced in the daily papers against the proposal to begin the manufacture of aluminum wares at Stratford-on-Avon. One protestant takes this to mean the erection of "blast furnaces and smelting factories." Even so—sentiment should not stand in the way of a community's welfare, especially the welfare of the hard-working farmer. On this side, the cloud of smelter smoke has had its silver lining for the thrifty tiller of the soil. Then again, when taxes are to be levied, the mining and metallurgical industries have proved a godsend to him.

Oil Stocks and the Movies

Oil-stock advertisements without any additional illumination seem to be bright enough to attract most of the "speculation moths," but it remained for a moving-picture firm to devise a method by the use of which stock-selling agents can surely induce the uncertain ones to part with cash for stock. "Seeing is believing; when they believe they buy; show them with moving pictures," reads part of the advertisement. A choice line of gushers, flowing wells, tank farms and refineries is offered. Think what an irresistible argument a gushing well photographically adjacent to the "X. Y. Z." ten-acre tract would be to a wavering would-be speculator in the stock of that company! The world moves; and moving pictures and stock brokers are well in advance of the main body of the procession.

Problems in Seating Capacity

The school men of the Middle Ages, it is said, were fond of debating such problems as how many angels could sit on the point of a needle. Time rolls on, and today in New York and elsewhere subway experts and others are confounding their brains with similar problems. The vexing question bobs up again in the Interior Department at Washington, where, by recent order, each employee has been restricted to 78 sq. ft. of floor space. Almost a mutiny has resulted, according to our Washington correspondent. Though this amount of space may be sufficient for stenographers and clerks, it is not sufficient for geologists and engineers. The latter, who must have space for map cases and for cabinets of specimens, as well as the usual desks, chairs, and bookcases, are certain that they cannot get along in such confinement. But everything has its compensation. What if a geologist be confined bodily within narrow limits! How fancy free he is to roam! With what mental strides he skips from Archean time to the glacial period without even a thought of the layman at his

side. Let him take similar thought with Lovelace that "stone walls do not a prison make," and perhaps even out of his confinement will come a masterpiece.

A Time Consideration

M'son, this 'ere pro'fition be 'ard for some chaps to h'understan'," said Cap'n Dick. "May be a bloody good thing for tha country, although, min' you, I'm not speakin' my feelin's, so thee does'nt naw 'ow I stan's on tha matter. 'Owver, as I wuz sayin' be'fore, I naws some chaps 'o does'nt like un, an' per'aps they 'as good reason h'after h'all. Tha h'other day Billy Penglase an' Sammy 'All wuz walkin' from tha mine after shif'. Min' you, it 'ad been their custom for years to stop at 'Arry Nesbit's place an' stan' h'each h'other to a pint afor' they went 'ome. An' this time w'en they gaws by, an' sees tha ol' place closed h'up like a las' year's bird's nes', they wuz pretty much dis'eartened, Billy 'specially. So Sammy, by way o' cheerin' 'im h'up, sez, "I tell 'e, Billy, let's gaw to one o' these 'ere soda fountains an' see w'ot we can do there.' So in they gaws, an' Sammy, 'o'd been there h'often, sez, 'Ere, boy, bring me some chocolate soda and get Billy 'ere a strawberry sundae.' An' Billy, 'e starts h'up an' makes for tha door. 'Wot's tha matter naow', sez Sammy. 'W'y, dam-me,' sez Billy, 'if I can't 'ave un naow, I don't want un. I'll be blawed if I'll wait till Sunday.'"

D. E. A. C.

A Glance Into Ancient History

The first technical book produced by any of the ten papers now published by the McGraw-Hill Co. appears to have been Dr. Edward Dyer Peters' "Modern American Methods of Copper Smelting," published in 1887. Through succeeding editions the sale reached the surprising total of 15,000 copies. Though Dr. Peters later produced two big books on the subject of copper smelting, his original work under the title of "Modern Copper Smelting" is still in print and in good demand. In 1890 came Professor Henry Marion Howe's "Metallurgy of Steel"—another classic of metallurgical literature, which remained actively in print for twenty years, and now commands high prices whenever it appears in the second-hand market. It was reprinted from the type pages of the *Engineering and Mining Journal*.

The *Journal* under the guidance of Richard P. Rothwell developed a notable series of books on mining, metallurgy and geology. Among these should be mentioned Hofman's "Metallurgy of Lead," Richard's "Ore Dressing," Ingalls' "Metallurgy of Zinc and Cadmium," Campbell's "Manufacture and Properties of Iron and Steel," Kemp's "Ore Deposits of the United States and Canada" and numerous others, most of which, though fully twenty-five years old, have in various revisions held their places as standard works.

Similarly, the *Electrical World*, under the direction of W. J. Johnston, contributed some of the most important books in the literature of electrical engineering. The works of Charles P. Steinmetz, which he has loyally revised and to which he has constantly added new volumes first appeared in this regime. Again, the works of Dr. Louis Bell, Silvanus P. Thompson, and Kempster B. Miller are to be included.

Up to 1909 the book departments of the various papers had produced about 200 books. In the ten years that have elapsed, the list has grown in the hands of the McGraw-Hill Book Co. to approximately 1,000 titles.

PERSONALS

EDSON S. BASTIN, who is in charge of the mineral resources division of the U. S. Geological Survey, has accepted an appointment to the chair of economic geology in the University of Chicago. He will continue his work with the Survey until Jan. 1, after which he will enter upon his new duties.

A. D. Cox is making an examination of a placer deposit at Kirkland, Ariz.

W. A. Simkins, Lieutenant of Engineers, has returned to San Francisco from France.

Fred Hellmann passed through Reno, Nev., on July 29 after visiting the Divide district.

C. C. Van Nuys, of the Air Reduction Co., has gone to Petrolia, Tex., on professional business.

H. R. Hanley, superintendent of the Mammoth Copper Mining Co.'s zinc plant at Kennett, Cal., has resigned.

Everett H. Patterson, mining engineer now of Long Beach, Cal., has been visiting his former home in Spokane.

L. F. S. Holland will return to California early in August from Bingham Canyon, Utah, where he is making examinations.

C. A. Hoffmaster, for fifteen years purchasing agent for the Mammoth Copper Mining Co., at Kennett, Cal., resigned on Aug. 1.

A. H. Graham, recently construction engineer with the Burma Mines, Ltd., at Namtu, Burma, has returned to New York.

Donald R. MacKay, has left the Sunnyside mine at Eureka, Col., and is now at his permanent address, 766 York St., Denver, Col.

N. C. Sheridan, mining engineer of Wallace, Idaho, is now general manager of the Snake and Opportunity mines at Hillsboro, N. M.

Adolph Knopf, of the U. S. Geological Survey, arrived in Tonopah, Nev., July 26, for the purpose of making a preliminary report on the Divide district.

John H. Eggers, mining engineer of San Francisco, recently completed an extensive examination of mining property on the Mother Lode in California.

Charles F. Haselton returned from France with the 27th Engineers and will soon assume a position with the Modoc Consolidated Mines Co., Victor, Col.

Lieutenant H. K. Bowen has returned from overseas, where he served in the R. A. F. Lieutenant Bowen will soon resume practice as a mining engineer.

Harry Donaldson, who has latterly been engaged in mining near Madoc, Ontario, has been appointed superintendent of the Beaver Consolidated mine, Cobalt.

D. McPhail, who has been in charge of operations at the Hudson Bay Mines, of Cobalt, has succeeded C. Randall as resident manager of the Dome Lake property, Porcupine.

John T. Reid, mining engineer of Lovelock, Nev., has recently returned to Lovelock after extended mine examination work in the Blue Mountains of northeastern Oregon.

Lieut. Col. S. R. Elliott, of the 28th Engineers, has returned to Ishpeming, Mich., and resumed his duties as assistant general manager of mines of the Cleveland-Cliffs Iron Co.

A. H. Jones, superintendent of mills of the Tonopah Belmont Development Co., has resigned to accept a position with the Butters Filter Co., with headquarters at Salt Lake City.



Photo by Harris & Ewing, Washington, D. C.

EDSON S. BASTIN

D. L. Goddard has been appointed manager of the smeltery at the Chillagoe works, in Queensland. Mr. Goddard was manager for nine years at Cloncurry under W. H. Corbould.

Charles W. Burgren was appointed assistant superintendent of the Dolores Mines of the American Smelters Securities Co. at Matehuala, S. L. P., Mexico, instead of superintendent, as previously announced.

Rene J. Mechin has resigned as engineer for the Nacozari Consolidated Copper Co. and has accepted a position in the engineering department of Cia de Santa Gertrudis, S. A., at Pachuca, Hidalgo, Mexico.

C. Lonsdale Smith has been appointed manager of the Tungsten Mines, Ltd., Frogmore, N. S. W. Mr. Smith was formerly manager of the Macdonald Kitchner molybdenite mines, Queensland, and Butler's tin mine, N. S. W.

D. M. Faries, civil and mining engineer, of Wallace, Idaho, has been appointed chief deputy of the State High-

way Commissioner. He will supervise road construction in all parts of the state, making his headquarters at Boise.

Olaf P. Jenkins and **E. D. Wilson**, of the Arizona Bureau of Mines, have returned from Jerome, where they have been engaged in areal mapping and making a study of the geology of the Jerome Quadrangle and along the Verde River.

Major W. M. Henderson-Scott has been appointed to the secretaryship of the Imperial Mineral Resources Bureau in England. Major Henderson-Scott is a graduate of the Royal School of Mines and the winner of the De La Beche medal of that institution.

C. L. Larson, of Kellogg, Idaho, has accepted the position of manager of the Boston & Arkansas Mining Co., at Gillham, Ark. For the last four years Mr. Larson has been in charge of experimental work for the Bunker Hill & Sullivan company, at Kellogg.

Robert Slessor left Australia recently for Hongkong to assume a position with a British firm as consulting engineer. Mr. Slessor had been for the last fourteen years occupying a similar position with Messrs. Brandeis, Goldschmidt & Co., metal merchants.

H. W. Stotesbury has resigned his position as engineer and mine superintendent with the Tonopah Mining Co. after twelve years service and will engage in consulting business for himself. Mr. Stotesbury is temporarily in Reno, Nev., but expects to open offices in Los Angeles, Cal.

J. Parke Channing will attend an industrial conference to be held at Silver Bay, Lake George, N. Y., beginning Aug. 29. The general theme is "Human Relations and Betterment in Industry." The conference will be held under the auspices of the International Committee of Young Men's Christian Associations.

W. C. Clemons, superintendent of drilling of Beaumont district for Gulf Production Co., has been promoted to superintendent of drilling of West Columbia, Goose Creek, Humble, and nearby fields, with office in Houston. Mr. Clemons will be succeeded by J. V. Reddick, now field superintendent at Sour Lake.

Captain W. J. Rose, M. C., 3d Pioneer Battalion, and formerly chief metallurgist of Amalgamated Zinc, Ltd., returned to Australia via America and New Zealand by the SS. "Makura." Captain Rose is on leave and came to America in the interests of the Electrolytic Zinc Co. He has been on active service for three years.

Marshall D. Draper is chief of a mining exploration party, capitalized by a syndicate composed of Denver, New York, and Boston men, to conduct a thorough exploration of the mineral resources of southwestern China. Several American engineers joined the party in San Francisco, where they sailed for Hongkong on the "Persia Maru."

Major Charles Will Wright recently arrived in Sault Ste. Marie, Mich., with his family from Sardinia where he was managing lead-zinc mines and during the war had charge of the American Red Cross work. Major Wright intends to return to Italy in September. His present address is care of J. S. Dunstan, 42 Broadway, New York.

J. C. Farrant is the author of a series of articles being published in "The Mining Magazine" entitled "Four Years as a Prisoner of War." Mr. Farrant is at present the London representative of the Hardinge Conical Mill Co., as was announced in a recent issue of the *Journal*. He had been taken a prisoner of war and sent to Russia.

W. C. Robinson, a director of the Bureau of Oil and Natural Gas Conservation of the U. S. Food Administration, has been elected a director of the Massachusetts Oil Refining Co., recently incorporated. Mr. Robinson is also president of the Pittsburgh Pipe Line Co., vice-president of the Pittsburgh Oil Refining Co., and president of the W. C. Robinson & Co.

D. W. Kerr, through the sale of his stock in the American Zinc Products Co., Greencastle, Ind., and Fort Smith, Ark., has transferred control to the Valley Iron Co., Youngstown, Ohio. Mr. Kerr has resigned as president and is succeeded by C. W. Martin, formerly vice-president of the DeForest Sheet & Tin Plate Co., Niles, Ohio. C. C. Stewart is the new vice-president, and C. H. Stewart the new secretary. The New York offices will be continued at 50 Church St. with Marcus L. Filley as Eastern sales manager.

INDUSTRIAL NEWS

Rossendale-Reddaway Belting and Hose Co., Newark, N. J., announces the appointment of E. O. Floyd as its general sales manager to take effect Aug. 1, 1919.

Morse Bros. Machinery and Supply Co. have issued a stock list of machinery at Denver, Col., which includes all kinds of power house, milling plant, laboratory and underground equipment.

L'Eclair Building, No. 15 Boulevard des Italiens, Paris, is now in the process of completion and will be the only American type of office building in Paris. For information regarding the leasing of premises apply to Mark R. Lamb, Woolworth Building, New York.

Acieral Products Co., 25 Church St., New York, has issued a pamphlet on "Acieral", an alloy of aluminum and steel. The physical properties of this alloy and uses are listed and a table of acieral aluminum sheets giving a report of tests conducted by the Bureau of Standards, Washington, D. C., is included.

The Electric Furnace Co., Alliance, Ohio, has just shipped to the Dayton Engineering Laboratories, Dayton, Ohio, an electric furnace for melting and re-

fining aluminum in the Delco plant. This furnace has a hearth capacity of 500 lb. and a melting rate of 200 lb. of aluminum per hour. It is equipped with a double charging door in the front and rear, and otherwise is similar to the standard Baily electric furnace of 105-kw. electrical capacity, and 1,500-lb. hearth capacity.

United Filters Corporation announces that, in addition to the present filtering equipment it is marketing, additional filter presses of the plate and frame and recessed types will be added. It is now in a position to furnish the three types of filters in general use—the pressure leaf type represented by the Kelly and Sweetland filters, the continuous suction type represented by the American filter, and the plate filter presses known as the United. Bulletin No. 50 illustrates the new filter presses and will be sent on request.

Hercules Engineering Corporation announces the following additions to the staff: Major M. G. Donk, previously associated with and in charge of government work at Midland, Mich., will undertake work of a special character on the installation of equipment. J. T. Brewster, who has acted in a consulting capacity with the corporation for the last three years, has succeeded A. H. Alberger in charge of the technical and engineering departments. Previous to his association with the corporation, Dr. Brewster was connected with the Du Pont organization.

Chas. Butters & Co., Ltd., 90 West St., New York, announces that Charles Butters, who has been acting as managing director, is no longer associated with the company. Arrangements have been completed whereby the company retains all its former business and assets intact. American offices have recently been established at 90 West St., New York, where a general business in metallurgical engineering and in the application of the company's special processes and apparatus to metallurgical and chemical problems will be conducted under the direction of F. L. Bosqui. This is the only official representation the company has in the United States at the present time.

TRADE CATALOGS

Large Power Drives. Morse Chain Co., Ithaca, N. Y.; Publication No. 14 revised, entitled "A Chain of Evidence"; 6½ x 9; 22 pp.; illustrated. A pamphlet illustrating and describing the Morse Silent Chain and showing a few large power drives.

Mining, Quarry, and Gravel Pit Machinery, Smith Engineering Works, Milwaukee, Wis. Bulletin Nos. 261, 266; 7½ x 10½; 36 and 16 pp. respectively; illustrated. Descriptive of Tel-smith primary breakers, reduction crushers, screens, elevators, conveyors, washers, and bin gates. The last pages in Bulletin 266 are devoted to blank

forms to be filled in when ordering any machinery required for rock-crushing plants or gravel-washing equipment.

NEW PATENTS

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

Conveying Fine Ore—Apparatus for Pneumatic Conveyance of Materials. Jens Westly, Lysaker, near Christiana, Norway, assignor to Sulitelma Aktiebolag, Helsingborg, Sweden. (U. S. No. 1,308,464; July 1, 1919.)

Copper-Cadmium Alloy, Method of Making. Walter C. Smith, Roselle, N. J., assignor to United States Smelting, Refining & Mining Co. (U. S. No. 1,307,642; June 24, 1919.)

Crushing—Ball Mill. John R. Ball, Durango, Col. (U. S. No. 1,307,951; June 24, 1919.)

Crushing—Ball-Mill Liner. John R. Ball, Durango, Col. (U. S. No. 1,307,952; June 24, 1919.)

Crushing—Roller Mill. Frank E. Marcy, Salt Lake City, Utah. (U. S. No. 1,309,210; 1,309,211; and 1,309,212; July 8, 1919.)

Drill—Percussion Rock Drill. James Fletcher, Newnes, New South Wales, Australia. (U. S. No. 1,305,349; June 3, 1919.)

Drill—Rock Drill. Wilhelm Mauss, Johannesburg, Transvaal, South Africa. (U. S. No. 1,303,705; May 13, 1919.)

Drill—Rock-Drill Hose Connection. Malcolm S. Beaton, Jeppetown, and Stewart Youngson, Johannesburg, Transvaal, South Africa. (U. S. No. 1,304,248; May 20, 1919.)

Drill. Cornelius J. Esseling, Heerlen, Netherlands. (U. S. No. 1,306,674; June 10, 1919.)

Drill-Bit-Pulling Device. William M. Williams, Tonopah, Nev., assignor of one-half to Burney Langston, Reno, Nev. (U. S. No. 1,305,184; May 27, 1919.)

Electric Heating and Melting Furnace. Victor Stobie, Dunston-upon-Tyne, England. (U. S. No. 1,305,177; May 27, 1919.)

Fuel-Feeding Device (for Pulverized Material). Charles S. Heffelfinger, Lebanon, Pa. (U. S. No. 1,304,973; May 27, 1919.)

Furnaces—Pre-Heating Apparatus for Furnaces. Horace E. Smythe, Pittsburgh, Pa., assignor to the S. R. Smythe Co., Pittsburgh, Pa. (U. S. No. 1,305,176; May 27, 1919.)

Furnace-Charging Apparatus. William E. Moore, Pittsburgh, Pa. (U. S. No. 1,304,351; May 20, 1919.)

Ingot Tongs. Angus A. Hanlan, Gary, Ind. (U. S. No. 1,306,255; June 10, 1919.)

Locomotive—Storage-Battery Locomotive. Raymond Mancha and Joseph Teipel, St. Louis, Mo., assignors to Mancha Storage Battery Locomotive Co., St. Louis, Mo. (U. S. No. 1,306,371; June 10, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

SAN FRANCISCO, CAL.—July 30

A Wage Increase of 50c a day has been announced by the Bully Hill Mining Co. of Shasta County, Cal., effective immediately. This raises the wages for miners from \$4 to \$4.50 per day and for muckers from \$3.50 to \$4 per day. These are the highest wages paid on the Shasta County copper belt, and are a little higher than wages now paid in the Grass Valley district.

Comstock Northend Mines, at Virginia City, Nev., for the two weeks ending July 26, produced a total of 1,128 tons, valued at \$32,000. Of this Consolidated Virginia produced 614 tons, which contained \$13,200, and Ophir 496 tons, valued at \$18,800. A noticeable feature of the conditions at the mines is the high-grade character of the ore coming from the Ophir. Fourteen bars of bullion were shipped to the San Francisco mint.

A New Schedule of Rates for electric power for gold-dredging purposes has been fixed by the Railroad Commission to be charged by the California-Oregon Power Co., and is as follows: First 50,000 kw.-hr. per meter per month, 1c. per kw.-hr.; next 50,000 kw.-hr. per meter per month, 0.8c. per kw.-hr.; up to 100,000 kw.-hr. per meter per month, 0.7c. per kw.-hr. These rates apply in all California territory served by the company and are for all installations of 300 hp. or over.

California Oil Fields in June produced 8,455,152 bbl., an average of 282,838 per day. This makes a total production for the first six months of 1919 of 50,903,451 bbl., a daily average of 281,236, and increase of 2,617 bbl. per day over the production for the corresponding period of 1918. Shipments for June were 7,712,455 bbl. a daily average of 257,082. Shipments for the first six months of 1919 averaged 2,754,423 bbl. per day, compared with a daily average of 2,921,153 in the first six months of 1918, a decrease of 16,722 daily for 1919.

In the oil field of the state activity is noticeable in every section, with many companies busy on proved territory or wildcatting. Some of the oldest and most conservative oil countries in the state are even leading the wildcat work and are meeting with success. In southern California more than fifty oil companies are at work. In the Midway Summit No. 1 Kern River field much new work is being planned, and the Standard, in the Elk Hills and near the Kern River field, is increasing its drilling operations. In many localities where wells were drilled several years ago and abandoned, operators are going back and trying again with more up-to-date equipment and sinking deeper holes. The wells recently drilled in the Elk Hills by the Standard are maintaining output, and in the south some of the big wells are making large production. Near Santa Maria, in Santa Maria and leased by the Palmer Union, a gusher came in recently, spreading a pool of heavy black oil hundreds of feet wide on the surrounding land. This well in the Standard No. 1, which yielded at the rate of 15,000 barrels a day after being shot. It required eight hours of hard work to cap the well.

Amendments to the Workman's Compensation, Insurance and Safety Act, as adopted by the last California Legislature, became effective July 22, 1919, and are as follows: Compensation will be payable to the injured man on the eighth day after he leaves work as the result of an industrial injury, instead of the eleventh day, as heretofore. When an employee under sixteen years of age is injured, it shall be the presumption that such injury was not caused by serious and wilful misconduct. Serious and wilful misconduct cannot be charged against the injured employee by the employer if the injury is caused by the failure of the employer to comply with any provisions of law or any safety order of the commission with reference to the safety of places of employment. Injurious acts and omissions and wilful misconduct made against the employer, the general superintendent is made responsible for the corporation, as

well as the executive or managing officer. Non-resident aliens are required to prove their dependency and cannot be conclusively presumed to be dependent. Applications for adjustments of controversies may be filed with the Industrial Accident Commission by the attorney or other representative of the injured employee, if authorized to do so in writing. A lien against compensation will be permitted for the support of dependents, as well as for the living expenses of the employee. Self-insurers shall not be required to pay any sums into the State Compensation Insurance Fund to cover liability for compensation, excepting a life-pension case. It is a misdemeanor not to report forthwith a fatal industrial injury, by either telephone or telegraph, to the Industrial Accident Commission. An injunction may be issued against an unsafe place of employment, if it constitutes a serious menace to employees, provided that such application for an injunction comes from the Industrial Accident Commission or a member of the commission. Chapter 183 creates a liability on the part of the employers or their insurance carriers in addition to any liability heretofore fixed by law in cases of the death of an employee who leaves no dependents. Under such conditions it is required that a death benefit of \$350 be paid. The Industrial Accident Commission is authorized to draw upon the fund created for the promotion of re-education and rehabilitation of persons disabled in industry in California. The fund has been passed in response to a public demand that crippled men be aided in acquiring new occupations. It will reduce dependency and prove of material benefit to the citizens of the state.

GRASS VALLEY, CAL.—July 31

Miner Workers' Protective League of July 26 voted to ratify the agreement under which the miners in the Grass Valley district, who struck in June, returned to work on June 30. This agreement is to run until July 1, 1920, and may be suspended by either side upon due notice.

PHOENIX, ARIZ.—Aug. 1

The Basic Wage Scale of Arizona miners has been raised 75c. a day, anticipating a 24c. market for copper, under a decision reached at a late meeting of the Arizona Chapter of the American Mining Association. Miners and machine men have been given extra pay beyond this flat increase. The basic pay for miners will be \$5.65 a day. A small degree of labor trouble has been known at Miami, where W. W. agitators tried to start a movement for \$6 a day for six hours' work. The leader was jailed as a vagrant and the movement died.

SPOKANE, WASH.—July 31

Francis A. Thomson, dean of the School of Mines of the University of Idaho, has announced that during this summer the newly created State Bureau of Mines and Geology will survey a tract fifteen miles square in the Seven Devils copper district, in central Idaho. This work will be done in conjunction with the U. S. Geological Survey. Professor D. C. Livingston, of the University, will be in charge. A specialist in contact metamorphic deposits will be detailed for the work.

The War Minerals Relief Commission will be in Spokane about Aug. 15. The principal hearing in Spokane will be in regard to the claims of the Tri-State Chrome Co. formed during the war, of which J. D. Sherwood, Walter J. Nichols, and A. L. White, all of Spokane, are the principal stockholders. This company remodeled the old Fred Diggins gold mill, near Canyon City, Ore., in the Grant County chrome area, and operated for a short time before the bottom fell out of the chrome market.

WALLACE, IDAHO—July 31

The Attitude of the Unions in the Coeur d'Alene district has been affected by the success of the unions at Butte in securing all their demands from the mining companies. Up to that time they had been

satisfied with demanding an increase of 50c. per day, eight hours "from portal to portal" and recognition of the union. The increase of 50c. per day was allowed, though not in response to the demand of the union. About the same time an advance of \$1 per day was allowed at Butte, making the scale 50c. per day more than in the Coeur d'Alene—a difference that has always prevailed and which is regarded as justified owing to the difference in working conditions. But it appears that this difference is no longer to be recognized, for Coeur d'Alene operators are now asked for another raise of 50c. per day, making the rate \$5.75, and, in addition to the two other demands, they are also asked to allow time and a half for overtime and double time for Sundays and holidays, these having been conceded in Butte. These additional demands have not been formally presented, but at a mass meeting of the unions in Wallace on July 27 the chief spokesman stated that every concession granted at Butte would be demanded in the Coeur d'Alene. As the operators have refused to confer with union representatives or to recognize the union in any manner, the unions have called a referendum on the question of striking.

SALT LAKE CITY, UTAH—July 31

The Assessed Valuation of mining property in Juab County, which includes most of the Tintic district, according to the State Board of Equalization, is \$5,990,107, this being more than one-third of the total assessed valuation of property in the county, which is \$17,050,425.

Wages at the Utah Copper Mine in Bingham Canyon, where operating conditions require a large number of surface workers, have been increased, according to announcement, so that all day labor paid more than \$3.25 a day receives an advance of 75c. per day, and all day labor receiving \$3.25 a day or less, 70c. per day, the increase being effective July 16. In regard to the above changes in the wage scale, R. C. Gemmel, general manager of the Utah Copper Co., is quoted as saying: "The advance announced is a recognition of the continued high cost of living, the principle of a living wage, an improved copper market, as well as an effort on the part of the management to demonstrate its appreciation of the attitude of its loyal employees at the time of the reduction in wages made last February, which reduction was necessitated by the stagnation of the copper market at that time. Since then a considerable improvement in the copper market has occurred, and it is hoped that it will continue, but the advance in wages now announced is based more on a belief in a better market in the future rather than upon present conditions. The present market conditions do not justify an increase now made. It is true that the copper quotations in the daily papers have recently shown an advancing price, but our daily information on the copper quotations apply to small sales of spot copper and not to any appreciable quantity that would absorb even present production. As an illustration, our production for June (and it should be borne in mind that we are operating on a 50 per cent basis) was approximately 9,000,000 lb. Our net sales for that month totaled about 4,100,000 lb. and, therefore, it is apparent that they were less than 50 per cent of production and but 25 per cent of our capacity. The average price we received from these sales was 16.5c. per lb., a trifle less than 16.5c. per lb. Moreover, this is not all, because on June 30, 1919, we had on hand a very large amount of unsold copper."

DENVER, COLO.—July 31

Boulder County Metal Association met July 28 to discuss plans for celebrating the fiftieth anniversary of the Boulder County silver-mining industry.

The State Mines Development Association, recently promoted by M. Brokaw, of Denver, is intended to arouse and restore public interest and confidence in mining in Colorado. To accomplish its purpose a subsidiary company is to be organized in

at least ten of the important Colorado mining districts. Thus far subsidiary companies have been formed at Leadville, Silverton, Ouray, Georgetown, Red Cliff, Buena Vista, and Aspen. A definite project will be planned in each district to secure financial support. At present the stumbling block appears to be the location of such a definite project for each camp.

C. Barlow Willmarth, president of the Radium Ore Sampler Co., of Montrose, predicts radium ore will be in demand during the war, when the price reached a maximum of \$175 a milligram, European countries could not procure American radium, and were compelled to use substitutes such as mesothorium. At present radium prices are down to \$80 to \$100 a milligram. Despite these low prices, the following leading producers of radium ore are regularly making small shipments: Standard Chemical Co.; Cummings Chemical Co.; Radium Co. of Colorado; Colorado Radium Products in Paradox Valley; American Rare Metals Co.; Chemical Products Co., at McIntyre, and Carnotite Reduction Co., at Gateway. In Paradox Valley, radium is found in carnotite ores. The increased demand for vanadium has obtained a byproduct in the recovery of radium, makes possible maintenance of the present production.

Dredges in the Breckenridge District almost every season encounter heavy sulphides of zinc and lead ore in the stream beds. Recently the dredge of the French Creek Dredging Co., operating about three miles east of Breckenridge, struck some heavy sulphide ore in the bed of the stream, on the Emille placer. The material which was scooped up was so unusually heavy that it completely filled the bins of the dredge aboard the dredge. The superintendent, Trevor Thomas, had to change the course of the boat to prevent the loss of gold. He marked the spot where the material was found and notified Mark Evans, manager of the company. The latter has organized a prospecting and developing syndicate and is following up the bed-rock veins encountered in the placer beds. Associated with him are E. R. Winn and D. A. Fairbanks, of the American Harvester Co., of Chicago; T. Crane, of Philadelphia, and W. P. Hamon, gold-dredge operator of San Francisco. The syndicate purposes to sink a number of vertical shafts to bed rock level. Several of the known veins which have been disclosed by dredging operations, and by necessary drifting and bed-rock tunneling endeavor to ascertain the most promising ore-shoots before sinking working shafts.

LEAD, S. D.—July 31

The discovery of Geologic Structure favorable to the occurrence of oil near Fairburn, S. D., has caused much activity in the vicinity. Several concerns have obtained leases on land and are preparing to begin drilling. The Roxana Oil Co. with headquarters at Cheyenne, Wyo., was the first to enter the field, and has secured a large acreage on which drilling will be started as soon as rigs can be brought in. One of the larger Wyoming operators has scouts in the field, and all favorable ground is being taken. This is an entirely new field, and drilling will be rushed to determine the depth to oil.

AUSTIN, TEX.—July 31

The Texas Railroad Commission has no authority, according to a decision of the Attorney General, handed down to the commission, to issue permits for wells, under the terms of the Oil and Gas Conservation Act, on account of overproduction. This decision indicates that the commission exceeded its authority in stopping production in the northwest extension of the Guernsey burnett field for a period of five days recently.

New Oil and Gas Conservation Rules have been adopted by the Texas Railroad Commission, and will be issued by the rules conform closely to the temporary rules adopted a few weeks ago. The commission has decided to issue rules and regulations which are as strict as possible upon a recent hearing. The only point left at issue at the close of this hearing was the amount of production from the strapping of tanks. This has later been fixed at 1 per cent for coastal fields, and 2 per cent for north Texas fields.

The Texas Company is restrained from drilling for oil and gas other minerals, according to an injunction issued July 23 by District Judge Calhoun, upon a strip of land in Eastland County claimed by the lease to it by the Refining Co. to be under the custody of the Resurvey of the tract of land purchased by the Texas Co. showed an excess in acreage in the form of a strip about 240 ft. wide and two miles

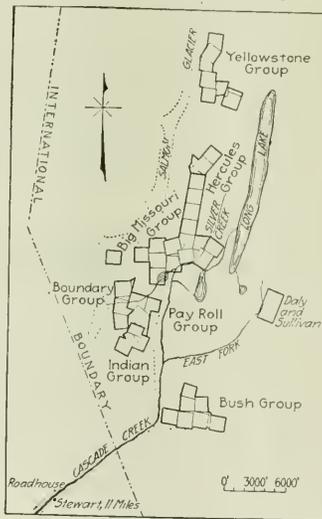
long. This was filed on by Eugene Giraud, of Austin, who secured a mineral lease from the state, and later sold it to the Humble company for a price reported to be \$200,000. The state is defending the lease originally given to Giraud because of its far-reaching importance, there being much excess of acreage in some of the original surveys of railroad land.

MOUNTAIN HOME, ARK.—July 31

The Rising Price of Zinc is creating a little activity in the North Arkansas zinc field. A number of smaller properties are starting up, and some ore is being sold. Two cars having been shipped from Zinc in July. None of the large producers are likely to start unless assured that the price of ore will remain long enough for them to make a profit. Heretofore many of the larger operators have had smelter contracts, and if these can be had now, covering a stipulated tonnage, or the production over a certain period, all camps will become active again. Nearly all the larger mines in the field have good reserves and are in shape to make a record production. F. E. Heywood and associates, of Yellville, Ark., are considering the erection of a plant in St. Louis for making zinc chemical products from Arkansas carbonates. J. H. Haddox, of Oklahoma City, president of the Magnolia Lead & Zinc Co., which operates the Tar Kiln mine, in Zinc camp, states that the Oklahoma Ore Storage Association may build a warehouse at Zinc.

DULUTH, MINN.—July 31

All Ore-Lading Records were broken by the new No. 6 ore dock of the Duluth, Missabe & Northern R.R., on July 17, when 12,683 tons of ore was placed in cargo hold



SALMON RIVER DISTRICT, BRITISH COLUMBIA
Reproduced from Bulletin of British Columbia Department of Mines.

in 35 minutes. Sixteen men performed all the hand labor required.

The Kennedy and Meacham Mines, on the Cuscuta River in the recent merger of the Otis Steel Co. and the Cleveland Furnace Co., both operating at Cleveland, Ohio. The new company will perpetuate the name of the Otis Steel Co. and its directorate will interlock with that of the Cleveland-Cliffs Iron Co., which has recently entered upon a period of expansion in the Lake Superior district.

Vermilion Range Iron Ores in practically all respects are the most desirable ores mined in the Lake Superior district, according to figures recently issued by the Lake Superior Iron Ore Association, which has offices in Cleveland. The report covers the period from 1902 to 1918 inclusive, and shows that Vermilion ores which average close to 58 per cent in natural iron have always ranked highest with those of the Gogebic, Marquette, Mesabi, Menominee and Cuyuna ranges following in order named. The highest average silica content is found on the Marquette, the highest average phosphorus on the Menominee, the highest average moisture on

the Mesabi, and the lowest average physical structure of Vermilion ore is of course unexcelled. Average analysis on the bulk shipment of 27,585,000 tons from the entire Lake Superior district in 1902 was 55.77 per cent natural iron, 0.075 per cent phosphorus, 6.23 per cent silica, and 8.71 per cent moisture. Of the 62,836,000 tons of ore shipped in 1918, the average chemical elements was: 51.29 per cent natural iron, 0.104 per cent phosphorus, 8.12 per cent silica, and 7.57 per cent moisture. During the period covered by the shipments from the Lake Superior district increased 128 per cent, and shipments from the Mesabi Range alone increased 203 per cent. Bessemer ore has constituted 95 per cent of the total shipment in 1902, had decreased to 33 per cent in 1918.

ASHLAND, WIS.—Aug. 2

All Workers on the Ore Docks at Ashland, Wis., owned by the Chicago & North-western Ry., walked out on Aug. 1, demanding a 33 1/3 per cent increase in wages and time and a half for overtime. At most of the mines on the range, trestles are being stockpiled, so that ore hoisted can be put on hand to hold one or two days, but are now full. An effort will be made by dock officials to settle the strike promptly.

ISHPEMING, MICH.—Aug. 2

No Labor Surplus exists on any of the iron ranges in Michigan, despite the fact that all returned to seeking employment have been given places in this field. On the Menominee Range, workers are a number of the mines are idle, that they would experience difficulty in getting men if orders were received now to operate at full force. The ore movement is about the same as it has been for several weeks, no increase in production being noticeable, so it is impossible to state just now what the winter will bring. There is some time yet before many of the ore piles, but the mining business and time to experience retardation if the demand for iron ore does not show improvement by September.

VICTORIA, B. C.—July 31

Efforts to Finance a Railroad to be built from Portland Canal to the mines, of the Salmon River district in British Columbia, are being made. Charles F. Caldwell, of Kaslo, E. C., and Spokane, is president of a company incorporated in Washington and to be known as the Portland Canal Rail & Terminal Co. Preliminary surveys already have been made and plans filed at Victoria. Mr. Caldwell hopes the road will be completed by the end of the coming winter. Ore can then be shipped out from the Premier, Missouri, Forty-nine, Little John, Bush, Yellowstone, New York, and other properties which are rapidly acquiring importance. Ore from these properties will be shipped to the new railroad by tramway, and steam locomotive extension of the road is built on the British Columbia side of the boundary.

TORONTO, ONT.—Aug. 2

Strike Situation at Cobalt remains unchanged, with no indications of any immediate settlement. The lower levels of some mines contain considerable water, though the flooding process in most cases is comparatively slow. The mine managers, though remaining firm in their decision to refuse to recognize the union, state that if the men of each mine will organize committees independent of the union they will be given opportunities to discuss matters with their respective managers. This was the custom before the strike, but many of the strikers have left the camp. One result of the strike has been to give a stimulus to development of the Gowganda district, where many of the men have gone. Some of the companies whose properties at Cobalt are closed down are now devoting their attention to Gowganda prospects.

QUEBEC, Q.E.—Aug. 2

Production of Asbestos in Quebec in 1918, according to the report of the Bureau of Mines of the province for 1918, exceeded that of any previous year, both in quantity and value. Asbestos in the shape of "crude" and "mill" was shipped to the amount of 142,375 tons, valued at \$9,019,899, in addition to 16,850 tons of asbestos, a byproduct of low price, making a total tonnage of 159,225 tons, of the value of \$9,653,945. As compared with the figures for 1917, 154,452 tons, valued at \$7,240,697, this shows an increase of 3 per cent in quantity and 23.5 per cent in value. Returns were received from thirteen producers operating eight mines.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ARIZONA

Cochise County

PHELPS DODGE (Bisbee)—July production of copper from Phelps Dodge smelteries as follows: Copper Queen branch, 5,011,000 lb.; Moctezuma Copper Co., 2,516,000; Burro Mountain branch, 530,000; custom ore, 357,000; total at Douglas smelter, 8,394,000. Detroit branch (Morenci, Ariz.) produced 1,361,075 lb.

SHATTUCK-ARIZONA (Bisbee)—Large orebody cut on 1,700 level of Denn. Management will install larger pumps for prospecting on 1,800 level.

Pima County

NEW CORNELIA (Ajo)—New flotation test mill about complete.

SILVER BELL (Silver Bell)—American Smelting & Refining Co. to resume production. Ores to be sent to company's Hayden smelter, to which El Tiro is also shipping. Sasco smelter will not be operated at present.

SABRAGANSETT (Tucson)—Company defendant in foreclosure suit brought by Albert Steinfeld & Co. on four notes aggregating \$300,000. Property consists of sixteen claims in Helvetia district. Inactive lately.

SILVER VIRGIN (Tucson)—J. J. Adair, superintendent, reports development of 10,000 tons of ore averaging above \$56.

Pinal County

POLAND COPPER (Ray)—Shaft down 350 ft., with 50 ft. more to go before cross-cutting begins. Extensive development planned for 400 level.

Santa Cruz County

BACA FLOAT GRANT mines to have concentrator for handling low-grade copper and silver ores developed.

Yavapai County

DUNDEE-ARIZONA (Jerome)—Opened new residential addition to Jerome on its property.

U. V. EXTENSION (Jerome)—Report of president to stockholders on Aug. 1 states company has been making about seventy tons copper daily since June 9, when blast furnace was blown in. Smelter shut down Feb. 13, which permitted all available mining force to be used in concreting Audrey shaft and the tunnel where necessary. This concrete work will probably be finished in ninety days. Raises have been completed to surface from 1,200 level to provide filling for stopes from surface. Crosscutting will start in about a month on 1,300 level. Will increase output when demand justifies. Necessary to build employees' houses and hospital and to pay for construction of much-needed schoolhouses at Jerome and at smelter. On July 1 there was 17,594,000 lb. copper in transit and in hands of selling agent, mostly unsold.

BIG LEDGE (Mayer)—Purchased Good Luck group of six claims from P. E. O'Brien, E. C. Hill, and W. J. O'Brien.

PECK (Prescott)—Company has purchased Pat Dolan claims adjoining from R. H. Burmister. New Peck mill operating on 30,000 tons of second-class ore. J. J. Macrs in charge.

ARKANSAS

Boone County

BOO-GRA-LOO (Zinc)—Company developing Frisco tract has six headings opened, assuring steady supply for mill.

COON HOLLOW (Zinc)—Folk Kendall lease in Coon Hollow bought by J. H. Deyerle, who is cleaning up ground and starting production of hand-cobbed zinc silicate.

HARVEY MINING (Zinc)—Getting from one to two tons of hand-cobbed silicate a day with small force. Property in Coon Hollow.

RHODES-MANCHESTER (Zinc)—McCurry M. & M. Co., operators of Rhodes-Manchester zinc mine, are running new mill.

Marion County

DIXIE GIRL (Buffalo)—Good body of zinc carbonate developed. Now opening body of zinc sulphide.

KATIE AND PACE (Rush)—D. J. McCargars interests bought by H. M. Kelsall and William Harticon, of Fall River, Mass., and development resumed.

CALIFORNIA

Butte County

INDIAN SPRINGS GRAVEL (Magalia)—Preliminary work begun under management of J. Woodruff. Adjoining Hupp property will be operated through main working tunnel of Indian Springs, which is 4,000 ft. long. Litigation between these two properties has delayed operations for several years.

Inyo County

WILSHIRE BISHOP CREEK (Bishop)

sive mine developments. Engels recently examined by D. C. Jackling and engineers. E. E. Paxton general manager and John Reimiller superintendent.

WALKER (Portola)—Flotation capacity increased to 160 tons a day by adding Marcy ball mill, Callow cones, and 12-rr filter. Big drainage and haulage tunnel being driven at rate of 400 ft. a month, and now in over 1,400 ft.

Sonoma County

WESTERN QUICKSILVER (Cloverdale)—New rotary furnace giving excellent results, production for June being 197 flasks.

Trinity County

JACOBS (Junction City)—Jafet Lindere has purchased Jacobs property on Trinity River. Has not been worked for years, on account of scarcity of water. Purchaser owns ground adjoining with suf-



SAVAGE BASIN, SAN MIGUEL COUNTY, COLORADO, SHOWING MILL AND CYANIDE PLANT OF TOMBOY GOLD MINES, LTD.

—Mill running two months, with average capacity of sixty tons per day giving 80 per cent extraction. Ore averages \$12 per ton, and costs, inclusive of tailings loss, \$6.40, leaving profit of \$5.60 per ton. Reported there are 25,000 tons of ore in sight.

Kern County

RANDBURG DIVIDE (Randburg)—Sale of seven-sixty-fourths interest for \$50,000 reported.

Nevada County

EMPIRE (Grass Valley)—N W 20-stamp addition to mill well advanced. Milling stopped at Pennsylvania mine, where mill will be dismantled when new unit is completed. Draining of mine progressing rapidly. Mine nearing normal production.

HIGHWAY GOLD (Grass Valley)—Shaft down 20 ft. Crosscut being run to cut second vein. First vein cut 2 ft. wide.

PITTSBURG GOLD FLAT (Nevada City)—Pacific Gas & Electric has instituted proceedings by means of sheriff's sale to collect debt of \$2,382 incurred for power.

Plumas County

ENGELS COPPER (Engelmine)—Meeting of stockholders on Aug. 5 to vote on increase of capital stock from \$2,000,000 to \$5,000,000. Stated that one million new shares will be sold to strong interests at \$1.50 per share, proceeds to be used to increase flotation capacity and for exten-

sive mine developments. Engels recently examined by D. C. Jackling and engineers. E. E. Paxton general manager and John Reimiller superintendent.

Tuolumne County

BUCKHORN GROUP (Jacksonville)—Bonded by D. Cushman for \$25,000. Development work to start immediately under J. L. Gibbs.

PORTUNA MINE (Soulsbyville)—Equipment good for considerable depth being installed.

CARLOTA (Tuolumne)—Operations will be resumed when transformers are connected. Carlota Gold Mining Co. is developing Pennsylvania mine also.

COLORADO

Lake County

C. S. DOLD (Leadville)—Company recently made promising strike on property in Poverty Flat section. Has been shipping manganese ore for several months, but recently contract expired. Before discontinuing operations, C. S. Dold, manager, decided to drift on manganese ore-body on 640 level toward Penderly fault. Ore gradually changed into hard compact lead carbonate, which at present is exposed for three sets in length. Where first encountered was 8 in. wide, and at third set 4 ft. wide. 512 sacks sorted out.

IBEN (Leadville)—Annual meeting of stockholders held at offices of A. V. Hunter, president, on July 24. New directorate as follows: A. V. Hunter, J. J. Brown, Gerald

Hughes, John Campion, F. L. Smith, John A. Ewing, and J. C. Mitchell.

Montrose County

CASHIN (Paradox)—H. C. Carlton, president of Michigan Colorado Copper Co., operating Cashin mine in Paradox Valley, expects to have first unit of flotation mill completed within ninety days. Will build other units as output of mine warrants. Also planned to build smelter at mine to handle flotation concentrates, instead of shipping them to Durango.

San Miguel County

SHIPMENTS FROM TELLURIDE during June were as follows: Tomboy, 60 cars of lead concentrate to Durango; Smuggler-Union, 25 cars lead concentrate to Durango and 20 cars of zinc concentrate to Blende, Col.; Liberty, Bell, Jesses, 2 cars; and Carraron, 2 cars; total, 109 cars. Ore produced from Argentine and Montana properties, of Tomboy Gold Mines Co., Ltd., was concentrated in Tomboy mill. A Savage Basin, shown in the illustration on preceding page.

COLORADO VANADIUM (Telluride)—Dismissing and tearing down old Simmons mill to erect modern vanadium concentrator on site. Also developing properties recently acquired on Leonard Creek near Sawpit.

Summit County

AMERICAN DREDGING (Brokenridge)—Company, operated by S. L. Bright of Chicago, and promoting in upper Swan Valley, is drilling recently acquired placer ground prior to installing dredge.

IDAHO

Shoshone County

LINFOR (Etnaville)—Linfor Copper Co. organized to take over Horn-Fowler property on Little North Fork Empire Copper Company built 150-ton mill and developed and shipped considerable ore while holding option on the property, but failed financially. William Beaudry, formerly director and manager of Stewart property, will manage new company.

ELTORADO (Kellogg)—Crosscut near vein at depth of 350 ft. Upper work shows strong lead-silver vein carrying high silver.

STEWART (Kellogg)—After losing apex suit with Ontario three years ago, remaining known orebody was quickly exhausted and operations were suspended. Work recently begun to find vein east of fault.

BULLION (Wallace)—Company will prospect ground from lower tunnel with diamond drill.

NORTH BUNKER HILL (Lardner)—Preparing to sink 200 ft. further. Shaft down 200 ft. Crosscut to vein shows 6 ft. of lead-silver ore of milling grade.

MICHIGAN

Copper District

SENECA (Calumet)—Shaft down 1,842 ft. and second crosscut to start soon. Character of lode rock good wherever opened.

FRANKLIN (Demmon)—Continuing sinking with small force. Shaft now 165 ft. below 37th level. There will be no 38th level. Will cut a station at 34th level. Planned to resume mining this fall if market warrants. Company has worked intermittently for 62 years.

QUINCY (Hancock)—Receiving parts for new No. 2 boiler and engine for two years ago. Erection in progress.

WINONA (Houghton)—Operations resumed, 75 men being put to work. Force will be increased as men can be secured. Two weeks required to cut No. 1 and No. 4 shafts in condition for hoisting ore. Mill will also be operated. At time of shutdown flotation plant machinery had begun to arrive and building had been completed. Machinery now on ground, and will be erected without delay.

MASS CONSOLIDATED (Mass)—Wages further increased. Needs at least 200 more men. Shipping 300 tons ore daily.

MICHIGAN (Rockland)—Will be connected with railway to facilitate shipments, now handled by motor truck. Construction of new rock house progressing.

VICTORIA (Victoria)—Advertising for miners.

CHEROKEE (Winona)—May resume operations soon. Company has \$20,000 in treasury and small working plant. Shaft is 35 ft. deep, being in copper rock for half this distance.

Gogebic Range

ELECTRIC LIGHT & POWER (Ashland, Wis.)—Started water-power development project on Flambeau River near Ladysmith, Wis. Power generated here will be sold to mines on Gogebic Range. Transmission line will be built from plant through Park Falls to Ironwood, Mich., and there will connect with present line, new line being about seventy-five miles long. Construction of line to be rushed so that power can be sent over it from present system and used in construction of new power plant. About 15,000 hp. can be developed, with available head of 100 ft. Company closely identified with Commonwealth Edison interests, of Chicago. Mines will furnish ready market for electric power, as it is desirable for driving pumps and compressors. This has been shown by Peninsular Power Co. on Menominee Range.

DAVIS (Ironwood)—Fatal accident occurred July 31, when laborer fell off coal dock and had no fall.

PAIST (Ironwood)—Crosscut on 24th level of H shaft encountered slates of Palms formation 502 ft. north of shaft.

Marquette Range

IN CASCADE DISTRICT Isabella, Richmond, and Maitland properties are active shippers this season. Volunteer and Empire idle. Richmond and Maitland are pit mines, and ship low-grade ores. Isabella an underground mine, with ores of low and high grades.

REPUBLIC (Republic)—One of working shafts out of operation temporarily. S4B road damaged. Only one shaft can be used until repairs made.

Menominee Range

BRISTOL (Crystal Falls)—Shaft being sunk another level. Some ore shipped. Bulk of stockpile still intact.

MCKINNEY STEEL (Crystal Falls)—Stockpiles being moved at Dunn and Tobin mines. All ore in stock will probably be shipped this year.

ODGERS (Crystal Falls)—Shaft concreted from collar to ledge. Sinking operations resumed. Shaft work will be hastened by raising. All ore in stock shipped.

MINNESOTA

Mesabi Range

BOURNE (Hibbing)—New property of Cleveland-Cliffs Iron Co. progressing rapidly with work preliminary to development. Planned to install two 200-hp. hoists.

HAROLD (Hibbing)—Increasing number of underground loading machines after extensive experimenting.

STEVENSON (Hibbing)—Resumed operations July 24 after two months' shutdown. Has 90,000 tons in stock, which will be shipped in addition to 60,000 tons direct from workings. Belongs to McKinney Steel Co. Formerly open pit, but now milling. Shipped 13,800,000 tons to end of 1918 season.

ADRIATIC (Mesaba)—Shipment of stockpile begun. Underground workings remain idle. R. M. Sellwood, operator.

JULIA (Virginia)—Ownership passes from Inland Steel Co. to Julia Mining Co., subsidiary of Gates & Co. Property originally opened in 1900 by Franklin Rockefeller and associates, who disposed of it to Republic Iron & Steel Co., which company, in turn sold the property to Inland Steel Co.

Vermilion Range

MCCOMBER (Ely)—Two-compartment shaft 372 ft. down and working pit blackjaper. Will be bottomed at 400 ft. and drifting north to orebody will begin. Mutual Iron Mining Co. operators.

L'LLIVAN (Ely)—Algonquin Iron Ore Co. announces intention to sink shaft on subsidiary, adjoining Chipewau mine of Chipewau Iron Mining Co., which is controlled by same interests.

MONTANA

Beaverhead County

BOSTON & MONTANA (Wise River)—Raise from 1,000 level on Idanha vein expected to hole through into upper Idanha tunnel within two next two weeks. Orebody continuous thus far in raise. Ore shows in roof of Idanha tunnel and on surface.

Missoula County

POTOMAC COPPER (Potomac)—Preliminary surface work on Leonard group shows mineral zone approximately forty feet wide.

Silver Bow County

ANACONDA COPPER (Butte)—Further efforts to develop sufficient flow of gas in northern Montana to warrant construction of pipe line to Boston & Montana smelteries abandoned after spending \$250,000. Copper production in July 11,222,000 lb.; June, 10,500,000 lb.

BUTTE-BULLWHACKER (Butte)—Will resume ore shipments within ten days.

BUTTE-DULUTH (Butte)—Shipments begun to leaching plant of Anaconda company at Washoe works.

BUTTE-NEW ENGLAND (Butte)—Oreshowing good on 150 level, with silver content holding up. Mining in Hesperus vein of Davis-Daly.

BUTTE & SUPERIOR (Butte)—Federal court has set Oct. 27 for hearing on accounting for damages in Minerals Separation case. Report that court had decreed damages to Minerals Separation from \$15,000,000 to \$23,000,000 is in error. Court also held that when more than 1 per cent of oil was used in flotation process there was no infringement of patent, and management of Butte & Superior stated company had been employing this percentage of oil and would continue, using this amount. Hearing of Elm Orlu supplemental suit begun Aug. 29.

CRYSTAL COPPER (Butte)—Tong shaft down to 600 level. Carload of ore will be shipped this week. Two carloads shipped in June. Three-foot orebody cut by shaft, which will be crosscut to from 600-level station.

DAVIS-DALY (Butte)—Sinking of Colorado shaft rapidly progressing toward 2,700 level. Six veins in evidence on 2,500 level will be cut. Colorado mine now producing about 250 tons daily, which will be doubled when capacity operations are resumed. June copper production 775,600 lb., against 620,000 for July, 31,400 oz. silver, against 25,000 for May.

NORTH BUTTE (Butte)—Production of Speculator mine being increased. Daily tonnage now over 700, compared with 450 ten days ago. Heavy tonnage of second-class ore developed on upper levels.

TUOLUMNE COPPER (Butte)—Crosscutting on 1,000 level for Spread Delight vein advancing about 100 ft. weekly. Expect to cut fissure fault by Sept. 1. Sinking of Sinbad shaft continued.

NEVADA

Esmeralda County

GOLDFIELD DEVELOPMENT (Goldfield)—Using 350 hp. of dynamite, 6,000 tons of ore was broken up in Red Top mine on July 23, ore averaging \$23.80, according to management. On July 15, 3,000 tons broken by one blast.

Elko County

BULL'S HEAD (Tobar)—Company reopening old mine in Spruce Mountain district, thirty-five miles south of Wells, and will build 50-ton shaft. District has produced over \$1,000,000.

Storey County

CONSTOCK (Virginia City)—Official report from Ophir mine of July 23 shows ore shipments for week averaged \$45.92 per ton. Con. Virginia shipments for same time averaged \$26.89 per ton.

Lyon County

DAYTON PLACERS (Dayton)—Bulkeley Wells and associates have acquired large acreage of placer ground near Dayton. Preparing to sink large dredge. Roy Elliott will be in charge.

Nye County

DIVIDE EXTENSION (Divide)—Drifting north and east begun on foot-wall side of vein on 100 level of Caldwell shaft, where it shows 14 ft. high-grade ore. Winze also started in this foot-wall ore. Crosscut not yet reached, hanging wall shipping regularly to West End mill ore averaging \$40 per ton.

TONOPAH DIVIDE (Divide)—Shipments to mill continue at rate of 60 tons a day. Southeast drift on 830 level advanced 110 ft. and still in commercial ore. Crosscut on 370 level being driven to pick up gold vein which was original discovery on property.

CONS. SPANISH BELT (Manhattan)—In west drift from tunnel top of oreshoot found carrying principally silver, with lead and zinc. Winze will be started soon. East drift on same level in good mill ore.

TONOPAH EXTENSION (Tonopah)—Net earnings for June were \$58,490 from 9,073 dry tons milled, producing 981.64 oz. gold and 104,749 oz. silver bullion. Con-

nction made between 1,760 and 1,680 level, giving better air in long crosscut.

SOUTH DAKOTA

Custer County

ARGENTINE POTASH (Burckett)—Machinery being moved to ground six miles west. Company purposes producing potash as soon as installations are completed.

Lawrence County

CUTTING (Deadwood)—Water has interfered with shaft sinking and work will be delayed until new pumps can be installed. Work being continued in main drift and good grade of ore developed.

DEADWOOD LEAD & ZINC (Deadwood)—Motors arrived and being placed in position. Plant will be placed in operation in short time, and with ore developed should be able to run continuously.

MOGUL (Terry)—Several ore verticals are being opened in Ofer-Mogul tunnel, and good tonnage being sent to mill from this source. One ton of ore has been worked at normal capacity.

TEXAS

Brazoria County

WEST COLUMBIA PRODUCTION third week in July averaged 26,000 bbl. per day. Producing companies: Gulf Oil Refining Co., 10,000 bbl.; Gulf Production Co., 2,000 bbl.; Humble Oil & Refining Co., 6,500 bbl.; Hannicker Co., 35 bbl.; Sun Co., 450 bbl.; Texas Co., 7,000 bbl.

CROWN OIL AND REFINING (West Columbia)—Marmion No. 3 well came in July 18 at 3,060 ft., making large production of high-gravity oil.

GULF PRODUCTION (West Columbia)—No. 1 McCMeans well, over 3,500 ft. deep, spraying crude containing oil with drill stem stuck in hole. Oil of high gravity; other oils of district lighter.

Goliad County

DRILLING TO BEGIN on Eckhardt land one mile south of Goliad. Men and materials on hand.

Harris County

GOOSE CREEK COMPLETIONS recently as follows: Joint well of Crown and Gulf Coast struck No. 4 Gallard, pumping; Gulf Production Co., No. 15 State land, testing; Atlantic Oil & Production Co., No. 1 well, testing; E. F. Simms Co., No. 24 Smith testing and No. 5 Schilling, pumping; Humble Co., No. 6 Beaumont, will pump soon.

BRAZOS OIL & REDUCTION (Humble)—No. 5 Fuller well came in as small pump.

F. D. GEORGE CO. (Humble)—Took over Mennis & Horn lease recently. Several wells cleaned out and production increased from 30 to 114 bbl. daily.

PETROLEUM REFINING (Humble)—No. 30 Stevenson well cleaned out, and now making fair production on pump.

Howard County

DEEP DRILLING near Big Springs will be done by L. C. House, independent operator.

Lampasas County

NELMS-MARVIN No. 2 Well, on McCrae ranch, now down 900 ft. Passed through shallow oil sand at 800 ft.

SMITH NO. 1 WELL on Smith ranch, has derrick built and is waiting arrival of rig. Several other wells in district will be drilled when rigs are obtainable.

TILBURY OIL (Lampasas)—Douglas No. 1 well down 400 ft. Standard rig being substituted for Star rig, and deeper drilling will be done.

La Baca County

SHAWNEE OIL (Hallettsville)—Large acreage secured by lessees, and test wells will be sunk for oil.

Liberty County

SUN CO. (Hull)—No. 1 Carr well being tested; indications good for production. Well abandoned several months ago in salt at 900 ft. Drilling resumed later, and salt passed through.

Tom Green County

OIL DRILLING NEAR SAN ANGELO under way. San Diego & Texas Oil Co., drilling on T. J. Flegg ranch, 15 miles north of town, passed 800 ft. oil sand at 800 ft. Tucker Oil Co., of Dallas, down 1400 ft. on Harris Bros. ranch, 25 miles north of San Angelo, just over Coke County line. Central Oil Co. has moved rig from Maryneal, Nolan County, to John Saut ranch, in Coke County, where test well will be drilled 4,000 ft. if necessary.

Wichita County

TEXAS OIL, GAS & MINERAL PRODUCTS (Burkburnett)—Gusher brought in July 22 that shot over derrick. Company controlled by W. C. Munn and associates, of Houston. Drilling also being done in Grimes County.

RED RIVER PIPE LINE (Wichita Falls)—Incorporated recently under Delaware laws for \$1,000,000. Right-of-way secured for pipe line from northwest extension of Burkburnett field to Wichita Falls. Pipe purchased, and construction will begin at once. Capacity, 20,000 bbl. daily.

UTAH

Beaver County

GOLDEN REEF (Frisco)—Work being done in hope of finding extension of Horn Silver vein in adjoining Horn Silver property.

Juab County

EUREKA BULLION (Eureka)—Ore showing good and working force to be increased at this East Tintic property.

NORTH STANDARD (Eureka)—New 35-hp. motor at property. Work shows increasing mineralization.

PROVO MINING (Eureka)—Rumored control of small territory in East Tintic gained by Tintic Standard adjoining.

TINTIC DRAIN TUNNEL (Eureka)—Shaft to be sunk on line of tunnel, at point about midway between Iron Blossom and portal of tunnel, to be of use in tunnel work as well as to open promising mineral ground.

PINION QUEEN (Eureka)—Understock Knight interests have gained control of this East Tintic property, situated near North Standard.

Morgan County

UTAH SILVER-LEAD (Peterson)—Old Carbonate Hill, credited with production of \$400,000 to \$700,000 in early days, taken under bond and lease by Utah Silver-Lead company; J. Howard Garrett, G. W. Morgan, and W. H. Exwater interested. Old workings total 6,000 to 7,000 ft. Considerable ore opened on Silver Zone claim by new work, 700 to 800 ft. from old workings. Tunnel being driven to get under orebody in 1,000 ft., with about 240 ft. more to go. Property comprises seven patented and four unpatented claims. Lease runs for period of years, royalties to go toward payment for property. Bonded indebtedness, \$125,000; first payment of \$10,000 made in about two years. Company has 400,000 shares in treasury.

Salt Lake County

UTAH CONSOLIDATED (Bingham Canyon)—Reported mill of Utah Metal & Tunnel Co. leased for three months' experimental work and that mill to treat low-grade lead ores will soon be built.

Summit County

PARK CITY SHIPMENTS week ended July 26 amounted to 2,835,110 lb. Shippers—Ontario Silver, Daly West, Naldrivier, Judge Mining & Smelting, and Silver King Coalition.

GLEN ALLEN (Park City)—Contract let for small mill. Development work being pushed. M. P. Braffet, Major S. A. King, and E. G. Schuler interested.

ONTARIO SILVER (Park City)—Lessees forced to cease work at time of strike again operating.

Tooele County

WESTERN UTAH COPPER (Gold Hill)—Work on concentrator being pushed. To be operated on custom basis. Development on lower levels encouraging. Working force doubled. Shipments of copper and lead ores resumed, owing to better market.

WASHINGTON

Pend Oreille County

BEAD LAKE GOLD (Newport)—Has moved to its property the mill machinery purchased from Western Union Mining Co. in Coeur d'Alenes. Expect to erect small concentrator. W. E. Allen, of Spokane, manager.

Snohomish County

SUNSET COPPER (Index)—Operations resumed in mine and mill.

Lincoln County

O-LO-LIM COPPER (Dayenport)—Company operating on Spokane Indian Reservation about three miles from Detillion Bridge shipped ten 20-ton cars averaging 9 per cent copper to Tacoma smeltery in last six

months. Ore hauled 26 miles to railroad at Dayenport. James Keith, of Spokane, president.

Stevens County

ELECTRIC POINT (Northport)—Hauling ore by auto trucks to railroad at Boundary while awaiting better market and smelting conditions. Handcapped by inability to ship to Trail. Exploration work in progress. Roy Young manager.

COLVILLE VALLEY COAL (Valley)—Will ship first coal in August to Loom Lake Copper Co. latter hauling it twelve miles by truck. Said to be first coal marketed in Washington from mines east of Columbia River.

CANADA

British Columbia

MOLLY GIBSON (Paulson)—Ore struck 240 ft. from portal of tunnel on 300-ft. level.

CANADA COPPER (Princeton)—Settlement of strike said to be near at hand, miners to get 50c. advance for nine-hour day. Construction of railroad and power line will be resumed as soon as strike is settled, but delay of nearly four months caused by strike may prevent operation of property before next spring.

GIBSON (Slocan)—President D. K. Macdonald, Spokane, invited at annual meeting held at Kalso, B. C.; E. H. Latham, of Spokane, secretary-treasurer. Other directors are Robert Gunning, Spokane; Joseph Dasebach, Opportunity, Wash.; and F. E. Archer, Kaslo.

GOLD CURE (Kaslo)—Crew of men put to work. Charles F. Caldwell, of Kaslo, president.

Ontario

KILPATRICK CLAYM (Gowganda)—Property situated near Miller Lake-O'Brien taken over by W. Young and associates, and will be actively developed.

REEVE-DOBIE (Gowganda)—Installation of flotation plant completed.

WEST END (Port Arthur district)—Being worked by Mining Corporation of Canada, which recently made shipment of ore.

NORTH DAVIDSON (Porcupine)—Power transmission will be laid from Davidson to property.

NORWOOD (North Porcupine)—Has let contract for 6,000 ft. of diamond drilling.

MEXICO

San Luis Potosi

MANGANESE ORE being shipped through Charcas station from Santo Domingo district 30 miles west of Charcas. Petronilo Lopez in charge.

SAN DIEGO (Charcas)—J. T. Murphy shipping about 1,200 tons of ore from dump each month. Property about five miles west of Charcas.

TIRO GENERAL (Charcas)—Being unwatered by air lift. Depth of 650 ft. has been reached in one stage. High silver price causing considerable ore to be shipped from dump. S. F. Shaw, superintendent.

DOLORES (Matehuala)—Operating at about two-thirds capacity. E. E. Reyser superintendent.

SANTA MARIA DE LA PAZ (Matehuala)—Operating steadily owing to high price of silver. G. M. Wastehys general manager.

Zacatecas

BONANZA (Bonanza)—Long prospect tunnel being driven. S. F. Shaw, superintendent.

MATTHEWS AND IANKES operating property in San Pedro de Ocampo district.

MAZAPIL COPPER operating two copper furnaces at Concepcion del Oro. Lead smelting at Sattillo in steady operation. San Eligio mine producing lead ore and Aranzazu group copper ore. Both properties near Concepcion del Oro. R. H. Jeffreys general manager.

PURCELL INTERESTS operating Catacillas and other properties in Mazapil district. P. K. Lucke consulting engineer.

AUSTRALIA

New South Wales

AT BROKEN HILL, mine buildings valued at \$500,000 have been destroyed by fire, according to London press dispatch dated July 31. Incendiarism given as cause.

BELGIAN CONGO

UNION MINIERE DU HAUT KATANGA (Elisabethville)—Copper production in June was 4,519,430 lb.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

July Aug.	Sterling Exchange	Silver		Aug.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
31	435 $\frac{1}{2}$	107 $\frac{3}{4}$	55 $\frac{9}{16}$	4	435	109 $\frac{3}{4}$	56 $\frac{1}{2}$
1	435 $\frac{1}{4}$	108	55 $\frac{3}{4}$	5	435 $\frac{1}{2}$	108 $\frac{3}{4}$	56 $\frac{1}{2}$
2	435	109 $\frac{3}{8}$	56 $\frac{1}{2}$	6	431 $\frac{1}{2}$	109 $\frac{3}{4}$	57

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

Daily Prices of Metals in New York

July-Aug.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
31	22.85 @ 23.10	68	5.75 @ 5.85	5.60 @ 5.65	7.40 @ 7.50			
1	22 $\frac{3}{4}$	67	5.75 @ 5.85	5.60 @ 5.65	7.20 @ 7.30			
2	22 $\frac{3}{8}$	66	5.75 @ 6.00	5.65 @ 5.70	7 @ 7 $\frac{1}{2}$			
4	22 $\frac{3}{4}$	66	5.75 @ 6.00	5.65 @ 5.70	7 $\frac{1}{2}$ @ 7 $\frac{3}{4}$			
5	22 $\frac{3}{4}$	65 $\frac{1}{2}$	5.75 @ 6.00	5.65 @ 5.70	7 $\frac{3}{4}$ @ 7 $\frac{3}{4}$			
6	22.35 @ 22.45	65 $\frac{1}{2}$	5.75 @ 6.00	5.65 @ 5.70	7 $\frac{3}{4}$			

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

July-Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
31	102	102 $\frac{1}{2}$	...	272	267 $\frac{1}{2}$	24	24 $\frac{1}{2}$	41	41 $\frac{1}{2}$
1	101 $\frac{1}{2}$	102	...	275	269	24 $\frac{1}{2}$	25	41 $\frac{1}{2}$	41 $\frac{1}{2}$
2	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...
5	99 $\frac{1}{2}$	100 $\frac{1}{2}$	...	276	268	25 $\frac{1}{2}$	25 $\frac{1}{2}$	40 $\frac{1}{2}$	41 $\frac{1}{2}$
6	96	97	108	276	263 $\frac{1}{2}$	24 $\frac{1}{2}$	25 $\frac{1}{2}$	39 $\frac{1}{2}$	40 $\frac{1}{2}$

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

Metal Markets

New York, Aug. 6, 1919

All of the metal markets this week were extremely dull and were rather disturbed, neither of which conditions was surprising in view of the phenomenally large sales that were made in July and the collapse in the stock market on Monday.

Freight rates to British and French ports are \$18. From San Francisco to Hongkong and Kobe, \$12.

In a recent hearing before a subcommittee of the House of Representatives, the following was testified respecting the ordnance stocks of metals and the disposition thereof: Antimony, total stock, 3,330,914 lb., whereof 2,918,000 lb. has been sold, principally to the Wah Chang Trading Co., at about 63c. per lb. Copper ingot, 100,000,000 lb., all sold. Lead, about 15,000 tons,

whereof about 12,000 tons has been sold. Zinc, 42,500 tons, whereof 1,000 tons has been sold at 7c. per lb. Platinum, 19,000 oz., whereof 8,650 oz. has been sold at \$105 per oz. The Government's large stocks of brass manufactures remain unsold, as also is about 20,000,000 lb. of copper in semi-manufactured forms. Also, the Government has 170,000,000 lb. of other brass, whereof none has been sold, but in connection with which a contract is now pending.

It is plainly the intention of the subcommittee headed by Representative Graham, which is investigating ordnance expenditures during the war, to show that the Government agencies were improperly influenced by the copper producers in making arrangements for the disposition of the Government's surplus stock of copper after the war. E. C. Morse, assistant director of sales, submitted the following figures:

Pounds
 April sales by producers... 89,864,239
 Government's share of same... 12,972,920
 May sales by producers... 207,649,198
 Government's share of same... 36,529,838
 June sales by producers... 202,539,751
 Government's share of same... 35,507,950

The remainder of the Government's copper was sold in July. All of the Government copper was sold on a rising market. The Government realized the same price that the producers did for their own copper, sold contemporaneously, less the usual selling commission of 1 per cent.

Copper

No business was done this week by any of the big producers. The market was established by the reselling of copper by speculators and by consumers who found themselves overbought. A good deal of such business was offered at prices that were shaded from day to day. In such a market variations in terms are naturally to be expected, and we can do nothing more than generalize. However, a round lot was sold Wednesday morning by a small producer on terms equivalent to 22.45c., cash, New York, and during Wednesday afternoon August-September contracts were offered at the equivalent of 22.35c., New York. But for the moment there is no further buying demand worth mentioning. On the other hand, the principal producers are firm in asking their previous price of 23.1-2c., delivered.

Germany bought 1,000 tons of copper through the Export Association last week.

Sales of copper by American producers in July were larger than those of any other month this year, which is saying a good deal.

Copper Sheets—The base price of copper sheets at 33c. per lb. Demand strong. Copper wire is quoted at 26 @ 27c. in carload lots, f.o.b. mill. Market not very strong, but producers are holding firm. Considerable second-hand copper is being offered.

Tin

With the arrival of the first lots of shipment tin permitted to enter this country, and the consequent increase in the supply, the market for tin of 99 per cent grade began on Aug. 1 to decline sharply, and up to today has fallen about 23c. per lb. The market for Straits and electrolytic tin, however, has remained steady at 70c. From now on there will be steady arrivals, and with the increase in supplies in this market further declines may be expected.

Straits tin, July shipment, was quoted at 54c. on July 31; at 54½c. on Aug. 1, 2 and 4; at 54½c. on Aug. 5; and at 54½c. on Aug. 6. August shipment was about 1c. less.

Singapore quoted, c.i.f., London, as follows: July 31, £269½; Aug. 1, £269½; Aug. 5, £271; and Aug. 6, £271½.

Lead

The lead market, like that for copper, was dull. Lead held speculatively was offered freely at 5.75c., and consumers bought at that price. On the other hand, the principal producers found themselves able to get the price that they asked, viz. 6c., from some of their regular customers. The market can, therefore, be characterized only as irregular. It is certain that no large tonnage could be bought at 5.75c., or could be sold at 6c., but without doubt liberal supplies could be obtained around 5c.

The statistical position of lead is excellent, and without doubt is better than that of any of the other metals. There was a sharp reduction in stocks during July.

Germany has been buying lead in Great Britain.

Zinc

Under the influence of efforts to re-align, the sharp decline in the market continued, and during the morning of Aug. 2, 7c. was touched. From 7½c. down to 7c., however, there was found to be strong resistance to the decline. Speculative interests attempting to cover their short contracts, and others endeavoring to institute new bull accounts, found that they could not easily buy what they desired. Therefore, a sharp rally naturally ensued, and the week closed with the market at 7½c.

The Great Falls zinc works of the Anaconda company are closed.

Germany is selling zinc in England, which has had the effect of depressing the price there to a point that is far below our parity and has therefore killed any immediate prospect for export sales to Europe.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 32½@33c. per lb. Market dull. Very little business.

Antimony—Unchanged at 9½@9½c. for spot, with market quiet but firm. Owing to interruption of cables there were no quotations for futures.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.10 per lb. for wholesale lots—500 lb. and over. No change.

Cadmium—Quoted at \$1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, \$1.75 per lb. No change. A little increase in business.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Unchanged at \$109, at which price the market is strong. San Francisco telegraphs \$103, steady.

Silver and Platinum

Silver—The market has ruled firm, with an advancing tendency in London, closing at 57d. With comparative steadiness in sterling exchange, New York price has been strong on buying for China, and offerings have been absorbed for export to the Far East at prices over the London market equivalent. Market closes firm, notwithstanding weakness in sterling exchange.

Mexican dollars at New York: July 31, 83½; Aug. 1, 83½; Aug. 2, 84½; Aug. 4, 84½; Aug. 5, 84½; Aug. 6, 84½.

Platinum—We quote refined ingot at \$105.

Palladium—Unchanged at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 2—Zinc blende, per ton, high, \$56.85; basis 60 per cent zinc, premium, \$48; Prime Western, \$47.50; fines and slimes, \$45@42.50; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$52.12; calamine, \$31.50; all zinc ores, \$51.73.

Lead, high, \$67.95; basis 80 per cent lead, \$67.50; average settling price, all grades of lead, \$63.72 per ton.

Shipments the week: Blende, 7,805; calamine, 148; lead, 1,079 tons. Value, all ores the week, \$481,770.

Buyers had light orders for this week, and all stood firm on offerings of \$47.50 basis, a drop of \$7.50 from last week. Some sellers declined to accept the low price level, but others sold. Settling prices are based on last week's purchases, settlements of which were made this week.

Platteville, Wis., Aug. 2—Blende, basis 60 per cent zinc, \$50 per ton base for premium grade. One car of Prime Western grade sold Friday at \$50 base, but buyers declined to buy Saturday at \$47.50 base. Lead ore, basis 80 per cent lead, \$67 per ton. Shipments for the week are 1,637 tons blende, 182 tons galena, and 553 tons sulphur ore. For the year to date the totals are 58,928 tons blende, 3,478 tons galena, and 9,069 tons sulphur ore. During the week 3,200 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Unchanged at \$25 per ton, f.o.b., California points, for ore running 40 per cent or better.

Manganese Ore—Unchanged at 60c. per unit asked, and 50c. bid.

Molybdenum Ore—No business reported. The last quotation was 85c.

Tungsten Ore—Some business in Chinese ore was reported at \$7.27@ \$7.75. High-grade ore was sold at \$9.25. Altogether, however, the market was small.

Other Minerals

Nitrate—Dealers are quoting a price of \$3 per cwt., but little business is being transacted, in view of anticipated changes in price of nitrate from Chile. Nitrate production in Chile during May, 1919, according to *Commerce Reports*, amounted to 3,039,390 Spanish quintals or 154,157 tons of 2000 lb., compared

with 268,574 tons in May, 1918. Exports at present are negligible.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace-size lump ore, free from fines, c.i.f., New York or other Atlantic port. Run-of-mine ore is quoted at 16½c. Market slow and unsettled; hand-to-mouth buying. Price will decrease with ocean freights.

Iron Trade Review

Pittsburgh, Aug. 5—Unfavorable influence in general trade, the continued high rate on dollar exchange, labor unrest, agitation over the high cost of living, the threat of railroad men to strike if their proposal for tripartite operation of the railroads is not accepted, and the strikes of railway shopmen in various sections have not visibly decreased the total volume of steel orders placed or arrested the tendency to increase production. At some points, particularly at Gary, there is forced curtailment of pig-iron and steel production by the absence of transportation facilities, caused by railroad shopmen's strikes.

Steel producers recognize, however, that factors unfavorable to the future have developed, and progress of the iron and steel industry to a stage of full operation may be slower than was expected a month or two months ago. The exchange situation has clearly operated to curtail the buying of American products by Great Britain and Europe, but there remains good buying by Japan, China, and South America.

Though no definite expectation had been entertained as to when a resumption of railroad buying of steel and other products could be expected, it is recognized that the additional uncertainties injected into the general situation as to what is going to be done with the railroads tend to postpone the inception of railroad buying, and this is a matter of great importance, as the hope recently entertained in some quarters that the steel industry could reach the full protective activity without the support of railroad buying has been abandoned.

Without allowing for the temporary curtailment in tonnage caused by railroad strikes, the steel industry is operating at fully 75 per cent of capacity. Pipe, wire, sheet, and tin-plate mills are operating almost full, and plate, structural, and rail mills are operating at relatively low rates. Structural-mill operations are increasing. Merchant bar production is at not far from capacity, and the distribution of orders for bars, as to classes of consumers involved, is improved.

Effective Aug. 1, rivet makers have advanced prices \$4 a ton, to 3.90c for button-head structural rivets and 4c for cone-head boiler rivets.

Pig Iron—Trading is of moderate proportions, in point of tonnage. Foundry iron is well sold up, as to the operating furnaces, but idle furnaces would have some difficulty in selling enough backlog tonnage to justify blowing in unless they should cut prices.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

	Large Pittsburgh	St. Louis	Chi- cago	San Fran- cisco	—New York— Cur- rent	—New York— One Yr. Ago
No. 10	3 55	4 64	4 57	5 80	4 57	5 50
No. 12	3 60	4 69	4 62	5 75	4 62	5 55
No. 14	3 65	4 74	4 67	5 90	4 67	5 60
Black						
Nos. 18 and 20	4 15	5 24	5 17	6 75	5 30	6 30
Nos. 22 and 24	4 20	5 29	5 22	6 80	5 35	6 35
No. 26	4 25	5 34	5 27	6 95	5 40	6 40
No. 28	4 35	5 44	5 37	7 05	5 50	6 50
Galvanized:						
No. 10	4 70	5 79	5 97	6 20	6 85	
No. 12	4 80	5 89	6 07	7 30	6 25	6 95
No. 14	4 80	5 89	6 07	7 30	6 30	6 95
Nos. 18 and 20	5 10	6 19	6 37	7 60	6 60	7 25
Nos. 22 and 24	5 25	6 34	6 52	7 75	6 75	7 30
No. 26	5 40	6 49	6 67	7 90	6 90	7 45
No. 28	5 70	6 79	6 97	8 20	7 20	7 75

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails, ...	\$45.00	\$65.00	\$45.00	\$65.00
Standard openhearth rails, ...	47.00	67.00	47.00	67.00
Light rails, 8 to 10 lb., ...	2.58*	3.36*	2.83*	3.36*
Light rails, 12 to 14 lb., ...	2.54*	3.09*	2.79*	3.09*
Light rails, 25 to 45 lb., ...	2.45*	3.00*	2.70*	3.00*

* Per 100 lb.

TRUCK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Francisco
	Current	One Year Ago			
Standard railroad spikes, 1/2 in. and larger, ...	\$3.35	\$3.90	\$4.27	\$4.44	\$5.65
Truck bolts, ...	4.35	4.90	5.17	Premium	6.65
Standard section angle bars	3.00	3.25	4.22	Premium	4.60

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	—New York— Cur- rent	—New York— 1 Yr. Ago	St. Louis	Chi- cago
Beams, 3 to 15 in., ...	\$2.45	\$3.47	\$4.245	\$3.54	\$3.47
Channels, 3 to 15 in., ...	2.45	3.47	4.245	3.54	3.47
Angles, 3 to 6 in., 1/2 in. thick, ...	2.45	3.47	4.245	3.54	3.47
Tees, 3 in. and larger, ...	2.45	3.52	4.245	3.54	3.47
Plates, ...	2.66	3.67	4.495	3.54	3.67

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$2 55	\$2 55	\$4 5

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL							
	Mill Pittsburgh	—New York— Cur- rent	—New York— One Year Ago	Chi- cago	St. Louis	San Fran- cisco	Dallas
1/2 in. and larger, ...	\$4.20	\$4.72	\$5.65	\$4.72	\$4.79	\$6.05	\$5.90

CONE HEAD BOILER							
	Mill Pittsburgh	—New York— Cur- rent	—New York— One Year Ago	Chi- cago	St. Louis	San Fran- cisco	Dallas
1/2 in. and larger, ...	4.30	4.82	5.75	4.82	4.89	6.15	6.00
1 1/2 in. and larger, ...	4.45	4.97	5.90	4.97	5.04	6.30	6.15
Lengths shorter than 1 in. take an extra of 25c. Lengths between 1 in. and 2 in. take an extra of 25c.	4.70	5.22	6.25	5.32	5.29	6.65	6.50

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging, ...	+12 1/2%
Galvanized cast steel rigging, ...	7 1/2%
Bright plow steel, ...	3 1/2%
Bright cast steel, ...	22 1/2%
Bright iron and iron tiller, ...	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cin- cinnati	Chicago	St. Louis	Den- ver	Birm- ingham
Straight, ...	\$5.75	\$7.50	\$6.50	\$6.25	\$8.50	\$7.35
Assorted, ...	7.50	6.50	6.40	8.75	7.60	

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh: Iron bars, ... 2 7/8c. Steel bars, ... 2 35c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
No. 12	\$0.16 1/2	\$0.18	\$0.19	\$0.18 1/2	\$0.16 1/2

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid, ...	14c.	13c.	15c.	15c.
Hollow, ...	14c.	14c.		20c.

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card of National Tube Co. for steel pipe, Carbury A. M. Byrns for iron, both dated Mar. 21, 1919.

BUTT WELD					
Inches	Steel Black Per Cent.	Galvanized Per Cent.	Inches	Iron Black Per Cent.	Galvanized Per Cent.
1/2 to 3, ...	57 1/2	44	1/2 to 1 1/2, ...	39 1/2	23 1/2
LAP WELD					
2, ...	50 1/2	38	1 1/2 to 2 1/2, ...	24 1/2	9 1/2
2 1/2 to 6, ...	53 1/2	41	2 1/2 to 3 1/2, ...	31 1/2	17 1/2
7 to 12, ...	50 1/2	37	3 1/2 to 4 1/2, ...	32 1/2	18 1/2
13 and 14, ...	44 1/2	31	4 1/2 to 6, ...	34 1/2	21 1/2
15, ...	38 1/2	25	7 to 12, ...	31 1/2	18 1/2
BUTT WELD, EXTRA STRONG PLAIN ENDS					
1/2, 1 and 1 1/2, ...	46 1/2	29	1 1/2 and 1, ...	28 1/2	11 1/2
1 1/2 to 1 1/2, ...	55 1/2	39	1 1/2 to 1 1/2, ...	39 1/2	20 1/2
2 to 3, ...	56 1/2	44			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2, ...	49 1/2	37	1 1/2 to 2 1/2, ...	25 1/2	10 1/2
2 1/2 to 6, ...	51 1/2	40	2 1/2 to 3 1/2, ...	31 1/2	17 1/2
7 to 8, ...	46 1/2	33	3 1/2 to 4 1/2, ...	35 1/2	23 1/2
9 to 12, ...	41 1/2	28	4 1/2 to 6, ...	34 1/2	22 1/2
			7 to 8, ...	26 1/2	14 1/2
			9 to 12, ...	21 1/2	9 1/2

From warehouses at the places named the following discounts hold for steel pipe.

	New York	Black Cleveland	Chicago
1/2 to 3 in. butt welded, ...	47%	43%	37 1/2%
3/4 to 6 in. lap welded, ...	42%	45 1/2%	53 1/2%
Galvanized			
	New York	Black Cleveland	Chicago
1/2 to 3 in. butt welded, ...	31%	34 1/2%	44%
3/4 to 6 in. lap welded, ...	27%	30 1/2%	41%

Malleable fittings, Class B and C, from New York stock sell at list plus 12 1/2%.

Cast iron, standard sizes, 10%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	—New York— Current	—New York— One Year Ago	—Cleveland— Current	—Cleveland— One Year Ago	—Chicago— Current	—Chicago— One Year Ago
Hot pressed square, ...	\$1.50	\$2.50	\$2.25	\$1.40	\$2.00	\$1.05
Hot pressed hexagon, ...	1.50	2.50	2.25	1.20	2.00	85
Cold punched square, ...	1.50	2.50	2.25	75	1.30	1.50
Cold punched hexagon, ...	1.50	2.50	2.25	75	1.30	1.50

Finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York, ...	50-10-75%	40%
Chicago, ...	50%	50%
Cleveland, ...	60-10-10%	60%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
1/2 by 4 in. and smaller, ...	50%	50%	50-10%
Larger and longer up to 1 in. by 30 in., ...	40%	40%	40-10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:					
New York, ...	\$1.25	Cleveland, ...	\$3.75	Chicago, ...	\$2.25
For cast-iron washers the base price per 100 lb. is as follows:					
New York, ...	\$4.00	Cleveland, ...	\$3.75	Chicago, ...	\$4.00

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots		Less Than Carload Lots	
	New York	Chicago	New York	Chicago
Tar felt (14 lb. per square of 100 sq. ft.), ...	\$60.00	\$60.50	\$61.00	\$61.50
Tar pitch (in 400-lb. bbl.), ...	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels), ...	34.00	34.00	37.50	37.50
Asphalt felt, ...	63.00	63.00	67.50	67.50

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply		2-Ply		3-Ply	
	e.l.	l.e.l.	e.l.	l.e.l.	e.l.	l.e.l.
No. 1 grade, ...	\$1.50	\$1.75	\$1.90	\$2.15	\$2.30	\$2.55
No. 2 grade, ...	1.35	1.60	1.70	1.95	2.05	2.30

Asbestos asphalt-saturated felt (14 lb. per square) costs \$150 per ton. Slate-surfaced roofing (red and green) in rolls of 108 sq. ft. costs \$2.25 per roll in carload lots and \$2.50 for smaller quantities. Shingles, red and green slate finish, cost \$6.00 per square in carloads, \$6.25 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x 12 x 12	8x 12 x 12	12x 12 x 12
St. Paul.....	\$0.056	\$0.11	\$0.162
Seattle.....	.09	.175	.30
Los Angeles*.....	.082	.154	.246
New Orleans.....	.165	.22	.325

* F. o. b. factory, 4, 8 and 10 in.

LUMBER—Price per M in carload lots:

	8x 8-In. x 20 Ft. and Under				12x 12-In. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston.....	\$50.00	\$49.00	\$48.00	\$48.00	\$50.00	\$50.00
Kansas City.....	45.50	50.25	50.25	52.25	51.50	51.75
Seattle.....					51.25	51.75
New Orleans.....	45.00				48.00	63.00
St. Paul.....	60.00	61.00	60.00		62.00	63.00
Denver.....				No quotations		
Atlanta.....	55.50	57.50	58.00	68.00	68.50	70.50

	1-In. Rough, 10 In. x 16 Ft. and Under				2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir	
Boston.....	\$50.00	\$50.00	\$48.00	\$50.00	\$50.00	
Kansas City.....	64.50	72.75	72.75	67.25	79.00	
Seattle.....		30.50			30.50	
New Orleans.....	55.00			54.00	56.00	
St. Paul.....	58.00	55.00	54.00	63.00	63.00	
Denver.....			No quotations			
Atlanta.....	80.00	85.00		65.00	67.50	

NAILS—The following quotations are per keg from warehouse:

	Wire	10d	8d	6d	4d	3d	San Francisco
Cut.....	\$3.25	\$3.90	\$5.00	\$3.90	\$5.00	\$5.00	6.65
	4.25	5.40	6.40	5.00	5.00	5.00	6.65

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	with Bags
New York.....	\$2.30	\$2.30	\$2.50
Jersey City.....	2.27	2.27	2.50
Boston.....	2.42	2.42	2.87
Chicago.....	2.00	2.00	2.90
Pittsburgh.....	2.05	2.05	2.71
Cleveland.....	2.32	2.32	2.15
Denver.....	2.67	2.67	3.07

Note—Charge for bags is generally 15c. each, 60c. per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York.....	\$17.50	\$14.50	\$2.30	\$2.65
Kansas City.....	22.00	21.00	2.30	2.20*
Chicago.....	18.00	17.50	1.80*	1.10*
St. Louis.....	22.75	18.00	1.75*	1.75*
Boston.....	2.25*	1.25*	3.65	3.30
Dallas.....				2.00*
San Francisco.....	19.00		1.60*	1.50*
St. Paul.....	23.00	20.00	1.60*	1.10*
New Orleans.....		1.90*	1.75*	1.75*
Atlanta.....	20.00	20.00		2.15*
Denver.....	20.00	20.00		2.15*

* 200-lb. barrels. † Per 100-lb. bbl. ‡ Per ton.
Note—Refund of 10c. per barrel.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel.....	\$2.15	\$1.86	\$2.15	\$2.00	\$2.48	\$1.97
5-gal. cans.....	2.28	1.96	2.40	2.15	2.68	2.17

WHITE AND RED LEADS—In 500-lb. lots sell as follows in cents per pound:

	Red				White			
	Current		1 Year Ago		Current		1 Yr. Ago	
	Dry	In Oil	Dry	In Oil	Dry	In Oil	Dry	In Oil
100-lb. keg.....	13.00	14.50	14.00	14.00	13.00	14.00	14.00	14.00
25- and 50-lb. kegs.....	13.25	14.75	14.25	14.75	13.25	14.20		
12-lb. keg.....	13.50	15.00	14.50	15.00	13.50	14.50		
5-lb. cans.....	15.00	16.50			15.00	16.00		
1-lb. cans.....	16.00	17.50			16.00	17.00		

MINING AND MILLING SUPPLIES

HOSE—

Underwriters' 2½-in.....	Fire	50-Ft. Lengths
Common, 2½-in.....		70-Ct. per ft.
	Air	40-100'
	First Grade	Second Grade
1-in. per ft.....	\$0.45	\$0.30

First grade.....	35%	Second grade.....	45%	Third grade.....	50%
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LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York.....	45%	35%
St. Louis.....	45%	40%
Chicago.....	45%	40%
Birmingham.....	30%	35%
Denver.....	35%	30%

RAWHIDE LACING—30% off for cut; 6c. per sq. ft. for lacing.

MANILA ROPE—For rope smaller than 1-in. the price is 1/2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: 1-in., 8 ft.; 1½-in., 6 ft.; 2-in., 4 ft.; 2½-in., 3 ft.; 3-in., 2 ft. 10 in.; 4-in., 2 ft. 4 in. Following is price per pound for 1-in. and larger, in 1,000-ft. coils:

Boston.....	\$0.25	Denver.....	\$0.29
New York.....	.27	Kansas City.....	.28
Cincinnati.....	.29	New Orleans.....	.27
Chicago.....	.26	Seattle.....	.27
St. Paul.....	.28	St. Louis.....	.26
San Francisco.....	.26	Atlanta.....	.29

PACKING—Prices per pound:

Rubber and duck for low-pressure steam.....	\$0.90
Asbestos for high-pressure steam.....	1.50
Duck and rubber for piston packing.....	1.00
Flax, regular.....	1.20
Plax, water-proofed.....	1.60
Compressed asbestos sheet.....	90
Wire insertion asbestos sheet.....	1.10
Rubber sheet.....	.50
Rubber sheet, fire insertion.....	.70
Rubber sheet, duck insertion.....	1.30
Rubber sheet, cloth insertion.....	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes.....	1.20
Asbestos wick, 1- and 1½-lb. balls.....	.85

REFRACTORIES—Following prices are f. o. b. works, Pittsburgh:

Chrome brick.....	net ton \$90-1.00	at Chester, Penn.
Chrome cement.....	net ton 45-50	at Chester, Penn.
Clay brick, 1st quality fireclay.....	net ton 35-45	at Clearfield, Penn.
Clay brick, 2nd quality.....	net ton 30-35	at Clearfield, Penn.
Magnesite, dead burned.....	net ton 32.50	at Chester, Penn.
Magnesite brick, 9 x 4½ x 2½ in.....	net ton 80-90	at Chester, Penn.
Silica brick.....	net ton 41-45	at Mt. Union, Penn.
Standard size fire brick, 9 x 4½ x 2½ in. The second quality is \$4 to \$5 cheaper per 1000.		
St. Louis—Fire Clay, \$30 to \$40.		
Birmingham—Fire clay, \$41-\$44; silica, \$46.50-\$54.50; magnesite, \$80-\$85; chrome, \$80 to \$90.		
Chicago—Second quality, \$25 per ton.		
Denver—Silica is \$35 per 1000.		

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 in. x 9 in.	6 in. x 8 in.
		by 8 Ft. 6 in.	by 8 Ft.
Chicago.....		1.42	1.33
San Francisco.....	Douglas Fir—Green	2.12	2.00
San Francisco.....	Douglas Fir—Creosoted	2.12	2.00
Prices per tie at Missouri mills; St. Louis prices about 25c. higher:			
Untreated A Grade White Oak	6x8x8		
No. 1.....	\$0.70	No. 1.....	\$0.55
No. 2.....	.80	No. 2.....	.65
No. 3.....	.90	No. 3.....	.75
No. 4.....	.98		
7x9x8 white oak.....	1.05		
7x9x8 red oak, No. 4.....	.80	No. 5.....	.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels

	New York	In Bbl.	Chicago	Carloads	Denver
Pure steam-distilled pine oil, sp.gr. 0.925-0.94.....	\$0.78	\$0.71	\$0.69	\$0.81	
Pure destructively distilled pine oil.....	.68	.68†	.66†	.53-.68	
Pine tar oil, sp.gr. 1.02-1.035.....	.45	.36	.34	.40-.47	
Crude turpentine.....	.72	.68	.66	.53-.65	
*Hardwood creosote, sp.gr. 0.96-0.99.....	.27			.50-.57	

* F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago	14 00	11 00 to 14 00
White.....	13 00	11 00	14 00	11 00 to 14 00
Colored mixed.....	9 00 to 12 00	8 50-12 00	11 00	9 50 to 12 00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

Cleveland.....	13½x21	13½x20
Chicago.....	\$2.00	\$3.00
	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing				Gelatine				Black Powder
	20%	40%	60%	80%	20%	40%	60%	80%	
New York.....	\$0.22	\$0.27	\$0.30	\$0.32	\$0.22	\$0.27	\$0.30	\$0.32	\$2.40
Boston.....	.20	.24	.26	.28	.20	.24	.26	.28	2.20
Cincinnati.....	.19	.21	.23	.25	.19	.21	.23	.25	2.25
Kansas City.....	.19	.23	.26	.28	.19	.23	.26	.28	2.45
New Orleans.....	.18	.22	.24	.26	.18	.22	.24	.26	1.90
Seattle.....	.14	.18	.21	.23	.14	.18	.21	.23	2.15
Chicago.....	.16	.21	.23	.25	.16	.21	.23	.25	2.00
St. Paul.....	.19	.23	.26	.28	.19	.23	.26	.28	2.45
St. Louis.....	.19	.23	.25	.27	.19	.23	.25	.27	2.40
Denver.....	.17	.22	.24	.26	.17	.22	.24	.26	2.25
Dallas.....	.18	.22	.25	.27	.18	.22	.25	.27	2.40

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Denver, 42c.; Chicago, 31½c.; St. Louis, 31c.

SODIUM SULPHIDE—In New York the price per pound is .05c. for concentrated, 2c. for crystals. The St. Louis price is 5c. for concentrated. The Denver price is 32c. The Chicago price is 6c. for concentrated, 31c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 10c. per lb.; Chicago, 13c., Denver, 13c. St. Louis, 15c.

ALUMINUM DUST—Chicago price is 1.30 per lb.

MINERS' LAMP CARBIDE—Prices net f. o. b. cars at warehouse points

	Union	Cameo	Union
	100-Lb. Drums	100-Lb. Drums	25-Lb. Drum
	Per Ton	Per Ton	Per Drum
East of the Mississippi, North of Chattanooga, S. S. A. A.....	\$106.00	\$101.00	\$1.52
Southeastern portion U. S. A. A.....	115.50	110.50	1.63
Texas (except El Paso).....	124.00	119.00	1.74
El Paso, Texas.....	126.00	121.00	1.77
Denver, Colo.....	124.00	119.00	1.74
West Coast.....	129.00	124.00	1.81

Engineering and Mining Journal

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Number 7

J. E. Spurr To Become Editor Of "Engineering and Mining Journal"

JOSIAH EDWARD SPURR, mining geologist, founder of *Economic Geology*, for many years actively in the service of the United States Geological Survey, and familiar with most of the important mines of North America, will become Editor of the *Engineering and Mining Journal* on Oct. 1, 1919. This preliminary notice of Mr. Spurr's appointment will be supplemented by a complete biography and a more extended announcement in a subsequent issue.

The Mexican Issue Must Not Be Sidetracked

IMPORTANT as our domestic problems are, their existence does not alter conditions abroad. When our troubles at home become magnified they simply cause foreign troubles to look small by comparison—they overshadow but do not remove the latter. Authentic news coming from our correspondents in Mexico indicates no noticeable improvement in conditions there.

It is reported from Washington that the Administration has let it be known that there is to be no change in the United States Government's Mexican policy. The impression is given that the various outrages recently committed are not to be taken seriously, and that Carranza is to be excused because of the difficulty of furnishing protection. Though it is quite true that there is nothing new in Mexico, the old conditions are extremely aggravating, and it was to be hoped that the Administration would find time to give serious consideration to the affairs of that country, and that it would evolve a substantial change in its policy toward the Mexican government.

One small grain of comfort may be gathered from the fact that the President has found that there exists in Mexico a condition of domestic violence promoted by the use of arms or munitions of war procured from the United States, and admonishes the people of this country to cease the exportation of arms to our neighbor. The passing of arms and munitions into Mexico at this time means two things: First, a continuance of domestic violence because of the impossibility of keeping these supplies out of the hands of revolutionists and bandits, and second, that more Americans will be killed by American bullets if it becomes necessary to send a military force across the border. We must congratulate the authorities at Washington upon even this small discovery.

However, in addition to domestic violence, has not the President "found" that hundreds of Americans have been killed and thousands driven from their legitimate occupations in Mexico? Has he not "found" that property of inestimable value has been destroyed or con-

fiscated? Has he not "found" that the government to which he gave recognition is utterly incapable of restoring Mexico to its former prestige?

We believe that the State Department at Washington contains documentary evidence of all these things, and we believe that the President is not in ignorance of them. We hoped there would be a change of policy when the press was again permitted to tell what was going on to the south of the border; that there would be an end of "protests," and "representations," and hints of intervention. Such procedure has accomplished nothing, and there is no prospect that it ever will accomplish anything. If history may be taken as a guide, there is evidence that such language is not comprehended.

The intelligent Mexican who hears of our desire to bring about "friendly intervention" thinks of us as two-faced cowards. To him friendliness means peace, and intervention means war, and the terms are incompatible. He is incapable of understanding how peaceful methods can be used to bring about desired results; he has seldom used them, or had them used upon him. He quite understands how results may be accomplished through force, but to him force means war.

As we understand that term, the United States wants no war with Mexico. Mexico has made some previous mistakes either through ignorance or inability to do what is right; and those mistakes continue to be made. They must be stopped.

Though we maintain that order should be restored, because of the suffering inflicted upon natives, Europeans, and Americans alike, it may be more practicable for us to consider, for the moment, only the plight of our own countrymen. In this alone we have sufficient reason for demanding order. And yet, while making demands, we know that they cannot be met, because the means of meeting them are not available, and will not be for years unless supplied from some outside source.

Primarily we demand protection of life and property. This requires an honest, competent, well-paid and provisioned constabulary, which the country does not and can not possess without a well-filled treasury honestly administered. That a treasury may be in a healthy state, reasonable taxes must be honestly collected from the industries of the country. When only a fraction of the normal industries are in operation, an adequate tax, that is at the same time reasonable, cannot be collected. To restore industry to normal conditions it is necessary to restore banking facilities, transportation, and property rights—in short, to restore order; all of which requires money. Thus it is evident that an endless circle exists, each part depending for its success on some other part, and no part capable of complete solution by the present government.

Order is the primary but not the only requirement. Compensation for the losses that have been suffered is

equally necessary, and beyond all is the demand that Mexico's affairs be so administered that the disorders of the past few years shall not be repeated.

With order restored, all of the other demands can be met without difficulty. Shall we loan Mexico money to enable her to bring about what we demand? No. We cannot do that, because we know that the government we recognize is either incompetent or dishonest; we cannot trust it, although we would like to do so.

There is but one course open that will yield results. The United States must furnish the money, and do these things herself. The United States must see that the constitution is followed, that justice is administered and that laws are enforced; that just taxes are levied, collected and accounted for; that restitution of property is made, and that just compensation is paid for losses; that industry is rejuvenated; that educational facilities are restored and expanded; that a just agrarian policy is established, and that peace reigns throughout the land.

We would call this intervention. Mexico would call it war. Perhaps it is better so, for "war" is a word that she understands. It signifies that someone is going to be forced to do something that he ought to do, whether he likes it or not. It may be contended that we are not justified in going to war, but for the sake of countless Americans, Europeans, and Mexicans we are justified in doing that which some Mexicans would call "making war on a small nation." Let us not hesitate to do our duty because an ugly word is used ill-advisedly.

The Rules Committee of the House keeps steadily at the task of trying to learn what has been done in Mexico for ten years past, and the Senate on August 8 adopted without a dissenting vote a resolution which provides that

The Committee on Foreign Relations or any subcommittee thereof is authorized and directed to investigate the matter of damages and outrages suffered by citizens of the United States in Mexico, including the number of citizens of the United States who have been killed or have suffered personal outrages in Mexico, and the amount of proper indemnities for such murders and outrages; the amount of damages suffered on account of the destruction, confiscation and larceny of personal property and the confiscation and deprivation of the use of lands and the destruction of improvements thereon; the number of citizens of the United States residing in Mexico at the time Porfirio Diaz retired from the Presidency of Mexico and the number of citizens of the United States at present residing in Mexico and the nature and the amount of their present holdings and properties in said country, and in general any and all acts of the government of Mexico and its citizens in derogation of the rights of the United States and of its citizens, and for this purpose to sit at any time or place during the session of Congress or during the recess of Congress, and with authority to subpoena such witnesses and documents as may be necessary, and to make a report of findings in the premises to the Senate; and said committee shall further investigate and report what, if any, measures shall be taken to prevent the recurrence of such outrages.

The President, the House and the Senate may keep us out of war with Mexico, but they will have to shut their eyes, stop their ears and hold their noses if they do not undertake to do what ought to be done. "Try as we will," the *New York Tribune* says, "we cannot get away from the Mexican problem. The Mexicans will not let us. Unless it is their purpose to force intervention, it is hard to understand their course."

Pulverized Coal in the Metallurgical Industry

ONE of the greatest improvements made along metallurgical lines in the last eight years has been the commercial application of pulverized coal as a fuel for reverberatory furnaces. The old hand-fired furnaces are practically extinct in this country, with the exception of small installations, and in the refining industry. Indeed, pulverized-coal firing is now successfully applied to copper-refining furnaces, those of the American Smelting & Refining Co., at Perth Amboy, N. J., being so equipped.

Elsewhere in this issue we publish an account of experiments which have been made with a view of substituting the cheaper powdered coal for coke as a charge to blast furnaces. The work which is being done is of absorbing interest, for if it proves successful an enormous field of possibilities will be opened in the smelting of practically all ores, including iron, and also in cupola work.

At the works of the Tennessee Copper Co., where the tests were first conducted, the results were most successful, and practically all of the coke formerly used could be replaced by coal. This, too, was accomplished without material change in furnace design. At Copper Cliff, however, many difficulties have been encountered, largely attributable, in all probability, to the refractory character of the ore. In ordinary practice about 12.5 per cent coke is required in the charge, whereas at the Tennessee plant about half that amount is necessary. In the latest work the design of the furnace has been completely changed to afford a large combustion chamber in front of the tuyères. Experiments with this furnace are now being made, and the results will be awaited with interest.

Should pulverized coal be successfully applied in blast-furnace practice it may mean the salvation of this branch of copper smelting. Heretofore the cheapness of coal as compared with coke has been one of the principal reasons why present-day operators have been leaning so strongly to the reverberatory. When it is considered that about 70 per cent of the cost of blast-furnace smelting is included in the coke, it may be easily seen that any material cut in the fuel cost will have a considerable effect on the total.

June Exports, \$918,000,000

EXPORTS in June totaled \$918,000,000, an astounding figure, and yet not so surprising as the trade balance for June in our favor, about \$625,000,000. Will it go on? It cannot continue much longer, or it will grow so large that it can never be paid, principal or interest. So long as Europe can pay interest and accumulate a sinking fund, these balances, or the obligations representing them, mean wealth, but should conditions be brought about that would prevent such payment, this accumulation of wealth would vanish. Europe and its colonies do not produce enough gold to secure these obligations. They can be made good with manufactured and raw materials if we will permit it.

Our producers and manufacturers are today beseeching Congress to prohibit, or make impossible, the importation of hundreds and thousands of articles that may be purchased in Europe for less than they can be produced here. Among these solicitors, begging for an opportunity to live, are many of our own friends, pro-

ducers of ores and the products from ores. We sympathize with them deeply, for if they do not get the protection asked for they must cease production. If protection is given to the new mineral industries, we must not deny it to other industries standing in an equally precarious position. If granted to all—if a wall be built that will allow everything to pass out but permit only little to come in—a disaster will confront us that will affect every industry.

There is a protection that this country needs today that it has never needed before. It is the safeguarding of that wealth which has been acquired so suddenly and unexpectedly—a wealth that we scarcely realize or know how to use. This is the country's wealth. It belongs to no capitalists and to no class. It belongs to all workers. If amply protected, we will all share that protection; if lost, every man will feel the loss.

Our problem today is that of feeding Europe and restoring her to a condition of normal production, taking our pay in promises that for several months may be as large as those for June. However, our problem does not end there: we must for our own salvation help Europe to make those promises good. And, as contrary to self-interest as it may seem, opposed to the interest of manufacturer and laborer, we should be searching for lists of those things that Europe can make cheaper than we can make them, rather than be compiling lists of those things which she must not send us.

Self-preservation is the first law of nature, but if the individual asks for and receives the maximum protection as his only means of preservation, is there not a grave danger of sacrificing the national wealth which will very quickly reflect upon every individual composing the nation?

Labor Threatens Labor

IF THE Railroad Brotherhood does not succeed in forcing the present Government to take over the railways on terms agreeable to the Brotherhood, the railways are to be shut up tight—not a wheel is to turn; such is the threat that has gone forth. Will it be made good? It certainly will not if the members of other unions fully appreciate the significance of the threat.

About three-fifths of the income of railways in normal times is derived from moving the raw and finished products of mines. Some fuels are worth less than railway freight charges, but most ores and metals are worth many times the freight tariffs. The value of mine products is several times the cost of moving them. The value of these products is made up chiefly of the various forms of labor that go into their production. As large as the collective income of American railways is, three-fifths of it measures but a fraction of what is paid to labor to mine the coal and ore and to produce the metals which it hauls. This is only a portion of the labor which the Railway Brotherhood threatens, but it is an intelligent portion and will not submit quietly to the dictation of another group as to whether it shall continue to work and earn a living, or starve.

There is no doubt that it is physically possible for a well-organized union of all the railways to stop rail traffic completely by simply refusing to work. But it is extremely doubtful if the leaders advising such drastic course would be supported by a majority of their followers. It is certain that they would not be supported by the members of unions depending for

their living on the rapid movement of a large amount of freight.

Coal miners, the miners of iron and other base metals—those who smelt and refine—would not sit quietly and see their women and children starve in order to place the railways in the hands of incapable experimenters. What could the miner do to help himself if the railways cease to function? He might quote from a member of the Brotherhood who remarked that "obstructors ought to face a firing squad," but this contingency will not arrive. There is too much intelligence, patriotism, and self-interest at stake for the 4,000,000 affiliated union members to support 2,000,000 railway men in a proposition containing no justice and little wisdom.

The proposal of the Railway Brotherhood is not to be sneered at. It may be foolish or unjust, but it is backed by hard workers; it will not die quickly. It must be opposed by harder workers than those that support it. Every miner, every smelterman, laborer, operator, and owner is keenly interested in seeing our railways efficiently operated at the minimum cost. So far, experience has shown that our interests are best conserved when the railways are operated by their owners under proper control of the Interstate Commerce Commission. It is the duty of each of us to see that our representative at Washington does not make a false step at this critical time.

The Passing Of a Great Man

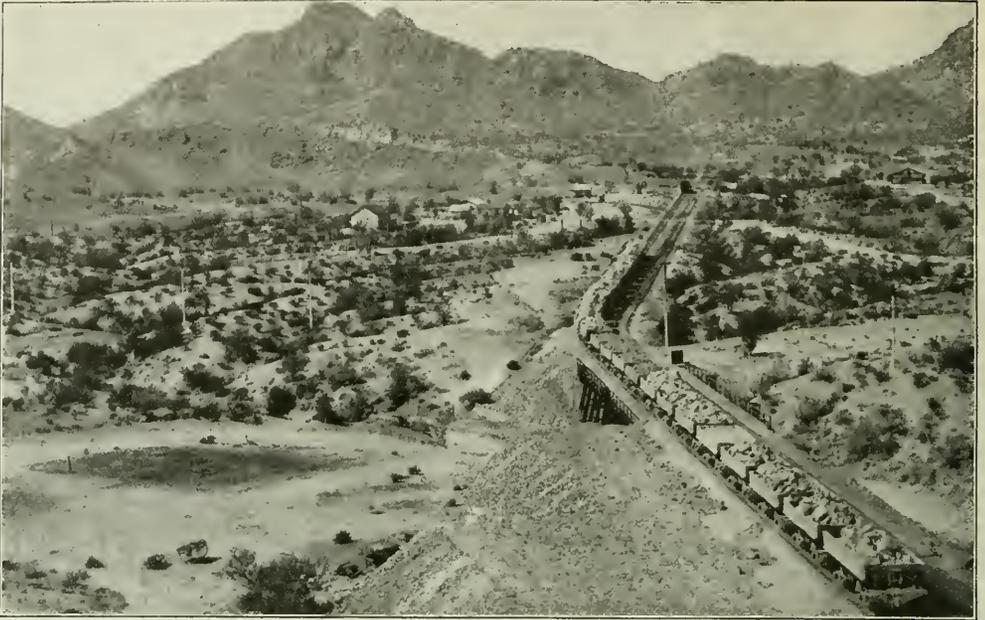
ANDRREW CARNEGIE, ironmaster and multi-millionaire philanthropist, died of an acute attack of bronchial pneumonia on Aug. 11, at Shadow Brook, Lenox, Mass., in his eighty-fourth year. He was born in Dumfermline, Fifeshire, Scotland, on Nov. 25, 1835, in poverty, but with health, capacity for work, and ability to take advantage of opportunities. Starting business life a messenger boy, he became the greatest manufacturer the race has ever produced.

After achieving great success in industry, Carnegie devoted his fortune and his energy to the causes of education and peace. He possessed the faculty of inspiring others to unusual efforts, and achieved his objects by expressions of appreciation rather than by criticism. He was ingenious in devising means to encourage and sustain all that is best in human nature. In his confidence in youth, and his practice of searching out men with superior natural ability, and bringing them quickly to the front, he set an example that every employer may profitably heed.

In Carnegie's death the world has lost a great man, beloved and admired by all who knew him.

No Engineers On the Job

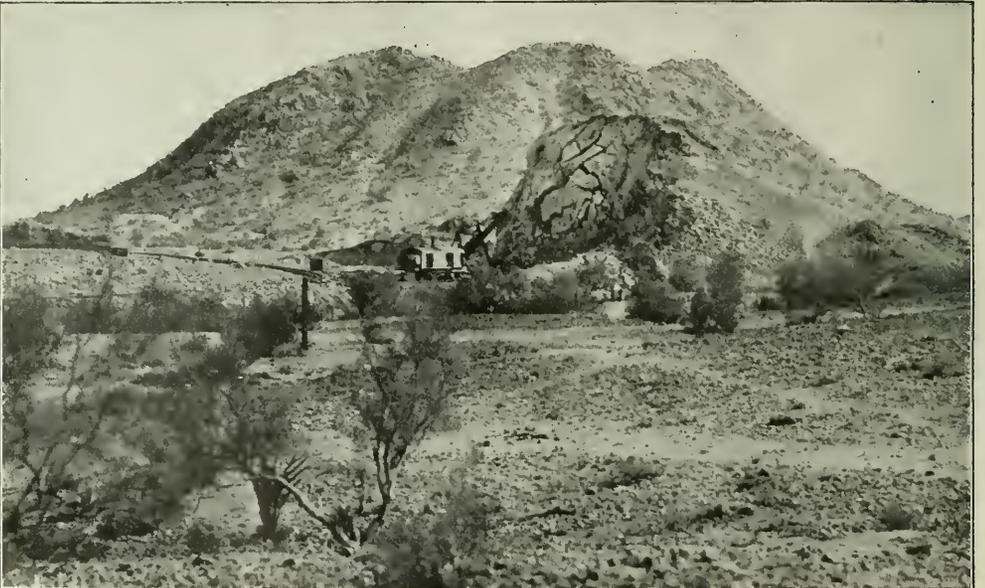
THERE is one big business concern in the United States in which engineers have no part. The House of Representatives, with a membership of 435, contains not a single engineer to participate in its deliberations or to sit upon its committees. Nothing can be more eloquent of the fact that engineers fail utterly to assume the duties that they should in the civil and political affairs of their country. They are not sufficiently self-assertive to make themselves known among their own people, and hence they fail to get that public recognition to which their abilities entitle them.



ORE TRAIN ON THE WAY FROM NEW CORNELIA STEAM SHOVEL OPERATIONS TO TREATMENT PLANT

Photographs From the Field

A BLAST AT HILL NO. 2, NEW CORNELIA COPPER CO., AJO, ARIZONA



West Shining Tree Gold District, Ontario

A New Field Which Has Attracted Interest Owing to the Occasional Discovery of Rich Ore—
Sufficient Development Work Not Yet Done To Establish
Its Future Importance

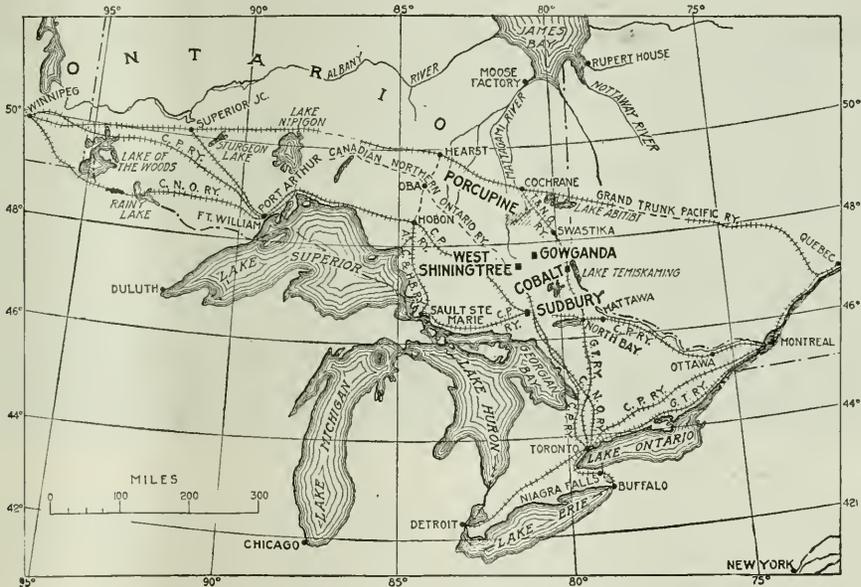
BY L. H. GOODWIN

Mining Engineer, with Rogers, Mayer & Ball, 4, Broadway,
New York

THE West Shining Tree gold area of northern Ontario is now attracting considerable attention. Although it has been known for several years that gold is present in this section, not enough work has been done to put the district in the producing rank, nor even to prove definitely that it has the necessary richness to warrant mining on a large scale. Early development was retarded by the indisposition of prospectors to work their claims sufficiently to expose their possibilities to the engineer, and at the same time prices were put on the prospects which would hardly have been warranted for fully developed mines. Later, the war and conditions induced by it retarded prospecting and development work. At present, however, there is evidence of a reawakened interest in the district.

northwest of Sudbury, and about 340 miles from Toronto. It comprises parts of the townships of Macmurehy, Churchill, Asquith, and Fawcett, in the Sudbury mining division, and is within the Temagami Forest Reserve. The Porcupine gold camp lies about sixty miles north, and the Gowganda silver district is about twenty miles to the northeast. The principal prospects occupy two sections, about three miles apart, and both some distance east of West Shining Tree Lake.

A government road is cleared the entire distance from Westree to the northern part of the district, and in winter the prospects can be readily reached over it. Grading and bridges are completed to a place called the Bridge, or the Halfway, which is at the point where the route crosses the Opickinimika River and about



MAP SHOWING SITUATION OF WEST SHINING TREE DISTRICT

A notable feature of the prospects in this area is the presence of spectacularly rich specimen ore, carrying heavy gold. That is not always considered a favorable factor when judging future possibilities, as it carries the implication that the gold probably occurs in small rich pockets which may be difficult to find and follow.

TRANSPORTATION NOW DIFFICULT

The district is situated about twenty-five miles northeast of Westree, a station at Mileage 64 on the Canadian National R.R., Westree being about eighty miles

half the distance to the region. Transportation in summer is, therefore, a difficult matter, as the wagon road cannot be used beyond the Bridge, except as a trail. Supplies must be carried by canoe from this point, and the canoe route involves a roundabout course and several portages.

To add to the difficult canoe trip, the condition of the road in to the Bridge has been deplorable, so that summer transportation has been especially difficult. At present, however, the provincial government has a large crew of men at work on the road, and it is hoped

that by the end of the season a serviceable wagon road will have been completed over the entire distance. Another canoe route into the district is by way of Ruel, a station twelve miles south of Westree. The canoe landing is two miles from the station over a marshy trail, and as this route involves a longer trip it has been little used.

GOLD DISCOVERED IN 1911

Gold was first discovered in the West Shining Tree area in August, 1911, by prospectors, considerable dispute being made concerning the exact identity of the original discoverer. In the autumn of that year R. B. Stewart, geologist with the Ontario Bureau of Mines, made a brief visit to the section, and his report was published in the 21st Annual Report of the bureau. The following year, W. H. Collins, geologist for the dominion government, spent considerable time in the district,

The topography of this section is typical of that covering extensive areas of northern Ontario. It is a rocky plateau of an elevation about 1,400 ft. above sea level. The relief is slight, the summits of high ground being generally less than one hundred feet above the surrounding low land. The height of land skirmishes the western part of the area, drainage to the east of it finding an outlet into the St. Lawrence River, and to the west into James Bay.

Glacial lakes form a prominent feature and cover an appreciable proportion of the area. Muskeg swamps, most, if not all, former lake bottoms, occupy another considerable proportion of the terrain. The higher ground is generally covered by drift, which, although thin, covers effectively most of the land surface. Despite these drawbacks, rock exposures are frequent, and prospecting is fairly easy over large areas.



THE WESTREE PROSPECT IN THE WEST SHINING TREE DISTRICT

and his observations were incorporated in a memoir on the Onaping Map Area.¹ His investigation was entirely geological, and as an area of seventy-two square miles was covered, it is evident that the work could not be done in great detail. It is intended that P. E. Hopkins, of the Provincial Geological Survey staff, shall make a detailed study of the geology this summer.

Up to 1916 no actual development, aside from the necessary assessment work to keep claims in good standing as specified in the Mines Act, was done in the district. During that year a little shaft sinking was done on several properties, and steps were taken toward substantial development, but owing to labor shortage not much was accomplished. During the present season more interest is shown in the area. Several prospects are being actively developed.

The lakes are connected by wide, deep, sluggish creeks which represent the water erosion which followed that of the glacier. An occasional rapid in these creeks necessitates short portages, but generally the connected lakes are accessible to canoes, and the waterways so formed are an important feature in the pioneering work. The connecting lake system is intricate in the extreme. A case in point is the shore line of West Shining Tree Lake, which is said to be over 100 miles in extent. The lakes, aside from any economic consideration, are beautiful and afford interesting scenery, except in those areas which are so unfortunate as to have suffered from the dreaded forest fires of this section.

PRE-CAMBRIAN ROCKS UNDERLIE THE ENTIRE AREA

The geology of this section is similar to that covering large areas of the surrounding portions of Ontario, and is made up entirely of pre-Cambrian rocks. In

¹No. 77, Geological Series, Canada Department of Mines, Ottawa, 1917.

neighboring areas these formations are separable into two distinct divisions, the ancient pre-Huronian, which was succeeded by a major unconformity, and the much younger Huronian (the Cobalt series). The West Shining Tree area, however, is composed entirely of the older pre-Huronian rocks. This classification, as employed by Collins, is apparently only a refinement of the term Keewatin schist, expressing a more exact knowledge of sequence than was formerly held.

The greater portion of the area was mapped by Collins as undifferentiated schist-complex. The complex consists largely of trachytes, andesites, and rhyolites. A tuff of the volcanic series grades into a series of volcanic sediments, consisting of conglomerates, arkose, and slates. The sedimentary series is at least 400 ft. thick, probably much more than that; and it is prominent in the vicinity of Okawakenda Lake.

There appear to be two well-defined systems of mineralized veins, each probably dependent upon distinct periods of shearing. The strongest and most persistent veins are those of the north-south system. The strike in all observed cases is nearly true north and south, and the dip is steep or vertical. The veins vary in width between wide limits, and are noticeably irregular in that dimension, but are exceptionally persistent in length. The Ribble vein, upon which the Wasapika prospect is situated, can be traced for over a mile, and is supposed to be much longer than that. The Gosselin vein also has a considerable length, although most of the quartz on this property appears to occur in large masses rather than in veins. The Saville vein (McVittie property) and the Knox vein (Herrick property) are other examples of this series.

The east-west system of veins are generally shear



SECTION NO. 1 VEIN AND MAIN SHAFT AT THE BUCKINGHAM

Centered about West Shining Tree Lake lies a considerable area of ellipsoidal andesite. In the vicinity of Michikawakenda Lake there are outcrops of a conglomerate, and it is considered by some that there is a considerable thickness of sediments here. The vein being explored on the Herrick property is a persistent quartz body inclosed partly in conglomerate and graywacke and partly in a porphyritic igneous rock.

All other geological formations are cut by broad, north-south trending dikes of quartz diabase and olivine diabase. They are apparently the youngest rocks of the district, and are not considered a part of the schist-complex. The dikes have not been favorable for ore deposition, and they are apparently the only rocks in the district which do not contain quartz veins. They are thought by some, nevertheless, to have helped in the mineralization of the quartz veins, and to have enriched the quartz veins where the two intersect.

zones in which the fractures are occupied by irregular veins, or lenses, of quartz. Occasionally a continuous vein may be traced for some distance, but generally they are small. The zones are often wide, frequently attaining a width of twenty feet, and the length also is usually satisfactory. The strike is usually approximately east-west, but is not as uniform as in the case of the north-south veins. Dips are also irregular, some being toward the south and others toward the north and at varying angles. The Holding, Atlas, West Tree, and Buckingham prospects are examples of this system.

In both systems of veins mineralization occurs both in the quartz and in stringers of the wall rock inclosed in the vein, but is particularly in evidence at and near the contact between the quartz and wall rock. Much of the quartz in the district is of a glassy variety which does not appear favorable to mineralization.

The property of the Wasapika Gold Mines, Ltd., has

been worked for over a year, and previous to that considerable stripping and sampling had been done. George R. Rogers, mining engineer of Toronto, has been actively interested in the undertaking from its inception, and is now president and manager for the company. The property is equipped with a steam power plant which is entirely adequate for the requirements of the prospecting work, and it is intended to push the preliminary development as rapidly as possible.

A description of the work, and the results of the preliminary sampling upon which it was begun, was given in the *Canadian Mining Journal* of Aug. 15, 1918. The original sampling was confined to the main quartz vein, but later work has furnished grounds for the hope that a band of ferrodolomite, which forms the hanging wall of the vein proper, will also prove to be workable ore.



FOLDED VEIN AT THE WASAPIKA

Owing to the width and continuity of the ferrodolomite formation, there appears a possibility that a relatively low-grade but large body of ore can be developed.

As has already been indicated, the vein strikes in a general north and south direction, and the dip is to the west at a steep angle. The country rock to the east, forming the foot wall, is a massive dark green component of the schist-complex, and the hanging wall is a ferrodolomite which has the appearance of a highly altered lava. It is a schistose rock, in color dark green with irregular patches of lighter green, and contains a large amount of quartz. The quartz occurs in small lenses and as narrow veins which are quite persistent. The rock as a whole is similar to the gray ferrodolomite at the Hollinger mine, of Porcupine.

The ferrodolomite hanging wall is readily weathered, whereas the massive foot wall is resistant, and this has

given rise to an escarpment or bluff, which stands a few feet above the surrounding low land on the hanging-wall side and has the quartz vein as its face. To the west a diabase dike borders the ferrodolomite, and another dike cuts the vein at a small angle. The vein itself is intricately folded and irregular, although continuous. The folding is more pronounced at the point where the dike cuts the vein. The vein matter is a dull grayish quartz, containing lenses of schistose wall rock impregnated with iron pyrite. Free gold is found, but not in the spectacular form in which it occurs at some other properties of the district.

OTHER PROPERTIES BEING PROSPECTED

Other properties at the northern end of the district which are being prospected are the West Tree, the Herrick (Knox), the Atlas, and the Bennett, and active work will doubtless be undertaken on other prospects during the season. The West Tree is working in a shear zone and has two shafts about 40 ft. deep and 500 ft. apart, from one of which spectacular high-grade ore has been taken. It is intended to deepen both shafts and connect them by a drift. The Herrick is working a rather narrow but persistent vein, and at the time of visit had a shaft down about 50 ft. Sinking by hand is expensive, however, and it was the intention to use diamond drills for further prospecting.

At the southern end of the district, also, work is being pushed. The Buckingham has a narrow but persistent vein, with an inclined shaft about ninety feet deep. The Holding property carries a wide and persistent shear zone, which has been explored by a 40-ft. shaft and short drift. Both of these properties have yielded rich ore. The quartz appears glassy, and does not impress one as being favorable for deposition of metal, but is evidently deceptive, and most of the gold occurs along the contact between the schist and the quartz.

In conclusion, gold is widely distributed throughout a large area in this district. Though the veins are somewhat irregular and the occurrence of gold in them is erratic, they appear to warrant more systematic and fuller development than they have as yet received.

New Thickener for Pulps That Are Hard To Settle

A new thickener has been put on the market by the General Engineering Co. under the name "The Genter Positive Thickener." While designed primarily for other than metallurgical work, it is likely that it will find a place in some ore-dressing plants where pulp is very dilute and hard to settle.

The principle of operation is entirely different from that of the large tanks in common use. The Genter thickener effects the separation of the clear liquid from the unthickened material through a series of cylindrical filter elements submerged in the material to be thickened. When a thin layer of solids has collected on the filter surface, the current is reversed for an instant, the clear filtrate flowing back through the canvas, thereby forcing the cake off. The sludge then falls into the bottom of the chamber, from which it is removed through a valve. The reversal of the current is automatic and can be set to occur at any time and for as long a time as is found necessary. The discharge would probably be of approximately the same moisture content as that of the thickeners now in use.

Losses in Furnace Slags

Influence of Slag and Matte Composition and Temperature on the Copper Content of Slags at Copper Cliff—A Summary of the Results of a Series Of Experimental Tests

BY EDWARD H. ROBIE

THE interesting discussion in a recent number of the *Journal* on copper slag losses brings to mind some work which I did at the smeltery of the International Nickel Co., Copper Cliff, Ontario, two years ago. Mr. Maier and Mr. Van Arsdale confined their experiments to the form in which copper occurs in slag, whereas my idea in this work was to determine if possible how changes in furnace practice would affect the slag loss.

The Copper Cliff slags contain nickel as well as copper, in about the same ratio as these metals occur in the ore and matte—roughly, one part of copper to two parts of nickel. The nickel, however, merely replaces copper which would otherwise be present, so that the figures given for combined copper-nickel are comparable to an all-copper slag. The general practice in smelting nickel-copper ores up to the white metal stage is identical with that used for straight copper ores.

At the time these observations were made there were seven blast furnaces in operation. Four-sevenths of all converter slag made was poured into the settlers of four of these furnaces, and no cold converter slag was carried on the charge. The remaining three-sevenths of converter slag was poured on the ground, broken up, and charged to the other three furnaces, along with the regular charge.

The work at Copper Cliff was done in 1917. At that time, there was some discussion as to what effect an increase in the coke on the blast furnace charge would have on the CuNi content of the slag. It was thought possible that a slight increase in the coke would raise the temperature of the slag, thereby making it less viscous and allowing the prills of matte to settle out to better advantage. This brought up the question of just what factors influenced the slag loss, and at that time the following outline was made:

CuNi in blast furnace slag probably occurs as:

1. Particles of matte or sulphide in suspension, the amount depending on
 1. Per cent CuNi in matte, depending on
 - (a) Per cent sulphur in charge.
 - (b) Oxidation of sulphur.
 2. Viscosity of slag, depending on
 - (a) Composition of slag.
 - (b) Temperature of slag.
 3. Specific gravity of matte and slag, depending on composition.
 4. Length of time allowed for settling, depending on
 - (a) Amount of material put into a settler.
 - (b) Amount of slag in the settler.
 5. Distance the matte particles have to fall, depending on amount of slag in the settler.
 6. Size of matte particles.
2. Oxidized Cu and Ni, the amount depending on¹

1. Size of coke charged to furnace.
 2. Weight of individual charges of coke and ore.
 3. Height of ore column.
 4. Per cent SiO₂ in furnace charge.
 5. Grade of matte made.
3. Dissolved CuNi sulphides, the amount depending on
1. Composition of slag.
 2. Temperature of slag.

The above outline is not complete and probably not correct in all particulars, but was intended to form a basis on which to work.

Several of the conditions mentioned on which the slag loss is assumed to depend are fairly constant in the International Nickel Co.'s practice, as follows:

1. Amount of slag in settler (one settler carries about the same slag layer as another).
 2. Size of coke charged to furnaces.
 3. Weight of individual charges of coke and ore.
 4. Height of ore column.
- Most of the other factors outlined are embraced in:
1. Per cent CuNi in matte.
 2. Per cent SiO₂ in slag. (Other constituents are in a fairly uniform ratio in all slags.)
 3. Temperature of slag.
 4. Amount of material put through a settler.

During the months January, February, March, September, and October, 1917, temperature readings were made twice daily on the slag-matte stream from the furnaces then running. Any furnaces running on special charges, and the furnaces with settlers in which converter slag was poured, were kept separate. The grade of matte, percentage of silica in the slag, and tonnage put through the furnaces were also noted. The results were then summarized as follows:

1. *Per cent CuNi in slag compared with per cent CuNi in matte.* (Per cent SiO₂ in slag, tons charged per day, and temperature constant.)
2. *Per cent CuNi in slag compared with per cent SiO₂ in slag.* (Per cent CuNi in matte, tons charged, and temperature constant.)
3. *Per cent CuNi in slag compared with temperature of slag-matte to settler.* (Per cent SiO₂ in slag, per cent CuNi in matte, and tons charged per day constant.)
4. *Per cent CuNi in slag compared with tons charged per day.* (Per cent SiO₂ in slag, per cent CuNi in matte, and temperature constant.)

It was found that in many cases the individual figures were discordant, but the averages, which were plotted, show interesting tendencies.

Attention is directed first only to those furnaces which carried solid converter slag on the charge, viz., Nos. 1, 5, and 6.

Curve 1 shows that the tonnage charged has no pronounced effect on the slag loss, other factors being the same. That is, it is possible to get the same per cent

¹See "Peters' Practice of Copper Smelting," p. 194.

of CuNi in the slag whether 375 or 475 tons are put through a furnace. The extra tonnage would not allow quite so much time for settling but would probably keep the settler a little hotter.

In view of the information given by Curve 1, the other curves were constructed without regard to the tonnage put through, the only factors considered being the temperature, per cent SiO_2 in slag, and per cent CuNi in matte.

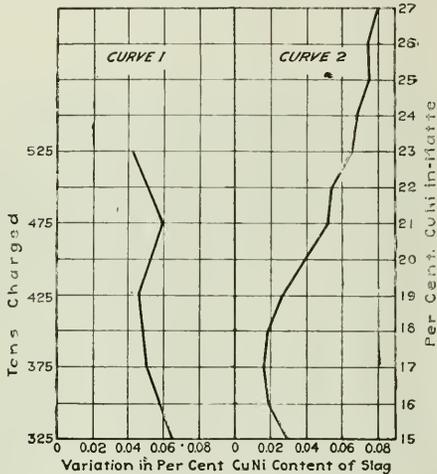
Curve 2 shows how the grade of the matte affects the slag loss, with the temperature, and SiO_2 in the slag constant. Between the limits of 18 and 27 per cent

hotter slag of a given SiO_2 content is more limpid than a colder slag, and therefore it is reasonable to expect better settling, but there is evidently a more compelling reason working the other way.

Comparison of the temperatures obtained (over 2,000 readings) with the percentage of SiO_2 in the slag and the grade of the matte, indicates that there is no relation between the temperature of the slag-matte stream and (1) the CuNi in the matte, or (2) the SiO_2 in the slag. A furnace running on green ore will deliver a low-grade matte and a highly siliceous slag, but at the same temperature as a roast-ore furnace, though not necessarily on the same amount of coke.

No attempt was made to find what factors influenced the temperature of the slag-matte stream. No doubt increasing the coke would raise it, and probably increasing the air pressure within certain limits would also raise the temperature.

At the time these records were taken, furnaces Nos. 2, 3, 4, and 7 were having their proportion of converter slag poured into the settlers, instead of having it charged to the furnace. It was therefore possible to find out with approximate accuracy how much the slag

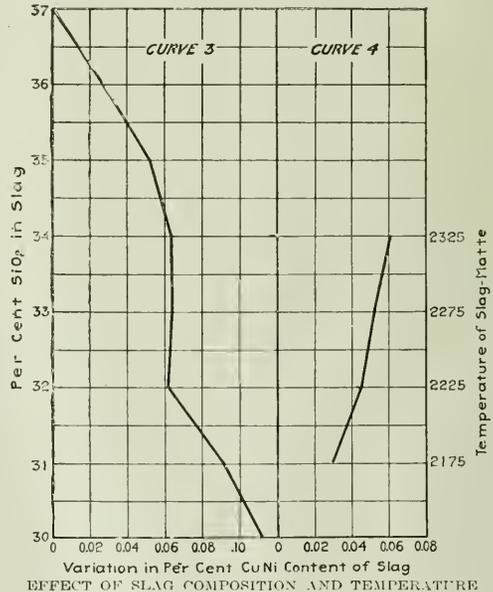


EFFECT OF TONNAGE CHARGED AND MATTE GRADE

matte, a decrease of 1 per cent CuNi in the grade of the matte results in a decrease of about .008 per cent CuNi in the slag. A 16 and 17 per cent matte gives about the same slag loss as an 18 per cent matte, and below 16 per cent CuNi, the slag loss becomes greater as the grade of the matte is lowered. This was an unexpected condition and indicates that with low-grade mattes some other factor apparently enters which tends to raise the slag loss.

Curve 3 shows the effect of the percentage of silica in the slag on the slag loss. From 37 to 34 per cent SiO_2 the CuNi in the slag seems to increase about .02 per cent for every decrease of 1 per cent SiO_2 . From 31 to 32 per cent the percentage of SiO_2 seems to have no effect, but below 32 and down to 30 per cent the slag loss increases again, a little over .02 for every 1 per cent decrease in SiO_2 . This indicates that for some reason a 34 per cent SiO_2 slag will not give any better slag loss than a 32, but a 32 per cent is better in this respect than a 30, and a 36 per cent is better than a 34.

Curve 4 shows the effect of temperature, and it is just the opposite of what was expected. Unfortunately, there was not a large temperature range, most of the readings being between 2,200 and 2,325 degrees. A decrease of 50 degrees in the temperature of the slag-matte stream results in a decrease of about .008 in the CuNi in the slag. As the slag gets colder, the slag loss drops, within the limits, of course, of the proper running of the furnace, for a very cold slag would without doubt increase the slag loss. There is no doubt that a



EFFECT OF SLAG COMPOSITION AND TEMPERATURE

loss was increased by pouring the slag into the settlers instead of charging it solid.

With the following factors in each case (Nos. 1, 5, and 6, and Nos. 2, 3, 4, and 7) constant:

1. Temperature of slag-matte stream,
2. Per cent CuNi in the matte tapped,
3. Per cent SiO_2 in slag from settlers,
4. Tons put through furnace + slag poured into settler,

the slag from the settlers taking liquid converter slag averaged .045 CuNi higher than that from the others. In other words, with the amount of converter slag normally made with mattes of about 23 to 24 per cent CuNi, the slag loss will be .045 higher if all the slag is poured into the settlers than it will be if all the slag is charged

to the furnaces cold. With much lower-grade matte, and the proportionately larger amount of converter slag which would then be made, there might be a greater difference than this.

It was found in the case of the settlers taking liquid converter slag that the greater the tonnage the greater the slag loss. This was particularly evident when more than 475 tons per day was charged.

Too much reliance must not be placed on the numerical results exhibited in these curves, as the work was not sufficiently exhaustive to be more than indicative of general tendencies.

Industrial Democracy

Progress in the Development of Plans Designed To Eliminate Industrial Strife—Advantages and Disadvantages of Systems Now Under Tests

BY F. C. HENDERSCHOTT

Managing Director, The National Association of Corporation Schools, New York

IT IS difficult to determine to what extent the readjustment of working conditions in the industries of the United States is giving the workers a voice in management. The effort to democratize the industries is making steady progress, but so far results are not conclusive.

The National Association of Corporation Schools, with headquarters in New York City, which is studying the problem of a more equitable distribution of created wealth, through industrial pursuits, and also attempting to eliminate present wastes, due to lockouts, strikes, and other forms of industrial strife, through scientific employment, training of the industrial workers, and other personnel problems, and in which 133 of the larger industrial institutions of the United States have membership, advises that a recent inquiry among several hundred industrial corporations reveals that three plans are being used, all designed to give employees more voice in management, especially as relating to working conditions, hours, and wages. The results of the inquiry indicate that a considerable majority of the larger industrial institutions have either experimented with one of the three plans or are studying the various plans and gathering data on results so far obtained, with a view to determining which of the plans they will inaugurate. The plans are known as the "works' committee" plan, the "industrial council" plan, and the "house and senate" plan. The purpose of the three plans is practically the same, but the method of operation differs. So far as known, none of the plans involves direct representation on the part of the workers on the board of directors. However, it is anticipated, if it is found, as a result of experiments, that employees assume the responsibility which logically they must assume if they are to have a continuing voice in the management, that ultimately they will be permitted to name a minority representation upon the board. Such action will probably occur only in industrial institutions where a considerable number of employees are stockholders, and the representation which they secure upon the board of directors will be dependent upon the amount of shares of stock represented by the employees who have a right to vote for such representation.

In one of the largest industrial institutions, where the "industrial council" plan has been made effective, the immediate result was a request on the part of the em-

ployee's representatives in the industrial council for an increase in wages and shorter working hours. This was followed by an avalanche of requests from individual employees for increases in wages. When it was pointed out to the representatives of the employees, by members of the industrial council representing the stockholders and management, that such action would necessarily involve an increase in the cost of the product of the company, and that this increase would bring the selling price of the company's product to figure considerably higher than the selling price of their competitors, the request for shorter hours and increased wages was temporarily, at least, withdrawn. In other words, the immediate results of giving a voice to employees through delegated representatives were wholly selfish and not based upon investigation as to conditions, and were made without any assumption of responsibility whatsoever.

In at least three large industrial institutions where some one of three plans has been introduced strikes have followed within a period of one month. In other companies the plans have worked well, although the period of trial is of too short duration to admit of conclusions as to what will be the final results and as to what definite attitude the representatives of employees may ultimately take. The assumption may be safely made, however, that employees of industrial corporations will continue to demand a voice in those problems of management which affect wages, working conditions, and hours of labor.

Whether or not the representatives of the workers in industrial councils will assume a fair portion of responsibility remains to be determined. So long as shorter hours and higher wages can be secured through strikes, it is probable that the new co-operative plans will make slow progress, but when the time arrives, as it inevitably must arrive, that strikes are no longer successful, and when the public will demand to be heard in the settlement of wage disputes, it is believed that more constructive progress can be made in the working out of co-operative management, and that the workers will then assume a more definite responsibility for production.

The survey also disclosed that plans to insure stock ownership by employees in the company by which they are employed are rapidly becoming installed, the number of companies now installing this feature being far in excess of the number that were working on similar plans prior to the construction period. Stock ownership plans almost invariably include provision for service annuities or retirement pensions.

The belief expressed by Judge Gary, chairman of the United States Steel Corporation, that efforts to unionize the employees of various subsidiary companies of that corporation would not succeed because the men realize that they are better off under the "open-shop" conditions than they would be under the control of unions, is confirmed by many other industrial executives. In fact, the present effort is not only to secure employee or co-operative effort in management, with proportionate responsibility, but also to provide conditions whereby the workers of the larger industrial institutions will receive a greater degree of advantage than would be possible under the unions' control and direction.

The crux of the situation seems to be the acceptance of responsibility by the representatives of the workers for greater output commensurate with shorter hours and higher wages.

Sealing Formations by Slime-Laden Fluid

For the Control of Gas Pressure, To Prevent Migration of Oil, Gas, and Water, and To Prepare Wells for Abandonment, the Method Described Offers Important Advantages

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MUD-LADEN fluid is the term commonly applied to the slush that is used to seal underground formations in well-drilling operations. As some operators do not recognize the difference between a real mud fluid and one containing sand and shale, it would be better terminology to adopt the expression "slime-laden fluid." Any engineer who has had experience in ore dressing will recognize the distinction between an all-slime fluid and one made of sand, shale, and slime. As it is the slime, and not the sand, that seals the pores of a filter, so it is the slime, and not the sand, that seals the pores of a formation. For the reason given the term "slime-laden fluid" will be used in this article.

The primary use of slime-laden fluid is to seal the formations penetrated by the drill. Rotary drilling

swivel joint at the top of the drill stem permits a hose connection to be made from the pumps, and fluid is pumped down the drill stem through the drill, and, rising up through the hole to the surface, carries the cuttings away from the drill. From the collar of the well, the fluid passes through a settling sluice or pits to the collecting sump of the pump. The clear water added while drilling, and the displacement of the drill stem, make a greater volume of fluid than can be carried in the circuit, and the excess is by-passed to an overflow pit. Should the percentage of sand become too great, all of the fluid can be discharged into the first overflow pit, a pump being used to deliver from the second pit to the sump. The arrangement affords easy control of the quantity of sand in the fluid.

If the surface formation does not furnish enough clay to supply the required slime, clay is brought to the well until the cuttings of the drill make up the necessary slimes. Sand, coarse shale, or gravel, will not aid in sealing formations, and when casing is being carried may lodge behind the couplings, causing the casing to become collar-bound. A further disadvantage of coarse material in the circulating fluid is the tendency to bridge between the casing and the wall of the hole-forming channels, or even to choke the discharge completely. If the circulating fluid is confined to channels, only that portion of the formation along the channels is mudded, and the coarse material will settle between the casing and the wall, with a tendency to freeze the casing. Note Fig. 2.

DESCRIPTION OF FLUID

The percentage of slime in the fluid will be governed by the conditions to be met. The inexperienced will probably conduct operations with too thin a fluid. A consistency of porridge, not bouillon, or, in terms of weight, from 7 to 15 or 16 per cent heavier than water, is a fair guide. Specific gravity is not a satisfactory method of control, as of two fluids of the same specific gravity one may be more viscous than the other. A fluid that flows freely and pours like neat cement will meet most requirements. A "too-thin" fluid will penetrate a coarse sand for long distances, and yet leave the sand open, whereas a "too-heavy" fluid will clog the formation along the walls of the hole before it can enter far enough to build up a penetrating seal. As the result desired is a formation so clogged with slime that no filtration can start, a sticky gumbo that will barely pass the pumps would serve no beneficial purpose. If filtration is once started, the fluid or gas will widen the passage, and the sealing will be destroyed.

Casing is not carried down the hole as depth is made in rotary drilling, but is run in when the point of shut-off is reached. Throughout the drilling, slime is pumped into the hole, and it will either rise to the surface or pass off into a porous formation, whichever offers the least resistance. As long as the fluid passes off into a

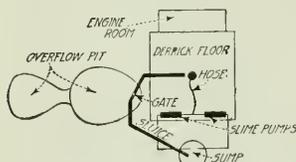


Fig. 1



Fig. 2

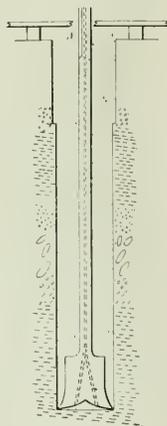


Fig. 3

PLAN OF EQUIPMENT AND ARRANGEMENTS USED IN ROTARY DRILLING

demonstrated that formations were effectively sealed by the column of drillings in suspension being forced to the surface, and this led operators to use the same type of fluid to seal formations when using standard tools. As operators became familiar with the action of slime-laden fluid, they began to make use of it in a variety of ways.

USE OF SLIME-LADEN FLUID IN ROTARY DRILLING

A ground plan of the equipment and arrangement commonly used in rotary drilling is shown in Fig. 1. As the name implies, rotary drilling is effected by rotating the drill. The bit is connected to a hollow stem, which, at the collar of the well, is square and passes through a turntable. The turntable is revolved by a drive operated by a slide-valve engine, with clutch and reverse gear as part of the driving mechanism. A

formation, the formation in question has not been slimed, and, conversely, when it is slimed, the fluid will rise above it to the surface, or into an upper open formation. It may happen that an upper formation, thoroughly slimed, when drilled through will clean itself when relieved of the hydrostatic head of the circulating fluid. This may happen when the fluid is passing off into a lower formation. Before the casing is landed for a shut-off, the fact that all formations have been thoroughly slimed is assured by pumping the fluid into the hole until it rises to the surface. See Fig. 3. As the drilling proceeds, the formations are slimed, and the walls plastered by the whirling action of the drill stem, the coating helping to support the walls of the hole.

As it is claimed that the contents of properly slimed formations cannot migrate, the question may be asked, "Why cement the casing?" If the hydrostatic head of

by the slime-laden fluid. Well No. 5 was drilled to test the gas shown in No. 3. The 12½-in. casing was cemented at 1,800 ft., and in drilling ahead with cable tools the gas was found at 1,835 ft., a correlative depth with 1,845 ft. in No. 3. The hole was finished at 1,900 ft. as a gas well. Well No. 4 had been drilled to 2,505 ft. and the 10-in. casing cemented at that point before No. 5 was completed. The same gas sand was passed in No. 5 as in Nos. 3 and 4. When testing the shut-off of the 10-in. casing at 2,505 ft., gas broke in, shooting the bailer out of the hole. No. 5 was controlled, and is a gas well. Well No. 5 undoubtedly went wild because the hydrostatic head was removed from the gas stratum, allowing it to clean itself of slime.

The cement shut-off was probably a failure, and, in bailing to test, the slime-laden fluid back of the 10-in. casing entered the hole, replacing the water bailed out. With the slime-laden fluid gone, the gas cleaned the pores of its formation, destroying the effect of the sliming. The use of slime-laden fluid in this field has made it possible to produce oil from a horizon below a gas pressure so great that it would be dangerous to drill through it by any other method. Fig. 4 shows a typical underground condition in a field where the same sands may be oil-bearing in one well and water-bearing in the next location; the conditions cannot be foretold. Well No. 1 was drilled as follows: Rotary tools, with slime-laden fluid, were used to 604 ft., where the 12½-in. casing was cemented with 150 sacks of cement by the Perkins method, making a tight water shut-off. The hole was then finished by standard tools to the depth of 979 ft., and production showed no water. Well No. 2 was drilled as follows: It was located 390 ft. south of well No. 1. Rotary tools, with slime-laden fluid, were used to 631 ft. and the 12½-in. casing was cemented as in well No. 1. When drilling ahead with standard tools, water was encountered in the tar sands logged at 645 ft. to 658 ft.; 680 to 695 ft.; and from 728 to 740 ft., and in the oil sands logged from 750 to 760 ft. This made it necessary to cement the 10-in. casing below 760 ft. The 10-in. casing was run to a depth of 770 ft., all formations between 770 ft. and the shoe of the 12½-in. casing at 631 ft. being slimed.

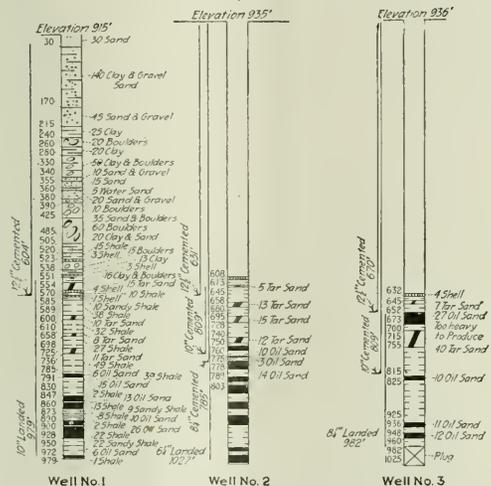


FIG. 4. WELLS SHOWING UNDERGROUND CONDITIONS AND MANNER OF DRILLING

the column of fluid is removed, the pressure within the formation may be great enough to clean the pores and so destroy the effect of sealing. To retain the fluid between the casing and the wall of the hole, the casing must be shut off by some one of the usual methods. Slime-laden fluid is a shut-off for formations, but is not a shut-off for casing.

It is common practice in California to drill with a rotary to the depth of shutting off the first string of casing, then to finish the hole with standard tools. Slime-laden fluid is used to the lowest shut-off depth, but from there to the bottom of the hole no sliming is done. This is due to the fact that it is not expected that water-bearing formations will be encountered while carrying the oil string.

A recent experience in the Elk Hills field demonstrated the action of slime fluid in controlling a heavy gas sand during drilling with a rotary, and, also, the fact that the hydrostatic head must be maintained after sliming. Well No. 3 was drilled by a rotary to 2,455 ft. with 12½-in. casing cemented at that point; the hole finished by cable tools and brought in as an oil well at 2,683 ft. A strong gas showing was encountered at 1,845 ft., but the gas was confined to its own stratum

After sliming, the 10-in. casing was cemented at 773 ft. by dumping ten sacks of cement. The test showed no water to be entering the well, and drilling was resumed. At 775 ft. to 778 ft. an oil sand was encountered, which could not be correlated with any oil or tar sands in well No. 1. The sand carried water, thus necessitating cementing the 8½-in. casing in the first suitable formation below 778 ft. A shale stratum was encountered at 778 ft. and the 8½-in. casing was cemented at 785 ft., after sliming all formations back of it, up to the shoe of the 10-in. casing at 773 ft. The well was then finished at 1,027 ft., with 6½-in. casing as the oil string.

Well No. 3 was drilled as follows: It was located 425 ft. south of well No. 2. With the experience gained in well No. 2, well No. 3 was finished at 982 ft. Only three strings of casing were used. This was accomplished by cementing the 12½-in. casing at 670 ft.; from there on, all formations encountered which were correlative with the water-bearing strata of No. 2 were tested, as reached, and the 10-in. casing cemented at 809 ft., after sliming all formations back of it, up to the shoe of the 12½-in. casing. The 12½-in. casing should have been carried to 809 ft. in well No. 3, or no 12½-in.

casing used at all, and the 10-in. casing carried to 809 ft., as thorough sliming would have shut off all formations above 809 ft., there being no commercial oil sands above that point. This is an illustration of an opportunity to save one string of casing by the proper use of slime-laden fluid.

The sliming with cable tools may be done by carrying slime-laden fluid in circulation while drilling with the casing carried close to the bottom of the hole, or drilling can be done in the usual way and the hole slimed when ready to land the casing for shut-off. Should the formations encountered while drilling with standard tools contain a great deal of sand, gravel, or boulders, which are liable to stick the tools or freeze the casing, it is best to proceed without slime, and, when ready to land the casing for shut-off, to clean the hole thoroughly and slime the formations.

INFLUENCE OF SLIME-LADEN FLUID ON CEMENT

Laboratory tests have shown that cement will set well when mixed with 30 per cent of slime, and even 50 per cent will not prevent a "fair set." From these tests, it seems doubtful if it is necessary to use clear water as a flush to drive slime away from the point of cementing. The clear water will wash the slime off the wall, and, if confined to channels, the formation will be under-scoured and so produce a condition favorable to caving. It is my belief that cement will carry the slime ahead of it, leaving a clean surface for a bond between the wall and cement.

SLIME-LADEN FLUID IN RE-DRILLING

In Fig. 5, A is illustrative of the conditions presented by the encroachment of edge water in upper sands after the well had produced some months. The condition after re-drilling is shown at B, Fig. 5. Re-drilling was begun Jan. 1, 1918, and was completed Mar. 25, 1918. The 12½-in. casing was cemented at 714 ft., and the 10-in. casing landed at 1,115 ft. This was the condition before re-drilling. The production was very low and carried no water. In the hope of increasing production, the oil sands at 820 to 835 ft., and 837 to 855 ft. were perforated. The well was put on production and showed large quantities of water. This pointed to edge water in the oil sands at 820 to 835 ft., and 838 to 855 ft. To exclude this water, the following operations were carried out:

The adapter between the 12½-in. casing and the 10-in. casing was fished out and 10-in. casing screwed on the 10-in. casing by a die nipple. The hole was then cleaned to the bottom and swabbed to 885 ft. (see B, Fig. 5). A rope and rock bridge was put in from 1,115 to 1,030 ft. and the 10-in. casing shot with 40 lb. of 50 per cent dynamite at 1,030 ft. The hole was cleaned out and twenty sacks of cement were dumped in the cavity at 1,030 ft.

Tested sands above 1,030 ft. showed a great deal of water and no oil. The hole was filled to 920 ft. with rock and brick, with chopped rope on top. A 40-lb. shot was put in at 920 ft.; the hole cleaned, and twenty sacks of cement dumped in the cavity at 920 ft. Test showed hole still making water and no oil. Jar-down spear got vibration at 840 ft. The hole was shot at 880 ft. with 25 lb. of dynamite. Pipe was free and raised to 722 ft. Rope, rock, and brick bridge put in to 723 ft. and test showed hole still making water. The 10-in. casing was freed, and, after cleaning the hole, six sacks of

cement were dumped in it at 723 ft. The top of the cement was found hard at 715 ft. The 10-in. casing was pulled out and test showed hole to be dry, thus showing that water above 715 ft. was prevented from entering the formations below that level. The hole was then cleaned to 892 ft. and bridged to 881 ft.

The 10-in. casing was run in, and all formations back of it up to the shoe of the 12½-in. casing at 714 ft. were thoroughly slimed under pressure. After circulation the 10-in. casing was cemented at 880 ft. with thirty-five sacks of cement with Baker retainer. Test showed water above 880 ft. was prevented from entering formations below that point. The hole was re-drilled to 1,115 ft., carrying 8½-in. casing, and a new hole drilled to 1,146 ft., where the 8½-in. casing was landed as the oil string.

CONTROL OF GAS BY SLIME-LADEN FLUID

Drilling with cable tools in a field having heavy gas pressure may result in enormous waste of gas, and in fires, and even fatalities among the drilling crew. Where the formations are not too sandy it is best to carry slime fluid while drilling. Should this be impossible, and a well "go wild," it may be put under control by introducing slime fluid either by the tubing method,

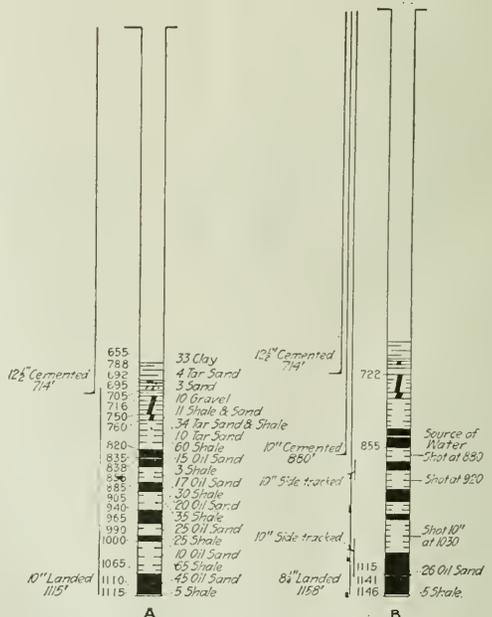
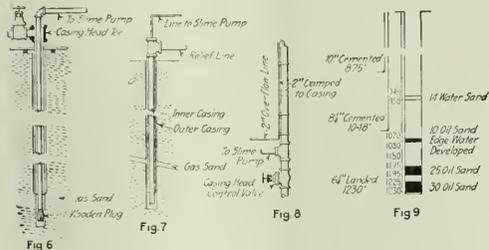


FIG. 5. CONDITIONS BEFORE AND AFTER RE-DRILLING OF A PRODUCING WELL

through a lubricator, or by using a string of casing as the tube. The tubing method is applicable when the well cannot be shut in. The tubing should be two or three inches in diameter and is lowered to a point below the formations to be slimed. The fittings at the collar of the well consist of a casing-head T through which the tubing passes, and a nipple, with relief valve on the side outlet of the casing-head T (Fig. 6). The line of tubing should have a valve between the casing head and the slime pump, and a wooden plug is placed in the end of the tubing before lowering in the well. This plug will keep the tubing clear, and when the slime is pumped

will be blown out. A metal check valve could be used, but it may fail to function and has no advantage over a wooden plug.

When the tubing is in, the slime pump is started with the relief valve open. The relief valve must not be closed, because the gas pressure would blow the tubing out of the casing-head T. After the slime-laden fluid has been pumped into the hole, it will begin to be blown out of the relief valve, and, at this time, the valve should be used as a throttle to prevent all of the slimes being ejected and to maintain enough pressure to force a por-



METHODS USED IN CONTROLLING GAS AND SEALING FORMATIONS

tion of the slime up along the formation being mudded. The pressure at the relief valve will begin to fall until the hole will stand full of fluid with the valve open and the pump stopped. The tubing can now be removed and the casing landed for a shut-off, or drilling may continue, as the case demands. It is dangerous to proceed in any manner which is likely to produce the sudden relief of the hydrostatic pressure of the slime fluid, as this may allow the gas formation to clean itself, and the work must be done all over again.

In using casing as the tube, if there are two or more strings of casing reaching to the collar of the well, and it is known that fluid will pass out of the inner casing up the wall to the formation to be slimed, the problem differs in no way from that of ordinary sliming under pressure. The only requirements are connections at the casing head (Fig. 7) which will allow a relief valve on the casing, so arranged that the slime can be pumped down the smallest string while the gas is free to escape from the well.

If the gas pressure is not too great to allow the well being shut in, the lubricator method (Fig. 8) can be used with good results, and the apparatus can be made up from the usual fittings employed in drilling. Two joints of casing are made up with a nipple and a T at one end and a 2-in line run out of the other end back along the casing, securely clamped to it. The casing is connected to the casing-head control valve with the T end down, while the slime pump is connected to the T, and the 2-in. line run to the slime pit with a control valve conveniently placed. With the casing-head control valve closed, and the overflow valve open, slime is pumped into the casing until the overflow appears in the 2-in. line. The line is then closed and the casing head valve opened. The slime fluid will then fall into the hole while gas fills the space which it occupied. After allowing a few minutes for the slime to drop, the control valve is closed, the overflow line opened, and the gas allowed to escape from the lubricator. This operation is repeated until the gas is shut in.

Old wells drilled without sliming will sometimes require great quantities of slime when abandoned. This is

due to the channels formed in strata which have been discharging water, oil, or gas, into the hole back of the water string. As they were not slimed when passed through in the original drilling, there has been nothing to prevent the intercommunication of their contents, and adjacent wells might be injured if no precautions were taken. It is not safe to assume that the shut-off of the water string will remain tight after abandonment.

Fig. 9 illustrates the method applied by an operator in the Midway field, and shows the original condition of the hole when production began. After producing several years from sands, logged at 1,070-1,080, 1,150-1,175, and 1,195-1,225 ft., edge water appeared in the sand at 1,070-1,080 ft. The 8½-in. casing was cemented at 1,048 ft., shutting off the water above. Later mechanical trouble developed which made it unlikely that the 8½-in. casing could be re-cemented, and abandonment was decided upon.

The 6½-in. casing was pulled from 1,070 ft. and the 8½-in. casing shot and pulled from 1,030 ft. The hole was then cleaned to the bottom and the 8½-in. casing run in to 1,110 ft. A 50-hp. boiler and a slush pump were set up some distance from the well. It was necessary to carry clay to the mixing pit. The slime-laden fluid was prepared by running clear water into the pit and passing it through the slush pump. As the suction of the pump was about 150 ft. from the mixing point, such sand as was in the clay settled out before reaching the sump. The 2-in. discharge of the pump led to the top of the 8½-in. casing. The slime fluid was pumped in the well for thirty days, the valve being controlled to maintain the hole full of fluid, but not so as to force it out between the 10-in. and the 8½-in. casings. When the sands were so slimed that they took no more fluid, a casing head was put on with a packing clamp between the 8½-in. casing and the 10-in. casing, and pumping was resumed until the pressure registered 250 lb. and decreased only 25 lb. in an hour and a quarter. The sands were slimed in succession downward, beginning with the formation nearest the shoe of the 10-in. casing. The fluid used in the first few days of operation was rather thin, in order to obtain penetration, but later the fluid was thickened to build up a retaining dam behind the deeper penetration.

In conclusion, the slime-laden fluid is the best method, in my judgment, to control heavy gas pressure; to prevent migration of oil, gas, or water; to prepare wells for abandonment; to seal formations not reached by cement; and to protect casing from corrosive water. Slime-laden fluid is a shut-off of formations, but not of casing, and often can be used to save a string of casing.

Manganese Ore Exports from the district of Santiago de Cuba for the years 1888 to 1917, inclusive, are summarized by the Boletin de Minas, No. 5, 1919, Havana, Cuba, in the following table:

Year	Tons	Year	Tons
1888	1,942	1903	20,438
1889	704	1904	14,500
1890	21,810	1905	4,500
1891	21,987	1906	19,000
1892	18,751	1907	35,645
1893	10,640	1909	2,500
1895	1,394	1914	1,300
1898	1,800	1915	6,338
1899	12,558	1916	38,883
1900	21,169	1917 Jan. and Feb.	7,100
1901	30,142		
1902	26,261	Total	317,362

Diamond Fields at Bahia, Brazil



PARAGUASSU RIVER, BAHIA. OUTCROP OF DIAMOND-BEARING CONGLOMERATE AT LEFT



TOWN OF SAO JOAO DE PARAGUASSU, BAHIA, BRAZIL, OVERLOOKING THE DIAMOND FIELDS



VENTURA, AT THE SOURCE OF JACUYPE RIVER, IN DISTRICT WHERE THE BEST MORRO CARBONS ARE FOUND



DIAMOND-BEARING FORMATION NEAR LENGUES, BAHIA, BRAZIL

Pulverized Coal for Blast Furnaces*

Interesting Experiments Carried On by Tennessee Copper Co. and International Nickel Co.—
Coal Blown in Tuyères—Considerable Economies Expected—Estimated
Cost of Pulverized-Coal Installations

By E. P. MATHEWSON AND W. L. WOTHERSPOON

THE use of pulverized coal in reverberatory furnaces, cement kilns, open-hearth furnaces, boilers and other similar furnaces has been described extensively in many papers and publications. The present paper will be confined to the application of pulverized fuel to blast furnaces, wherein the mixture of fuel and air is injected into the lower portion of a piled mass of material, and combustion takes place under pressure.

Until recently the history of pulverized coal in blast furnaces contained nothing but records of failures. Sir Lowthian Bell, in his book on the "Principles of the Manufacture of Iron and Steel," published in 1872, which deservedly ranks among the world's metallurgical classics, mentions an attempt to introduce finely divided coal with the blast at the tuyères in an iron furnace. The attempt was soon abandoned, and Bell remarked that it needed little consideration to insure the rejection of all such schemes.

About 1902, W. J. Forster, of Darlston, England, satisfied himself by a great number of experiments at the Darlston furnaces, "that nothing but failure can be expected from the addition of cold materials into the hearth of the furnace with the blast."

In 1913, U. A. Garred became interested in the application of pulverized fuel to blast furnaces, but it was two years later when he applied some of his ideas in a practical way, by melting blister copper in a blast furnace. The design provided special facilities for combustion, and the tuyères were so arranged that in the event of the charge becoming frozen they would remain clear. During the experiment over a million pounds of blister copper was melted.

EXPERIMENTS AT THE TENNESSEE COPPER Co.'S SMELTERY

Experiments at the smeltery of the Tennessee Copper Co. were decided upon early in 1918, one of their standard blast furnaces, 22 ft. 6 in. long by 60 in. wide, being used. Ten tuyères on one side of the furnace were equipped for the use of pulverized fuel, and the first test run of importance lasted from April 22 to May 4, during which period the percentage of coal to the charge was 3.8, as against 5.7 of coke used on the other furnaces during the same period, when operating with a similar charge. The second test run started May 9 and continued until May 24. The percentage of coal used was 3.6 and a small amount of coke was charged intermittently.

A third test run was then made, feeding a little coke on the side of the furnace where no coal was fed previously, as it had been found there was a tendency for crusts to form on that side of the furnace. It was then decided to apply the coal in ten tuyères on each side, but experimental work was postponed,

owing to the possibility of some unconsumed carbon in the furnace gases causing discolorization and affecting the quality of the sulphuric acid made, which is an important product of the company. The company returned to the experimental work in January, and is continuing, with various modifications, the methods of applying the coal.

As the Tennessee company had not used pulverized coal previously, it was necessary to install a coal-preparation plant. A plant with a capacity of three tons per hour was constructed at a cost of about \$35,000. The cost of the feeding apparatus at the furnace was about \$5,000.

An analysis of the average ore smelted at Copperhill, Tenn., during 1918, is as follows: Cu, 1.55 per cent; Fe, 34.6; S, 24.6; SiO₂, 20.3; CaO, 4.9; MgO, 2.0; Zn, 1.4; Al₂O₃, 4.3. The furnace has 27 tuyères on one side and 24 on the other, and the air blast is maintained at 35 to 45 ounces pressure. Fig. 1 presents a general arrangement showing the method of applying pulverized fuel to the experimental furnace.

EXPERIMENTS AT THE INTERNATIONAL NICKEL Co.'S SMELTERY AT COPPER CLIFF, ONTARIO

The International Nickel Co. became interested in the work being done at Copperhill, and in June, 1918, secured the services of U. A. Garred, whose work has already been mentioned, to carry out experiments in the blast-furnace department of its smeltery at Copper Cliff, Ontario. It was decided to utilize one of the company's standard blast furnaces, 25 ft. 6 in. long by 50 in. wide. The furnace bottom is lined with magnesite brick to within 14 in. of the center of the tuyères; the two lower rows of jackets are cast iron, inclosing water-cooling pipes, and the two upper rows of jackets are of the standard water-cooled steel type. The furnace has 48 6-in. tuyères, 24 on a side, spaced about 12 in. centers. These are connected to a main bustle pipe with 6-in. galvanized branch pipes fitted with canvas sleeves. The bustle pipe is supplied by an offset from the main delivery pipe, which feeds seven other furnaces, the normal pressure of air carried at the tuyères being 23-24 oz.

The furnace charge consists mainly of a refractory copper-nickel sulphide ore, a large proportion of which comes from the company's roast beds. The composition of the charge and the average size and analysis of the charge and products are as follows:

COMPOSITION OF CHARGE

	Percentage of Charge to Blast Furnace, Av. 6 Months
Roast ore.....	74.8
Raw Creighton.....	2.8
Raw Crean Hill.....	8.0
Total ore.....	85.6
Converter slag.....	10.2
Converter scrap.....	3.2
Limestone and quartz.....	1.0
	100.0

*Excerpted from an article in the July, 1919, issue of the Bulletin of the Canadian Mining Institute.

SCREEN TESTS

	Per Cent.
Roast ore—on 1½ in.	53
Roast ore—on 1 in.	16
Roast ore—through 1 in.	31
Raw Creighton, practically all through 1 in.	

TYPICAL ANALYSIS OF BLAST-FURNACE CHARGE AND PRODUCTS

	Cu		Ni		Fe		S		SiO ₂		Al ₂ O ₃		CaO		MgO	
	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.	Pe.
Roast ore.	1.40	4.10	38.50	11.75	20.25	4.50	2.25	2.50								
Raw Creighton ore.	1.40	3.90	39.50	23.00	21.00	5.25	2.50	3.00								
Raw Crean Hill.	2.50	1.75	24.00	11.50	32.00	10.00	5.00	5.50								
Converter slag.	1.00	3.00	47.00	2.40	26.75	3.00	1.25	1.50								
Scrap charged.	2.25	6.00	42.00	2.00	21.75	2.00	0.75	1.50								
Limestone.			1.00		2.50		52.75	1.10								
Quartz.			3.00		91.00	2.90	1.00	1.00								
Bl. fur. matte.	5.85	14.35	48.40	26.25	(6 mos. avg.)											
Bl. fur. slag.	0.16	0.32	40.90	1.65	33.15	6.50	3.70	2.50								

The furnace, under normal conditions of smelting, treats about 500 tons of charge a day, utilizing 60 tons of coke, the average coke consumption for six months being 12.5 per cent of the charge.

Regarding air conditions, only approximate estimates

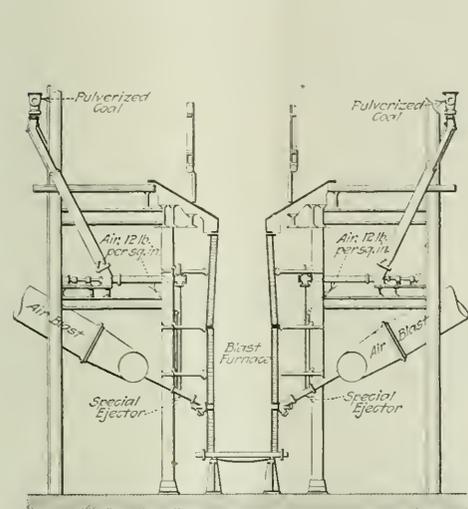


FIG. 1. GENERAL ARRANGEMENT OF BLAST FURNACE AT COPPERHILL, ON WHICH PULVERIZED COAL EXPERIMENTS WERE MADE

were available, owing to the whole of the blast furnace plant being supplied from a central blower installation. General observations indicated that the furnace charge is kept about 7 ft. deep, and the smelting zone is from 2 to 3 ft. above the tuyères. Blow holes form quickly after a fresh charge, but the amount of dust made is about normal, namely, 1.5 to 2.0 per cent of the ore.

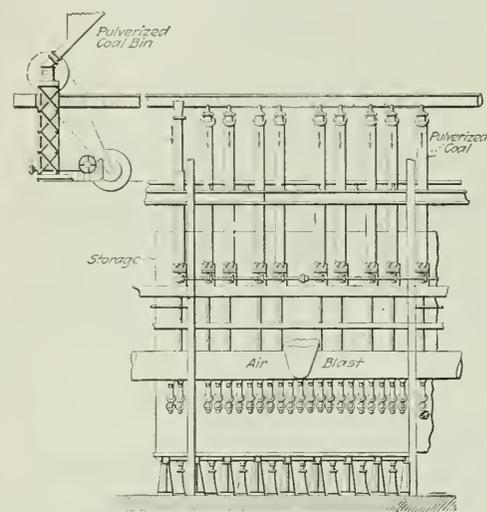
The tuyères require punching regularly, the method being to remove the tuyère cap, and, by introducing a rod, to stir up the ore in the vicinity of the tuyère. It was usual, when cleaning these tuyères, for some loose ore to be blown out on the furnace floor in a condition which indicated that the ore close to the tuyères had not been strongly heated. Through the tuyères the charge appeared black, and usually there was no appearance of fire until near the middle of the furnace.

Arrangements for conducting the experiments were greatly facilitated because the company had utilized pulverized coal in reverberatory furnaces since 1911. Some difficulty was first encountered in transferring the powdered coal from the bins at the rever-

beratory to the blast-furnace plant, but satisfactory arrangements were finally made for blowing it over by compressed air. It was found that 2½ tons of coal could be transmitted in five minutes through a 3-in. pipe 1,100 ft. long and with an elevation of 50 ft.

The feed or service bins at the blast furnace are about 13 ft. long, 3 ft. wide at the top, 14 in. wide at the bottom, and about 6 ft. deep. They are constructed of No. 14 gage steel plate, and are completely closed, a manhole being provided, and an air vent pipe, to which a cyclone separator is fitted. The bins each hold about 3½ tons of pulverized coal. At the bottom of each are twelve common screw feeders, operated from a line shaft through bevel gears, each feeder having a small clutch, the line shaft being driven from a variable-speed motor.

The feeders can be operated satisfactorily at speeds



between 40 and 100 r.p.m., to deliver from 3 to 6 lb. of coal per minute; and any individual feeder can be stopped without interfering with the general operating conditions. The screws are made of special length and pitch, being made in a lathe, and in calibrating these at different speeds for the discharge of the coal no flushing effects have been noticed. This arrangement of feeding the coal is positive, sufficiently accurate, and mechanically simple. The twelve feed screws at each bin discharge the coal into 1½-in. diameter pipes, which are in turn connected with the blast pipes or tuyères at the furnace, the coal being transmitted by ejectors, using a small quantity of high-pressure air, which is beneficial in the mixing of the fuel and air for the furnace.

METHODS OF INTRODUCING COAL

In beginning the experiments, the air blast for the combustion of the coal and for smelting was furnished in the regular way under normal operating pressure, and the pulverized coal was introduced directly into the blast before entering the tuyère. It was found that the coal could be introduced rapidly in this way while

the furnace had its regular charge of coke and ore, but when the coke was cut below 50 per cent of normal, it was found that the tuyères became closed, coal dust would lodge in the tuyère pipes, and a certain quantity would find its way into the bustle pipe, causing trouble at any leaky joint, thus rendering conditions around the furnace dangerous. At this time the joints between the furnace jackets and the tuyères were not as tight as they should be, and there was considerable leakage of coal dust. Tuyères of several designs were tried to avoid leakage, and the canvas sleeves on the branch pipes were replaced with 5-in. standard pipes, having flexible joints. Improved results were obtained in this way, and some of the arrangements used are illustrated in Fig. 2. Later on, the coal was introduced into the blast by means of an ejector like that used by T. W. Cavers at the Tennessee Copper Co.

During this stage of the experiments, the main troubles were at the tuyères, which required regular

leading to tuyères that were open. It was therefore agreed that any possibility of explosions could be effectively prevented by arranging check or explosion valves in the bustle pipe itself.

The experiment was then made of introducing the coal between and slightly above the tuyères, by boring a hole through the jacket and connecting to these the coal supply pipe from the ejectors at the screw feeds, thus introducing a dense mixture of coal and air into the furnace independent of the main air supply. This was found to be a clean method, and a test was made over a period of eight days. During this time the coke was reduced from 12 to about 6 per cent, with promising results; the most important and necessary conditions still being that of keeping the tuyères open. It was observed that the small openings (1½-in. pipe) through which the coal was introduced into the furnace required little punching, the main trouble being with the large tuyères; and by observation through the Dibley valve, the combustion and the smelting of the ore in the furnace could be seen. It was then decided to use specially designed furnace jackets at the tuyère level of the furnace. The design finally adopted is shown in Fig. 3.

The jackets, it will be seen, provide means for a more even distribution of the blast, and it was thought that they would give better opportunity for combustion at the entrance to the charge. It was also believed that

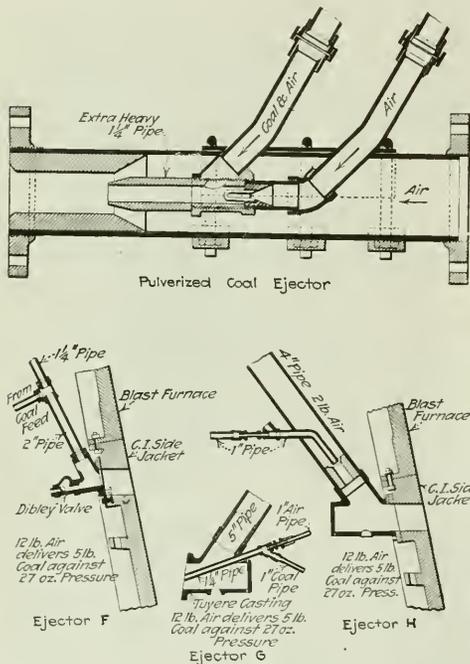


FIG. 2. DETAILS OF VARIOUS EXPEDIENTS TRIED FOR INTRODUCING PULVERIZED COAL INTO BLAST FURNACE TUYERES AT COPPER CLIFF, ONTARIO

punching, and there was some leakage of coal. The coal was applied to only half the tuyères on each side of the furnace, being introduced to alternate tuyères, those on the front of the furnace being staggered with those at the back. Mr. Garred experimented with check or explosion valves, which were placed in the branch pipes. It was found these check valves were not effective except when they were carefully designed and placed in every branch pipe, and this was a complication of apparatus that was not considered desirable. It was then found that if any individual tuyère was choked, the coal was drawn into the bustle pipe by suction and found its way down the branch pipes

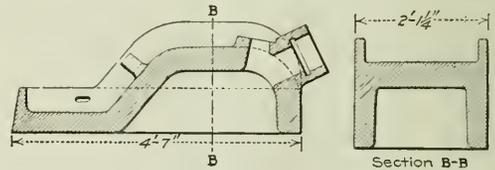


FIG. 3. ONE TYPE OF SPECIAL JACKETS USED

furnace jackets designed on this principle would not be more expensive than those of regular design, as two tuyère castings, with their joints and machine work, would be dispensed with. The furnace is now equipped with some of these jackets, but it is too early to state, definitely, the degree to which they are advantageous.

EXPERIMENTS WITH NARROWED TUYÈRE ZONE

Experiments have been made with a standard blast furnace reduced in width from 52 in. to 36 in. at the tuyère level, with the air blast at various pressures, and melting a variety of furnace charges. Considerable study has also been given to modifying the design of furnaces to obtain ideal conditions in smelting. Fig. 4 illustrates one of these modifications, and jackets of this design are now being tested on the experimental furnace.

To summarize the results of the experiments at Copper Cliff and Copperhill, it can be said that under difficult conditions it has been demonstrated that important economies are possible at many smelting plants by the utilization of pulverized coal, thus replacing a considerable portion of the coke.

It is a foregone conclusion that the characteristics of the charge will have an important bearing on the results obtained. At Tennessee the charge consists of run-of-mine ore and quartz in large pieces, with a high percentage of sulphur, and melting conditions that call for relatively small quantities of fuel. At Copper Cliff,

the ore is comparatively fine, over 74 per cent of the charge coming from the roast beds, from which it is reclaimed and handled two or three times, and the final sulphur content does not much exceed 12 per cent.

There are some blast furnaces operating in conjunction with reverberatory furnaces, under conditions in which the blast-furnace charge is favorable for easy smelting, due to the slags and other byproducts being treated therein. It is generally believed by those conversant with the experiments that successful work at Copper Cliff can assuredly be followed by successful work in a large proportion of the blast furnaces smelting non-ferrous ores elsewhere.

It is often stated that large pieces of incandescent coke are necessary in the charge to support the burden. This may be so under certain conditions, but the experiments indicate that it is not essential in smelting copper-sulphide ores, and it is not believed to be a matter of great moment when treating other non-ferrous ores.

Another point of great importance is the effect of the Garred-Cavers process on the tuyères and the amount

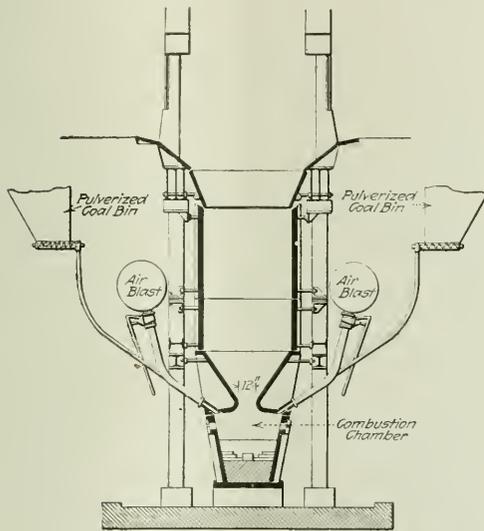


FIG. 4. FURNACE WITH LARGE COMBUSTION CHAMBER

of tuyère punching. Tuyère punching, under normal conditions, entails a good deal of hard labor, and it is our opinion that the conditions in this connection will be greatly improved. The moisture content in the charge may be high without causing trouble; during the experiments several charges of wet fines, the clean-up from storage bins, have been handled.

The most important influence on operating costs is in connection with the fuel utilized, the normal practice being to use coke alone, whereas these experiments show that coke can be replaced, to a large extent, by pulverized coal. The relative costs of coal and coke vary a great deal, but, on the average, coke may be stated to cost twice as much as coal delivered at the smelters.

The cost of preparing pulverized coal will vary considerably, as there are several factors bearing on the matter, among which are labor, power, fuel for drier,

and repairs, in addition to interest and depreciation on buildings and equipment. The power required for crushing, drying, elevating and conveying the pulverized coal will be about 20-hp.-hour per ton of coal handled, and with modern equipment under average conditions, the cost will be about 8c. per ton per hour.

At the International Nickel Co.'s smeltery, the average cost of preparing and delivering the coal to the furnace, in 1913, was as follows:

Labor.....	\$0.15
Power.....	10
Repairs.....	145
Coal for drying.....	055
Total.....	\$0.450

The present costs are abnormal, owing to war conditions, and will undoubtedly be reduced in the near future. They are as follows:

Labor (6 mos.).....	\$0.384
Power (June-Nov., 1918, inc.).....	084
Repairs.....	284
Coal for drying.....	108
Total.....	\$0.860

In this connection it may be stated that the cost of drying is excessive, because the moisture content of the coal averages about 10 per cent, and the amount of labor employed could conveniently prepare a much larger tonnage of coal. The item "repairs" includes all repairs to coal crackers, grinders, conveyors, fans, belting, and like equipment. Four men on an eight-hour shift are all that are necessary to prepare and deliver 100 to 200 tons per day.

The costs in connection with lignite are, of course, greater than with other fuels, due to the large increase in drier costs on account of the moisture. This, to a certain extent, is compensated for in reduced repair cost to pulverizing machinery, as lignite is easily ground. Some of the average operating costs, under recent conditions, are reported as follows:

- Small plants (2 to 5 tons per hour), \$1.20 per ton.
- Medium plants (10 to 15 tons per hour), 75c. per ton.
- Large plants (20 tons and over per hour), 45c. per ton.

The preparation of lignite calls for more attention than that of other fuels, because of the high moisture content, which is frequently in excess of 50 per cent, and on account of the large amount of volatile constituents. It is usual to reduce the moisture to about 6 per cent; to attempt further reduction is to invite trouble in the way of fires and excessive drier costs, and all to no avail, because it will again absorb this much moisture from the atmosphere. Various tests show that lignites lose 2½ per cent of their volatile combustible matter when exposed to a temperature of 284 deg. F. for a period of thirty minutes. Such losses cannot be allowed, and so the drying must be done at lower temperatures, and therefore with increased equipment, recent practice being to arrange the driers in series.

We have prepared a table showing the approximate costs of plants of different capacities:

ESTIMATED COSTS OF PULVERIZED COAL PLANTS			
Daily Capacity in Net Tons per 24 Hours	No. of Mills Required	Total Cost	Building Only
20	1 33 in.	\$34,000	\$5,500
50	1 42 in.	40,700	7,500
100	3 33 in.	49,500	10,700
200	3 42 in.	66,000	12,500
300	2 57 in.	79,200	14,750
400	3 37 in.	92,500	15,300
500	4 57 in.	106,700	16,000
750	5 57 in.	143,000	19,000
1000	7 57 in.	177,000	21,750

These costs are for complete plants, but there should

be added 10 per cent for engineering. They are for January, 1919. The estimates are for construction in the eastern or middle regions of the United States. We also include the distribution of an estimate for a plant of 500 tons per day.

COAL PLANT, CAPACITY 500 NET TONS PER DAY,
OR 333 TONS PER 16 HOURS
Building, 32 Ft. by 120 Ft. Erected

Structural steel	\$10,200
Corrugated roofing	782
Corrugated siding	1,400
Louvers	648
Steel windows and doors	1,650
Concrete foundations	1,200
Excavations	200
Total	\$16,080
Machinery	
Steel track, hoppers, grating, plate feeder, etc.	\$1,000
Single-roll coal crusher	1,410
Motor for coal crusher	683
Steel-cased elevators	4,266
Motor drivers for elevators	1,720
Magnetic separator	708
Storage bins and supports	2,600
Cradle feeder with driving mechanism	750
Rotary coal drier with exhauster; dust collector, piping and motor drive	12,670
Brick work for drier	1,400
Pulverized coal equipment for drier	1,500
Screw conveyor with trough	700
Three 20-ton bins above mills with discharge spouts, bin gates and spouts	4,571
Three 57-in. mills with pulley drives, motors and belts	31,260
Steel platforms, runways and stairs	4,000
Discharge spouts from mills	300
Ten ton crane	1,500
Screw conveyor with motor drive	620
Conveyor cover, exhauster, dust collector and piping	1,900
Wiring and installation of motors	4,000
Machinery foundations and floors	3,150
Excavations	1,000
Miscellaneous erection, labor	3,750
Total	\$85,458
For building and machinery, total	\$101,538
Engineering, 10 per cent	10,150
Grand total	\$111,688

GENERAL CONCLUSIONS

The experiments described give a general outline of the work done by Garred and Cavers, and the authors have presented general information obtained to date. The experiments of the Tennessee Copper Co. are continuing, with encouraging results, and at the plant of the International Nickel Co. the most recent work has been to endeavor to operate the furnace entirely without coke, following earlier work where an average of about 50 per cent of the coke had been replaced. The results, with all coke eliminated, have not as yet been satisfactory, but are sufficiently encouraging to warrant continuing the experiments with that object in view.

The processes involving the application of pulverized fuel to blast furnaces have been patented in the United States, Canada, and many foreign countries. The patentees, Garred and Cavers, both were engaged in work connected with the smelting of non-ferrous ores, and both were simultaneously working on practically the same problem, of the combustion of finely divided fuel in a blast furnace. Owing to the magnitude of the problems involved, a consolidation of their interests was effected recently, by the formation of the Garred-Cavers Corporation, New York, which company has acquired the patents issued and pending in connection with this work. It is expected that experiments on the smelting of silver-lead ores will be made in the near future, and there is reason to believe the prospects are good for increasing the efficiency of lead blast-furnace practice.

During the last few years, from twenty to thirty million tons of non-ferrous ores per year have been treated in blast furnaces in the United States, Canada, and Mexico, and it is believed that further developments

of a satisfactory nature in connection with this work will enable a large proportion of these ores to be smelted with considerable economies in fuel.

Right To Surrender Lease

By A. L. H. STREET

Attorney at Law.

Where a lease of mining property specifies its duration as extending over a certain period of years, with provision for the payment of minimum royalties, is the lessee entitled to surrender his rights before expiration of that time and release himself from liability for further royalties, when it appears that the ore has been practically exhausted?

This question was involved in the recent case of Virginia Iron, Coal & Coke Co. vs. Graham et al., 98 *Southeastern Reporter*, 659, decided by the Virginia Supreme Court of Appeals, and was answered in the affirmative.

Plaintiff company held a lease on defendants' lands for 40 years, and less than one-half that period had expired when plaintiff gave notice of a cancellation of the lease on the ground that iron ores could no longer be found in merchantable quality or in quantities which could be profitably mined. Defendants denied right to cancel and indicated that they would seek to hold plaintiff liable for the stipulated minimum royalty.

The contract contained no clause specifically providing a privilege in the lessee to surrender the lease in the contingency stated, although mining leases frequently contain such clause. But the lease did contemplate the shipment from the mine of not less than 20,000 tons of ore annually.

The trial judge dismissed plaintiff-lessee's suit to cancel the lease, but the Supreme Court of Appeals reversed the decree, saying, in part:

"If one makes a contract to do a thing which is in itself possible, he will be liable for a breach of the contract, notwithstanding it is beyond his power to perform it. But where, from the nature of the contract itself it is apparent that the parties contracted on the basis of the continued existence of the substance to which the contract related, a condition is implied that if performance becomes impossible because that substance does not exist, this will and should excuse such performance. . . .

"Applying these principles to the lease here involved, it appears clear that the main purpose of the contract was to mine iron ore, the existence of which in quantities great enough to justify the continuance of mining operations for 40 years was assumed as a fact by both parties, and by its express language the lessor was to receive 50c. per long ton as compensation, 'for each ton of good merchantable ore mined and shipped.' The subject and substance of the contract is merchantable iron ore, to be mined and shipped, and the obligation to pay therefor, or to pay such royalty on the minimum quantity which both parties assumed could be so produced. . . . It is manifest, then, that if the facts alleged in the bill can be proved, and the ore does not exist, the lessee should be relieved of its obligation to pay the royalty provided for in the lease, because the paramount consideration of the contract has failed, and performance thereof by the lessee has become impossible."

Chicago Meeting of the A. I. M. E.

C. M. Schwab Will Speak—One Hundred and Fifty Papers To Be Presented—Trips to Whiting And East Chicago

CHARLES M. SCHWAB will be a speaker at the banquet of the American Institute of Mining & Metallurgical Engineers to be held in Chicago, Sept. 22 to 26 inclusive. Elaborate plans for both the technical and social side of the meeting have been perfected. Engineers who make the trip to Chicago for this occasion are assured of a most interesting annual meeting. In addition to about 150 papers which have been prepared for the sessions, trips to the zinc-smelting districts, the steel works at Gary and the refineries at Whiting and East Chicago are included. A boat trip on the lake, together with numerous social events, has been arranged for the ladies. The Fifth Annual Exposition of the Chemical Industries will be held in Chicago at the same time as the meeting, and members of the Institute are cordially invited to attend the exposition and become better acquainted with the allied industries.

South African Mint Proposed

The establishment of a South Africa mint at Johannesburg is authorized in a bill that was read a third time in the Union House of Assembly on June 19. It is intended to mint the gold produced annually by the country, which some anticipate will result in a considerable saving to the mining industry.

"It now seems fairly assured," says Samuel Montagu & Co., of London, "that a government mint will be set up in the Transvaal, probably at Johannesburg. The Dominion of South Africa will follow the example of Australia, Canada, and India.

"The British sovereign has enjoyed universal popularity. It has commanded, and does still command, a premium in certain places over gold, coined or otherwise. If the whole output from the Transvaal be minted (instead of only a part, as heretofore) the British sovereign is likely to be still more conspicuous throughout the world, although shortage of gold bullion, consequent upon such increased mintage, would probably impel a considerable quantity of the new coin into the melting pot, after a brief and barren lease of life."

Conditions in the Callao District of Venezuela

By C. F. Z. CARACRISTI
Caracas, Venezuela

The properties of Lo Increible Gold Mining Co. in the Callao district of Venezuela are reported to be under option to an American syndicate for, it is said, \$2,000,000. The adverse climatic conditions of the Callao region must delay development on a large scale until an effort is made to improve sanitary conditions. Besides, labor is scarce and supplies are high. Labor from the island of Trinidad is used at the mines, but this is permitted by the government as a matter of courtesy, as the law provides that two-thirds of all manual labor must be native. The native labor of the region that devotes its time to mining usually prefers to work streams or placer deposits on its own account, thus earning more money. These placer deposits, while sometimes rich, are small and scattered and cannot form the basis of

organized mining. However, the region is rich in low-grade ores (\$4 to \$7 in value) that will be worked whenever the labor and sanitation problems are solved.

Recovering Manganese From Ores of the Cuyuna Range by the Jones Process

During the war, every effort was made in this country to bring the manganese production to the highest possible figure, but it was not considered economically feasible to extract this metal from the manganese iron ores of the Cuyuna Range and elsewhere, where the association of the manganese and iron is so intimate that ordinary methods of gravity or magnetic separation are impracticable. John T. Jones, however, devised a direct reduction process applicable to these ores, on which considerable laboratory work was done at the Minneapolis Experiment Station of the Bureau of Mines, the results having recently been published.

The original ore assayed Fe, 40 per cent; Mn, 13; SiO₂, 10. The process consists in first crushing the ore to pass 10 mesh, then mixing with about 20 per cent of coal, and heating in a crucible for one-half hour to two hours at 1,250°C. This produces a metal containing approximately 94 per cent Fe and 1 per cent Mn, and, after the addition of lime, a slag assaying Fe, 5 per cent; Mn, 29; SiO₂, 31. The slag is then crushed to 30 mesh, mixed with lime and 25 per cent of coke, and heated in a graphite crucible at 1,450°C. The metal produced is essentially a silico-ferro-manganese assaying Fe, 15 per cent; Mn, 60 to 67; Si, 10 to 25. The manganese recovery is about 72 per cent.

The metal produced in the first stage is suitable for conversion into steel by any basic steel process. The manganese product obtained in the second stage would be new to the steel industry, but it is believed that it could be used to advantage. The laboratory work demonstrated only that the process is metallurgically possible.

Foreign Trade in Copper

Exports of copper from the United States in June, 1919, and for the first six months of the year are reported by the Department of Commerce as follows:

	June, 1919	Jan.-June, 1919
	Pounds	Pounds
Ore and concentrates, etc., contents.....	2,100	488,346
Unrefined, in bars, pigs, etc.....	970	270,421
Refined, bars, etc.....	24,250,659	177,079,491
Old and scrap.....	725	408,468
Plates and sheets.....	514,136	10,466,234
Pipes and tubes.....	536,422	3,077,017
Wire, except insulated.....	4,766,354	33,292,139
Composition metal, copper chief value.....	10,175	295,091

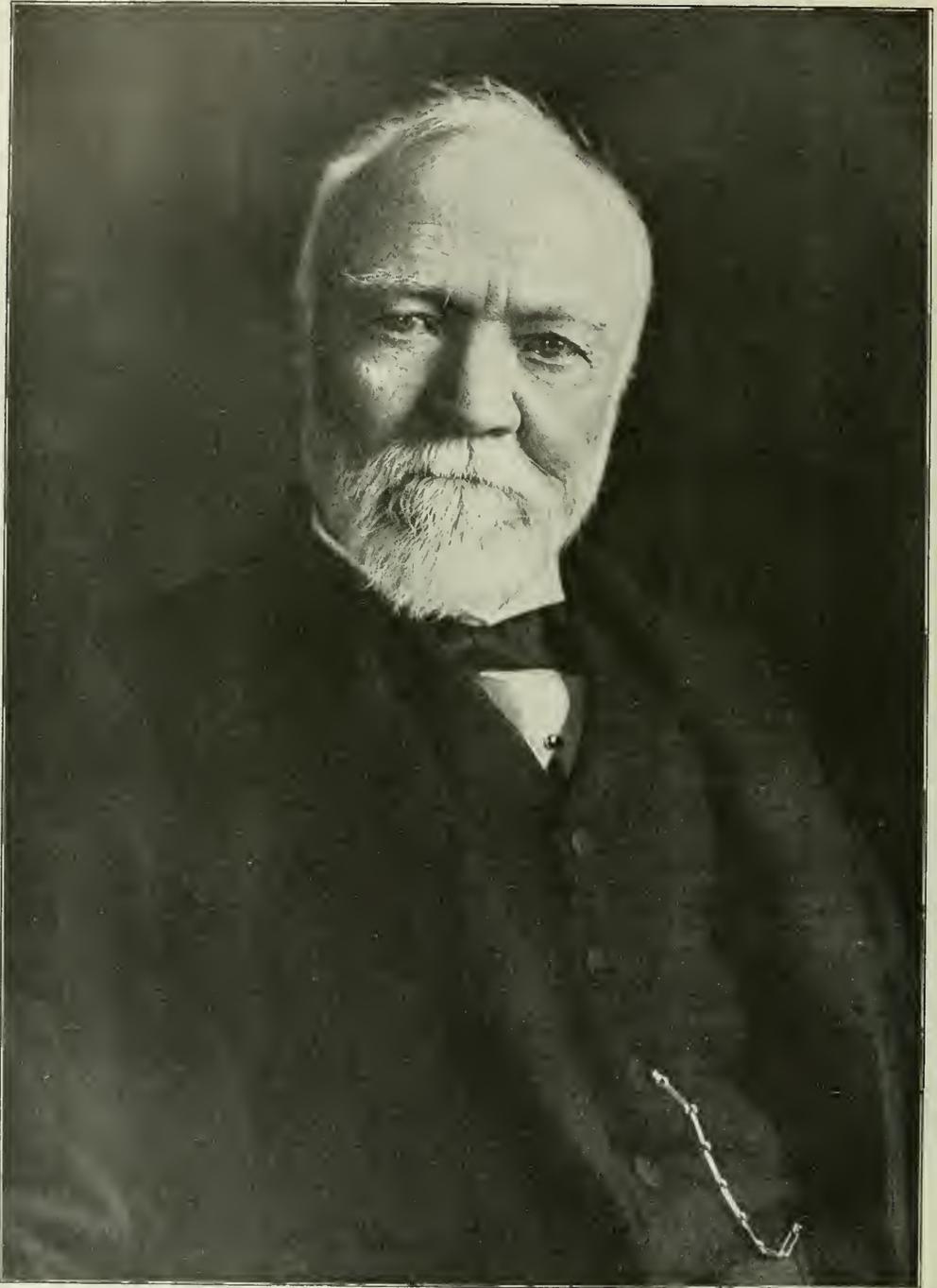
The weight of ore exported in June was 35 long tons.

Imports of copper in June and the first six months were:

	June, 1919	Jan.-June, 1919
	Pounds	Pounds
Ore and concentrates, contents.....	6,545,343	39,927,888
Matte and regulus, etc.....	2,985,286	21,220,525
Unrefined, in bars, pigs, etc.....	19,842,478	146,620,976
Refined, in bars, etc.....	3,721,956	11,032,460
Old, etc., for remanufacture.....	2,110,034	4,890,264
Composition metal, copper chief value.....		19,400

Ore imported in June amounted to 20,460 long tons; concentrates, 11,215; matte and regulus, 2,186 long tons.

¹War Minerals Investigations Series No. 12: "The Jones Process for Concentrating Manganese Ores," U. S. Bureau of Mines, Washington, D. C.



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ANDREW CARNEGIE

Andrew Carnegie

WHEN Andrew Carnegie came to America, at the age of thirteen, and began working as a bobbin boy in a weaving industry at \$1.20 a week, he little thought, and still less did the world think, that he was destined to become the American steel magnate. And yet his progress was logical. Too ambitious to be a bobbin boy, he resigned to become a telegraph messenger; and too ambitious for this work, he made the most of his opportunity for learning telegraphy. The next step, of course, was to become an operator, a position which he secured with the Pennsylvania RR. Then came a wreck. The division superintendent could not be found. The circumstance created an opportunity for Carnegie to assume responsibility, and he showed a willingness and ability to do things which was characteristic throughout his life. He sent orders to the various superintendents, and signed them with his superior's name, which quickly cleared the situation. He carried the message to Garcia, without even being told to carry it.

Mr. Carnegie's ability recognized, he was quickly promoted to higher positions. It was in England, after the Civil War, while selling Pennsylvania RR. bonds that he obtained the idea which led him from railroad-ing into the steel business. He observed that the English railways were discarding iron rails for steel. Investigation of the subject impressed him with the possibilities of this change in railroad practice, and on his return to America he organized the firm of Carnegie, McCandless & Co. This company purchased a large tract near Pittsburgh, and it was here that a large bessemer steel plant was erected under the name of the Edgar Thomson Steel Works.

Carnegie never pretended to be a practical master of the iron and steel trade. His place was "to look after the advertising and drive the band wagon." Important work, too, for band wagons must be driven properly. The new method of steel manufacture thrived and Carnegie saw to it that the company, in which he gradually acquired a controlling interest, maintained its supremacy. By 1891 he had become absolute master of steel. For the next ten years he was actively engaged in the industry, eventually selling out his interests to the United States Steel Corporation in 1901 for \$460,000,000, the greatest transaction of the kind ever recorded. With this event, Carnegie ended his active participation in business at the age of sixty-six years.

Mr. Carnegie's business acumen was well typified by the class of men whom he attracted to his employ. He was quick to judge a man and had a particular preference for eager young men who had radical ideas. To such as proved their ability, he afforded every facility for rapid promotion. His was a business in the making—it was not fettered by traditions—and new discoveries and improvements were constantly being evolved. For such an industry, men who were impatient for progress were required, and to these Carnegie looked to fill his organization.

Carnegie was a successful business man, but he was much more. During his declining years he escaped to a considerable degree the criticism which has been directed against American millionaires, and deservedly. He worked hard to accumulate his great wealth, but he also spent a great deal of time in an endeavor to "die poor." He realized that thoughtless charity did more harm than none at all, and it was no small problem to expend half a billion dollars to the best advantage. He once stated: "I never give a cent to a beggar; nor do I help people of whose record I am ignorant. This, at least, is one of my really good actions." Deprived of the opportunities of education himself, he realized its value in the upbuilding of the commonwealth, and a large proportion of his benefactions went into educational work. Six highly endowed foundations owe their existence and maintenance to his philanthropy, and he made numerous gifts to universities and to negro educational institutions. Carnegie libraries are found even in the Fiji Islands.

In religion Carnegie was an agnostic, a student of Herbert Spencer, and it is noteworthy that he never gave money for the support of a church, believing the highest good would not come of this form of giving. He did, however, contribute over \$6,000,000 to the purchase of church organs. The engineering profession had a great friend in Mr. Carnegie, and several years ago he financed the United Engineering Societies Building on West 39th St., New York City, at a cost of \$1,500,000. This building is the headquarters of five separate organizations of engineers.

Carnegie probably took more interest in peace propaganda than in any of his other public activities. Some remarks made in 1907 will throw an interesting light on his attitude in these matters:

"Not so long ago a speaker recited in my hearing how he had seen the most powerful naval vessel in the world—the 'Dreadnought'—with her 18,000 tons displacement. When my turn came I said that I must regret to dispute the statement. I, myself, had seen the most powerful naval vessel in the world. She was a tiny, yacht-like vessel, painted a beautiful white, with a flag at her masthead and a toy cannon on her deck—for use in firing salutes, mostly.

"Such dainty vessels as these serve to maintain the neutrality of the North American Great Lakes. The little white yacht was the true dreadnought. The name of the other, the vast, gloomy and terrible engine, should be 'Dreadeverything'—dread wounds, dread shot, dread drowning, dread savagery, hellish passions, dread miserable, tortured, fruitless death."

The late war was a heavy blow to Mr. Carnegie, as it shattered one of his greatest dreams. Nevertheless, when America entered the conflict he proved he was a true American in thought and deed.

Carnegie's life may well be an inspiration to the plodding American, but it may also be a model for the retired millionaire. The acquisition of the good things of life is no more a problem than their proper dispensation.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Suspension of Assessment Work

Without amendment, the Senate, on Aug. 7, passed the bill providing for the suspension of annual assessment work on certain mining claims during 1919. The bill already had passed the House and now goes to the President for signature.

Perfunctory objection to the limitation of the suspension to five claims was voiced by Senator King, of Utah, who foresees "very grave difficulties arising from the attempt to secure the benefit of this bill limited to only five claims, where they may be a group of claims." Senator Smith, of Arizona, in addressing himself to the bill, said: "I cannot help protesting against this relief, which comes under the guise of helping the poor, but which gives a great deal of comfort to those who easily could afford to do their assessment work. The whole assessment work proposition is wrong. There are some who hold title who are digging ten feet of soft ground anywhere on the surface of the claim in order to keep the title perfect."

Senator Thomas, of Colorado, predicted that the suspension would be demanded and passed again for 1920, and in his discussion of the matter brought out some interesting points, as follows:

If this joint resolution passes at all it should retain this limitation, in my judgment.

The act of 1872, under which practically all mining locations have been made, as an evidence of good faith required the bona fide expenditure upon every mining claim prior to patent of not less than \$100. The operation of that requirement has been, I think, beneficial. No limitation is placed by the law upon the number of claims which a citizen may locate, and in many sections of my state, and I have no doubt in others, that privilege has been taken advantage of by the location of a large number of claims held either for speculative purposes or upon the contingency of some development in the neighborhood proving valuable, and thereby making the groups valuable. That practice has interfered, I will not say frequently, but occasionally, with the bona fide development of mining property by holding out of the public domain premises which many citizens would like to exploit; but they were unable to do so because of these pre-existing locations.

I do not believe in suspending such a requirement in the absence of extraordinary conditions, and not then unless the necessity for it is overwhelming. This provision of the law was very severely criticized in the West in the elections of 1872. It was inserted in the bill at the instance of the then Delegate to Congress from Colorado, afterward United States Senator, Jerome B. Chaffee. He was a candidate that year for re-election upon the Republican ticket, and a very vigorous fight was waged against him because of what was dubbed in the campaign the Chaffee requirement of the expenditure of \$100 upon these claims prior to patent. Mr. Chaffee's answer seemed to me to be conclusive, as it certainly was to the people of the territory, who returned him by an increased majority to Congress. It was that the privilege of unlimited location ought to carry with it a sense of obligation to the Government; that the man who would locate a claim and then be unwilling to spend \$100 upon it did not appeal very strongly to him as a bona fide locator. He also called attention to the fact that this annual expenditure can be terminated at any time by securing patent for the claim, and patent can be se-

cured, the law having been complied with otherwise, upon the expenditure of at least \$500 in the improvement of the claim. So that those who do not like to pay this assessment can easily terminate it by applying for and securing patents; and, of course, the receiver's receipt, being the entry or the equivalent of a patent, suspends the work as soon as the money is paid to the Government for the claim.

The panic of 1893 struck the Western mining interests very hard. During the summer of that year the Indian mints suspended the coinage of the rupee, and the subsequent business disaster to the world is of too recent occurrence for me to do more than refer to it.

Congress during that year by special act suspended the operation of this law, relieving the holders of mining claims in the West from the necessity of making this expenditure. With that exception, I think no suspension was made, although it may have been asked for, until last year and the year before, when, owing to the pendency of the European war, the operation of this requirement was again suspended.

One great drawback to the suspension of these requirements is that once it is done it operates as a precedent, and those having the benefit of the suspension want its continuance, somewhat analogous to a man who, once having ridden upon an annual pass, never pays his fare without a sense of injustice. We are about to get into the habit, in other words, of suspending this requirement, and it is not good for the mining industry. If a man has a claim worth anything, he ought to be willing to pay \$100 every year or patent it; and until he patents it there should be some overweighing reason why the law itself should be suspended. I predict that if the joint resolution becomes a law, as it probably will, it having passed the House, we will repeat it next year. The high cost of living, the general turbulent conditions, and the scarcity of labor will all appeal to those who desire its suspension, and they will appeal to Congress.

Before reporting the bill providing for the suspension of assessment work on mining claims, the Committee on Mines and Mining of the Senate was inclined to insist on an amendment specifying that its provisions apply to Alaska. To avoid the delays of a conference, it was desirable to report the bill exactly as it passed the House, and Senator Henderson was assigned to make a study of the statutes involved, to see if the House bill would include Alaska. He was able to establish that the bill will apply to Alaska without specifically mentioning that territory.

A copy of the discussion of the proposed suspension of assessment work on mining claims for 1919 may be secured gratis on application to Paul Wooton, Union Trust Building, Washington, D. C., our special correspondent.

War-Minerals Relief

Senator Henderson's bill proposing to liberalize the War-Minerals Relief Act has received tentative consideration by the Committee on Mines and Mining. Before undertaking any extensive discussions of the measure, however, it was referred to the Secretary of the Interior for a report. While the Secretary has not formulated his reply at this writing, the feeling is manifested in the department that the War-Minerals Relief

Act should not extend beyond those who were solicited directly by Government agencies in the matter of producing war minerals. If some liberality of action is allowed in the interpretation of just what constitutes a direct request or demand, it is believed that the moral obligation of the Government will have been discharged. The idea is held by some at least that a very dangerous precedent would be set if any claim is allowed where there has not been direct contact between the claimant and representatives of a Government agency. Otherwise, producers of foodstuff and of a wide range of commodities would have the same moral claim against the Government.

Attention is called to the fact that with very few exceptions the Government was not consulted in any way as to expenditures. The natural tendency, it is argued, if a producer felt that he was entering into an informal contract with the Government, would have been to make some little inquiry at least before expending thousands of dollars.

There is some discussion as to the advisability of introducing a bill in Congress providing for the prorating of the payment of war-minerals claims. Of course such legislation would not be necessary unless the law is liberalized, as, under the Attorney General's decision, there will be ample funds to pay such of the claims as may comply with his interpretation of the act.

The War-Minerals Relief Commission expects to return to Washington by Sept. 1. In order to expedite the hearings, each of the commissioners has been conducting separate conferences with producers in the West. The members of the commission, however, were to reunite in Salt Lake City on Aug. 11, for a hearing at that place. The entire commission will sit at the hearing in Denver on Aug. 18. It had been hoped to have another hearing at Minneapolis for the Minnesota claims, but it has been found necessary to have claimants from that state appear in Denver or in Washington after the return of the commission.

Basing Point for Steel

The Federal Trade Commission has announced its intention to attempt the solution of the admittedly difficult question involved in the selling of steel on a basing-point basis. The matter was precipitated by an application of the Western Association of Rolled Steel Consumers to do away with the practice of selling rolled steel on a Pittsburgh basing-point basis. The association alleges that the present practice is repugnant to the Federal Trade Act and to the Clayton Act. Judge Gary, of the United States Steel Corporation, characterizes this action as "the biggest lawsuit ever tried in this country."

The commission, analyzing the complaint, says in part:

The applicant submits that the normal, reasonable price for rolled steel should be measured by cost of production with addition of reasonable profit and without addition of a large and arbitrary increase which forms no part of the production cost and is over and above such reasonable profit. The applicants declare that despite the fact that steel is made more cheaply at Gary, the complainants are compelled to pay a set price plus a freight rate of \$5.40 per ton from Chicago to Gary, although, in fact, the steel is not actually shipped from Pittsburgh at all.

The question raised by the applicant may not be the only question involved in this matter, and the remedy suggested by the applicant, namely, to make Chicago a basing point,

may not be the only remedy, or the appropriate remedy, even in the event that the applicant's contention is found to be valid. In other words, the whole question of the practice of having basing points for making rolled-steel prices may be involved, as well as the question whether Pittsburgh, or some other place, should be the sole basing point, or whether there should be more than one basing point.

Zinc Tariff Bill Reported

After having listened to producers and others concerned, and after thorough discussion among its members, the Committee on Ways and Means has recommended to the House of Representatives the re-enactment of the zinc schedule contained in the tariff act of 1909. As proposed by the committee, the duty would be as follows:

Zinc-bearing ore of all kinds, including calamine containing less than 10 per cent of zinc, shall be admitted free of duty; containing 10 per cent or more of zinc and less than 20 per cent, 1c. per lb. on the zinc contained therein; containing 20 per cent or more of zinc and less than 25 per cent, 1c. per lb. on the zinc contained therein; containing 25 per cent of zinc or more, 1c. per lb. on the zinc contained therein.

Zinc in blocks or pigs, and zinc dust, 1½c. per lb.; in sheets, 1½c. per lb.; in sheets coated or plated with nickel or other metal, or solutions, 1½c. per lb.; old and worn-out, fit only to be remanufactured, 1c. per lb.

Tariff on Laboratory Apparatus

Without a record vote, the House of Representatives on Aug. 2 passed the bill imposing a tariff on laboratory glassware, laboratory porcelain ware, optical glass, and scientific and surgical instruments, after ineffectual efforts were made to amend the bill reducing amounts of duty. The bill came in for an unusual amount of discussion on account of the fact that it gave the first opportunity for extended discussion of tariff matters. The principal opposition to the bill was based on the allegation that the increase in duty would cost the students of the country \$12.23 each. The arguments for the measure were overwhelming, in view of the fact that Japanese products already are on the American market in large quantities, produced at a rate far below costs in this country, a fact attributable largely to the higher wage paid to American labor.

Potash Restrictions Removed

The bars were let down to German potash when the War Trade Board Section of the State Department on Aug. 7 amended the General Enemy Trade License to that effect. German potash now may be brought into the country without individual import licenses, but potash from Hungary and those parts of Russia under Bolshevik control is still prohibited, if it was produced in Germany.

Before the action was taken, the board gave consideration to arguments presented by the producers of domestic potash and also to those presented by the representatives of organizations of farmers. The latter were insistent that all restrictions on the importation of German potash be removed.

The Committee on Mines and Mining of the Senate has referred Senator Henderson's bill providing \$140,000 for an oil-shale investigation to the Secretary of the Interior for a report on the advisability of such an investigation.

Mine Taxation

Special Meeting To Be Held at the Annual Convention at Chicago To Consider Plan Outlined By Internal Revenue Bureau

A SPECIAL session of the American Institute of Mining and Metallurgical Engineers will be held at the Chicago meeting on Monday, Sept. 22, at 11 a. m., for the purpose of discussing mine taxation. It appears that there exists a feeling on the part of many mining companies that the Internal Revenue Bureau regards them with suspicion, and is likely to follow a narrow-minded, arbitrary and exacting policy, which it will apply in an arrogant fashion. Such a feeling is not conducive to the simplest and easiest administration of the tax problem. To administer the present heavy taxes in a fair and businesslike way is a big job, and incapable of accomplishment unless there exists between the principal classes of taxpayers and the Government a reasonably good feeling of understanding and co-operation.

The program of mine taxation is now in a critical and formative stage. Those who are trying to solve the problem need advice and assistance from engineers and mine owners the country over. The Internal Revenue Bureau desires to place the problem clearly before those who are interested. At the special session on Sept. 22, L. C. Graton, representing the Internal Revenue Bureau in connection with a study of mine valuation under the income-tax law, will present an outline setting forth tentative proposals as to the proper methods of solving the problem of mine taxation. It is hoped that this presentation will result in a full discussion of the matter, both at the time of its presentation and later by contributions and correspondence. Members who are interested in mine taxation are urged to attend this special session.

Earnings of Porphyries Increase

Utah Copper, However, the Only One To Earn Its Dividend in Second Quarter—Continued Improvement Expected

ALTHOUGH all earnings improved over the first quarter, the Utah Copper Co. was the only one of the four big porphyries under control of the Jackling interests to earn its dividends in the second quarter of the current year. At present, the companies are paying the following dividends per quarter: Utah Copper, \$1.50; Nevada Consolidated, \$0.375; Ray Consolidated, \$0.50; and Chino, \$0.75. During the last quarter they earned, respectively, \$1.63, \$0.09, \$0.20, and \$0.42. At present selling prices (Aug. 8) the second-quarter figures show that the stocks are earning as follows; Utah, 7.6 per cent; Nevada Con., 1.9 per cent; Ray Con., 3.3 per cent; Chino, 3.8 per cent.

Production of the Utah Copper Co. amounted to 27,523,600 lb., a slight decrease from the first quarter. The average cost of this output, excluding Federal tax deductions and credit for gold and silver, was 11.59c., as against 13.72c. in the first quarter.

Nevada Consolidated produced 11,149,362 lb., also a slight decrease from the first quarter. The average cost was 18.07c., compared with 16.85c. in the first quarter of the year.

Ray Consolidated shows a production of 11,306,118 lb. at a cost of 14.64c. In the first quarter there was produced 12,291,381 lb. at a cost of 15.15c.

Chino's output amounted to 10,541,471 lb. at a cost of 14.16c. per lb., compared with 15.03c. in the first quarter on a production about 10 per cent greater.

Nevada Consolidated is therefore the only one of the companies whose costs have not been lowered. Considerable improvement is shown by all of the companies in the matter of profits, Utah Copper being the only one which was able to show a surplus available for dividends in the first quarter. The report predicts increased foreign and domestic demand, and a continued improvement in the position of these companies may be expected.

Bunker Hill & Sullivan Mining & Concentrating Co.

Detailed Information Respecting Mining and Concentrating Costs—Ore Reserves Increase—Kellogg Smeltery in Continuous Operation

OPERATIONS at Kellogg, Idaho, were continued on a reduced scale during the year ended Dec. 31, 1918, on account of labor shortage. Earnings were also slightly reduced, the balance carried to surplus account being \$1,631,242, compared with \$1,891,580 for the previous year. Dividends paid on the 327,000 shares amounted to \$1,553,250. The company is practically a close corporation, but is unusually liberal in publishing costs and operating data. The report which has just been issued gives complete and detailed mining and concentrating costs, covering about twelve pages. No smelting costs are included, due, no doubt, to the fact that the smeltery handles a considerable amount of custom ore. Also, no mention is made of the agreement with the A. S. & R. Co. whereby it is understood one-half of the Bunker Hill product may be smelted at Kellogg. A total of 387,027 tons of ore was mined and milled during the year and 84,170 tons of middling and concentrate was made and shipped to the Tacoma smeltery. The mill feed averaged 10.65 per cent lead and 4.32 oz. silver per ton, the concentrates assaying 45 per cent lead and 16 oz. silver. The ore blocked out in tons at the end of 1917 and 1918 in the various mines was as shown in the following table:

ORE IN BUNKER HILL & SULLIVAN MINES

	1917	1918
Stemwinder mine	25,170	16,434
Sullivan mine	157,045	135,429
Bunker Hill mine	3,275,204	4,210,111
Total	3,457,419	4,362,024

A significant item in the concentrating costs which has not appeared in preceding reports is that of \$23,076 for royalty to Minerals Separation. This amounts to 5.9c. per ton of total ore milled.

It is expected to have the smeltery construction practically finished this year. Experimental work is now being done on the production of copper, which metal is contained in considerable quantities in matte from the smeltery.

The Golden Cycle Custom Mill at Colorado City, Col., is said to be the largest mill in the world treating gold ores by a combination of roasting and cyaniding. Most of the Cripple Creek high-grade ores and concentrates are shipped to this mill.

Pyrites Mining at Mineral, Va.

SPECIAL CORRESPONDENCE

Pyrites mining at Mineral, Louisa County, Va., the principal mining activity of the district, has fallen off considerably since the armistice was signed. Mines having wide deposits, however, are still pushing work and making the most of the present market. The Sulphur Mining & Railroad Co., producing pyrites, is one of the oldest and largest in the district and is still producing at the rate of 100 to 125 tons of concentrates daily. Little development work is being done, most of the work consisting of recovering ore from old pillars and levels. The orebody has been worked to about 600-ft. depth.

The Arminius Chemical Co.'s mines are now operated by the Grasselli Chemical Co., which is pushing development. The main working shaft was destroyed by a cave-in in 1916, and only the 200 and 400 levels have been worked since then. A new 60-degree inclined shaft is being sunk in the foot wall and is down 750 ft. It was recently connected with the old workings on the 700 level, and ore is now being hoisted from it. The mine is being dewatered as the shaft progresses. The orebodies were opened to the 1,200 level in former times, and show no signs of diminishing, averaging 30 to 50 ft. in width.

The Boyd-Smith property, now owned by the Du Ponts, has been closed down, although there is a good showing of ore at depth. The lenses do not lie with regularity, as in the other properties of the district, and considerable underground prospecting must be done as development proceeds.

The Armour's began development of the Julia property in 1917, and found an orebody about 1,000 ft. long, but rather low in grade, and mined it to a depth of 150 to 250 ft. They erected a mill of 100-ton daily capacity, and during the war maintained a considerable production, but at present the mine is closed down and the equipment is being disposed of. The same interests also did considerable work on the adjoining property, known as the Kent, but never tried to make a producer of it, although some very good showings were found by a shaft sunk below the Iron Cap.

The labor situation has improved since the demand for men from nearby cantonments and shipyards ceased. Only local labor was used until last year, when Government competition forced operators to bring in men from outside, most of whom are still in the district. The Dolan gold mine, near Mineral, has been taken over by New York capital.

Chile Copper Co. Quarterly Report

Chile's report covering the first quarter of 1919 has only recently been published. On account of the condition of the copper market, operations have been curtailed to approximately a 50 per cent basis, the production for the quarter averaging a little over five million pounds per month. An average of 216,000 tons of ore per month, containing 1.57 per cent copper, was treated. The copper in stock increased considerably, only four million pounds being sold during the quarter out of a production of over fifteen million pounds. On this account, this and future reports will base the cost of copper on the number of pounds produced rather than on the amount sold, as has heretofore been the custom,

the copper on hand being inventoried at the cost price.

For the first quarter, the cost of producing copper, including depreciation and general expense, but excluding the cost of delivering and selling, excess profits tax, obsolescence, depletion of ore reserves, interest and amortization of bond discount, was 15.25 cents per pound, compared with 13.15 cents per pound for the last quarter of 1918. As the average price realized for copper during the quarter was 18.72 cents, the net profit on copper delivered showed a loss of \$74,276. Adding to this the accrued bond interest of the Chile Copper Co. and also taking account of other minor charges and credits, a loss of \$660,770 is shown for the quarter.

On account of the recent rise in the price of copper, the operations for the second quarter should show an improvement. With the new world price level in force, however, it is extremely unlikely that the company will ever be able to deliver copper in New York for six cents a pound, as originally proposed.

Cerro Gordo Mines Co.

The annual report of the Cerro Gordo Mines Co. for the year ended Dec. 31, 1918, shows that 2,166 tons of silver-lead ore, valued at \$70,528; 619 tons zinc ore, valued at \$10,128; and 9,389 tons of slag, valued at \$37,071, were produced during the year. Actual operations indicate a deficit of \$26,481, which was partly owing to the fact that 4,602 ft. of new development was accomplished at a cost of \$58,155. The sum of \$91,694 was charged off for depreciation and depletion.

During the previous year, the Jefferson orebody was cut off by a fault near the 900-ft. level, and although over 500 ft. of exploration work has been done, the faulted segment was not discovered. As the width of the brecciation is over 250 ft., it was decided to abandon operations in this part of the mine. The lower-grade ore deposits have until recently remained unexploited, but arrangements have been made to mine these ores under lease to H. R. Layng and associates, the lessees agreeing to erect a milling plant.

International Nickel Earns 2c a Share

Net earnings of the International Nickel Co. for the quarter ended June 30 showed a decline of \$2,825,651 from the corresponding period of 1918, and amounted to \$1,012,855. To this amount income from other sources was added, bringing the total to \$1,032,454.

Administration and general expenses aggregated \$129,612 and depreciation and mineral exhaustion \$486,294. After United States and foreign taxes were written off, profits were \$174,929, equivalent, after the payment of a preferred dividend of \$133,689, to 2c. a share, compared with \$1.02 a share in the same period of 1918. As no dividend was paid on the common stock, the balance carried forward was \$41,240. It is understood that the market for the company's products is improving.

Flotation of the Sulpho-Telluride Gold Ores of Cripple Creek is accomplished under difficulties, owing to the excessive amount of colloidal, clayey matter or primary slime present. To counteract the effect of this to some extent the impellers of the Minerals Separation machines are run at the high speed of 2,000 peripheral ft. per min. A mixture of 0.5 gal. Florence fuel oil and 0.11 gal. G. N. S. No. 8 is used per ton of ore.

BY THE WAY

Underground in New York

Another link between New York and Brooklyn was completed recently when the headings met in the new tunnel that runs from 14th St., Manhattan, to North 7th St., Williamsburg. The tunnel has been built by Booth & Flinn, Ltd., for \$6,639,000. It is 7,089 ft. long, 3,000 of which is under the East River. There are two separate tubes. The remaining bore will be holed through soon.

Miners Paid in Butter

Sixty thousand laborers in the Ruhr district of Germany have declared that they are willing to work overtime to produce sufficient coal to enable them to compensate Denmark for butter, according to a consular report. A part of the butter is to be divided among the laborers who do overtime work. In some of these mines the so-called butter divisions already work twelve hours out of the twenty-four, instead of eight, as formerly.

Oil for Foolish Virgins

The advertisement of a certain Western broker, who is dealing in oil stocks, is undoubtedly meant to catch the eye of the fair bargain hunter. "Oil Stock à la Department Store," it proclaims. "Monday being the favorite day for the department stores to startle you with 'bargains,' we decided just for once to copy their methods. As the department stores tell you sometimes that quantities are limited and that you must 'shop early' to get the plums, so do I tell you the same thing. Naturally, all the offers are subject to prior sale, and I think you had better wire." Then follows a list of bargains "for Monday only."

Metric and Poetic

"Uneeda Meter-Liter-Gram." The World Trade Club, of San Francisco, says so, and so does Henry Ford. This clinches the matter. The club, representing over 500 of San Francisco's leading manufacturing merchants, has begun its campaign for world-wide adoption of the metric units of measurement. Another of the club's slogans is "Get the Thing Done," and still another "Our Weights and Measures Made in Germany." The club argues that the weights and measures now used by Great Britain and the United States were forced upon England by the Hanseatic League centuries ago. It looked as if the club would have uphill work until Mr. Ford lent his assistance. The metric Ford taking Socony in liters will indeed be a subject fit for poets.

Lake Superior District's Importance

"The importance of the mining industry of the Lake Superior district," says Albert H. Fay, mining engineer in charge of statistics of the U. S. Bureau of Mines, "is evidenced by the fact that in 1917 there was employed in this district 29 per cent of the men in the metal mining industry of the United States. In 1916, the Lake Superior district employed 27 per cent. The Lake district produces 81 per cent of the iron ore of the United States, and employs 72 per cent of the men engaged in iron mining. The Upper Peninsula produces

27 per cent of the copper of the United States and employs about 25 per cent of the men engaged in copper mining. The total number of men employed in the Lake Superior district in 1917 was 42,500, and in 1916 the number was 41,840, as compared with about 200,000 employed in the metal mines of the United States."

Within the Law?

In a certain section of Cuba an engineer was endeavoring to obtain data sufficient for the rendering of an advisory report for a client who had stated, in a positive manner, though possibly in a Pickwickian sense, that he had in mind a straight development proposition among just a few friends and not any stock-peddling business at all. In the course of trips over an extended territory, accompanied by a guide best described as a smooth fixer from the south of Spain, it was noticed that in the description of claim boundaries in the denouncement papers Victor had adhered largely to the form "for the point of reference, an excavation commenced in that neighborhood; thence so many meters to the point of departure, etc." In order to get an idea of the relation of the boundaries to some scattered croppings of gossan, it seemed rather desirable to learn just exactly what excavation was referred to. So Señor de la Santissima Trinidad was asked to elucidate. The request provoked a flood of Andaluz meriment, the explanation being more or less as follows: "There is no excavation. That is what makes these claims more valuable, since they are so conveniently elastic. You see, Don Caramelo Rapadura is so busy that he leave all those things to his cousin; and Don Trompeta is so busy he tell me to go ahead and fix it. We have a good friend in the Montes y Minas office, who is so foolishly honest that I would not dare offer a bribe to him. Only, I say if he orders the survey too soon, people will suspect that he is get some money. Ha! ha! Ho! ho! Excuse me to laugh; but do you see the funny thing? Meanwhile we are pretending to wait for the survey, some — fool is sure to come digging around and looking for copper. By the time we get the *acciones* all sold we are ready to tell the government engineer where is the *punto de partida*."

Song of the Gold Dredge

Oh! this the whine of bucket line—the plaint of grinding gear—
The song that lifts through graveyard shifts by hour, day
and year—
The anguished grind as buckets bind in stress and strain
and shear:

"Gold—Gold—futile gold!
Of wasted steel a wealth untold,
Of useful steel the ransom made,
Of squandered steel the purchase paid!
For Gold—Gold—Gold!"

Oh! this the sob as winches throb and straining gussets
creak—
As bucket grates on tumble plates, as tortured bushings
shriek—
As motors come with rising hum to overloaded peak!

"Gold—Gold—pliant gold!
For steel of uses manifold—
For sturdy steel in endless loss—
For squandered steel the senseless dross—
Of Gold—Gold—Gold!"

W. H. GARDNER.

PERSONALS

H. N. LAWRIE, after serving as chairman of the Oregon Bureau of Mines and Geology Commission, has assumed the position of chairman of the Division of Precious and Rare Metals of the American Mining Congress in Washington. This division intends to investigate, in the interests of the mining industry, the economic problems in the gold and silver situation and the decrease in gold production.

Waldemar Lindygre, of the U. S. Geological Survey, is in San Francisco, Cal.

H. E. Ferguson, of the U. S. Geological Survey, is now at Manhattan, Nev.

William F. Ward has left Puerto Andes for Barranquilla, Colombia. Address care of Wesselhoeft and Weisner.

James E. Strong, superintendent of mines for the Sloss-Sheffield Co., Birmingham, Ala., has resigned.

George J. Young, Western Editor of *Engineering and Mining Journal*, spent a few days recently in Divide, Nev., and vicinity.

H. Daniel, consulting engineer, of Roumania, has removed to El Paso, where he will continue his engineering practice.

L. D. Cooper, manager of the mining department of the E. J. Longyear Co., made a visit recently to Denver and Telluride.

Ralph C. Nowland spent several days in July in Divide, Nev., inspecting the Belchers, Victory, and Divide Extension properties.

F. A. Beauchamp, of Hamilton, Beauchamp, Woodworth, Inc., has left for Lark, Utah, and expects to be away about ten days.

Heath Steele, head of the mining department of the American Metal Co., Ltd., has returned to the office after several months' absence.

George S. Backus, who recently resigned from the staff of the Minerals Separation, has become affiliated with the Oliver Filter Co., of San Francisco.

Amor F. Keene, of the Gold Fields American Development Co., Ltd., accompanied by John E. Teeple, is at the property of the American Trona Corporation, Trona, Cal.

O. Falkenberg, an electrochemist of Christiana, Norway, is en route to Clifton, Ariz., to examine copper properties in conjunction with John Christy, a mining engineer.

N. H. Emmons, 2d, after four months' professional work in Louisiana, has returned to the East, and for the remainder of August will be at Camp Wabasso, Laconia, N. H.

C. E. Leshar will be in charge of the mineral resources division of the U. S. Geological Survey while **E. S. Bastin**, head of the department, is visiting the Western offices of the Survey.

Milnor Roberts, dean of the College of Mines of the University of Washington, Seattle, Wash., has been examining mining properties in the Kootenay district, British Columbia.

C. M. Young has resigned as assistant professor of mining research at the University of Illinois to become professor and head of the department of mining engineering at the University of Kansas.

James A. Farrell, president of the U. S. Steel Corporation, will be honored by the directors of the McKinley Memorial by having a bust of himself placed in the memorial building at Niles, Ohio.



H. N. LAWRIE

C. W. Wright, manager of copper properties at Ingurtosu, Sardinia, Italy, is visiting relatives in the Michigan copper country. During the war, Mr. Wright was a captain of engineers in the Italian army.

Charles O. Olsen has opened a mining engineering office in the Hutton Block, Spokane, Wash. For the last two months Mr. Olsen has been making surveys and plats for the Gold Hunter Mining Co. at Mullan, Idaho.

John Uno Sebenius, general mining engineer for the Oliver Iron Mining Co., will represent the U. S. Bureau of Mines in an investigation of Swedish methods of handling iron ore. He has arranged to sail from New York for Sweden on Aug. 20.

B. L. Thane, of San Francisco, and **Howland Bancroft**, of Denver, announce the consolidation of their engineering offices, with headquarters in the Crocker Building, San Francisco. Mr. Bancroft will continue to specialize in the examination and valuation of mining property.

James Underhill has been appointed associate professor of mining in the Colorado School of Mines. Professor Underhill has been active in the Clear Creek district of Colorado since 1895, and is at present engaged in general engineering and surveying business in Idaho Springs.

E. D. Johnson has resigned as purchasing agent for the Calumet & Hecla company and will reside at Grand Rapids, Mich. Mr. Johnson was employed by the Calumet & Hecla for thirty-five years, with the exception of seven years when he was clerk at the Quincy company.

L. W. Trumbull, for the last six years State Geologist of Wyoming, and formerly professor of geology at the State University, has resigned to devote his time to private practice and his personal interests in the oil fields. After Sept. 1 his residence will be at 1835 Gaylord St., Denver, Col.

A. L. D'Arcy, consulting engineer for the Tonopah Divide, has resigned his position with that company in order to give his entire attention to the Goldfield Development and other interests in Goldfield, Nev. **E. V. Julian**, consulting engineer of the Goldfield Consolidated, will succeed him for the time being at least.

R. C. Gosrow has changed his address to Box 846, Seattle, Wash. Mr. Gosrow is now touring from Denver, Col., to Seattle by automobile where he expects to arrive about Sept. 1 and will open an office as electrometallurgist and metallurgical and sales engineer. Mr. Gosrow will be the agent for the Pittsburgh electric steel furnace in the territory west of Denver, Col.

Reginald E. Hore, mining geologist, who has since June, 1913, been the Editor-in-Chief of the *Canadian Mining Journal*, is retiring from active direction of that journal to take up professional consulting practice. Mr. Hore will continue to be associated with the paper as consulting editor. **F. W. Gray**, who has been associate editor of that publication at the office at Ste. Anne de Bellevue, will assume the editorship. Mr. Gray has been a regular correspondent since 1907.

Van H. Manning, the director of the U. S. Bureau of Mines, and **F. J. Bailey**, the new chief of the operations branch of the Bureau, are engaged in a general inspection tour of the Bureau's stations. The trip is being made on one of the Bureau's mine rescue cars. Pittsburgh, Birmingham, McAlester, Bartlesville, Petrolia (where the Bureau is experimenting with helium), Tucson, San Francisco, Portland, Seattle, Butte, Salt Lake City, and Minneapolis are the points to be visited. **O. P. Hood** is acting chief of the Bureau.

Lester S. Grant has been appointed professor of mining in the Colorado School of Mines, succeeding **Harry J. Wolf**, who resigned to accept the position of Assistant Editor of the *Engineering and Mining Journal* as has been previously announced. Professor Grant was graduated from the Colorado School of Mines in 1899, and has been a practicing engineer for thirteen years in Cripple Creek, two years in Peru as manager of the Inca Mine, and for the last five years on the Mother Lode of California and in oil operations in Wyoming.

SOCIETIES

American Chemical Society will hold the autumn meeting at the Bellevue-Stratford Hotel, Philadelphia, Pa., under the auspices of the Philadelphia Section, from Sept. 2 to 6, 1919, inclusive. The Philadelphia Section, situated near the center of chemical activities, is planning an extensive program, and it is expected that the meeting will be the largest in the history of the society. On Sept. 2 a council meeting will be held and the following day a general meeting will be called, at which the address of welcome will be made by Secretary of War Newton D. Baker. Excursions to industrial establishments will be made on Sept. 4. A banquet will be held on Sept. 5, and the meeting will conclude on Sept 6 with a boat ride to the industrial plants on the Delaware waterfront.

INDUSTRIAL NEWS

Jonathan Bartley, known as a manufacturer of crucibles, is now at 50 Church St., New York, as manager for George F. Pettinos, importer and refiner of graphite and foundry supplies.

Chicago Pneumatic Tool Co. announces the appointment of J. L. Canby as district sales manager at Chicago, succeeding Nelson B. Gatch, who has been appointed district sales manager at New York.

Jardine Machinery Co., dealers in used mining machinery and equipment, and for many years at 55 New Montgomery St., San Francisco, has moved its general offices and warehouse to 115 Main St., San Francisco.

Deister Concentrator Co., Fort Wayne, Ind., has issued a new political map of Europe, in colors, 14 x 22 in., showing the national boundaries as determined by the Peace Conference, in comparison with the old outline of all countries. This will be sent free on request.

N. S. Braden formerly sales manager, has recently been elected vice-president of the Canadian Westinghouse Co., Ltd., of Hamilton, Ontario. **H. M. Bostwick**, assistant sales manager, has been appointed sales manager, to fill the vacancy created by Mr. Braden's promotion.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces that **Arthur B. Reynders**, formerly director of production at the East Pittsburgh plant, has recently been made works manager of the East Springfield plant. **A. E. Kaiser**, who has been assistant to the director of production since 1912, succeeds Mr. Reynders as director.

Green Engineering Co., East Chicago, Ind., has appointed the firm of Bull &

Livensparger as its sales representatives in Chicago and northern Illinois territory. The new representatives will have charge of the Chicago sales office at 14 E. Jackson Block. **E. H. Bull** has been connected with the company hitherto as engineer and **D. A. Livensparger** as a member of the sales force.

Hazard Manufacturing Co., Wilkes-Barre, Pa., opened a new sales office and warehouse on July 1 at 1415 Wazee St., Denver, Col., in charge of Ernest P. Kipp, district manager. The Denver office will include in its territory the states of Colorado, Wyoming, Montana, Idaho, Utah, New Mexico, and the western portions of Nebraska and South Dakota. A full stock of wire rope and rubber insulated wire, including Olympic brand wire rope and mining machine cables, is carried at the Denver warehouse. Mr. Kipp was a captain in the U. S. Engineers.

Jualin Alaska Mines Co., 16 Rue de Turin, Brussels, Belgium, states that it is receiving many inquiries from American mining machinery companies, most of which are inadequately stamped; that while it in no wise objects to paying the extra postage, it thinks that possibly other European concerns, who may receive similar insufficiently stamped letters, will hold that American concerns should acquaint themselves with this matter. The company states that Belgian postal regulations require a five-cent stamp, and not a three-cent stamp, regardless of what information contrary to this may be given out from any other source.

TRADE CATALOGS

Pelton Centrifugal Pumps. Pelton Water Wheel Co., San Francisco and New York. Bulletin No. 11; 7 $\frac{1}{2}$ x 10 $\frac{1}{2}$; pp. 12; illustrated. Describes centrifugal pumps for irrigation and general utility.

Telsmith Jaw Crushers. Smith Engineering Works, 1154 32nd St., Milwaukee, Wis. Telsmith Bulletin No. 264; 7 $\frac{1}{2}$ x 10 $\frac{1}{2}$; pp. 15; illustrated. This catalog describes stationary and portable jaw crushers.

Forgings. Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Bulletin 1,538; 8 x 10 $\frac{1}{2}$; 18 pp.; illustrated. Describes the operations in the manufacture of forgings, which for ordinary shapes can be made up to forty tons' weight, and the maximum in shafts is 40 in. in diameter and 60 ft. long.

Osgood Steam Shovels, Cranes, Dredges, and Similar Appliances; Osgood Co., Marion, Ohio. Catalog; 8 $\frac{1}{2}$ x 11; pp. 31; illustrated. Descriptive of steam shovels of various types, ranging in capacity from $\frac{3}{4}$ cu. yd. to 6 cu. yd. Locomotive cranes, railroad ditchers, unloaders and dredges are also described, with illustrations.

Oliver Filters. Oliver Continuous Filter Co.; Bulletin 12; 6 x 9; 46 pp.;

illus. A general description of the use, construction and operation of Oliver filters, including a list of parts, with detailed drawings of each, is given in the first part. A chapter is devoted to the art of filtration, with a discussion on the various general types of filters classed under four heads: gravity, press or squeeze, positive pressure, and vacuum filters. Other auxiliary equipment of the company also described includes vacuum pumps and compressors, motor-driven centrifugal pumps, and sand-table filters. Several installations of the sand-table filters are illustrated, one being that at Nitrate Oficina, Chile, and another illustration shows an airplane view. The remaining pages are devoted to special filters for laboratory and acid-proof requirements. A partial list of Oliver installations is given in the remaining pages.

NEW PATENTS

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

Drill—Percussion Drill. Lewis L. Scott, St. Louis, Mo. (U. S. No. 1,308,811; July 8, 1919.)

Electric Furnace for Fusing Metals. John Thomson, New York, N. Y. (U. S. No. 1,308,877 and 1,308,880; July 8, 1919.)

Flotation—Apparatus for Concentrating Ores. Fred De Mier, Picher, Okla., assignor to himself and Arthur E. Bendelari, Picher, Okla. (U. S. No. 1,308,049; July 1, 1919.)

Gases—Apparatus for Electrical Treatment of Gases. Arthur A. Schmidt, Los Angeles, Cal., assignor to International Precipitation Co., Los Angeles, Cal. (U. S. No. 1,309,221; July 1, 1919.)

Mechanical Shovel. Fred Lerch, Virginia, Minn. (U. S. No. 1,307,448; June 24, 1919.)

Mine-Car-Wheel-Attaching Device. John H. Rutherford, Knoxville, Tenn. (U. S. No. 1,308,996; July 8, 1919.)

Molybdenum—Separation of Molybdenum Ores. Tormod Reinert Förlund, Haugesund, Norway. (U. S. No. 1,308,735; July 1, 1919.)

Open-Hearth Furnace. George F. Downs, Buffalo, N. Y. (U. S. No. 1,308,404; July 1, 1919.)

Scrap—Apparatus for Recovering Metal From Scrap Material. John W. Brown, Lakewood, Ohio. (U. S. No. 1,301,374; Apr. 22, 1919.)

Shoveling Machine. Frank M. Hewitt, Butte, Mont. (U. S. No. 1,304,683; May 27, 1919.)

Steel—Producing Steel and High-Phosphorus Slag. William R. Walker, New York, N. Y. (U. S. No. 1,299,072; Apr. 1, 1919.)

Tin—Process of Extracting Metal Values. Walter Zacharias, Neville Island, Pa. (U. S. No. 1,304,842; May 11, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief
of Interest to Engineers
and Operators

SAN FRANCISCO, CAL.—Aug. 6

A decision has been handed down by the U. S. Circuit Court of Appeals in the case of the Petroleum Rectifying Co. vs. the Reward Oil Co. The court holds that the patented process of refining petroleum known as the Speed and Mitchell process has been infringed upon, and the court has issued an injunction restraining the Reward company from further use of the process and has ordered an accounting made to the owners of the process. Similar suits are now being prepared against other large oil refiners by the Petroleum Rectifying Co., which will endeavor to secure payment of royalties by all the concerns which have used this patented process.

GRASS VALLEY, CAL.—Aug. 7

Agreement Between the Mine Workers' Protective League of the Grass Valley district and the larger mining companies of the district as finally adopted on July 26, following the strike in June, is here given in full as signed by the companies:
"To aid our surface and underground men we believe that the following proposition, to remain in force for the period of one year from date, will help the living conditions of our miners as well as make it possible for the gold-mining industry of the district to continue.

"1. We will abolish the bonus system.
"2. We will establish a free market at no cost to the purchaser or seller. This will eliminate the middleman and his profits. This free market will be able to supply goods to the consumer at the lowest cost, overcoming expensive hoarding, delivery, and service costs. The free market will handle boots, drygoods, meats, groceries, and, in fact, goods of every description.

"3. We ask that hereafter should any grievances arise that these be taken up with the management and discussed freely and in a proper manner before any drastic action be taken. We welcome the appointment at each mine of a committee of three of our employees, to be chosen by you, to bring to our attention any grievances that may arise. Such committee to hold office for six months.

"4. Whenever an employee has worked for us continuously for three months he shall be paid 10 per cent. of the total wages earned by him during that period. Absence through leave or sickness will not cause the forfeit of this percentage wage increase.

"5. As a proof of our sincere desire to aid you we will pay on next pay day one-half of the wages lost on our employees, provided that you return to your former work promptly after the settlement of this matter.

"6. We will pay time and a half for overtime and time and a half for Sunday work with the exception of routine and day work, such as Sunday work in mill, cyanide plants, pumppens, engineers, watchmen and shaft sinking in mines conforming their work entirely to development.

The agreement is signed by J. B. Bennett as president and F. C. Osborne as financial secretary of the Mine Workers' League; George W. Starr for the Empire Mines Co.; J. A. Powers for the North Star Mines Co.; J. A. Fulton for the Idaho-Maryland Gold Quartz Mining Co.; and E. R. Abadie for the Golden Center Mining Co. The managements of the Sullivan Allison Ranch and the Norabagua mining companies have been approached with the object of their also becoming parties to the agreement.

MEDFORD, ORE.—Aug. 8

The War-Minerals Relief Commission arrived in Medford, Ore., from San Francisco July 27, and began its session July 28, consuming the entire week in taking testimony in the cases of 173 applicants for relief in the Medford district, which includes all of southern Oregon and northern California. The largest claim to come before the commission was that of Dr. J. P. Reddy, of Medford, who sought to recover \$80,000 losses in chrome mining in Siskiyou County, Cal. The next largest was that of the Man-

guese Metal Co., of Tacoma, Wash., for \$85,000.15, which operated in the manganese deposits at Lake Creek, east of Medford. In his statement, Herbert Brewitt, president of the company, sets forth that the money was expended in equipment, erection of a reduction plant, building roads, ditches and dams, and in purchasing the property in which the ore was located. Other claimants for large amounts were Malme & Reichman, of Fort Jones, chrome miners in Siskiyou County, Cal., in the sum of \$29,435.66, and a clay of the Superior Co., chrome operators, in Coos County, Ore., for \$27,516.

H. M. Parks, director of the Oregon Bureau of Mines and Geology, appeared before the commission in behalf of the Oregon operators, and filed a communication, showing how the mineral production in Oregon was increased by direct Government solicitation. It reads in part as follows:

"As director of the Oregon Bureau of Mines I am appearing before you to make clear the part taken by the bureau and the members of its staff in encouraging and stimulating the development of new properties and the increase of production of war minerals during certain periods of years 1917 and 1918. In October 1917, I received a letter from George Otis Smith, Director, U. S. Geological Survey, a copy of which is inclosed, in which he requests me to exert every effort to increase the domestic production of chrome ore. During the month of May, 1918, I had occasion to visit Washington, D. C., and called upon Mr. W. K. Lethbridge, the War-Minerals Import and Export Committee, who called my attention to the impending crisis in war minerals, due to the shortage of ships for importing such materials from foreign countries, and requested me to assist with the greatest speed the development of all manganese and chrome properties in Oregon.

"On account of this critical situation in connection with the war-minerals demand, I ordered the field staff of the Oregon Bureau of Mines to do everything possible to encourage new development, and speed up the production of manganese and chromite. To this end the staff of the bureau visited many manganese and chrome properties in Oregon and came in direct touch with the miners and prospectors both by correspondence and personal conferences. In all cases where in our judgment an extra effort was warranted, we requested on the behalf of the Government the speeding up of production and development.

"This activity on the part of the staff of the Oregon Bureau of Mines caused many prospectors and miners to engage in an effort to produce these war minerals, as is shown by the fact that Oregon's production of chromite in 1918 over 1917 increased from 7,500 tons to 10,000 tons, and the production of manganese increased from 26 to 59. Many others engaged in development work, but did not have sufficient time before Nov. 11, 1918, to bring their properties to production."

BUTTE, MONT.—Aug. 8

Hearing of the Supplemental Suit of the Elm Orlu Mining Co. against the Butte & Superior company, involving ownership of a portion of the Rainbow vein beneath the surface of the Black Rock claim of the latter, was devoted during the first week of testimony of experts for the plaintiff, who endeavored to show a continuous apex of the Pyle vein within the confines of the Elm Orlu claim. If this apex be proved, by virtue of the prior location of the Elm Orlu claim over the Black Rock, the Rainbow vein becomes the Pyle below its point of union with the latter, at about the 100-foot level of the Elm Orlu claim, a ruling made by Federal Judge G. M. Bourquin at the original hearing of the Elm Orlu case. The outstanding feature of the evidence thus far is that though the apex of the Pyle vein is broken up into a number of strands, they are easily recognizable and all combine into one fissure before a union is had with the Rainbow vein.

The defense of Butte & Superior has not yet been outlined, but it is believed that an effort will be made to correlate some of the Pyle apices strands with northwest veins, on a claim that these strands are not part of the Pyle vein. Counsel for plaintiff stated that since the original hearing approximately 500,000 had been spent in proving and working other development necessary to establish its case. It was also stated that both sides had driven about six miles of crosscuts, drifts and raises.

It is expected that the presentation of evidence will require another week. Each side by stipulation will present the evidence of five geologists and one practical mining man. For Elm Orlu the following among others, will be heard: Horace V. Winchell, of Minneapolis; Professor J. F. Kemp, of Columbia University; Dr. C. K. Leith, of the University of Wisconsin; W. E. Fisher, of San Francisco; J. F. Searies, Jr., of San Francisco, and Russ J. White, of Wallace, Idaho. For Butte & Superior, among others, are the following: Hart Lurch, of San Francisco; Professor William H. Emmons, of the University of Minnesota; Walter H. Wiley, of Los Angeles; Percy Earl, of Seattle; Carl H. Hand, of Los Angeles, and Samuel Barker, of the engineering firm of Barker & Wilson, of Butte.

SALT LAKE CITY, UTAH—Aug. 7

The Bureau of Mines Rescue Car No. 11 will be stationed at Lingham Canyon on the Bingham-Caribou siding at the Utah Copper Co.'s warehouse until Aug. 16.

A Reduction of Freight Rates to Salt Lake City is being sought by the Commercial Club, which is seeking to raise a fund of \$100,000 for use in the recently started campaign to bring about the proposed reduction. It is sought to lower the rates raised during the war, if not to the pre-war standard, in any case to some intermediate figure, and also to get the Salt Lake City same schedule of rates as that in force at Ogden, which is a common point on the Southern Pacific and Union Pacific railroads in regard to ore shipments, such a reduction would effect chiefly ores from Nevada and outside camps coming into Utah, but an effort is also being made to obtain a reduction in rates on ores from Utah camps.

DENVER, COL.—Aug. 8

Boulder County Metal Mining Association held a joint meeting on July 30 with several other commercial and industrial organizations at which it was decided to hold a Boulder County Silver-Mining Jubilee on Sept. 1, to commemorate the discovery of silver at Caribou in 1869. An elaborate program is planned.

Upon Motion of the Colorado Metal Mining Association and Boulder, Gilpin, Clear Creek, Park and Summit County associations, the Denver District Freight Traffic Committee will hold a hearing on the subject of a lower through rate from Salt Salida, so as to force the Pueblo smelter of the American Smelting & Refining Co. to compete with the Salida plant in buying ore.

At Cripple Creek, a contract has been entered into between the Blue Flag Gold Mining Co. and the War Eagle Consolidated Mines Co., which it is expected will prove of benefit to all property owners of the western section of the district, especially those on Bull, Raven and Gold hills. Work was begun on Aug. 1 on one 1,800 feet of the Blue Flag shaft from which point a drift 450 ft. long is to be driven on the Happy Year vein to connect with the Opheila or Moffat tunnel. Work will then be continued to a point directly under the Scott shaft of the War Eagle company. The shaft at present is only 550 ft. deep, and connection will be made by raising. When this is completed the ventilator will be improved and the Happy Year group will be further developed. It is planned to bring the Moffat tunnel, at present 1½ miles long, into use again as a public trans-

mining and drainage tunnel. This will greatly stimulate leasing. To encourage lessees, a reduced scale of royalties will be introduced.

Many Test Holes for Oil have been drilled in various parts of Colorado during the last year. Practically all of these have been in "wildcat" territory. Following is a list of some of the most important developments that have been undertaken recently: The Roxana Petroleum Co. recently let a contract to the Keough-Hurst Drilling Co. to drill a test hole on the Wellington structure, three miles west of Dulzer Station, near Fort Collins. The Allied Oil & Leasing Co. is drilling below 750 ft. near Eads, Kiowa County, Col. This well had several showings at lesser depths last year. It was originally started by another company. The Black Canyon Oil & Gas Co. abandoned as a dry hole its test near Delta, and is moving its rig to Texas.

The Chandler Creek Oil & Gas Co. is drilling below 1,300 ft. near Canyon City; Continental Oil Co. on Rathburn Dome near Loveland, in Larimer County; Fry Creek Oil & Gas Co. below 520 ft. four miles west of Loveland; El Paso Oil Co., about 4 miles east of Colorado Springs, near Rush; and the Eman Oil Corp. around 1,000 ft., near Watkins, in Adams County, twenty miles northwest of Denver.

The Flarler Oil & Gas Co. is drilling around 3,000 ft. near Flarler, in Kit Carson County. The Grover Oil & Gas Co. is drilling below 945 ft. near Grover, in Lincoln County. Kaywood Oil & Gas Co. has started a new hole on the Miller ranch, thirty miles south of La Junta.

The Lincoln County Oil & Dev. Co. is drilling at Bovero, near Hugo, in Lincoln County, and the Monarch Oil Co. in Pueblo County. The Morgan County Oil & Gas Co. will resume drilling soon near Morgan, where it lost two wells on account of acid sand. The Nee-No-Shee Oil Co. is drilling below 940 ft. near Eads, Kiowa County. The Ranger Oil & Gas Co. is drilling below 900 ft. south of Rocky Ford. The Red Rock Oil & Gas Co. has encountered gas showings and salt water south of La Junta. The Sterling Oil Co. has resumed work below 3,750 ft. near Padroni, fourteen miles north of Sterling.

AUSTIN, TEX.—Aug. 8

Mineral Royalty Act was signed by Governor Hobby at Austin, Tex. on July 31. This provides that owners of land purchased from the state with the mineral rights reserved shall be allowed one-sixteenth royalty on oil and gas produced. The act revising the state mining laws, as they apply to hard minerals, to conform to the Federal laws, was also signed.

Blue Ridge Farm Bill, passed recently by the Texas Legislature, instructing the Prison Commission and Governor to enforce the state's option to buy the Blue Ridge prison farm, was signed by Governor Hobby. This property is a prospective oil land of considerable value, the oil having been discovered after the state acquired the option.

Raise in Wages of 50c. per day for oil-field workers in southern Texas and Louisiana was agreed upon July 31 at a meeting of executive committee of Texas Gulf Coast & Louisiana Oil & Gas Association. New wages for 10-hour shift are as follows: Drilling crews' drillers, \$275 per month; helpers, \$47.5 per day; derrick men, \$6; firemen, 12 hours, \$5.25, less than 12 hours, \$4.75. Production operators: firemen, 12 hours, \$5.25; pumpers, 12 hours, \$5.25. Other work, such as pipe gangs, foremen, \$6; derrickmen, \$5, helpers, \$4.75.

State Will Cancel Leases in the Goose Creek field on which the lessees have failed to do the work required by the terms of the leases. Some of these tracts are of considerable value. Other leases on tracts on Matagorda Bay, in the Big Hill district, will also be canceled. After cancellation of these leases new surveys will be made, and the land will be offered for sale by advertisement and bonus under the new act passed by the special session of the Legislature. The list of state lands that will be sold Sept. 1, comprising about 2,000,000 acres, will be ready. All of this land can be acquired without conditions of actual settlement, and this will probably be the last big sale of land conducted by the state.

Rules for Conservation of Oil and Natural Gas have been issued by the Texas Railroad Commission, after an open meeting with the producers. Practical application of the rules will be made, and to further this work the commission has already appointed one conservation expert, to be stationed first at the Eureka-

nett field. Under the rules relative to gas "waste" is defined as follows: Permitting the escape of natural gas into the open air from a stratum recognized as a natural gas stratum; drowning with water a stratum capable of producing gas in commercial quantities; underground waste; the burning of gas that could be utilized or kept in the ground; the wasteful utilization of gas (four flammable only allowed to a derrick) and burning it between 8 a. m. and 5 p. m. unless regulated on a meter.

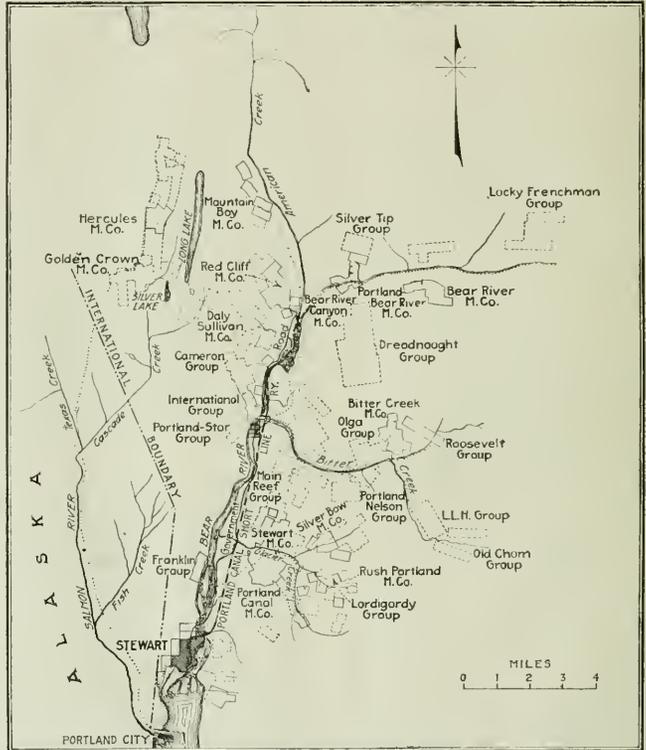
DULUTH, MINN.—Aug. 8

The Strike of Shipmen on ore-carrying railroads on Aug. 4 spread to the coal docks on the following day. The Alouze ore docks of the Great Northern Ry. Co. shut down Aug. 6 on account of the refusal of the demand for \$1 per day wage increase. Possible demands by the men on the docks of the Duluth, Missabe & Northern and the Duluth & Iron Range railroads were forestalled by the Railroad Administration

with nearly two-thirds of its receipts of the year in the treasury. It is an active organization and is taking part in civic and general engineering affairs. Its organization, a year ago, was owing in a large part to the work of the retiring president, W. G. Swart. Mr. Swart's valedictory address was on the education of the engineer, in which he urged the need of a broad culture in the humanities, in contrast to a strictly technical training. The meeting, besides the regular election, was devoted to the Duluth-to-the-ocean deep waterway. The club has decided to take up the subject of forest fire protection in northern Minnesota, and to study the engineering needs of Duluth from the city-planning standpoint.

BIRMINGHAM, ALA.—Aug. 9.

The Tennessee Coal, Iron & Ry. Co.'s ore mining division on July 29 went back to the ten-hour day, with time and one-half for all time over eight hours, and was fol-



PART OF PORTLAND CANAL MINING DIVISION, BRITISH COLUMBIA. SALMON RIVER DISTRICT LIES IN UPPER LEFT CORNER. Reproduced from Bulletin of British Columbia Department of Mines

by closing down those docks on the night shift. Beginning Aug. 7 the day shift started to clean up the boats at the docks, and when this is done the tie-up will be complete. Open-pit mines and washing plants shut down on Aug. 7. Beginning Aug. 8, underground mines began to stockpile their ore. It is estimated that the tie-up may last for thirty days.

Duluth Engineers' Club held its annual meeting on Monday, Aug. 1, resulting in the election of the following: President, Colonel F. A. Pope, U. S. Engineers; vice-presidents, W. A. Clark, chief engineer Duluth & Iron Range Railway, and J. L. Pickles, resident engineer Canadian Government Railways; secretary, W. H. Woodbury, valuation engineer Duluth, Missabe & Northern Railway; treasurer, A. U. Shipman, assistant city engineer; representative on Minnesota Joint Engineering Board, W. G. Swart, manager Messers Syndicate directors, W. G. Swart, J. R. Stack, W. H. Hoyt and F. E. Downing. The club closes its first year with a membership of 136, and

loved in this move on Aug. 1 by the Republic Iron & Steel Co.'s Raimund mines. The eight-hour day has been in force since the latter part of April and has proved a decided failure; the opposition of the men to the shorter day being the principal cause for this failure. The longer day will mean a considerable increase in wages, and as a result of the change all mining companies on the western end of Red Mountain have had large additions to their crews, and considerable increase in tonnage is noted. The clerical department of the Bessemer division of the Tennessee company is expected a 15 per cent wage increase during August.

The strike of the railway shippers in the Birmingham district is causing no little concern, and embargoes on iron and steel are expected to spread to all roads quickly, some shipping already having been interfered with. Though the bins are filled at the furnaces, a steady supply of raw materials is necessary, and, unless there is some improvement in the railroad situation

in the next 36 or 48 hours, it is probable that some of the furnaces will have to bank fires. As a result of the strike, the ore mines are being affected by a car shortage, several companies reporting no empties received recently.

With iron up \$1 a ton, sales in the district are still for third-quarter delivery, with an occasional sale for fourth quarter. As yet no orders for 1920 delivery are being accepted, though many inquiries are being made.

Suit has been brought by Warwick Saunders against R. N. McDonough, J. J. Shannon, J. H. McDonough, W. A. Fowler, Self-Fluxing Ore & Iron Co., W. H. Coverdale, Standard Steel Co., and the Gull States Steel Co., claiming \$5,000,000 for the alleged conversion of 9,970 shares of the Self-Fluxing Ore & Iron Co., with interest to date and damages for their retention. The complainant was interested with the defendants in the organization of the Self-Fluxing Ore & Iron Co., and alleges that, after he and the defendants had secured an agreement with W. F. Aldrich to convey to them some ore lands, Aldrich refused to carry out the agreement, but later carried it out with defendants without consulting the plaintiff or giving him a one-fifth share of the company's stock, as previously agreed upon.

The tonnage tax provided in the bill before the Alabama Legislature has been changed from 5c to 2c per ton on coal, but remains at 3c per ton on iron ore. This bill has passed the House and is now before the Senate. Every effort to prevent its passage is being made by the Birmingham district.

HOUGHTON, MICH.—Aug. 9

Student Miners are now established in regular classes in the Calumet & Hecla mine as part of a general educational campaign to develop better miners. Other mines are planning to adopt this practice. Young men, nineteen to twenty years old, are given machine drills and put in charge of an experienced miner. While learning the students are paid good wages, with the understanding that as soon as they are experienced enough to work without instruction they will be given a contract such as is given to any other miner.

Stockholders of New Arcadian and New Baltic Copper Companies are to meet Oct. 7 at Houghton, Mich., to take action on a unanimous vote of the directors looking to a consolidation of the two properties. The new company is to have an authorized capital of 250,000 shares, par \$25, which will equal the aggregate capitalization of the New Arcadian and New Baltic. Of the 44,042 shares of the new company, 44,042 shares will be issued to New Baltic stockholders, 150,000 shares to New Arcadian stockholders, and 42,958 shares will be retained in the treasury, with 13,000 remaining shares held as unissued stock. The name Concord Consolidated Copper Co. is proposed for the new company.

VANCOUVER, B. C.—Aug. 7

In the Salmon River District, a map of which was published in the last issue, development of the various properties is progressing. On the Premier, the No. 2 tunnel crosscut is still advancing in ore. A three-story boarding house is being built,

and, when the road is complete, machinery will be hauled up hill. The sawmill has been moved to the lower tunnel and is cutting lumber. Work has started on the Fresh Extension, situated between the Premier and Bush mines. A camp is being established, and prospecting by surface cutting will be done. O. E. Bush and Grant Mahood recently bought this ground from Lake and O'Leary. At the Bush mine, the open crosscut has been advanced 100 ft. across the orebody. On the Big Missouri, work of exposing the orebody by surface cut is continuing. A large development program is being formulated by the management. At the Forty-nine, a tunnel has been started on the ore. The Mineral Hill people will build a warehouse at Hyder and a camp at the mine.

TORONTO, ONT.—Aug. 6

Reports of Gold Discoveries at Copper Lake, situated east of the Pine Flon copper mines and north of The Pas, have been confirmed by Dr. R. C. Wallace, commissioner for northern Manitoba. The find was made by Jacob Cook, who was engaged in development work on the claim of J. P. Gordon, formerly chief engineer of the Hudson Bay I. R. The vein is 4 ft. in width, consisting of quartz veinlets and greenstone schist, which pass very coarse gold. Dr. Wallace states that he "has never in his experience seen gold specimens to equal those brought to town. It is actually all the tenacity with which the quartz, owing to the quartz layers together." Boats leaving The Pas for Sturgeon Landing were crowded with prospectors.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ARIZONA

Cochise County

CALUMET & ARIZONA (Bisbee)—July production of copper, 4,302,000 lb., of which 4,234,000 lb. were available for company; June, 4,142,000 lb. for company; July, 1918, 4,214,000.

Gila County

OLD DOMINION (Globe)—July production of copper, 1,629,000 lb.; June, 2,015,500; July, 1918, 2,523,000. New orebody struck in crosscut from A shaft on 18th level north. Thought continuation of one found on 12th level. Heading 12 ft. in ore, with hanging wall not reached. Ore is chalcocite and bornite, and runs 5-6 per cent copper. New crosscut started 100 ft. west on 18th or lowest level, also one on 16th level 200 ft. above. Company, with other producers in district, increased wages of miners \$1.25 per day, muckers 50c. per day, with corresponding increases for surface men.

INSPIRATION (Inspiration)—July production of copper, 6,000,000 lb.; June, 6,300,000; July, 1918, 9,000,000.

MIAMI COPPER (Miami)—July production of copper, 4,113,452 lb.; June, 4,385,865; July, 1918, 4,734,082.

Pima County

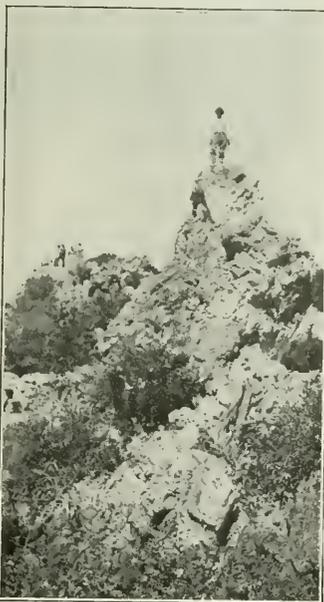
NEW CORNELIA (Ajo)—July production of copper, 3,240,000 lb.; June, 3,410,000; July, 1918, 3,900,000. Of July output, cathodes composed 2,736,000 lb.; smelting ore, 198,000, and cement copper, 306,000.

Pinal County

ARIZONA HERCULES (Kevin)—Cloud-burst on Aug. 1 carried out company's tailings dam and did considerable damage to water line. Mill lost about two shifts.

BUNKER HILL COPPER (Winkelman)—Preparing to develop holdings extensively. High-grade copper-silver ore recently uncovered in shaft being shipped to El Paso. Sinking will be continued to 500 ft. and drifting done at 200 and 400 levels. A 7 x 9 Sullivan compressor recently purchased. Development to be directed by G. G. Wald, formerly with Ray Consolidated Copper Co.

DRIPPING SPRINGS COPPER (Winkelman)—Planning to resume operations at property in Dripping Springs district. New Sullivan 10 x 10 compressor purchased of



OUTCROP OF A CALIFORNIA MAGNESITE DEPOSIT

Kelvin Lumber & Supply Co. Development will be in charge of Joe Bandauer. **SUNSET COPPER (Winkelman)**—Shipping ore from property in Copper Creek district. George Parsons and Jack Steele, of Hayden, are principal owners.

GRAND PACIFIC (Superior)—Thirty-two claims belonging to Consolidated Holding & Trust Co. purchased by Grand Pacific Copper Co. Superior. Group long known as Dags group and was located in 1899 by A. J. and H. R. Dags. Monte Carlo and Touchnot claims have been large producers of silver in past. C. C. Steinbremer, president of Galena Silver & Copper Co., is president of purchasing syndicate, which is made up of Pennsylvania and New York capitalists. Walter Harvey Weed is consulting engineer and A. C. Denton general manager. New company plans to install central electric power plant for operation of both properties.

CALIFORNIA

Amador County

CALIFORNIA SLIME CONCENTRATING (Jackson)—Flotation plant being added to equipment.

EDWARD HAWKE and associates, of San Jose, Cal., operating small dredge on Hawke ranch, on Deer Creek, west of Nevada City. Working old mining debris.

Nevada County

JOEL BASTIAN (Grass Valley)—Purchased by Idaho-Maryland company.

GRASS VALLEY BULLION EXPLORATION (Nevada City)—Articles of incorporation filed with county clerk. Capital stock \$1,000,000; shares of \$1 par value. Incorporators E. H. Armstrong, George Mainhart, John T. Leatham, Frank Mainhart, and John G. Curtis. Will engage in general mining business.

Plumas County

ENGELS COPPER (Engelmine)—Borings have recently shown ore-body persists 600 ft. below present mine workings.

San Francisco County

HOFF MAGNESITE (San Francisco)—John D. Hoff, president, granted patent No. 1,507,794 for manganese kiln, specifically designed for calcining magnesite to be used in making plastic flooring and stucco work. Plants at Red Mountain and Oakland running and shipments going East. Selling at small margin of profit. Users low in stock, and apparently fear imposition of protective tariff, according to Mr. Hoff.

Office of company is at 333 Monadnock Building, San Francisco.

Missouri County

MAMMOTH COPPER (Kennett)—Miners' wages increased to same scale as was recently adopted by Bully Hill mining company. Announcement of this increase in wages made voluntarily by both companies.

Siskiyoun County

BOXBURY MINING (Yreka)—Application made to State Water Commission for water rights of 60 cu ft. per sec. from Canyon Creek and 65 cu ft. per sec. from Honey Creek. To make this water available at mine requires construction and repair of ditch lines at estimated cost of \$80,000. Advantages to be derived are all-year mining and larger-scale operations than are possible at present.

Yuba County

SMITHERS (Brown's Valley)—Shaft re-enters and stamp mill being repaired for early resumption of operations.

COLORADO

Clear Creek County

PRIMOS CHEMICAL (Empire)—Operations resumed on small scale at molybdenum mine shut down several weeks ago. Only development work at present. Mill not running.

Dolores County

MARMATITE (Rico)—Development of Enterprise vein of Pro Patria mine begun. **SILVER GULCH** (Rico)—Building concentrator to treat low-grade silver ore from Rosebud mine and dump. At present only high-grade ore being produced.

WELLINGTON (Rico)—Expects to start up. Shut down during winter because of depressed market for copper.

Ouray County

CAMP BIRD (Ouray)—Important decision rendered by county court reducing taxation value from \$400 to \$21 an acre.

Guadalupe Leasing (Ouray)

Crawford, York and Aderson have recently re-discovered old Guadalupe orebody in old workings of mine. Full extent of discovery not yet ascertained.

Park County

LONDON (Alma)—Development work resumed in South Side tunnel. At present rate vein will be encountered within thirty days. Also over thirty groups of lessees working.

San Juan County

GOLD KING EXTENSION (Silverton)—Mill at Gladstone again in operation. Capacity, 500 tons daily. Machinery recently installed includes Gates gyratory crusher, amalgamating tables, Card tables and tube-mill equipment. Company includes former Gold King Mining Co., which was consolidated with it.

San Miguel County

GOLD RUN PLACER CO. incorporated by John L. McManis, W. J. Kennedy, and R. C. Wood to treat sands of San Miguel River if they prove worth milling after testing. Lease executed on river sands from Pandora to Keystone hill. Test plant now working at Pandora.

METALS EXPLORATION (Telluride)—Subsidiary of Smuggler-Union Mines Co., of Telluride, has recently taken over Genessee group of mines on Red Mountain. Genessee formerly heavy producer.

Summit County

QUEEN OF THE WEST (Kokomo)—This group on Jacque Mountain in Ten-Mile district recently examined by engineers representing Chicago and New York interests. Has produced over \$2,000,000. Controlled by John W. Springer, of Denver.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—New flotation plant will be running in September, according to present plans, and will handle all conglomerate sands. Steel work completed.

ISLE ROYALE (Houghton)—Getting back old miners faster than other producing in copper in August. Production coming from three shafts. Three-head mill running full time, including Sunday. Further increase in rock output will mean shipments to Point Mills.

WINONA (Houghton)—Surface plant in good condition despite long suspension of operations. Will work three shafts at once, deepest being 1,500 ft.

QUINCY (Quincy)—Changing mill over to utilize recent metallurgical improvements. Ball mills and slime tables added.

Gogebic Range

DAVIS (Ironwood)—Miners resumed

work Aug. 4 after four months' shutdown caused by fire in shaft. Shaft now repaired and water lowered to within 50 ft. of 21st level.

DUPONT POWDER (Bessemer)—Ding sued for \$6,000 by two miners who claim that while working at Newport mine in September, 1918, they were seriously injured by premature blast caused by defective fuses.

PLYMOUTH (Wakefield)—Pit being widened to north, one shovel stripping there. 300-ton shovel down in pit stripping on south side.

Gogebic Range in Wisconsin

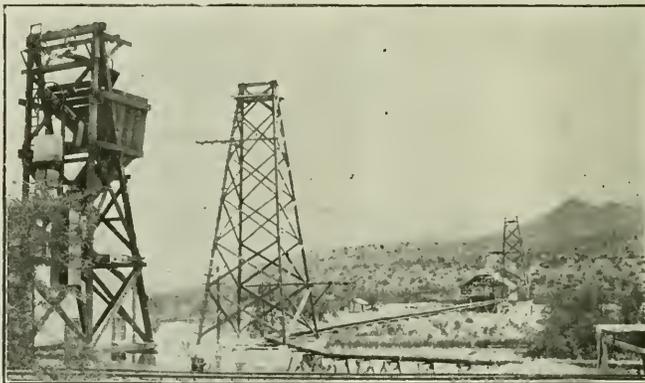
PLUMMER (Hoyt, Wis.)—Republic Iron & Steel Co., has had this property for about two years and is spending much money in exploration. Several diamond drills working on deep holes from surface and underground workings unwatered. Now planned to sink shaft from 1,300 level to 1,500 level.

MINNESOTA

Mesabi Range

BILLINGS (Chisholm)—Tod-Stambaugh made first shipment from new property Aug. 1. About eight gangs on development work. Stockpiling two grades for direct shipment via Great Northern.

DUNCAN (Chisholm)—Steam shovel working on old development stockpile July 26. Property opened by Oliver company in 1912 closed down in 1914 because off-grade. Previous shipments from stockpile hand loaded.



ARIZONA HERCULES CO.'S PUMPING PLANT AND PIPE LINE ON GILA RIVER. WATER LINE ON AUG. 1 WAS DAMAGED BY CLOUDBURST

HARTLEY (Chisholm)—Oliver Iron Mining Co. has removed shovels which have been loading ore to unstripped portion of pit and will continue to employ full force during failure of shipping facilities.

LEONIDAS (Eveleth)—New wash concentrator of Oliver Iron Mining Co. completed at cost of \$200,000. Trial run being made.

WEBB (Hibbing)—Winston-Deare contractors working clean-up shovel on open pit section of property. Night shift resumed underground, with small force, Aug. 3. Shenango Furnace Co., operators.

MONTANA

Beverhead County

BOSTON & MONTANA (Wise River)—Ore continuing in Idanha raise. Crosscut from upper Idanha tunnel in softer ground.

Jefferson County

LEGAL TENDER (Clancy)—Power line constructed. Car of ore ready to ship.

LIVERPOOL (Clancy)—Re timbering shaft still in progress. Electric power available. Expect to be mining within ninety days.

ANGELICA (Wheeler)—Large body of silver-lead-zinc ore opened on lower levels and regular shipment being made.

Powell County

CHAMPION (Deer Lodge)—Cross-cutting for vein continues, with ground softening.

EMERY (Deer Lodge)—Fifty-ton flotation plant at old mine dump to be started

as experiment. Efforts under way to re-finance property.

Silver Bow County

ANACONDA (Butte)—Shortage of water interfering with milling operations at Anaconda, and company will be unable to increase production materially over 55 per cent capacity. Scarcity of miners also interfering. Men taken from zinc properties and placed in copper mines, four zinc producers having temporarily suspended.

BUTTE COPPER & ZINC (Butte)—Mining suspended at Emma mine owing to shutdown of Anaconda's zinc plant at Great Falls.

BUTTE-NEW ENGLAND (Butte)—Mining operations suspended in consequence of ore found being in extralateral rights of Davis-Daly. Company in negotiation with Hayden-Stone interests looking to sale of property.

BUTTE & SUPERIOR (Butte)—Hayden-Stone interests, back of Butte & Superior, installing large hoisting plant on Otisco claim, adjoining Davis-Daly to south, and will develop extension of Hesperus vein of latter. Territory already optioned by Hayden-Stone or under negotiation aggregates more than 200 acres.

CRYSTAL COPPER (Butte)—Car of ore shipped averaging over 35 oz. silver. Orebody cut in shaft two feet wide. Cross-cutting on 600 level.

DAVIS-DALY (Butte)—Colorado shaft has cut stringers of high-grade glance ore at 2,650 ft. Concrete foundation for new ore bins and skip dumps nearing comple-

tion. Colorado shipping 300 tons of high grade daily. Lessees at Hiberna shaft doing well.

TOLUMNE COPPER (Butte)—Sinbad shaft down 1,070 ft., with 1,200 level as objective.

NEVADA

Esmeralda County

FLORENCE GOLDFIELD (Goldfield)—F. Sommer Schmidt, consulting engineer for company, now at mine inaugurating a comprehensive plan for development.

Lyon County

LAHONTAN (Ramsey)—Company in Ramsey district fifteen miles northeast of Virginia City plans cleaning out old workings, sinking inclined shaft from 330 to 500 level, with drifts on vein, and adding cyanide equipment to mill. E. P. Howell, formerly operating Beck mine, at Gold Circle, Nev., president; Edwin M. Eddy, of San Francisco, vice-president, and Parker Liddell, of Reno, secretary and treasurer. Operations suspended in 1910 owing to litigation, and since then owing to war conditions. Produced about \$80,000 before suspending. Formerly known as Ramsey Consolidated Mining Co.

Nye County

BELCHER DIVIDE (Divide)—As result of disclosures made after cleaning out 400 ft. of old workings from 60-ft. shaft, where good average ore was found, new shaft has been started. Crosscut on 200 level of main Belcher shaft advanced 65 ft. and has cut two stringers of high-grade ore, but will have to go 100 to 125 ft. to pick up big vein.

BELCHER EXTENSION (Divide)—Vein cut 30 ft. from shaft on 300 level and drifting started.

DIVIDE EXTENSION (Divide)—Crosscut on 425 level of No. 1 shaft has struck good ore. Drifting both ways on vein on 100 level of Caldwell shaft continues, with little change in average values. Winze being sunk on same foot-wall vein 45 ft. northeast of shaft. Crosscut also started on 100 level to pick up another foot-wall vein, which Roy Hardy, consulting engineer for company, believes will be cut within 50 ft.

KNOX DIVIDE (Divide)—Shaft down 20 ft. on vein recently found on Knox. Vein 5 ft. wide between well-defined walls. Assays range from \$28 to \$121, according to George Badgett, superintendent. Quartz similar to Tonopah quartz.

BUTTE DIVIDE (Divide)—At 100 ft. depth shaft in ore. Vein goes through Belcher. Roy Hardy, consulting engineer for Herbert Humphrey, spotted shaft on Butte and is supervising operations.

TONOPAH DIVIDE (Divide)—Crosscut on 375 level advanced to south side, starting point 350 ft. from main crosscut. Object is to prospect big fractured zone and to open up at depth east-west gold vein on which original strike was made, which is expected to be cut within 400 ft. Believed by George H. Garrey, geologist for company, that gold vein mentioned will join main silver vein at point southeast of present Tonopah divide workings. Southeast drift on 580 level advanced 125 ft., with face in good grade of ore and whole drift in commercial ore. Southeast drift on 270 level driven 400 ft. Take being driven at 350-ft. point in drift, both raise and face of drift being in good ore. Sinking of main shaft will be resumed in thirty days.

TYBO (Tonopah)—Louisiana Consolidated has contracted with Nevada-California Power Co. to extend power line from Manhattan to Tybo. Contract calls for completion within sixty days. Expected 150-ton smelter will be completed in thirty days thereafter. Low bid received by bond issue of \$25,000, practically all of which was bought by directors of company, including Julius Seigrist, Herman Rawitser, Frederick Hausman, and Roswell P. Nichols. Last named is treasurer and spent ten days at mine recently. F. W. Draper manager.

White Pine County

AT CHERRY CREEK several old silver producers reopened and producing steadily. Population has increased several hundred.

NEVADA CONSOLIDATED (Ely)—A mine and smelter closed onough strike for higher wages. Men demand \$1 per day increase. Company offered 75c. At Consolidated Coppermines notice posted advancing wages 75c with statement that any advances made by Nevada Consolidated would be promptly met, with result that men are still at work at Kimberly. Fires have been drawn from Nevada Consolidated furnaces at McGill. No violence reported.

WYOMING (Ely)—Wyoming Mining & Milling Co. erecting 100-ton cyanide plant at Taylor camp. Expected to be in operation by Sept. Dr. D. Bennett, president, recently visited property.

NEW MEXICO

Grant County

EL DORADO GROUP (Lordsburg)—A. J. Inderreiden states item was incorrect that appeared in issue of June 23 to effect that option had been secured on El Dorado group by himself and others.

LAST CHANCE (Lordsburg)—Making regular shipments of concentrates to El Paso smelter. Installing pipe line from El Aberdeen shaft two miles to mill to insure water supply.

Lincoln County

JACK'S PEAK TRAMWAY & MINING (Dahart, Tex.)—Building tramway 8 miles long from iron deposits near Carrizozo, N. M. Has contracts for 200 tons of ore per day. N. W. Vennard, president and manager.

Sierra County

SILVER MONUMENT (Chloride)—Sold to El Paso interests. Details not given out. C. B. Hullinger, superintendent.

UTAH
Juab County

TINTIC SHIPMENTS during July were 143 cars.

CENTRAL STANDARD (Eureka)—Contract let for sinking shaft to 400 ft.

SOUTH STANDARD (Eureka)—Machinery to be moved to site of proposed shaft and sinking to be started. Controlled by E. J. Kaddatz, of Tintic Standard.

TINTIC ZENITH (Eureka)—Shaft to be sunk in this East Tintic property. A. L. Hurley in charge.

Utah County

DELLEROPHON (American Fork)—Tunnel to be continued to connect with old workings and to prospect porphyry dike for milling ore. Mill again in operation.

Salt Lake County

MICHIGAN-UTAH (Alta.)—Ore shipments being made from Lavinia vein, in Grizzley tunnel. Patsy Marley vein to be prospected for at greater depth and Solitude tunnel to be extended, work starting from Big Cottonwood side to get under, old workings.

WASATCH (Alta.)—Tunnel to unwater and develop large area, now in 4,000 ft., has cut porphyry dike in Columbus Consolidated, where ore was left in old workings. Water receding in Columbus Consolidated shaft.

MONTANA-BINGHAM (Bingham Canon)—Shipping ore being mined from Mayflower vein at depth, opened by drift from main tunnel, now in 5,500 ft. from Bingham side of property.

WARDIFF (Salt Lake City)—Shipping about sixty tons of ore daily down Big Cottonwood Canyon by trucks. Winze from 800-ft. level down about 15 ft., with ore all way. Value of ore increasing with drift. Drift from 800-ft. level has entered Kennebec ground.

PRICE (Salt Lake City)—Stringers of ore showing in drift, which is being driven for limestone contact, 400 ft. ahead. Expected to cut fissure within 60 ft.

WASHINGTON
Stevens County

OLD DOMINION (Colville)—W. H. Linney, mining engineer, of Spokane, will again work this silver-lead property, which twenty-five years ago is said to have made large production.

HIGH GRADE (Deer Trail)—Attorney A. H. Kenyon, of Spokane, secretary, killed Aug. 2, and Henry Carstens, vice-president, badly injured when en route to mine, by collision of their auto with train. Kenyon, also secretary of Lucile Dreyfus Mining Co., was one of owners of Pittsburg property in Okanogan County, Wash., and had extensive other mining interests.

LOON LAKE COPPER (Loon Lake)—First 30-ton car of concentrates shipped.

CANADA
British Columbia

FRED A. STARKEY, of Nelson, gathering an exhibit from Kootenays for display next month at Vancouver. He urges all large mines to send in exhibits.

INLAND (Nelson)—Second payment made of \$10,000 on purchase of Eureka mine. Total amount paid to date is \$17,000.

PERRIER (Nelson)—Trevor Starkey making examination for Seattle investors. Seventy per cent of ore said to be free milling.

IRON DOLLAR (Sheep Creek)—Twenty-foot ledge shows considerable milling ore and is being shipped.

IRON MOUNTAIN (Sheep Creek)—Plans to install 30-ton concentrator on Emerald mine, to test ore.

VANCOUVER QUEEN AND KOOTENAY BELLE (Sheep Creek)—Long tunnel in 1,500 ft. with 300 ft. more to go to reach Queen vein. At 700 ft. Vancouver vein was reached and 200-ft. crosscut run east. Properties under bond to A. W. McCune.

STANDARD SILVER-LEAD (Silverton)—G. H. Alard, of Victoria, and Charles Hussy, of Spokane, vice-president and secretary, have inspected property.

INDEX (Slocan)—Elmer J. Edwards and associates, of Spokane, have bond on this and will incorporate in British Columbia. Installation of water-power plant, two-drill compressor, and buildings about completed. Deep crosscut tunnel started to reach four parallel veins.

RAMBLER-CARIBOO (Slocan)—Additional issue of 250,000 shares, recently added to capitalization, subscribed in full. On No. 9 level, across end line of newly purchased Jennie claim, 9-ft. vein exposed. No. 9 level carried along side line of Jennie claim for 130 ft. showing orebody 2 to 7 ft. wide. Sixty feet ahead of face of No.

10 level, a raise carried up from No. 12 shows same orebody, thus demonstrating continuation of new orebody for 220 ft. on strike and 150 ft. in depth.

SILVER BEAR (Slocan)—Francis Helme has given bond on this and Broughton claims to R. F. Green, who will develop them with adjoining properties.

SILVERSMITH (Slocan)—No. 8 level drift shows 12 ft. of good ore thirty feet west of new raise from No. 10 level. Superposed foot wall broken through and five feet more ore exposed.

GRANBY CONSOLIDATED (Vancouver)—June production of copper, 2,637,184 lb.; May, 1,848,892; June, 1918, 3,438,521.

Manitoba

GABRIELE (Rice Lake)—Shareholders approved increase of capitalization from \$100,000 to \$1,000,000. Treasury stock to be sold as occasion arises to obtain funds for development.

Ontario

KERR LAKE (Cobalt)—Shareholders have ratified by-law to reduce capitalization from \$3,000,000, with shares at par value of \$5, to \$2,400,000, par value \$4 per share.

CAMPBELL-FAIRBAIN (Gowganda)—Owners of this property, who are lessees of Foster, at Cobalt, are dismantling latter and removing mining plant to Gowganda.

DAVIDSON (Porcupine)—Shareholders at meeting held on Aug. 8 authorized plan submitted by directors for organization of new company under name of Davidson Consolidated Gold Mines, with capital of \$2,000,000, consolidating company's property with adjacent territory, enlarging area from 120 to 420 acres. Shareholders will receive bonus of one share of Consolidated stock for every share in original company. After issuing sufficient stock to pay for additional acreage, new company will have 1,000,000 shares in treasury, in addition to 125,000 cash. Of treasury stock, 500,000 shares will be underwritten at 75c net, to provide funds for extensive development and operation.

HOLLINGER (Timmins)—According to agreement with employees, company has begun building hospital and has taken over three stores, where goods will be sold at low prices.

SOVEREIGN (Timmins)—Preliminary development opening up promising orebodies. One vein reported 30 ft. wide. Shaft down 60 ft. Five thousand feet of trenching done.

VACUUM GAS & OIL (West Dover Township)—Has purchased leasehold adjoining producing wells of Union Natural Gas Co. in West Dover, which there are seven completed wells over 3,000 ft. deep, all producers.

MEXICO
Durango

AMERICAN S. & R. (Velardena)—Smelter operations ordered resumed.

Sonora

GREENE CANANEA (La Cananea)—Produced in July 2,200,000 lb. copper, 143,500 oz. silver and 700 oz. gold.

CHILE

CHILE COPPER (Chiquicamatá)—June production of copper 5,003,430 lb.; June, 1918, 9,280,000.

PERU

CERRO DE PASCO (La Fundicion)—July production of copper, 3,984,000 lb.; June, 4,026,000 lb.

BURMA

BURMA CORPORATION, LTD. (Nantun)—Lead production for June, 2,981 tons gross. Iron 5,284 tons of lead-bearing material (including secondaries); refined lead, 1,331 tons; refined silver, approximately 178,647 oz.

KOREA

ORIENTAL CONSOLIDATED (Umsan)—Tons milled in June at Tabowie and Tarsco mill 5,284 and 9,635 respectively. This was below normal for Paracel, owing to ore-transportation crew striking twice for higher wages. Crew now receiving same wages as before, which are good for this class of labor. Men scarce and difficulty expected in keeping full crew. Clean-up for June of \$84,832.05 positively low and will be low for July and August, owing to decision to run low-grade ore through plants during hot weather and rain season, which affect extraction. On Siribong power project 3,344 cu.yd. of masonry and cement was placed in dam during June.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver		Aug.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
7	431	110	57 $\frac{1}{2}$	11	431 $\frac{1}{2}$	112 $\frac{1}{2}$	58 $\frac{1}{2}$
8	431 $\frac{1}{2}$	111 $\frac{1}{2}$	58	12	431 $\frac{1}{2}$	112 $\frac{1}{2}$	58 $\frac{1}{2}$
9	431 $\frac{1}{2}$	111 $\frac{1}{2}$	58 $\frac{1}{2}$	13	451 $\frac{1}{2}$	113	58 $\frac{1}{2}$

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

Daily Prices of Metals in New York

Aug.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	N. Y.	St. L.	St. L.			
7	22.25 @ 21.95	65	5.65 @ 5.75	5 $\frac{1}{2}$	7.45 @ 7.35			
8	21.75 @ 21.50	59 @ 55	5.55 @ 5.60	5 $\frac{1}{2}$	7 $\frac{1}{2}$ @ 7 $\frac{1}{4}$			
9	21 $\frac{1}{2}$	55 @ 57	5.55 @ 5.60	5 $\frac{1}{2}$	7.25 @ 7.15			
11	21 $\frac{1}{2}$ @ 21 $\frac{1}{4}$	55	5.55 @ 5.60	5.40	7.20 @ 7 $\frac{1}{4}$			
12	21 $\frac{1}{2}$	55 @ 55 $\frac{1}{2}$	5.50 @ 5.60	5 $\frac{1}{2}$	7.20 @ 7.25			
13	21.75 @ 21.85	55 @ 56	5.50 @ 5.60	5 $\frac{1}{2}$	7.40 @ 7.45			

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
7	95	96	106	275	260	24 $\frac{1}{2}$	24 $\frac{1}{2}$	38 $\frac{1}{2}$	39
8	95 $\frac{1}{2}$	96 $\frac{1}{2}$	105	270	256	24 $\frac{1}{2}$	24 $\frac{1}{2}$	38 $\frac{1}{2}$	39
9									
11	91 $\frac{1}{4}$	92 $\frac{1}{4}$	104	270	254 $\frac{1}{2}$	24 $\frac{1}{2}$	25 $\frac{1}{2}$	38 $\frac{1}{2}$	39
12	92 $\frac{1}{4}$	93 $\frac{1}{4}$	103	276 $\frac{1}{2}$	259 $\frac{1}{2}$	24 $\frac{1}{2}$	25 $\frac{1}{2}$	38 $\frac{1}{2}$	40
13	91	92	103	280	264 $\frac{1}{2}$	24 $\frac{1}{2}$	25 $\frac{1}{2}$	39	40 $\frac{1}{2}$

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

Metal Markets

New York—Aug. 13, 1919

The metal markets this week were rather feverish and were almost wholly in the hands of speculative interests, the principal producers being well booked with orders and holding aloof pending developments.

The hearings in Washington before a Congressional subcommittee with respect to transactions between the Government and the copper producers during the war, and afterward, continued. These hearings have developed no facts that were not commonly known when the arrangements were made, and apparently the present developments are for political purposes. No serious attention is given to them in the copper business.

Freight rates from San Francisco to Hongkong and Kobe were unchanged at \$12.

Copper

The principal producers made no sales. A rather large business was done, however, by the smaller agencies and by brokers handling speculative accounts and resales by consumers. In the effort to make a market, these parties made sharp concessions in price, and in the early part of the week there was some exhibition of real pressure. Speculators desired to liquidate their accounts, consumers were inspired to resell, and it was intimated that some copper held in storage here for the account of a foreign government was being offered. On the other hand, there was good buying by domestic consumers, who were moved to take advantage of the opportunity to secure what appeared to be relatively cheap copper. Some of the largest consumers bought. There was also some export business, which was done outside of the Copper

Producers' Association. Japan bought, and so did a European country. Germany inquired for a small quantity, but bid under the market, and, anyhow, the decline in marks made the consummation of German business difficult.

Toward the close the selling pressure eased off and the price stiffened a little.

British advices are to the effect that the copper and brass manufacturers over there are full with orders, but before the end of July they had covered their immediate requirements. Wire bars have been very scarce and have commanded a premium over other forms. The Government took no advantage of its stocks to hold prices in check.

Copper Sheets.—The base price of copper sheets is 33c. per lb. Demand strong. Copper wire is quoted at 26 $\frac{1}{2}$ c. in carload lots. f.o.b. mill.

Tin

Large arrivals of tin of 99 per cent grade began to come in on Aug. 8, which precipitated a sharp decline in the market. On the other hand, there was good demand by consumers, especially by tinplate makers, and toward the close there was a distinctly better tone.

Straits tin, August shipment, opened the week at 53 $\frac{1}{2}$ c., declined to 52 $\frac{1}{2}$ c., and closed at 53 $\frac{1}{2}$ @53 $\frac{1}{2}$ c.

Singapore quoted, c.i.f., London, as follows: Aug. 7, £271; Aug. 8, £270; Aug. 11, £263; Aug. 12, £273.

Lead

Large offerings of lead from second-hands reappeared, and buyers being hesitant, there developed some real pressure to sell at a great reduction in price. The principal producers, being well booked up, made no efforts to dispose of anything further, but there was considerable ground for the suspicion that the selling of this week was not confined to second-hands, but probably included some of the smaller producers.

Labor troubles are brewing in the mining district of southeastern Missouri, where the men demand recognition of the union and higher pay.

Zinc

This market was rather feverish and was largely the plaything of speculators. The advance to 7 $\frac{1}{2}$ c. last week did not hold at that figure for more than a moment, some pressure to sell developing immediately, which resulted in putting the market down to 7 $\frac{1}{2}$ c. during the afternoon of Aug. 11. At that price there was good buying both by

consumers and speculators, and a sharp advance again followed.

Zinc production has been sharply curtailed, largely by labor troubles, and at the moment is perhaps no more than at the rate of 30,000 tons per month. However, increased output is already in sight. The two smelters at Henryetta and the smeltery at Cherryvale are still idle, but the troubles at Meadowbrook and Clarksburg have been composed, and resumption of operations at those places is now being made.

Business in high-grade zinc is dead as a doornail in so far as producers are concerned, and is likely so to continue while the Government is selling its surplus.

The price for zinc in London declined further under German offerings. Belgian smelters cannot meet the present market over there and still less can the British smelters, whose costs were £56@£67 before the recent advance of 6s. for coal. The present British price is below our parity, so American smelters have no inducement to sell for export.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market was dull and a little easier. We quote spot at 9@9½c. Futures were quoted at 8½@9½c, duty paid.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.10 per lb. for wholesale lots—500 lb. and over. No change.

Cadmium—Quoted at \$1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, \$1.75 per lb. No business being transacted. No change.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Quiet and steady at \$109. San Francisco telegraphs \$105; firm.

Silver and Platinum

Silver has ruled steady in London, with advancing tendency, and closes at 58½d. New York price has been firm, with China banks paying a premium over London market. The Secretary of State for India has announced that on and after Aug. 12, and until further notice, the Deputy Master of the Ottawa Branch of the Royal Mint, Ottawa, Canada, will sell on behalf of the Secretary of State for India immediate telegraphic transfers on India without limit of amount in exchange for gold tendered at the Ottawa Mint at the rate of 1 rupee for 10.3585 grains of fine gold. This raises the pound sterling value of the rupee from 1s. 8d., to 1s. 10d., and the pre-war value of 1s. 4d. This action by the British Treasury is in recognition of the sharp advance in the price of silver and an endeavor to make the exchange value of the rupee exceed the bullion value of the rupee.

Mexican dollars at New York: Aug. 7, 85½; Aug. 8, 85½; Aug. 9, 86½; Aug. 11, 86½; Aug. 12, 87½; Aug. 13, 87½.

Platinum—Refined, ingot, \$105.

Palladium—Unchanged at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 9.—Zinc blende, per ton, high, \$56.80; basis 60 per cent zinc, premium, \$43.50; Prime Western, \$42.50; fines and slimes, \$40@37.50; calamine, 40 per cent zinc, \$30. Average settling prices: Blende, \$49.32; calamine, \$31.74; all zinc ores, \$49.04.

Lead, high, \$70.45; basis 80 per cent lead, \$67.50; average settling price, all grades of lead, \$63.13 per ton.

Shipments the week: Blende, 6,486, calamine 109, lead 1,746 tons. Value, all ores the week, \$438,880.

The ore settled for this week was largely of last week and the previous week's purchases, and though the basis price has rapidly declined, the average settling price has remained strong. Sellers practically forced to raise funds were about the only ones that accepted the offerings on \$42.50 basis this week. Buyers with full orders fell short of filling. The market closed with a strengthening tendency tonight, and at least one buyer is late in the market with orders to fill, possibly at an increased price.

Platteville, Wis., Aug. 9.—Blende, basis 60 per cent zinc, premium blende base and high lead blende base of \$45 per ton were authorized to buyers, but no open market sales are quotable, due in part to freight embargo ordered on account of railroad strike. Lead ore, basis 80 per cent lead, \$64 per ton. Shipments reported for the week are 2,288 tons blende, 197 tons galena, and 418 tons sulphur ore. For the year to date the totals are 61,216 tons blende, 3,675 tons galena and 9,547 tons sulphur ore. During the week 2,807 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—In a little better demand and quoted at \$25 per ton, f.o.b., California points, or 80c. per unit, delivered in Pennsylvania, for ore running 40 per cent or better.

Manganese Ore—Market very dull, and, with ferromanganese on the downward grade, buyers are reluctant to contract for ore.

Molybdenum Ore—Nothing reported done. Quotations nominal at 75@85c. per lb.

Tungsten Ore—Charles Hardy reports that stocks of ore, mainly of foreign origin, in this country, exceed 5,000 tons, and that all the mines in California, Nevada, and Colorado are shut down. There was coloring but small business done this week. Chinese ore was quoted at \$7.25@7.50. Business in high-grade Bolivian ore was done at \$10.

Other Minerals

Nitrate—The average price is quoted at \$2.95 per cwt., carload lots, for immediate shipment, with only slight change for futures. Business is reported as dull for the present, and only

small quantities are being imported from Chile.

Pyrites—Spanish pyrites is quoted at 18c. per unit for furnace ore, c.i.f., New York or other Atlantic port, and 18½c. at Gulf ports. Market slow and unsettled; hand-to-mouth buying. Price will decrease with ocean freights.

Iron Trade Review

Pittsburgh—Aug. 12

The monthly ingot report of the American Iron and Steel Institute shows that in July there was produced 2,508,176 gross tons of steel ingots, by thirty companies which in 1918 made 84.03 per cent of the country's total steel-ingot production. This indicates that production by the industry was at the rate of 35,700,000 tons of steel ingots a year. Estimating capacity at 49,000,000 tons, this would represent 73 per cent of the productive capacity, against 67 per cent for June, 54 per cent for May, and 67 per cent for April. The estimate of 49,000,000 tons' capacity at this time is based upon actual output in 1916 plus allowances for new capacity. As production has been increasing rather steadily from week to week, the present rate of output may be taken at between 75 and 80 per cent; July showed 73 per cent. In some quarters the rate of operation is reported higher, due to a divergence in the capacity assumed. Thus the Steel Corporation regards its present operation as above 90 per cent, either through its not making full allowance for capacity added or through its regarding its 1916 production as in excess of a normal capacity rating. Such slight divergences are of minor importance, the important fact being that actual production is one-half greater now than at the middle of May, representing a remarkable increase for less than three months.

An unfavorable feature of the situation is the fact that the buying pressure is by far the greatest in the lines which were already fairly well sold up several weeks ago, whereas it remains light in the lines in which orders have been light right along. Wire products, pipe and sheets belong to the former category; rails, shapes and plates to the latter. The circumstances suggest that some of the buying occurs because buyers are afraid that otherwise they would not secure timely deliveries. Such a condition, however, has featured every regular buying movement in the steel trade.

The Steel Corporation's unfilled obligations at the end of July amounted to 5,578,661 tons, indicating an increase of 685,806 tons during July, against an increase of 610,545 tons during June, and fairly uniform decreases, averaging 640,000 tons a month, from December to May inclusive. The tonnages, however, include contract obligations as well as actual shipping orders, and contracts may or may not be specified against. The corporation has sometimes had a fair operation when it was booking no contracts at all, merely re-

ceiving shipping orders and specifications against contracts previously entered.

Throughout the iron and steel trade a more conservative feeling as to the immediate future is manifested, it being recognized that the increasing unrest of labor and the universal demand for a reduction in the cost of living are influences tending to defer the making of investments in large construction projects on which, in the long run, the steel industry must depend for a large part of its business. The recent buying of finished-steel products for ordinary every-day consumption has been remarkably heavy, and there is naturally a question whether such buying can continue indefinitely at the same rate.

Exports of steel products in June represented a rate of nearly 6,000,000 gross tons a year, in terms of finished rolled steel. Capacity is about 37,000,000 tons in rolled steel, and June production was at two-thirds capacity. Thus the steel exports represented about 16 per cent of the steel capacity and about 24 per cent of the production. In 1912, the best export year before the war, steel exports were about 2,400,000 tons, equal to about 10 per cent of the average capacity for the year.

Steel

Steel—Demand for sheet bars continues fairly heavy, consumers not being entirely supplied by their own production or by regular contracts. A sale of about 10,000 tons is reported, and a producer-consumer, normally with a slight surplus of sheet bars, is inquiring in the open market for 18,000 tons. Rolling billets are in light request, and there is a fair run of forging billet business, in the usual small tonnages. We quote: Billets, \$38.50; forging billets, \$51; sheet bars and small billets, \$42; slabs, \$41; rods, \$52.

Ferroalloys

Ferromanganese The market is quiet, with asking prices on 80 per cent at \$105, c.i.f. for English, and \$115, delivered, for domestic. The latter price would probably be shaded in case of any important inquiry.

Pig Iron

Pig Iron—The merchant furnaces in this general district that are in operation are comfortably sold up until almost the end of the year, and thus there is no pressure on the market, which, indeed, displays considerable strength. The market as a whole, however, cannot be considered strong fundamentally, when about 45 per cent of the country's merchant furnace capacity is out of blast. No doubt much of the idle capacity is awaiting a broader consuming demand, rather than higher prices, for it to get into blast, and though some districts, such as Birmingham and Chicago, have lately reported price advances, a different aspect may be created when idle furnaces begin to get into blast, at the same time selling backlog tonnages on which to operate.

MONTHLY AVERAGE PRICES OF METALS

	Silver					
	New York		London			
	1917	1919	1917	1918	1919	
Jan.	75.630	88.702	101.125	36.682	44.336	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.827
Mar.	73.811	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	101.125	36.963	47.215	48.886
May	71.745	99.565	107.135	37.910	48.902	52.104
June	76.971	99.500	110.430	39.065	48.875	53.896
July	79.010	99.625	106.394	40.118	48.813	54.133
Aug.	85.407	100.292		43.418	49.437	
Sept.	100.740	101.125		50.920	49.500	
Oct.	87.332	101.125		44.324	49.000	
Nov.	85.891	101.125		45.284	48.969	
Dec.	85.960	101.125		43.052	48.492	
Year	81.417	96.772		40.851	47.516	

New York quotations cents per ounce, fine 999.9 fine London, peace per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	109.619
Feb.	23.500	10.763	110.000	75.000	125.000	95.706
Mar.	23.500	14.836	110.000	76.821	125.000	82.071
April	23.500	15.240	110.000	77.000	125.000	82.200
May	23.500	15.864	110.000	77.767	125.000	81.227
June	23.500	17.610	110.000	83.062	125.000	85.000
July	23.504	21.604	119.914	89.376	131.913	103.046
Aug.	26.000		122.000		137.000	
Sept.	26.000		125.000		137.000	
Oct.	26.000		125.000		137.000	
Nov.	26.000		122.000		137.000	
Dec.	(a)		118.447		133.567	
Year	24.628		115.530		130.597	

(a) No market.

Tin

	New York		London			
	1918		1918		1919	
	1918	1919	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557		
February	92.000	66.801	311.725	223.963		
March	(a)	67.934	318.875	236.843		
April	(a)	72.500	329.965	225.275		
May	(a)	72.500	364.913	234.388		
June	(a)	71.240	331.925	238.263		
July	(a)	68.000	360.347	253.272		
August	(a)		380.000			
September	(a)		433.965			
October	(a)		355.543			
November	(a)		323.540			
December	(a)		267.336			
Av. year	(a)		330.158			

(a) No average computed.

Lead

	New York		London			
	1918		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.000	37.227
February	6.774	5.037	5.899	4.784	29.000	35.673
March	7.201	5.226	7.091	4.992	29.000	37.952
April	6.772	4.982	6.765	4.722	29.000	34.888
May	6.818	5.018	7.081	4.724	29.000	35.832
June	7.111	5.340	7.511	5.070	29.000	32.341
July	8.033	5.626	7.511	5.050	29.000	34.437
August	8.030		7.750	29.000		
September	8.050		7.750	29.000		
October	8.050		7.750	31.200		
November	8.050		7.750	40.000		
December	6.564		6.324	40.000		
Year	7.413		7.222	30.100		

Zinc

	New York		London			
	1918		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	7.922	34.000	35.043
February	7.814	6.623	7.639	6.273	34.000	34.150
March	6.461	6.500	7.286	6.150	34.000	38.500
April	6.800	6.615	6.715	6.111	34.000	38.118
May	7.314	6.429	7.114	6.079	34.000	35.347
June	8.024	6.301	7.911	6.544	34.000	37.753
July	8.688	7.973	8.338	7.253	34.000	41.813
August	8.985		8.635	54.000		
September	8.442		8.151	54.000		
October	8.801		8.451	34.000		
November	8.483		8.141	35.000		
December	8.163		7.413	30.450		
Year	8.159		7.890	34.150		

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

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 1 Foundry	
	1918		1919		1918	
	1918	1919	1918	1919	1918	1919
January	\$37.25	\$33.60	\$33.95	\$31.40	\$33.95	\$32.40
February	37.25	32.54	33.95	31.40	33.95	32.40
March	36.15	32.54	33.95	31.40	33.95	32.15
April	36.40	29.33	33.00	27.15	33.95	28.15
May	36.40	29.33	33.00	27.15	33.95	28.15
June	36.40	29.33	33.00	27.15	33.95	28.15
July	36.60	29.33	33.00	27.15	33.95	28.15
August	36.60		33.40		34.40	
September	36.60		33.40		34.40	
October	36.60		33.40		34.40	
November	36.60		33.40		34.40	
December	36.60		33.40		34.40	
Year	\$36.67		\$33.70		\$34.45	

As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. Exch.	Aug. 12	Boston Exch.	Aug. 12
Alaska Gold M.	3	Adventures	42
Alaska Juneau	21	Abmeck	83
Am. Sm. & Ref. Co.	106	Algonquin	11
Am. Zinc & Ref. Co.	106	Am. Zinc & Ref. Co.	15
Am. Zinc, pt. A.	53	Ariz. Com.	13
Am. Zinc, pt. B.	53	Ariz. Consol.	20
Am. Zinc, pt. C.	53	Bingham Mines	1
Am. Zinc, pt. D.	53	Bonanza	1
Am. Zinc, pt. E.	53	Butte-Baldhawk	1
Am. Zinc, pt. F.	53	Calumet & Hecla	76
Am. Zinc, pt. G.	53	Calumet & Hecla	120
Am. Zinc, pt. H.	53	Carson Hill	17
Am. Zinc, pt. I.	53	Centennial	17
Am. Zinc, pt. J.	53	Chile Cop.	17
Am. Zinc, pt. K.	53	Chile West.	17
Am. Zinc, pt. L.	53	Day-Daly	19
Am. Zinc, pt. M.	53	Day-Daly	19
Am. Zinc, pt. N.	53	Day-Daly	19
Am. Zinc, pt. O.	53	Day-Daly	19
Am. Zinc, pt. P.	53	Day-Daly	19
Am. Zinc, pt. Q.	53	Day-Daly	19
Am. Zinc, pt. R.	53	Day-Daly	19
Am. Zinc, pt. S.	53	Day-Daly	19
Am. Zinc, pt. T.	53	Day-Daly	19
Am. Zinc, pt. U.	53	Day-Daly	19
Am. Zinc, pt. V.	53	Day-Daly	19
Am. Zinc, pt. W.	53	Day-Daly	19
Am. Zinc, pt. X.	53	Day-Daly	19
Am. Zinc, pt. Y.	53	Day-Daly	19
Am. Zinc, pt. Z.	53	Day-Daly	19
Am. Zinc, pt. AA.	53	Day-Daly	19
Am. Zinc, pt. AB.	53	Day-Daly	19
Am. Zinc, pt. AC.	53	Day-Daly	19
Am. Zinc, pt. AD.	53	Day-Daly	19
Am. Zinc, pt. AE.	53	Day-Daly	19
Am. Zinc, pt. AF.	53	Day-Daly	19
Am. Zinc, pt. AG.	53	Day-Daly	19
Am. Zinc, pt. AH.	53	Day-Daly	19
Am. Zinc, pt. AI.	53	Day-Daly	19
Am. Zinc, pt. AJ.	53	Day-Daly	19
Am. Zinc, pt. AK.	53	Day-Daly	19
Am. Zinc, pt. AL.	53	Day-Daly	19
Am. Zinc, pt. AM.	53	Day-Daly	19
Am. Zinc, pt. AN.	53	Day-Daly	19
Am. Zinc, pt. AO.	53	Day-Daly	19
Am. Zinc, pt. AP.	53	Day-Daly	19
Am. Zinc, pt. AQ.	53	Day-Daly	19
Am. Zinc, pt. AR.	53	Day-Daly	19
Am. Zinc, pt. AS.	53	Day-Daly	19
Am. Zinc, pt. AT.	53	Day-Daly	19
Am. Zinc, pt. AU.	53	Day-Daly	19
Am. Zinc, pt. AV.	53	Day-Daly	19
Am. Zinc, pt. AW.	53	Day-Daly	19
Am. Zinc, pt. AX.	53	Day-Daly	19
Am. Zinc, pt. AY.	53	Day-Daly	19
Am. Zinc, pt. AZ.	53	Day-Daly	19
Am. Zinc, pt. BA.	53	Day-Daly	19
Am. Zinc, pt. BB.	53	Day-Daly	19
Am. Zinc, pt. BC.	53	Day-Daly	19
Am. Zinc, pt. BD.	53	Day-Daly	19
Am. Zinc, pt. BE.	53	Day-Daly	19
Am. Zinc, pt. BF.	53	Day-Daly	19
Am. Zinc, pt. BG.	53	Day-Daly	19
Am. Zinc, pt. BH.	53	Day-Daly	19
Am. Zinc, pt. BI.	53	Day-Daly	19
Am. Zinc, pt. BJ.	53	Day-Daly	19
Am. Zinc, pt. BK.	53	Day-Daly	19
Am. Zinc, pt. BL.	53	Day-Daly	19
Am. Zinc, pt. BM.	53	Day-Daly	19
Am. Zinc, pt. BN.	53	Day-Daly	19
Am. Zinc, pt. BO.	53	Day-Daly	19
Am. Zinc, pt. BP.	53	Day-Daly	19
Am. Zinc, pt. BQ.	53	Day-Daly	19
Am. Zinc, pt. BR.	53	Day-Daly	19
Am. Zinc, pt. BS.	53	Day-Daly	19
Am. Zinc, pt. BT.	53	Day-Daly	19
Am. Zinc, pt. BU.	53	Day-Daly	19
Am. Zinc, pt. BV.	53	Day-Daly	19
Am. Zinc, pt. BW.	53	Day-Daly	19
Am. Zinc, pt. BX.	53	Day-Daly	19
Am. Zinc, pt. BY.	53	Day-Daly	19
Am. Zinc, pt. BZ.	53	Day-Daly	19
Am. Zinc, pt. CA.	53	Day-Daly	19
Am. Zinc, pt. CB.	53	Day	

Engineering and Mining Journal

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Number 8

The High Cost of Striking

IF ONE word is used more often than another in the headlines of the press nowadays it is "strike." Just how many of the country's workers are out on strike is hard to determine, but the number must be large. And now we are threatened with a railroad strike which will tie up the country's transportation systems "so tight that they will never operate again" if the union demands are not met. What are these men striking for? In the vast majority of cases it is either for a reduction in the cost of living or for higher wages, and in the latter we include the demand for shorter hours, for the same pay is expected regardless of the shorter time worked.

The reasons for this social unrest are varied, but there is an important one which is given too little attention. The workingman cannot understand why he is not living better than before the war. As a matter of fact, in many cases he is; the theaters, baseball games, and seashore resorts are crowded as never before, and it is not the salaried men or the rich who are patronizing them more than usual. However, we will consider only the cases of those who are not living as well as formerly, but insist that their standard of living shall be raised instead of lowered. They do not understand that most of the war is yet to be paid for, and that until it is paid for the standard of living of everyone should equitably be lowered.

Millions of men and women were engaged for four years in work which did not add one iota to the sum total of human wealth. The result was a scarcity of the essential things of life, followed, of course, by higher prices. Prices will come down when goods are more abundant, and they will be more abundant when more people work at essential industries, or when they work harder, or longer hours.

Every time a man strikes he increases the average cost of living in the world; every week that he works forty-four hours when he should work forty-eight he makes things just that much harder for himself and for everyone else.

What the world needs is more production—the wages that a man gets are unimportant from the world viewpoint. It is just now better for the community if a man does nine hours' work for \$6 than eight hours' work for, say, \$4, provided he does not become so affluent that he lays off for a month or two.

The workingman must be educated up to the fact that the war must be paid for, that the only way to pay for it is by more work, and that the high cost of living cannot be reduced by selling a comparatively small amount of army supplies at cost, or by legislation. It is just as important to refrain from luxuries now as during the war if we want to keep the cost of living down. Every time we indulge in a luxury we make some one work for our pleasure who could better be employed in producing something useful.

The best service that the American Federation of Labor could perform would be to discourage and prevent all strikes for a certain period of years and to recommend that every one work overtime as much as possible. Production would increase, prices would come down, and profiteering would decrease. Profiteers do not thrive in a falling market. By striking for better conditions the workingman is increasing the cost of living for himself as well as for others.

Coal Producers Face Competition

MINING and metallurgical plants throughout the United States are feeling keenly the rise in cost of fuel. Demands for metals during the war made the rise from \$1 per ton at the pit mouth to \$2.75 per ton bearable, but now that the war demands have ceased, the further threatened rise, due to the demands of labor for a six-hour day and a five-day week, points toward serious difficulties. When an elastic band is stretched too far it breaks, and the fellows at either end get stung. Just so with the price of coal: it cannot be stretched beyond the elastic limit, or something decidedly unpleasant will happen. And that unpleasantness is going to be felt by the consumer, the coal-mine owner, and the coal miner.

That many consumers of coal feel that the price has gone beyond the economic limit is evidenced by the failure of the public to respond to the entreaties of Government officials and coal producers to order their winter coal now. The public may be mistaken. Perhaps the economic price of coal belongs where it is or even higher, but it appears to the consumer that it would be more to the point if operators would devote their selling energies to the task of convincing labor that the price of coal must not go higher, and that if labor wants greater compensation than it is now receiving the best way to secure it is by getting out additional tonnage per man employed. This will be a hard task if it can be done at all, for labor feels so thoroughly entrenched that it is prepared to defy operators rather than to listen to reasonable arguments from them. Labor's attitude seems to be one of antagonism rather than of assistance in this crisis.

There is, however, the possibility of relief to the consumer from an entirely outside source. Fuel oil, when once adopted, is seldom replaced by coal. Both mine owners and coal miners now face this formidable competitor, both as a fuel to be used under boilers, and the lighter forms direct in oil engines. The change from solid fuel to heavy petroleum for making steam is not an expensive operation. The installation of a modern high-class oil engine is costly, but once in place its economy of operation is apparent, and those employing it seldom revert to the use of coal.

The Atlantic ports are particularly favored for the

introduction of liquid fuel, because of the vast stores on the coasts of Mexico. Already Massachusetts manufacturers are considering its use. The Standard Oil Co. is building a large refinery at Providence, and another is being built at Charleston, S. C. The Sinclair company will build refineries at Boston, New York, and Philadelphia.

Our whole coast line is in a position to change advantageously from solid to liquid fuel; and the consumption of coal along our shores is no slight portion of our normal output.

Only a small quantity of the lighter fuels are distilled from the Mexican oils, but their amount is sufficient to more than pay the cost of transportation and refining, leaving a fuel residue that may be sold profitably at almost any price. Four barrels of heavy fuel oil are equivalent to about a ton of coal, and the cost of the former at any Atlantic port need not exceed the cost of carrying an equivalent weight of coal from the mines to the same port.

The Shipping Commission recently advertised for 34,000,000 bbl. of fuel oil for its vessels, the equivalent of about 9,000,000 tons of coal. It behooves coal operators to point out to their miners that the rising price of coal is encouraging the introduction of oil-burning plants and that at no distant date the miner may be begging for a week to be increased to six days rather than demanding that his working period shall be reduced to five.

The smelter and refiner may see a ray of hope in the possibility that the liberal substitution of oil for coal, by others, may increase the stocks from which their own supplies are drawn.

A Fable

IT HAPPENED that a Dog had got a piece of meat and was carrying it home in his mouth to eat it in peace. Now, on his way home he had to cross a plank lying across a running brook. As he crossed, he looked down and saw his own shadow reflected in the water beneath. Thinking it was another dog with another piece of meat, he made up his mind to have that also. So he made a snap at the shadow in the water; but as he opened his mouth the piece of meat fell out, dropped into the water, and was never seen more. Beware lest you lose the substance by grasping at the shadow."

Man has not changed in a thousand years. The fable has its counterpart in modern metallurgy:

"A Corporation once secured control of a useful process. It had an opportunity to render valuable service to thousands of smaller organizations engaged in the recovery of minerals. The small companies were willing to pay for the privilege of using the process, to pay a fair price, cheerfully, and for an indefinite period. They were ready to regard the large Corporation as a benefactor, a big brother, a powerful friend who extended to them a helping hand; one who could indicate to them a way to transform a doubtful venture into a profitable enterprise. The large organization was given the opportunity to make thousands of grateful friends, to render a great service, and to receive willing tribute which would have poured into its coffers in a steady stream to be measured in millions. The expenses of the large Corporation would have been small compared to its income.

"But the large Corporation was covetous and ex-

ortionate. These qualities blinded it to its opportunity. It lacked broad vision. It missed its chance. The small companies, that would have paid reasonable royalties willingly, were amazed, and then exasperated. Possible friendship was converted into enmity. Co-operation was replaced by opposition. Then followed estrangement and bitterness.

"And litigation without end."

The Chemical Foundation

CRITICISM has been offered both of the work and the objects of the Chemical Foundation, but it must have come from those not fully informed. At a meeting of the National Cotton Manufacturers' Association A. Mitchell Palmer related the experience of his office in tracing the ownership of the German chemical industry in the United States, and Francis P. Garvan gave the reasons for the acquisition of German-owned patents and the formation of an organization to own them.

Conan Doyle never wrote a story that held the reader's attention more closely until the last page was read than Mr. Palmer when he set down his experience of detecting the camouflaged ownership of German industries in this country. Moreover, in the latter's story was the added interest of truth surpassing fiction. The care with which German industry, supported and abetted by its government, had laid its plans to control all chemical manufacture and trade in the United States is fully set forth. And then, when the Great War started, perfect team work was shown in arranging, by legitimate means where practicable and by illegitimate means at other times, to keep out of their enemies' hands large quantities of munitions that would normally have reached France from this country. And still later is related the part that enemy aliens played in making our entry into the war of as little moment as possible. Not only did these things happen, but congratulatory letters were exchanged on the success of the perpetrator's duplicity.

We offer just one instance to illustrate the point. The following is quoted from a letter of appreciation addressed Dr. Albert, "Very Honorable Privy Councillor":

"The breadth of high-mindedness with which you at that time immediately entered into the plan has born fruit as follows: One and one-half million pounds of carbolic acid have been kept from the Allies; this equals 4,500,000 pounds of picric acid. This tremendous quantity of explosive was withheld from the Allies by your contract. (A contract that was, by the way, very profitable to its holders.) This is equivalent to three trains of explosives of forty cars each. Picture to yourself what a military coup would be accomplished by an army leader if he should succeed in destroying three trains carrying 4,500,000 pounds of explosives."

One's thoughts are divided between contempt for the authors who were capable of stooping to such means of gaining their objects, and admiration for the skill shown in working out the plans that succeeded.

Every American citizen should know of the work done by the Alien Property Custodian and the various Government departments that assisted in the work. A knowledge of what was found would be the strangest possible incentive toward the curtailment of importation of those things from Germany that can be made equally well in America.

The Chemical Foundation occupies about the same attitude to chemical industry that the Research Corpo-

ration holds toward metallurgy, and it merits corresponding support. It has taken over more than four thousand German patents, by far the greater part having to do with the manufacture of medicinal chemicals and dyes. There are many, however, that have a bearing on metallurgical operations and the manufacture of chemicals used in the treatment of ores.

We recommend to chemical and metallurgical engineers that they examine the list of patents now controlled by the Chemical Foundation. The rights for operating under these may be procured at trifling cost, and even this small tax goes toward the further development of the processes controlled.

Improving the Patent Office

MINING and metallurgical engineers will be interested in noting the progress being made by Engineering Council in its efforts to strengthen the Patent Office. With the co-operation of the National Research Council and the staff of the Patent Office, remedial legislation has taken form, and three bills have been introduced bearing on this question. H. R. 5011 detaches the Patent Office from the Department of the Interior and simplifies the procedure of the courts with reference to assessment of damages or profits for infringement. H. R. 5012 establishes a single Court of Patent Appeals, and H. R. 7010 increases the force and salaries in the Patent Office.

If legislators realized the importance of the proposed changes as do many engineers the proposed measures would be enacted speedily. Unfortunately, many legislators have not come into close contact with patent litigation, and fail to realize the crude condition of our laws. Unless advised of this by their constituents, and impressed by them with the necessity of revision, enactment will probably fail, or be indefinitely postponed.

National Highways

THE National Chamber of Commerce, because it has been strongly advocating a national highway system, calls attention to Senate Bill 1309, also introduced into the House, for the establishment of a national highway system and creation of a Federal Highway Commission.

To one point in the Chamber of Commerce report we take exception. It states that the national needs are "for interstate commerce, agriculture, postal delivery, common defense, and general welfare." Our exception is to the omission of the needs of mining operations, for they are as pressing as are any others.

Perhaps it is because of the small amount of direct revenue which mines yield to the states that their transportation requirements are generally overlooked by county and state authorities.

Many a prospect in the West has not been developed because of lack of roads, and many a small mine is small because no wagon or truck road reaches it. Throughout the Western states a small mine in an isolated locality must shift for itself until it becomes a rather large producer of ore or consumer of freight. Then county officials take notice, and a wagon road is built in time to take out the mill when it has passed into the condition of scrap.

In British Columbia they do things differently. Just as soon as the prospector in the North has shown enough

to warrant his building a cabin for himself, up comes the surveyor, and a pack trail is cleared out. Then, as soon as there is any real evidence of a commercial quantity of ore being developed, the provincial authorities either build or assist in building a road.

Our mines are a national not a state industry, and any national system of highways should provide for extensions not only for the benefit of moving agricultural products but for the movement and development of mineral wealth. A striking example of this necessity came to light in 1918, when it was found that the West possessed rather extensive chrome deposits, but owners were unable to move their ore because of its distance from good roads. The same was true to a greater or less extent with manganese.

We heartily approve of a National Highway System, but we insist that the movement of mine products is as essential as the movement of agricultural products.

In the bill as drawn the commission is to be made up of three members elected from different geographical sections of the country, "not more than two to be of the same political party." It would have been better had it read, "not one of whom should be of any political party."

It is intimated that the three \$10,000 commissioners are to be non-technical men, who are to have authority to appoint a chief engineer. This undertaking, if brought to fruition, will be one of strictly technical character, and though recognizing that engineers must be employed for laying out and doing the work, the spirit of the bill does not recognize that the commission should itself be made up of men already skilled in the science and practice of engineering. Perhaps a bill could not be passed wherein the best salaries were paid to men who understood the work they were called upon to perform, but it strikes us that the committee of the Chamber of Commerce, active in the campaign for national highways legislation, is of such calibre that it must see and know the importance of placing this work in the most competent hands available—the hands of engineers.

The Need for a Silver Exchange

THE United States is now the chief producer and distributor of silver, but the price of the metal is still regulated in London, where it has been controlled for many years. Has the time come when the producer shall have something to say regarding the price of his product?

It is evident that more adequate facilities for trading in silver, and stabilizing the price thereof, are needed. On page 301 of this issue of the *Journal* we publish an article by Srinivas R. Wagel, who suggests a medium whereby control over the price of silver may be exercised in the United States. We believe that Mr. Wagel's presentation will be read with interest, and we hope it may lead to instructive discussion and constructive criticism.

Citations

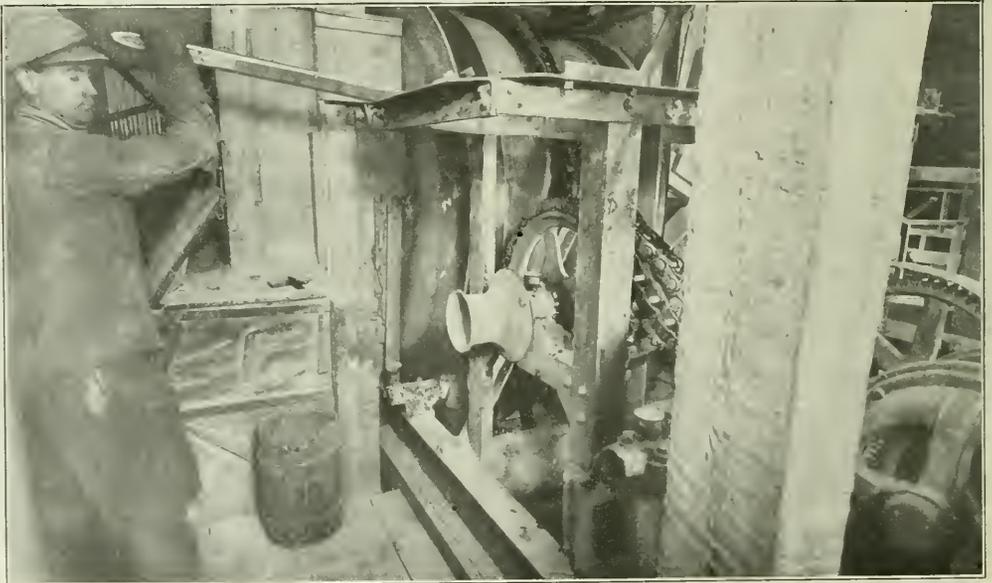
THOSE mining and metallurgical organizations which promised to re-employ, have re-employed, or are now re-employing their old service men who left to take part in the war are entitled to citations from the War and Navy departments. The Assistant Secretary of War requests that all employers who are entitled to this citation make application to him for it.



IRON AND MAGNESITE WEIGHED IN PROPER PROPORTION AND CONVEYED BY BELT TO MIXER

Mixing Iron and Magnesite

MIXER IN OPERATION AT MILL OF NORTHWEST MAGNESITE CO., CHEWELAH, WASH.



A Silver Exchange for New York

Unprecedented Demand for the White Metal, and the Passing of London as the Primary Market, Emphasize the Need of More Adequate Trading Facilities and of Stabilization Possible Only Through the Medium Suggested

BY SRINIVAS R. WAGEL

AFTER the demonetization of silver by the principal nations of the world, and the enthronement of gold as a sole standard of value, it was the general assumption that silver could play only a minor part in the currency of the world, serving principally as subsidiary money. Few believed in a war that, among other changes, would bring about a complete *volte face* in the relation between gold and silver and money. Gold no longer functions as the standard of value; it is not allowed even to circulate or to settle international balances of trade.

GOLD NOW ONLY A RESERVE

It is beginning to be realized that under conditions that are likely to prevail for the next few decades gold can serve only as reserve for circulation. Even as a reserve, it is unable fully to perform its function, because of the expansion in the issue of paper money, the circulation of which in all parts of the world is estimated at \$35,000,000,000—exclusive of Russia. But the total gold reserve, outside of the United States, is barely \$2,000,000,000. In countries like Spain, Italy, Norway, Denmark, and Switzerland silver performs the function of reserve side by side with gold. The only money in circulation consists of paper and silver. The demand for silver, principally for currency purposes, has been so great that the price of silver has actually doubled in the last three years. This demand is certain to increase with the settling down of the new states of Europe and the resumption of activity in the old countries.

UNITED STATES, MEXICO, AND CANADA SOLE SOURCES OF SILVER PRODUCTION

The only parts of the world where silver is produced in appreciable quantities are the United States, Mexico, and Canada. Nature has lavished upon these countries a wealth of silver; and the whole world is dependent upon their production to provide the metal needed for the regulation of its economic life. Canada is a poor third, because the production there is decreasing, the total for 1919 being estimated at less than 18,000,000 oz. The output of the United States and Mexico in 1919 will be about 120,000,000 oz. of the total estimated production of the world of 160,000,000 oz. But this total will be far from sufficient to meet the needs. The average offtake in India and China in a normal year is about 120,000,000 oz. In 1918, shipments from the United States ports to India and China amounted to 192,000,000 oz. Most of it, however, was contributed by the melting of silver dollars in the U. S. Treasury.

Every country is clamoring for silver, and the only way to meet the demand will be by the increased production from the mines of the United States and Mexico. Apart from the question of profits, it is imperative that the nations, many newly created, be assisted to get on a sound financial basis, and that

responsibility lies almost entirely with the United States. Enterprise in Mexico is three-quarters American, and both geological and political conditions necessitate development of the friendly influence of the United States in Mexico.

UNITED STATES CHIEF DISTRIBUTOR OF SILVER

In former years, although the largest producer in the world, the United States was content to let Great Britain distribute the metal and control prices. Today such distribution of the metal is being done mainly by the United States. In 1911 America sent 51,000,000 oz. to the United Kingdom, 9,000,000 oz. to Asia, and the remainder of 4,000,000 oz. to the rest of the world. In 1917 the United States sent 27,000,000 oz. to the United Kingdom, 50,000,000 oz. to Asia, and the balance of 2,000,000 oz. to other countries.

Direct exportation to the various countries is the present practice. Nevertheless, the price is still being regulated from London, except during the period of about twelve months when the Treasury fixed the maximum price, after consultation with British interests. The price of silver has for many years been determined by London, whatever may be the condition of the local market or the consuming markets of the world.

It has not generally been understood that the London dealers who acted as middlemen between the United States producers and the consumers in the various parts of the world have no interest in the high price of silver; that the British government in India, being the largest purchaser of the metal for coinage, is not likely to look with favor on any effort to maintain the price of the metal; that the China markets, controlled by European interests, will not favor the high price of silver, because it affects the volume of trade; and that a foreign market will not look with favor on any effort to benefit the producers of the United States. It is all very well to say that supply and demand regulate prices, but a great deal depends upon the regulation by the interests that act as distributors.

LONDON, BOMBAY, SHANGHAI, AND HONGKONG THE CHIEF FOREIGN SILVER MARKETS

The principal silver markets of the world outside of the United States are London, Bombay, Shanghai, and Hongkong. In all these places stocks are kept, and prices vary from day to day, according to the stock on hand, the volume of trade, the nature of the trade, and the demands of currency. London takes stock of all these conditions, and generally of the status of the New York market, in fixing prices from day to day. Except in special periods, prices in all of these places have always tended to stabilize themselves; for if the metal was cheaper in one place than another, the demand naturally went to that center to buy until the price was raised to the level prevailing in other countries. But the regulation was manipulated, so that the

tendency was always toward depressing the value of the white metal and ignoring the interests of United States producers altogether. London was not interested in a big demand for silver in India, China, or in any other country; the pound sterling was the medium of trade, and the lower the value of silver the better for the country that controlled the international medium of circulation.

It is not to be presumed that London had a deliberate plan for purposely keeping down silver prices, or to work against the interests of the United States and other silver-producing countries. It was purely a question of self-interest. London was a buying and distributing market, and it is only natural that such a market should take no pains to keep the price of silver at a high level. It is against human nature that a buyer should be anxious to pay a higher price than he has to. It is equally against all experience that the seller, as the United States has been in the silver market, should voluntarily lose all control over the trade in the commodity that he sells.

INSTABILITY OF STERLING EXCHANGE HAS MADE AMERICAN DOLLAR STANDARD OF VALUE

There has been a material change in conditions as a result of the war. The most noteworthy and important of all is the instability of sterling exchange. In former times, the only currency that had a fixed value, and in terms of which the moneys of the world were measured, was the pound sterling. At present, the value of the pound sterling varies from day to day, and the only currency that has any stability is the American dollar. In former times, it might have been valid to argue that the fixing of the price in sterling was the most logical proceeding. Today, such an argument cannot be considered sound.

The second important modification in conditions is the relative position of Great Britain and the United States in world commerce and international finance. Before the war, Great Britain was the greatest creditor nation; the United States, with all its wealth and resources, remained a debtor. Today the United States alone, of all countries, is the greatest creditor nation, and England owes as much as five billion dollars to America.

The third change is the elimination of London as the intermediary in international finance. In former times, every nation brought its surplus funds to London, and consequently all nations that wanted to borrow went to London to find accommodation. Great Britain, being a borrower today, cannot accommodate other nations, and both neutrals and belligerents are coming to the United States to obtain money and materials.

The fourth is, as I have already mentioned, the increased importance of silver in the currency of the world. When London was the money center of the world, the British Empire was, as is the case at present, the producer of two-thirds of the total output of the world's gold. When gold is no longer serving the purpose of a circulating medium, it is fortuitous that the United States should be the largest producer of the only metal that is the basis of the circulating metallic money of the world. No great argument is needed to show that the rehabilitation of the world is greatly dependent upon increase in silver production—in the United States and Mexico.

The United States can perform its full duty only if control of the market is firmly established. If

extraneous conditions and agencies should have the power to decide upon courses of action which will not be strictly in keeping with the interests of the United States, the country can do little or nothing but drift—as it has been doing for the last three or four decades. For instance, the price of silver has been at a materially low level for the last three weeks for no other reason but that sterling exchange in New York has been weak. This has nothing to do with supply and demand, and certainly not in the interests of American miners or trade. Still, the domestic market appears to have been helpless, because there is no agency by means of which it is possible to control the market.

Though there is legitimate complaint that the interests of all producers have not been safeguarded, it is neither fair nor advisable that the question should be treated solely from that point of view. Owing to the advent of new conditions, especially the part that the United States will have to play in the hegemony of the world, any proposed step should have an international import. Silver being for all practical purposes the only metallic circulating medium—for the present at least—the United States must consider not only domestic interests, but also those of the various nations with which America trades. Even within the United States itself, the interests of the miner, smelter, and dealer are not all identical; and, consequently, a plan for the better regulation of the silver market of the world should take into consideration not only the interests of the miners, smelters, and dealers in the United States, but also the consumers and traders in other friendly countries.

It is not often recognized that, although not producers of the white metal, India, China, and Spain have sufficient stocks to disorganize the market of the United States if American producers take advantage of the present demands to force prices up to unconscionable levels. India has been known as the sink of silver, and supposing, for argument's sake, silver goes up to \$2 per oz. there is no question that India can easily part with 500,000,000 or 600,000,000 oz. China, at a pinch, can sell over 100,000,000 oz., and Spain an equal amount—not to speak of the smaller European countries which have large stocks of silver. The international value of silver depends upon prices remaining high, consistent with stability, for at least a decade.

After careful consideration of all the points that I have detailed, it seems to me that the only plan by which it is possible to assure essential regulation of the silver market is that of creating a major market in New York—that to be achieved by the establishment of a Silver Exchange. It is an erroneous conception that this will mean a fight between London and New York. It is not at all improbable that the Exchange may lead to a closer co-operation between London and New York. Even before the war there were markets, independent of London, in Bombay, Shanghai, and Hongkong. Though there was interdependence between these markets, there were periods when it was cheaper to buy in Bombay or Shanghai than in London, although these two former markets were invariably supplied by London with the actual metal—originally shipped from New York. It was New York alone that had no volition and simply translated the London prices into United States currency.

The first essential of a sound market is that there should be equal facilities for both buying and selling. In all other silver markets, except New York, buying

and selling can be done to an extent several times that of the actual silver changing hands. New York alone has remained a selling market pure and simple. Such selling being in the hands of a few interests which have facilities for marketing in London, the great majority of producers are at times practically helpless. On the other hand, in London, Bombay, and Shanghai, where not an ounce of silver is produced, one can buy and sell a million ounces in a day.

It may be averred that these markets are speculative, and that it is an advantage that the United States has little or no speculation in silver. Anyone who is conversant to the slightest extent with economic principles will know that a market which is solely a buying or selling market can never be healthy, and that speculation is necessary to stabilize prices. This is evidenced by the operations in shares in the Stock Exchange, as well as in commodities like cotton, coffee, corn, and wheat in the several produce exchanges. If one follows the logic of eschewing speculation, there ought to be no selling market at all in London, Bombay, or Shanghai. That these markets both buy and sell in unlimited quantities, and have done so for decades, is proof positive of the fact that such is necessary and beneficial.

PRESENT PLIGHT OF THE SMALL PRODUCER

The actual condition of the silver trade in New York is almost deplorable. The larger interests that have connections in foreign countries, of course, are not affected by the present situation; but numbers of smaller miners find it absolutely impossible to sell their silver except at reduced prices and to the bigger concerns. By retaining the market in London, certain large interests are able to control almost the whole of the production in the United States and Mexico. By allowing London to distribute the metal, such organizations avoid or minimize competition in the United States. It is not to be presumed that such a course is intentionally pursued. I believe it was an accidental evolution, and that it is only natural that those who exercise control should be unwilling to give it up easily.

But the situation in every respect is changing rapidly. First of all, London in the past was able to offer certain advantages which our market was unable to give. The London dealers financed purchases in China, India, and other countries with the aid of their banks, acceptances. Today, they are unable to offer the same facilities. Furthermore, several countries in the world are anxious to do direct business with the United States, the banks of which are in the enviable position of being able to offer the credit facilities which London was able to grant in the past.

Banks and bankers from all countries would gladly purchase silver in the United States, and avoid the double freight, insurance and the middlemen's profit which they have been obliged to pay for in London. But their friendly offers are always spurned here. Why? Because those who buy in this market can do so only if they have opportunities of selling the silver, whenever necessary. Silver purchases, except for that part used in arts, are mainly exchange transactions.

It is well known that it is not always necessary to ship the metal in order to conclude such exchange business. When done in volume, the silver is resold frequently in large quantities. There are no facilities for resales here, and purchasers are reluctantly returning to London. If there were an organization like the pro-

posed Silver Exchange, purchases and sales could be made in large volume, as in other countries. Of course, care should be taken that speculation does not overreach itself. If purchases and sales are done by responsible parties, as, for instance, in the several well-established exchanges, speculation can always be kept at a healthy point.

In spite of the fact that the United States is the largest producer of silver in the world, the domestic silver trade is thoroughly disorganized. Concerted action even by the producers has many obstacles to encounter, owing to the special conditions prevailing in the market. There must be a mechanism to adjust the differences between the several parties interested in the silver trade, and such does not exist at present. The success of the trade depends on the smooth regulation of the differences between the producer, the dealer, the buyer, and the consumer. With the Silver Exchange in New York, all these parties could come together, and any differences could easily be adjusted.

The silver market will be healthy when the several points of view are disclosed to all those who have vital interests in the satisfactory progress of the commerce in silver. The main advantage of the Silver Exchange to the trade would be the creation of a buying market in the United States. As I have already stated, London buys and sells, and thus regulates the market. So also do the Bombay and Shanghai markets. For instance, if the consuming markets be dull, and it is known that the future is certain to bring about a good demand, the Exchange will be able to maintain prices by trading between the members.

CENTRALIZED TRADING WOULD PROVE A BENEFIT TO COMMERCE IN GENERAL

Of even greater import than this is the advantage that would accrue from having all the parties interested in the trade in one center. The buyers of silver come from all countries, and are generally banks of repute. It would add to the prestige of the United States if these buyers should deal here, directly or through representatives, and such direct representation would be not only a benefit to the silver trade but also to the general commerce of the United States with the rest of the world. New York is fast becoming a money center, and the establishment of the Exchange would facilitate this process.

With the changes brought about by the war, the trade of the United States is expanding, and it is the laudable ambition of American merchants to take their wares to all parts of the world. Incidentally, this means that they should buy largely in other markets. The Asiatic markets are not negligible, and if the American people are to trade with Asia they ought to have a correct appreciation of the silver position. Imports to China, for instance, although sold on a gold basis, are concluded on a silver basis by the Chinese dealers. Consequently, the American exporter must follow the silver market if he is to succeed. He must also operate in silver exchanges, as the Manchester dealers have done for a long time. How is it possible to do so if silver prices are controlled by London, and the Manchester dealers and other dealers of the European continent have the advantage over the American merchant? The merchants of the United States can develop the full strength of their position only if there be created a Silver Exchange in New York.

AMERICA SHOULD ENCOURAGE PRODUCTION OF SILVER

Silver is fast becoming the sole metallic money of the world, and as the wealthiest and most powerful country of the world, the United States has a responsibility which it cannot shirk. This responsibility lies in encouraging silver production in the United States and in adjacent countries in which the influence of the United States is potent. Such development will be greatly hampered if America does not exercise control over the price of silver, and such control cannot be obtained without a Silver Exchange.

Although it is beyond the scope of the producers or the consumers of silver to take direct interest in the international currency regulation, it may soon become necessary to make joint efforts at the present period of reconstruction, when silver bids fair to play a large part in the currency of the world. It is for the good of the world that the United States must maintain the lead which it has now attained, more by chance than by organized effort.

The American people must keep watch over legislation in Washington, as well as other countries, with regard to silver, and in every way make concerted efforts to protect the interests of that metal. Such efforts can be made successfully and results achieved, only if there shall be established a Silver Exchange in New York.

Audible Electric Signals in Industrial Plants*

Advantages of the Electric Horn With Code System Over the Ordinary Telephone for Notifying Employees When They Are Wanted

By V. KARAPETOFF

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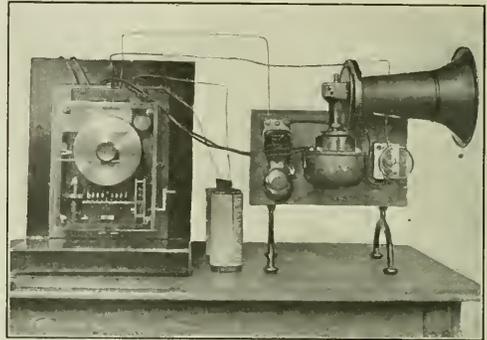
A PRIVATE telephone system, however extensive, promptly establishes communication with any important employee only so long as the needed man is at his desk. As soon as he leaves his desk the problem of finding him becomes a hit-or-miss proposition. On the other hand, a superintendent, a foreman, or a repair man is ordinarily useful only in so far as he can move about the plant or property freely, without the fear that someone of importance may need him.

An electric signal can be introduced for notifying heads of departments or foremen when they are needed at the head office, and it is similar in construction to the familiar electric "horn" used on automobiles. It consists of a diaphragm with an anvil at its center. A toothed wheel driven by a small electric motor strikes the anvil many times a second and causes it to vibrate vigorously. The device is provided with a projector or horn, the shape of which depends on whether it is desired to scatter the sound, to intensify it in a horizontal direction, or to deflect it downward. Such motor-driven signals are now made much more powerful than automobile horns, and are wound for 110 or 220 volts, direct or alternating current, so that they can be connected to a lighting or power circuit, and do not require a separate low-voltage battery.

When someone who may be anywhere in the plant is desired, the telephone operator simply sounds this particular man's call, whereupon he comes to the near-

est telephone, and reports, and the operator then connects him with the person at the other end. A special code-calling automatic instrument has been developed for this purpose. The operator merely sets the desired person's-code number on a dial and pulls a lever. A contact-making mechanism is thereby set in motion, which closes the electric circuit and operates the code signals throughout the plant the required number of times (usually three times) and it stops automatically.

A further application of loud electric horns in industrial plants is for extensions to telephone bells. The ordinary telephone ringer is not loud enough in



APPARATUS FOR USING THE ELECTRIC SIGNAL HORN

many shops when the foreman is away from his desk. In this case, a relay is connected in parallel with or in place of the telephone ringer, and when it is actuated it closes a secondary circuit, which causes an electric horn to sound. This call should be a single blast, to distinguish it from code calls.

A modern coal mine may have miles of passages and rooms underground, so that the superintendent and his assistants have to cover an extensive area. A system of powerful horns installed throughout the mine and connected to a code-calling instrument outside the mine would instantly convey any call, and the superintendent or whoever is called would come to the nearest telephone and report to the operator.

A further improvement of this system might consist in providing the superintendent, the foremen, the electrician and others with portable telephones, which could be connected to the line wires at any point. This is possible in many mines in which bare steel wires are used for the telephone circuit. In some mines, especially where rope haulage is used, the man on the train is given a piece of metal with which he short-circuits these two wires, and causes a signal gong to ring at the winding engine. In this case the telephones are connected through condensers, and electrical connections are used similar to those which permit simultaneous telegraphy and telephony over the same wires.

The same acoustic signals may be used for sounding emergency calls or for a general alarm, although the exact arrangement would have to be worked out separately to meet the conditions in each individual mine.

Rubber is one of the Few Commodities which has not advanced in price since the war began. The average New York wholesale price for Para Upriver fine grade in 1913 was about 92c. per lb. In July, 1919, the price was 55c.

*Abstract from a paper presented before the Rochester (N. Y.) Section of the American Institute of Electrical Engineers, Apr. 25, 1919.

An Automatic Iron-Ore Unloader

Electrically Driven Machines Are Used To Remove Iron Ore From Lake Carriers to Cars or Stockpiles Ready for Shipment to Furnaces—Entire Operation Automatic, And Controlled by Two Men

ONE of the most successful machines for removing iron-ore cargoes from Lake steamers that has been devised is the Wellman-Seaver-Morgan automatic unloader, shown in the accompanying illustrations. Although of large proportions, the design has been simplified, and the operation of the machine is such that excellent control is maintained at all times. The unloader consists of a main framework, mounted on trucks which travel along guide or runway rails, which extend back to the rear runway over a temporary storage pile, where the ore can be discharged if desired. Space is provided for railroad tracks between the front and rear runways, and cars placed under the machines

In addition to the main parts of the machine, there is also a hopper, placed at the forward end of the main framework and between the main girders, which receives the ore discharged from the bucket. The hopper, which has a capacity of about three bucket loads, serves as a balancing point for the ore between the bucket and the cars or storage as the case may be. The bottom of the hopper is provided with outlet gates, and the contents are discharged as required into a larry, which runs on an auxiliary track suspended from the under side of the main girders. The larry, after receiving its load from the main hopper, moves to a point where its contents can be discharged either into the cars stand-



EIGHT ELECTRICALLY OPERATED IRON-ORE UNLOADERS ON THE DOCKS AT ASHTABULA, OHIO

may be loaded with ore for transportation to the furnace plants.

The girders of the main framework form a support for runway rails. A trolley supporting a balanced walking-beam, from the outer end of which a stiff bucket leg depends, travels on the rails. At the lower end of the leg is the bucket, which is operated by machinery placed on the walking-beam. All horizontal movements of the bucket are accomplished by means of moving the trolley backward and forward on the girders, and vertical movements are effected by the operation of the walking-beam. When the forward portion of the beam is out of balance, the bucket descends by gravity as soon as the brakes of the hoisting mechanism are released. The hoisting-mechanism control is housed at the rear end of the walking-beam. Ropes from the winding drums of this mechanism pass around sheaves placed at the rear end of the trolley and are anchored to the walking-beam.

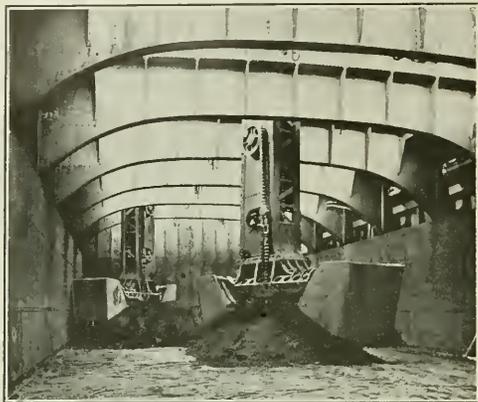
ing on the railroad tracks beneath the main span of the girders or into a temporary storage pile under the cantilever at the rear of the machines. The ore so placed in this temporary stockpile cannot be reclaimed by means of these machines, as their function is solely one of unloading the cargo from the ships.

Unloading machines of this type have been made in two sizes, the smaller size having a capacity of ten tons and the larger a capacity of seventeen tons in the bucket shells. The larger type of machine, such as shown in accompanying illustrations, is electrically driven throughout, and its speeds are regulated so as to complete the cycle of operation in about fifty seconds.

Some idea of the tonnage unloaded by this method may be gathered from consideration of a record that was made at Ashtabula, Ohio. Eight machines, having a capacity of fifteen tons each, unloaded seven boats, at a total capacity of 70,000 tons, in twenty-two hours' actual time. At other points, four machines, working

in boats having capacities as high as 13,000 tons, have unloaded these cargoes in about three hours and twenty-five minutes.

The operation of the machine is as follows: After the boat has been docked, the machine is moved opposite one of the hatches and the bucket is lowered through the hatch into the ore. As soon as the bucket is filled, the walking-beam hoist mechanism is put in operation and the bucket hoisted out of the boat. Simultaneously, the



HOLD OF IRON-ORE BOAT, SHOWING BUCKET LEG OF UNLOADER IN THE ACT OF SCOOPING ORE

trolley moves back so that the bucket is brought over the main hopper between the girders in the main framework, and the contents are discharged into the hopper. The bucket is then immediately returned to the boat for another load. The ore in the main hopper is discharged into the larry, which has been brought to a point directly underneath the discharge gates of the hopper. The larry hopper is filled, and the larry moved over the desired discharge point, where the gates are opened to discharge the ore as required. The hopper is provided with scales so that the contents are accurately weighed and recorded. In this manner, a car can be loaded to capacity and an accurate record kept, thus eliminating the necessity for the use of track scales.

If railroad cars are not available for immediate shipment, the larry is moved to a position on the rear cantilever and its contents are discharged on a temporary storage pile, from which the material is usually reclaimed for shipment or storage by means of a bridge, situated on the runway at the rear of the unloader.

UNLOADING OPERATION CONTROLLED BY TWO MEN

Only two operators are required for the entire operation of one of these machines. One occupies a station in the bucket leg directly over the bucket shells, and controls all of the motions of raising and lowering the bucket, of traveling the trolley back and forth, and moving the machine along the dock from one hatch to another. The second operator is stationed in a cab on the larry, and controls the movement of the larry, the operation of the larry gates, and the weighing of the ore.

The bucket shells are each made of a single piece of plate and are usually provided with manganese-steel cutting lips, which are essential to resist the abrasive

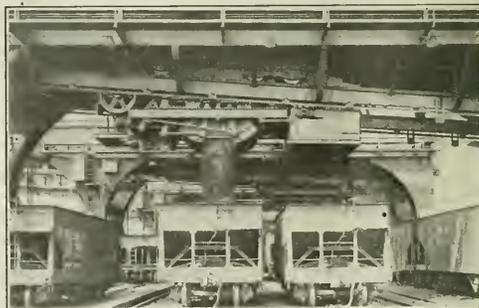
action of the ore. The shells themselves are carried on heavy cast-steel arms mounted on rollers that travel in guides in the fixed portion of the lower end of the bucket leg.

The motor used to operate and close the bucket is situated in the machinery house at the back of the walking-beam. Ropes from the bucket-closing mechanism are carried through the walking-beam and the bucket leg and are attached to a power drum in the bucket leg directly over the operator. This drum is geared to the closing chain drums. The bucket is closed by rotating the drums in the proper direction and opened by reversing the motor, which forces the bucket shells apart by means of an opening chain placed in the center of the bucket leg between the two closing chains.

UNLOADING FACILITIES OF BUCKET LEG

In addition to the vertical movement, which is given to the bucket leg by means of the walking-beam, it also has rotation about its vertical axis. This is accomplished by means of ropes attached to a segment on the bucket leg itself, the ropes being carried back in the walking-beam to a rotating mechanism placed adjacent to the bucket-closing mechanism. This motion is introduced for the purpose of turning the bucket at right angles to the hatchway to secure as great a reach lengthwise of the boat as possible, so that the bucket is enabled to reach out under the hatches and remove the ore not directly beneath the hatch opening. The distance from point to point of the bucket shells when open is approximately twenty-one feet.

The scale larry, into which the main hopper discharges, has a capacity of between thirty-five and forty-five tons, and two larry loads constitute a full carload of ore. The discharge gates of the larry are suspended from the sides of the larry frame and are operated by connecting rods which attach to cranks, also connected to the main larry frame. The gates are operated by means of a small motor which is carried at the rear of



SCALE LARRY DISCHARGING ORE

the larry, and are so arranged that all or a portion of the contents of the larry may be discharged. The hopper of the larry is suspended in the frame on scales so that the contents may be wholly or partly discharged and be accurately recorded.

The mechanism for moving the larry back and forth on its track is also situated on the larry and consists of winding drums upon which ropes are wound, the end of the rope being attached to the rear end of the cantilever on the main framework.

Although usually electrically driven, these machines have been made to operate by steam and hydraulic cylinders, water being supplied to the operating cylinders by means of a steam accumulator, which furnishes water at a pressure of 1,000 lb. per sq.in. The electrically operated machines are usually designed for a 220-v. direct current. Alternating current is never used. Motors required for the equipment of one of these machines are as follows: Beam hoist, 1 motor, 275 hp.; bucket closing, 1 motor, 120 hp.; bucket rotating, 1 motor, 25 hp.; trolley travel, 1 motor, 120 hp.; hopper gates, 1 motor, 100 hp.; longitudinal travel, 1 motor, 100 hp.; larry travel, 1 motor, 150 hp.; larry gates, 1 motor, 40 hp.

The regulating equipment for the motors is of the magnetic-switch type throughout, having master controllers placed in the operators' cabs in the bucket leg and on the larry.

Current is conducted to the machine by means of insulated rails running the length of the main runways, being collected from the rails by means of pick-up shoes and distributed to the various parts of the machine. A similar collecting device is also employed for supplying the main current to the trolley. Conductor rails are attached to the main framework, and the current is collected by means of pick-up shoes attached to the trolley.

ADVANTAGES CLAIMED FOR UNLOADER

Among the points of superiority claimed for the Wellman-Seaver-Morgan ore unloader are the following: The design is heavy. There is little to get out of order, which results in a low maintenance cost per ton of material handled. The control is accurate and positive, and manual labor is reduced to a minimum. The bucket is positively guided in passing through the hatches of ships, thus eliminating the danger of damage, either to the boat or to the machines, arising from the use of rope-suspended buckets. The operator travels with the bucket into the boat, and can always see exactly what he is doing. The bucket is of large capacity, but is so suspended from the walking-beam that the weight resting on the tank top of a boat is less than one-third of the weight of a rope-suspended bucket of equal capacity. In fact, it is impracticable to use a rope-operated bucket of the size attained on these unloaders.

An important consideration is the low operating cost obtainable with these machines. Records extending over long periods show unloading costs ranging from 2½ to 4½c. per ton, which includes superintendence, labor, repairs, and materials on the machines, as well as the cost for power and light.

Owing to the extreme reach of the bucket, it is possible for the machine to discharge a much higher percentage of a ship's cargo than can be accomplished by ordinary rope-operated buckets. The bucket can be rotated at right angles to the hatch and reach out for ore which would be entirely inaccessible to an ordinary bucket.

Mining in Colorado in 1918 and 1919

During 1918 Colorado mines produced \$12,705,000 in gold, 6,900,000 oz. of silver, 66,000,000 lb. of lead, 6,190,000 lb. of copper, and 86,550,000 lb. of zinc, according to statistics compiled by the United States Geological Survey. The statistics for 1919 will show a considerable decrease in the output of all metals

in the state. The production of gold alone will decrease at least \$2,000,000.

If production is continued at the rate maintained for the first five months of 1919 the mines of Cripple Creek, which produced \$8,125,000 in 1918, will produce \$1,500,000 less in 1919. The Telluride district, which for several years has been the most persistent producing district in Colorado, will probably not equal its output of 1918, for the prevalence of influenza and lack of electric power reduced the output considerably during the winter and spring. The recent resumption of work at the Humboldt mines will help to maintain the output of silver.

The closing of the Smuggler mine and the idleness of the Wasatch mill, at Silver Plume, will mean a greatly reduced output of silver, lead, and zinc from Clear Creek County. Though development work and production in Gilpin County have been resumed, the closing of the Argo mill, at Idaho Springs, and of the associated Fremont mine will cause a decrease in the production of gold which can be offset only by increased production at several mines.

At Leadville, the closing of the Iron Silver Mining Co.'s mines and the Greenback mine and the abandonment of the Western Mining Co.'s operations will entail a greatly reduced output of silver and zinc from the district. The cancellation of contracts for manganese to be supplied from this district has resulted in the suspension of the shipments of lead-silver ores from mines at which manganese was a product.

The low price and the lack of market for lead and zinc have resulted in the closing of the Wellington mine, at Breckinridge, and the Eagle mines, at Red Cliff. The snowslides and fire at the Sunnyside mine, at Silverton, have handicapped operations there. The removal of the pumps from the lower levels at Aspen naturally indicates a heavy decrease in the production of silver-lead ores in that district. The shipments of silver ore from Creede have not equaled those of 1918.

Development work is being done in several districts. The silver output of Boulder County may show a small increase and the Camp Bird mine, at Ouray, may resume milling during the year. Development is continuing at many mines that have stopped shipments until the prices of metals increase.

The closing of the Globe smeltery, at Denver, will put an additional burden of freight charges on shippers from Boulder, Clear Creek, and Gilpin counties, who will now ship to Pueblo. Only four lead smelters are now operating in Colorado, none of them at full capacity, and some at less than half capacity.

July Pig-Iron Production

July pig-iron production amounted to 2,428,541 gross tons, or 78,340 tons daily, as compared with 2,114,738 tons, or 70,495 tons a day, in June, according to *Iron Age*. There was a net gain of 39 stacks during the month, 46 being blown in and 7 blown out. The estimated capacity of the 239 furnaces in blast Aug. 1 is 85,635 gross tons, as compared with 200 furnaces, having a capacity of 71,700 tons, active on July 1. Of ferroalloys 14,805 gross tons were made, this rate of production now having held for a full quarter. Output increased 55 per cent in the Wheeling district, 45 in New York, 23 in the Mahoning Valley, 19 in the Pittsburgh district, 13 in the Shenango Valley, and 10 per cent in the Chicago district.

Determination of Magnetite in Matte and Slag

Troubles Caused by Magnetic Oxide—Qualitative Tests of Little Significance—Quantitative Method Has Been Proved To Be Sufficiently Accurate,
And It Is Also Rapid

By F. G. HAWLEY

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MAGNETITE is a common though undesirable constituent of most copper furnace charges. It may originate in the raw ore treated or be formed during some of the smelting operations. As magnetite is chemically rather inert, it does not readily combine with the other elements of the charge, and because of its high melting point it has a tendency to collect in granular particles. As the smelting proceeds, part of it enters the slag, part enters the matte and some of it may collect in rather large pasty masses and float on top of the matte. This prevents a good separation and may be the cause of high slag losses.

A qualitative test for the presence of magnetite in slag is sometimes made by means of a magnet, but such a test is of doubtful significance, as many samples will be quite strongly magnetic though containing little magnetite. Generally the sample will be contaminated with minute particles of iron from the grinding machinery, that adhere so strongly to the particles of slag that the two are attracted to the magnet as one. Other compounds of iron that are quite magnetic are apt to be present, such as particles of matte which are frequently magnetic even when no magnetite is present. Possibly the most reasonable explanation of this is that most matte contains an excess of iron in the form of a solid solution of Fe in FeS.

The following experiment will give some idea of how misleading a test for magnetite by means of a magnet may be: A sample of converter slag known to contain considerable magnetite was ground to pass a 100-mesh sieve, and tested by a small and rather weak permanent magnet. Over 90 per cent was magnetic enough to be removed in this manner. A partial analysis of this slag gave: SiO₂, 23.4 per cent; Al₂O₃, 3.9; Fe, 45.8; Cu, 3.5. It is certain that the SiO₂ would be combined with more than its own weight of FeO to form silicate, so it is obvious that there could not possibly be over 30 to 40 per cent of magnetite present. Its amount was afterward found to be approximately 24 per cent.

A reliable quantitative method for the determination of magnetite in slag or matte would frequently be very useful, but so far as I know no simple method has been published.

Several years ago I devised such a method, and it has been improved and pretty thoroughly tested since, so that now I feel justified in offering it to others who may have occasion to make the determination. Extreme accuracy is not claimed, but I believe it to be capable of giving results that are sufficiently near the truth to be of considerable value in commercial work. Duplicate results will usually check to within 0.1 to 0.2 per cent, but probably the absolute accuracy is not greater than 0.5 to 0.6 per cent. The method is in frequent use at two large copper smelteries and is giving satisfactory results.

It is a well-known fact that when magnetite is dissolved in a strong acid such as HCl it forms one mole-

cule of ferric iron and one molecule of ferrous iron, thus: Fe₃O₄ + 8 HCl = Fe₂Cl₆ + FeCl₂ + 4H₂O. The formula for the ferric chloride can also be written 2FeCl₃ but the result is the same, for in either case two items of ferric iron are shown.

It occurred to me that there was little or no ferric iron present in either matte or slag except that contained in magnetite, and that by determining the amount of ferric iron present a fairly close approximation to the amount of magnetite could be calculated. The presence of metallic iron or matte would interfere, but a way was found to overcome that difficulty.

Probably everyone will concede that there can be no ferric iron in matte except that present as magnetite. It may not be quite so apparent that this must also be the case with slags, but consideration of the following facts has led me to believe that it must be at least approximately true:

At high temperatures the tendency of most chemical combinations is to dissociate and form new compounds in which the elements have lower valences. It is very common to have heat alone act as a reducing agent. Thus at high temperatures, CuO is reduced to Cu₂O, MnO₂ to Mn₂O₃, As₂O₅ to As₂O₃; SO₂ to SO, and Fe₂O₃ to Fe₃O₄. Ferrous oxide is a much stronger base than ferric oxide, and at the temperature at which slag forms ferrous silicate is much more stable than ferric silicate. When ferric oxide alone is heated to a very high temperature it is reduced to Fe₃O₄, even when no reducing agent is present, but if silica is mixed with ferric oxide it is further reduced to ferrous oxide, which combines to form ferrous silicate. The presence of lime or alumina does not alter this tendency.

Magnetite itself is a rather stable compound that does not easily react with other substances. It resists both oxidation and reduction better than other iron compounds.

In ordinary furnace practice slags are almost always formed in contact with some reducing agent. In the blast furnace there is carbon, carbon monoxide, sulphur dioxide, and a small amount of sulphide dissolved in the slag, all of which have a reducing action.

In reverberatory smelting the conditions for reduction are not quite so favorable, but there is always sulphur dioxide and the dissolved sulphide present. F. W. Clark¹ quotes Vogt as stating that hematite rarely if ever occurs in furnace slags.

DETERMINATION OF MAGNETITE IN SLAG

The method for determining magnetite, as applied to slag, is as follows: Grind the slag to about 100 mesh and weigh 0.5 to 1 gm. into an Erlenmeyer flask of about 175 cc. capacity. Prepare a mixture of equal parts of concentrated nitric acid and a 15 per cent solution of sodium chlorate in water. Heat this nearly to boiling and add about 20 cc. to the sample in the

¹"The Data of Geochemistry," 3d ed., p. 347.

flask; shake a little to prevent sticking to the glass and then heat just to boiling; remove and quickly dilute with about 100 cc. of cold water.

The sulphide and metallic iron are now in solution while all but a trace of the magnetite is in the insoluble residue.

Let settle a few minutes and decant through a small filter; wash several times by decantation and also wash filter until free of acid. Add 7 cc. of water to the flask and cover with a platinum dish, or anything else suitable; set on a wire screen placed over a flame and heat to boiling to expel most of the air. Remove the cover an instant and add approximately 10 cc. of a previously prepared mixture of one part hydrofluoric and three parts hydrochloric acid which is mixed in a platinum dish and heated quite hot before using. If much magnetite is present, more hydrochloric acid may be needed. Replace the cover and heat to boiling as quickly as possible; remove the filter that contains the small portion of slag that was filtered out, tear off as much of the clean portion as possible and place the rest, containing the residue, in the flask. Boil until the sample appears to be entirely decomposed and the filter is disintegrated, then add about 5 cc. of a saturated solution of boric acid in warm 50 per cent HCl. While still boiling, titrate with a standard solution of stannous chloride from a burette so placed that the tip is just at the mouth of the flask. The solution is run in rather quickly, with constant shaking, until the yellow color of the ferric chloride can scarcely be seen. At boiling temperature and under the conditions given, the end-point is quite sharp, and there is little difficulty in telling when it is reached.

From the equation $\text{Fe}_2\text{O}_3 + 8\text{HCl} = \text{Fe}_2\text{Cl}_6 + \text{FeCl}_2 + 4\text{H}_2\text{O}$ it is seen that 2Fe in the ferric state are equivalent to one molecule of Fe_2O_3 ; therefore the iron value of the stannous chloride solution $\times 2.073 =$ magnetite.

The time required for a determination by this method is not long, and a little practice is all that is needed. After the apparatus is assembled and the solution standardized, one assay can easily be made in 20 minutes and three or four assays may be made in half an hour.

When it is desired to determine magnetite in matte the method is modified as follows: Weigh 0.5 to 1 gm. of matte into a flask as before. Dissolve 3 cc. of bromine in 3 cc. of acetic acid and add to the flask, shake to mix, and let stand about 10 minutes in a warm place. Add cautiously about 20 cc. of the same dilute nitric acid and chlorate solution as used for slag; heat just to boiling and proceed exactly as before. The sulphide of the matte may be dissolved with the chlorate mixture alone without the use of bromine, but the results are more satisfactory when the latter is used. The solvent effect of bromine on magnetite is very slight. The presence of a few flakes of unoxidized sulphur does not seem to have any harmful effect on the determination.

Slag or matte that has weathered on the dump for some time will be oxidized, so it is not advisable to try to determine magnetite by this method on any except fresh samples.

To make the standard solution, dissolve 21 gm. of hydrated stannous chloride ($\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$) in 100 cc. of water + 55 cc. HCl + 5 gm. of tartaric acid, and then dilute quickly to two liters and place in a closed bottle; 1 cc. is equivalent to about 0.005 gm. of Fe.

To minimize as far as possible the oxidation caused by contact with air, the solution should be kept in a five-pint bottle, with the burette permanently attached, so that it can be filled by forcing the solution up through a rubber tube by means of compressed air from a rubber bulb. If it is desired to keep the solution for some time it is well to attach a tube or bottle containing an alkaline solution of pyrogallol acid to the inlet air tube to absorb the oxygen.

To standardize the solution, weigh out 700 mg. of ferrous ammonium sulphate, which contains 100 mg. of Fe, into a small flask; add 15 cc. of water, 7 cc. HCl, and when dissolved add 5 cc. H_2O_2 , or enough to oxidize the iron. Set on the hot plate and boil for five minutes to completely decompose the excess H_2O_2 . Add a few drops of HF and 5 cc. of H_2BO_3 solution, so that the conditions approximate those of the regular assay; then titrate with the tin solution. It is generally necessary to standardize the solution every day.

Magnetite could be used as the standard, but it should be remembered that most of that found in nature contains considerable titanium, whereas that formed in smelting operations contains but little.

The presence of boric acid is not absolutely necessary, but is beneficial, as it combines with the HF and has a tendency to retard oxidation; it also counteracts the bleaching effect of the HF on the ferric iron and retards the etching of the flask. Of course the HF will attack the flask considerably, but usually one flask will last for 15 to 25 determinations.

PROOF OF ACCURACY OF THE METHOD

Following are some tests made to determine the solubility of magnetite in the nitric-acid mixture used to remove sulphides. A sample of nearly pure magnetite was ground to 150 mesh in an agate mortar, and samples were weighed and treated in beakers with the acid for varying lengths of time. The assay was then diluted, filtered and the amount of Fe found in solution.

The acid used was concentrated HNO_3 diluted with an equal volume of a 15 per cent solution of NaClO , in water.

SOLUBILITY OF MAGNETITE IN NITRIC ACID MIXTURE

Acid Used	Time Boiled	Magnetite Taken	Magnetite Dissolved
1. 25 cc.	6 min.	500 mg.	22.0 mg.
2. 10 cc.	10 min.	20 mg.	1.5 mg.
3. 10 cc.	1 min.	20 mg.	0.8 mg.
4. 5 cc.	1 min.	20 mg.	0.7 mg.
5. 10 cc. Conc. HNO_3	4 min.	500 mg.	22.0 mg.
6. 5 cc. Conc. HNO_3	10 sec.	500 mg.	2.0 mg.

Another experiment was made on crystallized magnetite found in the walls of a reverberatory furnace, ground to 100 mesh.

EXPERIMENT ON CRYSTALLIZED MAGNETITE

Acid Used	Time Boiled	Magnetite Taken	Magnetite ^a Dissolved
1. 10 cc. HNO_3 + 15 per cent chlorate	2 min.	500 mg.	5.0 mg.
2. 10 cc. HNO_3 + 15 per cent chlorate	Just boiled	500 mg.	2.0 mg.
3. 10 cc. HNO_3 + 15 per cent chlorate	Just boiled	20 mg.	0.5 mg.
4. 3 cc. HF + 2 cc. H_2O	3 min.	400 mg.	170.0 mg.
5. 3 cc. HF + 2 cc. H_2O	15 min.	400 mg.	90.0 mg.

From these figures it may be seen that when but little acid is used and it is not boiled long the loss due to solubility is small.

Numerous tests were made to see if any error would be caused by oxidation of the solution of magnetite by the air, either before or during titration, or from any reducing action the filter paper might have. It was found that if the directions were followed no trouble need be feared from either condition.

In order to see how the method would check on

synthetic samples, the following was tried: A sample of slag was selected as free as possible from magnetite and matte, and run in the ordinary way. This gave 0.4 per cent of ferric iron, which is equivalent to about 0.8 per cent of magnetite. Several samples of this slag were weighed out and varying amounts of magnetite added. This magnetite was not pure but contained 97 per cent of Fe_2O_3 .

SLAG WITH ADDED MAGNETITE

	Magnetite Found, Per Cent.
1. 1 gm. slag + 0 magnetite.....	0.7
2. 1 gm. slag + 0 magnetite.....	0.8
3. 1 gm. slag + 1 per cent magnetite.....	1.7
4. 1 gm. slag + 2 per cent magnetite.....	2.9
5. 1 gm. slag + 2 per cent magnetite.....	3.0
6. 1 gm. slag + 4 per cent magnetite.....	4.3
7. 1 gm. slag + 4 per cent magnetite.....	4.6
8. 1 gm. slag + 10 per cent magnetite.....	10.2

It has already been pointed out that under the conditions of slag formation it would be impossible for any considerable amount of ferric iron, other than that contained in magnetite, to be present. However, it should be remembered that the reactions, in which ferric iron is reduced to ferrous, are reversible and that under these circumstances it might be possible for a normal slag, free from magnetite, to contain a very little ferric iron.

A good many experiments were made in trying to test this point. The experiments, though not absolutely conclusive, seemed to indicate that in most cases there was from 0.3 to 0.7 per cent of ferric iron present, exclusive of that in magnetite.

In one experiment, several samples of slag were ground quite fine in an agate mortar, the magnetic particles removed with a magnet, and then the ferric iron determined in the residue. The most satisfactory way found to remove the magnetite was to place about 10 gm. of the sample in a small porcelain crucible with about 10 cc. of gasoline. The sample was stirred with one pole of a straight-bar electro-magnet, tapped a few times, and the magnetic portion removed. The gasoline was then decanted and the residue dried. By working under gasoline in this manner the tendency of the non-magnetic particles to adhere to the magnetic particles is partly overcome. Tests for ferric iron in the non-magnetic residue gave about 0.4 per cent for blast furnace slags and 0.6 per cent for reverberatory slags.

It was thought desirable to check these figures by a different method, so an attempt was made to decompose the slag without dissolving the magnetite and then to determine the ferric iron in the solution.

Samples of properly chilled slag rather low in magnetite and known to decompose very easily were treated with warm dilute sulphuric acid and a little silver sulphate added, to combine with any H_2S that might be evolved. The solution was then quickly decanted and the ferric iron in both the solution and the residue determined. Of course this method is not very accurate, as with even a short treatment some magnetite will be dissolved. However, some separations seemed fairly good, and these in a general way checked pretty well with those obtained after removing the magnetite with a magnet.

I think there is warrant for assuming that all ferric iron found in matte and nearly all of that in slag is derived from magnetite. Probably there will be present in slag a few tenths of 1 per cent of ferric iron combined as ferric silicate, but, if desired, a deduction can be made for this small amount before calculating the results to magnetite.

The Sources and Uses of Cadmium

The U. S. Geological Survey has recently published a twelve-page pamphlet entitled "Cadmium in 1918," by C. E. Siebenthal, which contains much valuable information on the sources, production, prices and uses of this comparatively rare metal. During the war, cadmium was used as a substitute for tin and nickel to the extent that its production permitted.

Germany and the United States are practically the only producers. No commercial cadmium ores are known. The metal is a byproduct of the zinc industry, practically all spelter containing a fraction of 1 per cent of cadmium, which could be sold as such if the demand warranted. The production of cadmium in this country has never amounted to much over one hundred tons per year, but it could easily be increased to four or five times this figure. Practically none has been imported in recent years. The price at present is about \$1.50 per lb., though before the war it was considerably cheaper, selling as low as 53c. in 1909.

Cadmium lowers the melting point of alloys in which it is used, and is therefore employed in making easily fusible alloys and soft solders, such as those used in the fusible plugs of automatic sprinkler systems, boilers, and electric fuses. Cadmium can replace tin in solders, a solder of the composition lead eighty parts, tin ten parts, and cadmium ten parts having much the same properties as one composed of equal parts of lead and tin, and also being somewhat cheaper at present prices. It is suggested that better results can be secured in nickel plating by making the first deposit of cadmium, as it is a better rust preventive than nickel, though it tarnishes more easily. About one-fifth of the production is sold in the form of cadmium sulphide, a brilliant yellow pigment which is unaffected by coal smoke, whereas the common yellow pigments (lead chromes) are blackened in a smoky atmosphere.

Warning Miners Against Dangers

BY A. L. H. STREET

A rule of law governing an employer's liability for injuries to employees is that a worker assumes all risks of injury which are naturally to be appreciated by him, considering his experience and ability to discern the dangers, but that he does not assume risks not appreciated by him because of his inexperience and their latent character.

The United States Circuit Court of Appeals, Eighth Circuit, lately applied this rule in the case of *Silva vs. Ozark Smelting & Mining Co.*, 255 *Federal Reporter*, 821, holding that the danger that an ore chute in a mine might, after becoming clogged, open with such rush as to swallow miners shoveling ore, was such latent peril that a mine operator may be held liable for fatal injury to an inexperienced miner who was not warned against the danger.

However, it was decided by the Utah Supreme Court in another recent case—*Macky vs. Bingham New Haven Copper & Gold Mining Corporation*, 180 *Pacific Reporter*, 416—that defendant was not bound to warn an experienced miner and timberman of the location of chutes, which did not constitute latent defects, the miner having full opportunity to observe the situation and condition of chutes in the performance of his routine duties which took him to different parts of the mine.

The Care of the Human Machine

Proper Treatment of Injuries Has Resulted in a Reduction of Fatalities—Supplying of Wholesome Food and Proper Care of the Body Aid in the Conservation of Health, and Promote Efficiency

AT A MEETING of the Mining and Metallurgical Society of America on May 1 Dr. Thomas Darlington addressed the members upon the subject, "Man as a Machine." Much that he said is of such deep concern to the mining and metallurgical industry that the following extracts from his address will be of timely interest:

"I am going to talk to you about man as a machine and the necessity of keeping that machine in working order. Medicine has opened a new field, particularly in prevention of disease, and we have begun to consider man in a different light. We know, and have known for a long time, that it pays to take care of an accident, and we know that it costs something every time a man loses his finger. It used to be, even ten years ago, that in some of the steel plants when men became injured the wound would become septic in fully 50 per cent of the cases. Today in various plants, the United States Steel Corporation, Carnegie, Cambria, and Youngstown Sheet & Tube, the rate is only one out of a thousand, and in the Bethlehem Steel much less than that. In the big plant at South Bethlehem in four years of accidents, taking every little injury into consideration, fifty or sixty cases a day, there have been only two cases of septicemia.

"The deaths in the army, both from disease and those killed in battle, are nothing compared to those who become ill and die in industry.

"And how have we looked upon the man in industry and in the Army, and how have we been treating him? We think that hardship hardens a man, and we look at the brown faces of the men that have come from abroad and say they are 'hard as nails,' but I am thinking of all those that went down, of many deaths, for which there seemed to me to be no necessity. Given a well man, and you have absolute control of him. Why should he get ill?

"From my standpoint, efficiency depends primarily on health. The German philosopher Münsterberg said it depends on a man's psychology, but what does psychology depend upon? Flow of blood to the brain, and flow of blood to the brain varies with all kinds of things, with the weather, the pressure of the barometer. Suppose your liver is out of order. Don't things look with a green and yellow hue? Psychology depends on health. Efficiency depends on health, and it pays to take care of a workman.

"As a matter of fact, illness in industry already has an effect on operating costs that is far from being realized. Whenever a man is absent from his work because of illness, it is usually necessary to have someone else take his place. The substitute, as a rule, is a less efficient worker; he makes a smaller output for the day's wages; he spoils more raw material; he requires more supervision from the foreman, who is thus distracted from more important work; and procuring and sending the substitute to the work needed involves a cost and usually a delay in the operations.

"Efficiency depends on health, and health depends on

three things: the care that a man gives himself, the care that industry gives him, and the making and enforcing of health laws—city, state, and national. What can people do for themselves? Before I take up that question it is proper that I state that I have been told some of the members here are interested particularly in the question of fatigue. Fatigue means much to a worker. If a person catches cold it is when he's tired. If you catch an infectious disease it is when you're tired. Fatigue lessens resistance to disease. Fatigue is the one great thing in this world that we want to avoid. What makes people tired? Work? No. Very seldom. It isn't work. Cold will make you tired. It makes every cell in the body work fast. A great many things make fatigue, but seldom work. That is a different idea from that which most workmen have. How do people get tired? Now, to know that, you have got to understand a little physiology. We must understand the body. Every part of the body is in motion all the time. When any part isn't in motion in the body it is dead. You are manufacturing heat; you are getting energy all the time. That comes from your food. Food goes into the body, is taken up and stored in the body, and you have it to use. It is then burned up by means of the oxygen which you breathe. All the time in the body there is a breaking-down process; all the time there is a building-up process.

"Energy depends first upon the food you eat: the kind of food, whether the system can use it or not, whether you digest it and store it away. Next upon the oxygen which is carried by the red blood corpuscles, the hemoglobin in the blood. The first thing, then, in the question of fatigue depends upon the character of the food that people eat. Few persons understand that, and so far as workmen are concerned, few of them or their wives know anything about feeding the man, and any old thing goes in the lunch bucket. One day I opened 250 lunch boxes in a Carnegie Steel plant. The first bucket opened contained a whole boiled cabbage. How much $C_6H_{12}O_6$ did he get to use in the muscle; how much energy could he develop from that cabbage? The next man had nothing but cake and honey. He got all the $C_6H_{12}O_6$, but what did he get to make up for the loss of protein and muscle? Nothing, and he was thin.

ENERGY AND ITS RELATION TO FOOD

"But it is not alone a question of the kind of food that he gets. Does the man digest that food? Was it mingled with bacteria in the mouth and fermented in the stomach? Did the sugar split up into acids in the stomach before it got into the muscle? Don't you see that energy is the converse of fatigue and fatigue the converse of energy? Energy depends first upon food and its digestion, its absorption and utilization, and next, how are you going to burn it? It is burned with the oxygen. Take a drop of blood from a man and examine it under the microscope and we find that he has a 5,000,000 blood count. Yes, that is a good healthy

man. It is up to normal. The next man we take we find he has 2,500,000 blood count. Doesn't it take twice as rapid the circulation of the 2,500,000 to carry the hemoglobin as with the man with the 5,000,000? Yes, the blood has to work twice as fast because he has anæmia. What does anæmia come from? Dark, unventilated rooms, infectious disease, poor food, lack of movement from the bowels, bacteria in the mouth, in the tonsils.

"Next, getting rid of the ashes of waste. And how do we do it? The blood takes it up and takes it away. If a person drinks a great deal of water, that helps. If you have a shower bath, you drive the blood inside, and then it returns to the surface again, and that helps, and soon you get rid of all fatigue, and the waste goes out through the kidneys. But other waste produces fatigue. In fermentation we have bacteria in the bowels all the time. In fermentation, particularly of protein food, you develop certain poisons. These poisons are known as indol, skatol, mercaptan, and certain phenols. The last develop particularly from eggs and milk. The most common poison found is indol. That is absorbed and becomes a sulphate in the system, and that is known as indican. When you have a urine examination you see so much sugar, so much albumen, and so much indican.

"To show you how it works and how a lack of regularity of the bowels produces fatigue: A man gets up in the morning, and he hurries. He goes to work. He has got a lot to do, and the small amount of liquid material in the lower part of the bowels is absorbed and the desire to evacuate the bowels passes off. The poison is taken up by the blood and permeates all the muscles of the body, and the man becomes tired.

"This has been proved numerous times by injecting indol into the blood of perfectly fresh men, birds and animals, always with the same result, fatigue. The man has only about a little more than one-third the efficiency of the other man, so far as his actual muscular capacity is concerned. If the one man is worth \$6 a day, this man is worth \$2.30.

THE NEED FOR PERSONAL HYGIENE

"I said that a man's efficiency depends upon what he can do for himself. Now, among the many things of personal hygiene besides the question of taking baths, care of the eye, the ear and the nose and everything else of that kind, and regulation of a man's meals, there are simple things like the brushing of teeth. How many workmen in the factory brush their teeth every day? To be efficient men they must brush their teeth seven times a day. Do you suppose any of your workmen know that? Not a one of them. Why must they do it? The manufacturer is interested in it because of his output. If I had a factory I'd make every man a present of a toothbrush. It was done in the Army. I helped to take care of fifty thousand men, and had to talk to them. Pneumonia killed some of them, because they didn't brush their teeth. What did they do with the toothbrush? Used it around the edge of the shoes to get the mud out. What is the first thing about the teeth? Well, we need them for enunciation. In the Army it was absolutely necessary that orders should be distinct. The chewing of food means a lot in energy. Still, that means little compared with some of the other things. In the mouth are forty-eight varieties of bacteria. If you chew the food without brushing the

teeth you swallow those bacteria, and the food ferments in the stomach, and often it passes the quarantine of the stomach and goes down to the bowels.

"The gastric juice of the stomach will keep indefinitely, but swallow saliva and it quickly spoils from contamination with the bacteria that the saliva carries down. Do you know that in the Army in the grip epidemic few if any died from grip? They all died from pneumonia. Why? There are four types of pneumonia germs. Nearly all died of the fourth type. That is a mouth bacteria. They got the grip, and then the pneumonia bacteria that inhabited their mouth and grew there went into the lungs and killed them. If they had all brushed their teeth regularly, many of them would have lived. Many, very many of the 600,000 persons that died in the United States, would be alive today if they had brushed their teeth in that epidemic. But that is little compared with the other thing. A tooth dies, but you do not always know it. At the root of that tooth there comes a very small abscess. From this, bacteria and the toxin are absorbed in the system. Just the same as in the tonsils. The tonsils and the teeth make over 90 per cent of our infectious disease. The poison may go into the heart, producing vegetation of the valve; or go into the kidneys, and make Bright's disease; or go to the bladder and make inflammation of the gall bladder. Nearly all rheumatism comes from bad teeth.

"Do your workmen know that anæmia, the loss of the red blood corpuscles which carry the oxygen to the tissues, is often due to abscesses at the roots of the teeth or old roots in the mouth? Have you got a dentist in every factory pulling out those old roots? No. The first thing I did at Hog Island where I was consulting surgeon was to put three dentists there.

"Deaths from shock and hemorrhage! Men die in a few minutes from shock, but if you have blood to inject into them right away you often may save them. We hired three men, and gave them \$1,200 a year apiece and fattened them up and kept them raking leaves, and when a man got injured we took some blood from them and injected it into the injured person. We saved three men worth \$5,000 each according to the Pennsylvania Compensation Law the first month—\$15,000 against \$300 in the first month!

"How about washing of hands? It is from dirty hands that bacteria get into the mouth. What does the surgeon do? Simply wash his hands? No. He puts on rubber gloves, even after he has put his hands into absolute alcohol with bichloride. Take the case of 'Typhoid Mary.' How did she give typhoid to twenty-eight different families? Because she had typhoid germs on her hands. Very little—but it gave disease. Does every workman wash his hands before he eats lunch?

"There is one thing that workmen generally do not know. The man who does not sweat does not live as long as the worker. To live long you have got to work. Work leads to longevity. The rich man of today, what does he do? Does he do like the man in the Bible who said, 'Now, soul, we will enjoy ourselves and eat, drink and be merry?' The rich man today builds an eighteen-hole golf course and works like the devil to keep his health. Work doesn't hurt anybody.

"That is what we have got to teach the workman.

"We have in the neck a gland called the thyroid. We have more important ones over the top of the kidneys, little thin glands called the adrenals. These are like

the governor on an engine. They control our circulation. If you lose those glands, you die. These adrenals throw out a powerful drug. I know of two men on the front where a big shell burst and adrenaline was thrown out so that every hair stood on end for a week. A grouch, grief, anger, or worry are ruinous to the body. They cause adrenaline to be thrown out. But joy, love, laughter prolong life. What does that mean? It means that we must teach the employee cheerfulness; that every man shall find in his daily work his greatest happiness. Just as God Almighty found happiness in the creation of the earth, we, made in His image, must find our happiness in our daily work, no matter what that work is.

"We now come to another side of it, and that is this: Cain's answer by the Garden of Eden was, 'Am I my brother's keeper?' The Bolsheviks and the Socialists have used that for a great while, this cry of the brotherhood of man, which means nothing to that class. When I was in the Department of Health we had 187 laws. They all meant one law. How can you translate them into one law? The man that loves his neighbor won't spit on the sidewalks. He won't sell his neighbor bad food. He won't let smoke come out of his chimney. He won't let his child with contagious disease run around and spread the disease. That is the thing that we must teach workmen—the love of their neighbors. It is a great thing to relieve suffering. It is a far greater thing to relieve penury and crime, so we can say with Abou Ben Adhem, 'Write me as one who loves his fellow men.'"

Steam-Shoveling Muskeg

The illustration shows a condition that was encountered last winter in Minnesota on the Mesabi Iron Range during the process of removing the overburden from the orebody of one of the large iron-mining properties. The material which the steam shovel is digging is muskeg, or swamp land, and, as will be noted, the removal of this material is effected only with difficulty, owing to its tendency to spread and the fact that its consistency is such that the surface gives little support to any weight placed upon it.

Under severe weather conditions the frost in Northern Minnesota extends from three to eight feet below surface, and though this condition is a detriment in the stripping of the ordinary overburden, which consists mainly of glacial till, it is of some advantage in the removal of muskeg. The frost, however, is of little consequence after the first cut is taken, and it is necessary to keep the steam-shovel tracks blocked up to prevent settling of the shovel in the mud which soon forms in the bottom of the cut. The shovel tracks in this instance are entirely embedded in the mud, and though the digging bank shows a solid appearance, the underlying material is wet and swampy.

The steam shovel shown is known as Model 91, weighing about 120 tons, and is the type generally used in Mesabi Range stripping operations, as well as for loading the iron ore after it has been uncovered. During the last three years a larger type, weighing 360 tons and known as Model 300, has been adopted to some extent in stripping work.

In the foreground will be seen the loading tracks that carry the dump cars into which the material loaded by the shovel is placed. It cannot be said that

the alignment of the tracks is maintained, for a similar "sinking" results after a time, although not to such a degree as that which effects the steam-shovel tracks. The steam shovel is equipped with adequate safety devices, in accordance with standards adopted by many of the mining companies in that section. Guard rails



STEAM SHOVEL OPERATING UNDER DIFFICULTIES

extend along the running boards on either side, as well as along the ladders on the boom. All the running gears are substantially protected, and, where possible, the movable parts are covered. A short cable extends from the top of the "A" frame to the top of the boom, and this arrangement prevents the dropping of the latter in case the "hog rods" or supporting members of the boom should break. The steam-shovel dipper has a capacity of 3 cu.yd., and the material is loaded into dump cars of 12-cu.yd. capacity.

Annual Report of the Buffalo Mines Co.

The thirteenth annual report of the Buffalo Mines Co. for the year ended Apr. 30, 1919, shows that the mill treated 28,572 tons of ore from the mine, 2,000 tons from stockpiles, and 77,239 tons of sand tailing. The total production of silver, including ore and bullion, amounted to 625,786 oz. There are 17,607 tons of broken ore in the mine carrying approximately 11 oz. silver per ton, and 3,000 tons of doubtful grade. Two additional bodies of a better grade of ore were opened, which will assure the steady operation of the mill during the coming year. About 33,000 tons of sand tailing averaging 6.5 oz. silver remain for further treatment.

The revenue from the sale of ore containing 794,531 oz. of silver was \$802,426, and from the sale of bullion containing 9,206 oz. of silver, \$9,236. The value of ore and bullion on hand on Apr. 30, 1919, was \$288,700, as against \$441,872 on Apr. 30, 1918.

That a Small Percentage of Copper in basic open-hearth steel tends to prevent corrosion was shown by D. M. Buck in a paper entitled "The Influence of Very Low Percentages of Copper in Retarding the Corrosion of Steel," presented at the Atlantic City meeting of the American Society for Testing Materials. Copper to the extent of 0.12 per cent is said to be sufficient to neutralize the influence of 0.055 per cent sulphur. Even if the sulphur is much higher than normal, copper to the amount of 0.15 per cent is sufficient to protect the steel from corrosion.

Arizona Hercules Copper Co.



POWER HOUSE OF ARIZONA HERCULES COPPER CO. AND PART OF THE TOWN OF HERCULES, ARIZ.



SUSPENSION BRIDGE ACROSS GILA RIVER. A 420-FT. SPAN CARRYING A 10-IN. PIPE LINE



TOWN OF RAY. ARIZONA HERCULES AT RIGHT, RAY CONSOLIDATED NO. 2 PLANT IN BACKGROUND



COARSE-CRUSHING PLANT, HEADFRAME, HOIST HOUSE AND MACHINE SHOP AT ARIZONA HERCULES

Status of Flotation in Spain

The Process May Be Utilized To Recover the Mineral Content of Dumps Dating Back to Early Rome—Ramifications of Minerals Separation in the Future Development Of the Spanish Metal Industry

MADRID CORRESPONDENCE

MINING engineers in Spain have reached the conclusion that it is no longer possible to concentrate low-grade ores by older processes in competition with ores concentrated by flotation, owing to the lower cost by flotation and to the higher percentage of recovery obtained by that method. It had been observed by these engineers that today the bulk of the copper and lead concentrates produced in the United States is derived from plants using the flotation process. They are informed regarding the practices in the important lead-producing plants of southeast Missouri, Idaho, and other centers of large production, and the large copper producers, such as the Utah Copper Co., in Utah, the Nevada Consolidated at Ely, Nev.; the Miami, the Inspiration, and the Ray, in Arizona; the Chino, and the Burro Mountain, in New Mexico, and many more.

It has been observed that, almost without exception, the great mineral producers have denied the validity of the patents of the Minerals Separation Co., for reasons that are a matter of court record and of general knowledge. The opinion is freely expressed here that the resistance from the metal producers would not have risen had the terms of the Minerals Separation Co. been more generous. However, it is admitted that the discovery of any process so revolutionary as the flotation of minerals means that the old processes are destined to play an inferior role in the future, and that either the process will be used by the world at large, as was done in the case of the cyanide process for extracting gold, or the mineral industry must become in effect a monopoly controlled by the owners of the patents, until the patents have expired.

For some reason the flotation process has not hitherto been used in Spain, although it is covered by Spanish patents, obtained by British subjects, the same as those who patented the process in the United States. The Spanish mining engineers have not had an opportunity to see the process in operation, and consequently the great possibilities for its use in this country have not been improved.

The large low-grade deposits of minerals, especially of copper and lead, invariably constitute the most dependable source of supply of those metals for any country. The richer deposits, that can be smelted without concentration, are usually of limited extent. The permanence of pyritic copper mining in the Province of Huelva depends on the facts that the ores are exceptionally free from silica, the sulphur can be burned off and used in making sulphuric acid, the copper can be extracted from the calcine, and the residual iron tailing may be used for smelting. These conditions are exceptional.

The quantity of low-grade ores in Spain is far in excess of the ores that are available for smelting direct. In so far as concentration is applied it is of the old sort, and to a large extent is limited to the use of Cornish jigs of antiquated design, and in less degree

to various forms of table concentrators. Large deposits of low-grade lead ore are available, most of which contain above 10 oz. of silver per ton, and there are also important deposits of copper ores suitable for concentration by a cheap process, such as the flotation method patented by the Minerals Separation company's staff. Furthermore, there are numerous dumps in many districts, that have accumulated from mining operations dating back to the time of the Romans, and in some cases to the era of Punic control. The tonnage in dumps of low-grade ore and tailing in the Cartagena district is amazing. Much of this material could be economically treated by the flotation process, but not otherwise.

It is reported that a contract has just been signed between the Sociedad Minera y Metallurgica de Peñarroya and the Minerals Separation, Ltd., of London, whereby the Peñarroya becomes the sole owner of the patents in Spain. The Peñarroya has organized a separate corporation for the development of the flotation business, and the Minerals Separation, Ltd., has taken stock in this new company for at least part pay for the rights assigned. At present no outside parties can contract with the Peñarroya for the right to use the process, but the head of the Peñarroya company in Spain is quoted as saying that later the company would extend the right to others to use the process under terms which had not yet been decided upon by the board of directors. It is evident that the Peñarroya company regards itself as being in control of the situation, and it is thought that this means that those controlling that corporation will give the right only to operators who will contract with them for the smelting of the concentrate produced.

The Peñarroya company is in even more absolute control of the lead industry in Spain than is the American Smelting & Refining Co. in control of the industry in the United States. It either owns or controls every lead smelter in the kingdom. It is impossible to ship the ore out of the country in any considerable amount, owing to the distance of most of the mines from the sea. Accordingly, the lead-ore producers are subject to the demands of the Peñarroya lead trust, and though data are not available concerning the terms exacted, it may be recorded that popular opinion is exceedingly antagonistic. It is perhaps more bitter in its condemnation of the smelter trust than is the Western miner in the United States.

There are two sides to these squabbles between the ore shippers and the smelters, and it often happens that the criticism of the smelter is unjust, and his demands and "rake-offs" are exaggerated. Nevertheless, it must not be overlooked that the Peñarroya is absolute in its control of every avenue to market for the independent lead producer. The acquisition of the flotation patents enables it to insure its control, for the life of those patents, over concentrate as well as ore.

The small producer is thus placed at the mercy of this company. A large enterprise backed by abundant capital, seeing opportunities in the development of the lead and copper industry based upon the large low-grade deposits and dumps, might undertake to follow the example of the producers in the United States, and contest the validity of the patents in the courts.

The Peñarroya company is reported to have produced lead exclusively for the Allies during the period of the war. This was natural, as it is a French corporation, controlled by the Rothschild interests in Paris. It is closely associated in Spain with the banking house of Bauer. This is said to be Swiss, but with German leanings. However, there would seem to be doubt as to the accuracy of this report, from the fact that there has been no evidence of a rapprochement between the Peñarroya and the German owners of the Spanish mines. The Germans own the famous mine at La Carolina, near Linares, known as El Guindo, which is reported to be the largest lead mine in Spain. It has at the present time ore reserves, blocked ahead of production, amounting to over 200,000 tons. This refers to smelting, and not to concentrating ores. The Guindo organization has been backed by the Banco de Urquijo, a great private bank belonging to the Marqued de Urquijo, of Bilbao, with branches in Madrid and elsewhere. It must be noted, in passing, that this house, though accused of Teutonic leanings, advanced large sums of money during the war to facilitate American purchases in Spain for shipment to France.

A prominent Spaniard is quoted as saying, "Urquijo is in business to make money, regardless whether it comes from the United States, or Germany, or any other country." It is reported that recently Urquijo has been extending credits in considerable sums for the purchase of lead mines in Spain, and it is also said that the arrangement is with the old ring that engineered the Metallgesellschaft of Frankfort-am-Main. The object of the Germans is said to be to get underneath of the Peñarroya. This seems hopeless, especially now that the Peñarroya has acquired the flotation patents, unless the Germans contemplate attacking the validity of these patents.

The Peñarroya possesses a further advantage in the fact that the house of Bauer, which represents the same capitalistic interests, owns the railroads popularly known as the "Ferrocarril de Mediodia," from Madrid south and throughout a large part of Andalucia. Thus these allied railroad interests cover the great mineral districts that are tributary to the smeltery of Peñarroya. One of these smelteries is in the town of Peñarroya, one in Linares, and two are at Cartagena. Superior facilities are thus offered for the movement of ores, coal and coke. The Peñarroya owns coal mines, and is active in securing additional coal territory in the south. It has extensive batteries of byproduct coke ovens, and manufactures these byproducts at its works at Peñarroya.

It is of interest to note that the house of Bauer is the owner of the contract with the Spanish government for the sale of the quicksilver output of the great mines at Almaden. It will be seen, therefore, that the Rothschilds are strongly entrenched in the mineral industry in Spain.

It has been reported that the Marqués de Aldama and his friends have been the actual backers of the Cia. Minera el Guindo, but that they have been closely re-

lated to the house of Urquijo. It is regarded as certain that the latter house has just bought the "Los Quinientos" mine, at Linares, that the Germans are there in control, and that the same house has negotiations pending for other mines.

It may be of interest to note that the smeltery owned by the Peñarroya company at Linares is called the "Société Anciennes de Sopwith," though at Cartagena the smelteries that are operating are merely associated by contract with the trust. One of these belongs to a man named Enthoven, and the other, situated at Portman, near Cartagena, is owned by Miguel opata.

The annual production of pig lead by the Peñarroya company ranges from 140,000 to 150,000 metric tons (154,000 to 165,000 avoirdupois tons). At the present time the market is so dead that the company has 40,000 metric tons of pig lead in store. Nevertheless, the smelters are still receiving ore under contracts with shippers. For lack of any other outlet for its product, the Cia. Minera el Guindo is shipping to the Peñarroya.

The Peñarroya company has contracted with Bradley, Bruff & Labarthe, of San Francisco, Cal., for a new large smeltery to be erected at Peñarroya. Mr. Labarthe has been given full authority as engineer and purchasing agent to specify and contract for the necessary equipment. The design is rapidly nearing completion, and it is expected that the erection of the plant will begin early next year, and that the smeltery will be ready for operation early in 1921.

The Cleaning of Manganese Ore

The U. S. Bureau of Mines has just issued a mimeographed bulletin on the "Preparation of Manganese Ore," by W. R. Crane. As is well known, the production of manganese in this country was considerably stimulated during the war, many small companies beginning operations in the Virginia, Georgia, Arkansas, Montana, and other fields. Practically all of these companies went into the business without expert advice, merely following the practice of others in the district, which was usually bad. For this reason the Government sent engineers into the various manganese districts to assist the operators in the proper mining and treatment of their ores. Mr. Crane's paper presents outlines of the methods used in the various districts, pointing out their bad features and suggesting an improved flow sheet for the washing and jigging operations commonly employed.

The ores are ordinarily treated by some combination of grizzlies, log washers, screens, picking belts, and jigs. The chief fault found with the general practice was in the lack of proper screening, which gave the jigs an unsized product that could not be handled efficiently. Mr. Crane points the way to the proper operation of the jigs, going into considerable detail regarding the correct proportioning of the various units in his model plant as influenced by various conditions.

Though most of the manganese producers have sought greener fields since the war ended, the work done in an effort to improve the practice will prove valuable should conditions be more favorable to the domestic industry. It may be some time before Russia resumes her place as the leading producer, but the deposits of India, and to a lesser extent of Brazil, have been proved to be of considerable commercial importance and will doubtless contribute a large part of the world's supply.

Civic Duties and Opportunities of the Engineer*

Advisability of Utilizing the Services of Engineers in Public Affairs—The Value of Scientific Societies to the Government—Functions of the Engineer in Modern Business—Status of Engineering as a Profession

By HOWARD C. PARMELEE

ONE of the fundamentals in advertising is that if you say a thing often enough, you will not only convince all who hear you, but ultimately you will believe it yourself. It is on some such principle as this that I propose to discuss a subject that has been the theme for many presidential addresses during the year, hoping always that if the world is told often enough of the need for engineers in civil and political life, the people will be convinced, and engineers themselves will finally believe it.

Human experience has shown clearly that there are compensations for many incidents which in themselves seem wholly disastrous and without recompense; and so it is that out of the admitted cataclysm of war which has engulfed the world has come a definite demand for engineers, a keener appreciation of their service, and a belated recognition of their need in business and government. I have reason to believe that this recognition is a world-wide as well as a voluntary tribute, and that it offers the engineer an advantage which he must grasp if he would retain it. Had he the tradition or the training of the lawyer, he would not only accept this position of eminence from those who are willing to accord it, but would exercise his gift of speech to persuade the remainder that no mistake would be made in committing to his care the conduct of the world's affairs. But our engineer has been so unused to the limelight that he is likely to shrink from the public gaze and retire modestly to his laboratory or works. Being the lineal descendant of the artisan, and having long been accepted in the public mind as a glorified mechanic, he will be apt to retire all too readily to the background. He needs, as never before, the support and encouragement of the professional society to give him that solidarity and community of interest which will enable him to stamp his influence on the affairs of the world.

I think we may justly claim to have established a profession of engineering, although some may contend that we still have merely a "procession of engineers." By definition, a profession is that calling or occupation which one professes to understand, a vocation in which a professed knowledge of some department of science or learning is used by its practical application to the affairs of others. Formerly, theology, law and medicine were specifically known as "the professions," but I think we may fairly claim to have established engineering on a more solid and scientific basis than any of them. Theology has been almost wholly speculative, the law technical, and medicine empirical. Each has been irrational, and all have gained prestige by claiming it.

On the score of service to humanity, also, I think that engineering may fairly claim professional standing. The achievements of engineers in all parts of the globe

are accepted evidence of their ability, but tradition causes us to halt at this recognition, as though the only field in which an engineer could accomplish anything was in the design and construction of some great work. Such things are well enough in themselves, but in the meantime the affairs of business and government are left to men of limited training and narrow vision, and those things which are fundamental in our national life are suffering from the lack of vital direction, which engineers could give.

We have sometimes heard it said of an individual that "he may be a good engineer, but he is no business man." I resent the implied difference. An engineer is a manager, one who carries a project to conclusion in an efficient manner. I might consent to such a statement as "he is a good mathematician, but no business man," or "he is a good surveyor, or assayer, but no business man," but I must contend that if he is a good engineer, he will be a business man. The war has brought out few more striking incidents of management than the direction of the commission for relief in Belgium by Herbert C. Hoover, an engineer of technical achievement in his profession. This commission handled until near the close of 1916, \$227,000,000 worth of supplies, keeping alive a population of 9,000,000 and operating with an overhead expense of but three-quarters of 1 per cent of the gross cost. Such is engineering efficiency in business, organized in an emergency, and administered under constant stress. What might such ability accomplish applied under the normal conditions of business, with ample time for planning and execution?

The engineer is entitled to recognition not only as a producer but as a director of policy. Hitherto he has accepted the responsibilities of operation and production, while the control of the enterprise was in the hands of a banker or merchant. Under these conditions, the work of the engineer might be ever so efficient, and yet the enterprise might fail through ignorant management in the executive or selling department. Complete control on the part of the engineer might avoid such a catastrophe and relieve himself, as well as his associates, of inevitable embarrassment. I think that engineers are coming to demand this form of control, being willing to accept responsibility if they are also given authority. Any form of dual control, with the responsibility still resting on the engineer, is intolerable.

The modern engineer can bring to bear on business all of the general essentials to success. Organization is his forte and management his specialty. With him the handling of men and supplies is a matter of scientific procedure and the keeping of accounts and unit costs a prime necessity. Plainly the ability of such a man should not be confined wholly to the details of operation or production, but should be requisitioned on the board of directors or the executive committee.

Perhaps it is more in the realm of government of

*President's address at the annual meeting of the Colorado Scientific Society, Dec. 8, 1916. Because of the Government's request to conserve paper, the address was not published until June, 1919.

civic and political activity that the engineer is yet to receive his highest recognition. Certainly it is in this field that he must strive most earnestly for a hearing and for a chance to apply his methods. The strongest traditions are against him, and he is handicapped by a lack of familiarity or intimate relation with political organizations. There is no question, however, that his ability, viewpoint, and methods are sadly needed. Accustomed to considering propositions on their merit, and having an abhorrence of waste and inefficiency, he would be less likely to yield to political expediency in matters of great consequence. I doubt if "pork barrels" would appeal to engineers having ethical standards as high as our statesmen would probably assume for themselves. The latter may be good business men in this case, but certainly not good engineers.

There is probably a growing demand for fewer lawyers and more engineers in our civic and political life. There has never been a time in our national history when technical and engineering advice was more needed in matters affecting our industrial growth and welfare. The intricacies of the dyestuff tariff, for example, could not be reckoned with intelligently by lawyers and merchants, nor can the revision of the mining law be sanely undertaken by men who merely own stock in mining companies.

Popular impression prevails that governmental departments are not on an efficient basis, and engineers can render a service to the country by expressing that opinion in a manner so forceful as to show Congress the light.

In matters more vital to the mining and metallurgical industry, Congress has acted with even less discretion. The proposed tax on copper, for the purpose of raising revenue, was a case in point showing how illogically and superficially a profound subject may be approached. Apparently sensing a popular impression that copper was a highly profitable constituent of war munitions, and without first establishing a broad fundamental economic basis for raising revenue in an equitable manner, Congress singled out copper for taxation and gave itself over to class legislation of the wildest sort. Such unfair taxation as was proposed in the case of copper can be charged only to a profound ignorance of conditions. I have no doubt that instances might be multiplied to prove political inadequacy in dealing with technical affairs and showing the need of engineering advice.

One of the finest examples of national service on the part of engineers and technically trained men is the Naval Consulting Board. Through its numerous committees it has attacked fundamental problems of research, gathered technical data on the country's resources, and stimulated interest in the nation's welfare. Another instance is the Public Relations Committee of the American Electrochemical Society. This is composed of its past presidents and is organized for the purpose of advising with Government officials and expressing an interest in various public problems. Through this medium the electrochemists and electro-metallurgists exert their influence on such national problems as the development of hydro-electric power and the fixation of atmospheric nitrogen.

To what extent this voluntary public service can be carried depends wholly on the results obtained and the reception which it is accorded. Ultimately it should arouse a demand for that kind of service and result in

bringing more experienced engineers into public life. The good example thus set should be followed in state and municipal governments also. Our legislatures and city councils are no less in need of engineering advice than is Congress, while state and municipal affairs generally are subject to abuse and need correction. Town planning and management are engineering problems of first rank, wholly beyond the scope of politics and above the grasp of politicians. Numerous departments of government depend upon technical direction for their successful operation and for the economic handling of funds. In such things engineers should not only take an active part, but should advise those in authority.

Some attention also may be profitably turned to the daily press of this country. There is no more potent force in spreading information or creating public opinion. In technical and engineering matters, however, it is woefully ignorant and in need of sound advice. If we could encourage the editors of our dailies to consult with engineers and scientists on pertinent topics before publishing their dispatches or writing their editorials we would prevent the dissemination of a lot of things that are not so and avoid the ridicule which inevitably is heaped upon newspaper science.

I admit there are other things wrong with our newspapers, which engineers cannot correct, and I am not recommending that engineers become editors of our dailies, for I doubt if we would have much in the way of newspapers under such direction; but I do think it is possible to encourage a closer co-operation between newspapers and engineering of scientific societies, so that the public would get more exact information on technical matters.

Some of the most important civic problems which the engineer will have to solve in the future are more human in their aspect and concern the conservation and distribution of labor. Miss Frances E. Kellor, assistant to the chairman of the Immigration Committee in the Chamber of Commerce in the United States of America, believes that this is one of the great industrial problems of the day and that it will be solved only by the application of engineering methods. Writing on the subject of "Engineers and the New Nationalism," in the *Engineering Record*, she states that the stabilizing of the labor supply is of the utmost importance. "The average labor turnover in the United States is about 200 per cent in the industries upon which America must depend in time of war; in other words, for every 100 men kept at work, 300 are employed. This is a sheer waste of men due to lack of combination in the regularizing of industry and employment of men. In the past we have relied upon the economist and the professor to tell us about unemployment, irregularity of work, vocational education, and similar industrial questions. The laboratory for study has been the employment agency and the lodging house, and the remedy—a law. In the future it will be the engineer who studies the problem in the plant, and the remedy will be the adoption of measures within the industry itself, which will make laws as unnecessary as they are useless to deal with such questions. . . . When the engineer grapples with the problem of distribution he will give us a structure on which men can and will travel to work best suited to their needs."

If I have outlined a more or less ideal state of affairs, I do not wish to be understood as anticipating a sudden or immediate realization of my hopes. There

are, nevertheless, many indications that the public duties of engineers are being appreciated by the profession and that the faithful discharge of these duties will open the way to new opportunities. Finally, with a public conscience quickened by the failure of political government to give us a conservative and efficient management of public affairs, a demand will arise for engineering methods, if not for engineers.

Slitting and Perforating Pipes by the Oxy-Acetylene Process

The accompanying photograph (Fig. 1) shows an improvised washing device suspended above a rocking screen. The material being screened passes to the left and the streams of water are inclined slightly to the right; that is, they tend to retard the movement of the material on the screen. The novel feature is the manner in which the openings were cut in the pipe by means of an Oxweld cutting blowpipe. The slits were cut crosswise on the bottom and slightly inclined to the axis of the pipe (Fig. 2). The pipe is 2½ in. in diameter and the slits are about the same length, that is, they extend about one-third around the circumference. The slits in the front pipe were spaced six inches apart and those in the back one, twelve inches apart. The object of this was to determine which spacing gave the best results. It required approximately one-half hour to cut all of these slots, about a dozen in number, by means of the blowpipe. The value of the gases consumed was negligible, probably amounting to less than twenty-five cents. Four to five hours would have been required to do the same work with a hacksaw.

This application of the blowpipe suggests its use for cutting all sorts of perforations in pipes that might be difficult and expensive to accomplish by drilling and sawing methods, and particularly for experimental and emergency applications. For instance, in washing screenings and concentrates it

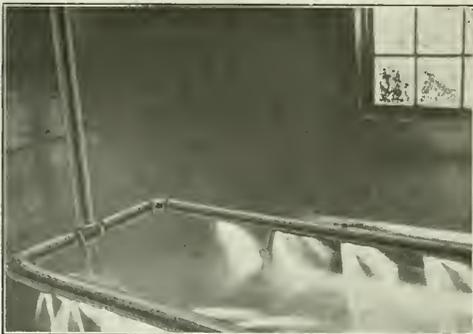
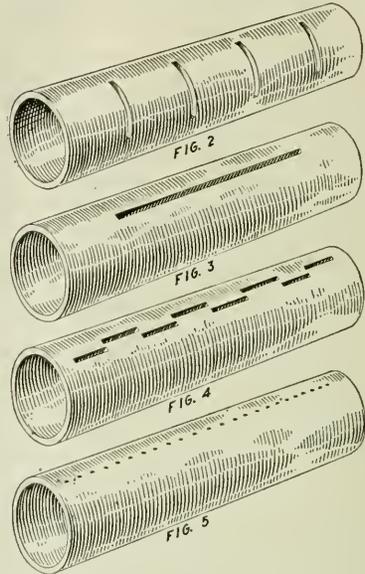


FIG. 1. WASH-WATER SUPPLY PIPE WITH WATER JETS ISSUING THROUGH SLOTS CUT WITH THE OXY-ACETYLENE BLOWPIPE

might be advisable under certain circumstances to run the wash-water pipes across the screen instead of lengthwise. In that case the slits could be cut as in Fig. 3, or staggered, as in Fig. 4, or perhaps circular perforations, as shown in Fig. 5, would give still better results. It is an easy matter to experiment

with different arrangements, to determine the most satisfactory method. The perforations in pipes supplying compressed air for agitating purposes may also be cut in the same manner to advantage. The holes would be sufficiently true in shape for most practical purposes, but if an absolutely perfect cir-



MANNER OF PERFORATING AND SLITTING PIPE

cular shape is desired, it could be easily obtained by applying a drift after cutting. The shapes of the streams of water in Fig. 1 demonstrate the excellence of the blowpipe as a cutting tool. The slight irregularities that appear in the stream forms are largely due to particles deposited from the water.

In making up coils or networks of piping for any of the purposes mentioned above, oxy-acetylene welding may be applied to advantage for joining the pipe sections, thus eliminating all trouble from leakage or loosening that is so common with screwed or flanged joints. Certain types of damaged or worn screens may also be easily repaired by welding in a new metal patch and cutting holes in it to correspond with the rest of the screen perforations.

Use Cone Classifiers To Build Tailing Dam

For building a tailing dam, 1,150 ft. long, the Old Dominion Copper Co., Globe, Ariz., is using twelve Allen cones. After this stretch has been completed, a second "lift" of 10 ft. will be added, which will give storage for several years. In this work the cones are placed 15 ft. apart so that 200 lin. ft. of dam is built without moving. It requires sixteen hours to move the cones to the new position and to make the necessary connection. The sand removed by the cones, although very fine, packs well, and the dam is stable.

Considerable economy is claimed for this method of dam building, the saving in cost over the old method of team and scraper amounting to several thousand dollars.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical Industry Dealing With Pertinent Subjects of Interest

The American Quicksilver Industry

In a letter published in the *Journal* of July 5, F. F. Sharpless, discussing the future of the quicksilver industry in the United States, suggests some questions which demand careful consideration by those who will finally decide the future of this industry. Whether all protection is to be abandoned and the industry left at the mercy of European monopoly, or sufficient protection accorded so that it will remain alive, is, in my opinion, important enough to justify thorough discussion, and I shall try to answer concisely the questions raised by Mr. Sharpless.

First: "Is the statement correct that the average ore mined in the United States during the year 1918 contained only five pounds of mercury per ton?" As the report for the year 1918 of the U. S. Geological Survey is not yet published, no official data are available regarding this point. At the conference of producers and consumers of quicksilver held by the U. S. Tariff Commission at San Francisco on June 26, 1918, the ore recovery of some California mines was given as 5 lb., and even lower, per ton of ore. However, it must be taken into consideration that the lower extraction per ton during the last ten years is due largely to the higher prices for the metal, which rendered the handling of the lower-grade ore possible. The following table shows a higher extraction than mentioned by Mr. Sharpless:

TABLE I. POUNDS OF QUICKSILVER RECOVERED PER TON OF ORE TREATED^a

Year	United States	California
1910.....	11.7	10.3
1911.....	11.5	10.8
1912.....	12.1	11.0
1913.....	11.1	9.8
1914.....	10.1	8.3
1915.....	9.9	8.3
1916.....	9.0	7.6
1917.....	9.6	6.7

^a U. S. Geological Survey.

Second: "Is it possible to continue to produce in this country approximately its normal consumption of mercury without a protective tariff that will be an actual burden on the consumer?" The yearly consumption for industrial uses can be averaged at about 22,000 flasks. The yearly production before the war was generally not far below that figure (See Table II).

TABLE II. PRODUCTION AND IMPORT OF QUICKSILVER IN FLASKS^a

Year	Production		Imports	
	Flasks	Value per Flask in San Francisco	Flasks	Value per Flask
1910.....	20,601	\$46.51	9 00	\$42.85
1911.....	21,256	46.01	6,292 60	39 950
1912.....	25,064	42.05	1,102.75	36.200
1913.....	20,213	40.23	2,288.70	32.930
1914.....	16,548	43.92(0)	8,198.25	34.175
1915.....	21,033	85.80	5,625.12	50.265
1916.....	29,932	125.89	5,657.25	91.195
1917.....	36,159	105.32	5,206.60	84.515

^a U. S. Geological Survey. Import duty to 1913, \$5.25 per flask, thereafter 10 per cent *ad valorem*.

^b A average of \$38.89, value per flask the first half of the year, and \$48.94 during the second half.

Even at the present low recovery, the quicksilver operators who have their properties in efficient condition

can produce at the present market price, \$85 to \$100 per flask, with some profit. The high cost of operation is due much more to the decrease in the purchasing power of the dollar than to the lower figure of recovery. Leaving depletion out of consideration, labor represents about 60 per cent of the total operating cost. Table III shows the number of flasks produced per man employed in California and in Italy.

TABLE III. COMPARATIVE ANNUAL PRODUCTION OF QUICKSILVER

	Flasks Annual Production Per Man Employed	Extraction in Lb. Per Ton Treated
California.....	25.1 (a)	6.7
Italy, Monte Amiata district.....	23.6 (b)	15.0

^a U. S. Geological Survey. *Mineral Resources*, 1917.
^b Dr. Roland Sterner-Rainer, "The Present Status of Quicksilver Metallurgy in Europe."

The American consumer of quicksilver is then simply expected to pay the difference in cost due to the higher rate of living expenses of the workers, as he does for every other necessity or luxury he consumes, not because the actual production per head is lower.

As to the relation of the London branch of the Rothschilds to the world's production, it must be noted that before the war that house controlled only 34.1 per cent of the total world production. The Rothschilds now control both the Spanish and the Italian production, 57.7 per cent, and will probably also control the former Austrian production, making the total proportion of the world's production under their control, 77.4 per cent. This condition presents an entirely different aspect than before the war, and certainly justifies the statement that, unless some protection be given by the Government, the domestic producers are entirely at the mercy of the interests mentioned.

The producers are satisfied with the present market price; all they ask is that some stability be given to that price and that they be not forced by foreign intervention to close down, in which case the consumer would eventually be in a much worse position than could result through reasonable tariff protection.

That the producers of the less common metallic minerals are small in number, and hence are placed at a disadvantage when trying to protect their interests, has again been emphasized by the decision of the U. S. Attorney General regarding the compensation that operators of the so-called war minerals are entitled to, in the reimbursement of their loss, from the fund appropriated by Congress for their protection. Compare this with the protection granted the dyestuff and potash industries, which have related interests that command consideration. If it is good economic policy to kill the quicksilver industry, because quicksilver can be bought cheaper from foreign countries, is it not equally good economic policy to import cheaper dyestuffs and potash, even if it destroys those two industries, which were developed here only because of war conditions? If the economic policy of internationalism, which has re-

ently found many advocates in this country, is correct, then at least carry it out in all lines of business, and do not restrict its application to those industries which lack sufficient political backing.

I fully recognize that the conditions under which the quicksilver industry operates are different from those of the dye and potash industries. This, however, does not preclude that the former is equally well entitled to protection as are the latter. The domestic quicksilver industry is in the peculiar position that its production can never become an important article of export, especially in the altered conditions of the world's production brought about by the war. On the other hand, it can for years to come cover the demand of the domestic consumption, as it has done for seventy years. This is simply a question of sufficient protection. Though the domestic production somewhat decreased during the last twenty years, it still remained about equal to the domestic consumption. This decrease was mainly caused by the low market price of the metal, which is established in London. When the prices justified it the production was increased from 16,548 flasks, in 1914, to 36,159 flasks, in 1917; which appears to me a conclusive argument that the decreased production was not due to deficiency of raw material, as is often claimed, but to the conditions which govern the market value of the metal.

Under the conditions governing the present world's market the domestic quicksilver industry is at the mercy of the Rothschilds, who, if they so desire, can undersell the domestic producers in all foreign markets, and in the United States, if they are not protected by a reasonable tariff. In fact, the protection of that industry is as much to the interest of the consumer as to that of the producer, because if the latter is wiped out the former is at the mercy of the foreign monopoly, which certainly will avail itself of its opportunity.

In the last years preceding the war production kept up, notwithstanding that the market price was below the cost of production of several of the operators; and even in those years developments of cinnabar deposits were made in some of the Western states, even though on a small scale. This would tend to prove that the exhaustion of cinnabar deposits in the United States is not as complete as maintained by some authorities.

The actual conditions are threatening to the quicksilver producers, and they can protect themselves only by concerted action, and by associating themselves with the body of American producers of all kinds of minerals, and working together for mutual benefit.

WILLIAM FORSTNER.

San Francisco, July 17, 1919.

Pillar-Shaft Gyrotories vs. Lever Type

I have read the very able article of Herbert A. Megraw covering the "Design of Small Metallurgical Mills" appearing in the June 28th issue of the *Journal*. Under the section "Rock Breaking in Small Mills," Mr. Megraw makes the following statement in relation to gyrotory crushers: "Any rock crusher, whether jaw or gyrotory, which takes the crushing pressure directly upon a bearing is mechanically wrong, and has not taken advantage of the features inherent to the type of the machine."

I am taking the liberty of calling attention to a few relative points of the two most distinct types of

gyrotory crushers, i.e., the pillar-shaft machine, taking pressure "directly upon a bearing," and the older lever-type machine. It is probably a fair assumption that neither type of machine is mechanically perfect. The question is therefore one of relative mechanical design for the two types. Mr. Megraw refers this question to the definite point of bearing pressures, and, as such, it is hardly a matter of opinion but one of fact, and the general statement above quoted cannot possibly be made to stand up under a more exact analysis.

In either type of machine pressures are, of course, transmitted to bearings, and this cannot be considered any great crime in machine design. That being the case, the argument logically evolves around unit pressures, which is the case in any machine design—crusher or otherwise.

There are two machines which I have in mind, both working on the same material. One is a pillar-shaft type and the other a lever-shaft type of crusher. The pillar-shaft type machine has a projected inside eccentric area of 688 sq.in. The lever-type machine of the same rating has an inside projected eccentric area of approximately 228 sq.in. The lever-type machine has a lever ratio of two and a half to one, or, in other words, the throw of the eccentric is approximately two and a half times as great as the throw of the head at the bottom of the concaves. Therefore, to exert the same crushing pressure, under identical conditions, the pillar-shaft machine would require a relative projected area of two and a half times the 228 sq.in. area, or, 570 sq.in., whereas it actually has an area of 688 sq.in., a 20 per cent surplus area by the most liberal comparison to be made in favor of the lever-type machine. The respective shafts in shear, as well as beams, are greatly favored by the pillar-type machine in all present designs. When it is borne in mind that the eccentric of the pillar-type machine has an extension greater than the entire length of the crushing head, the reason for this enormous area can be better realized. (Belt speeds and gyrations are about equal.)

The foregoing paragraph is a fair approximation of the definite points to which Mr. Megraw refers on two machines of the same capacity working on the same material.

Now, regarding the general reference to short-shaft machines where "the power for crushing is applied almost directly to the bearing of the eccentric." Whether the shaft is long or short, there is probably no reason to change the number of gyrations per minute for the same conditions. Therefore the r.p.m. on the eccentric would be constant. Consequently, should the designer desire to decrease the shaft length by one-half, he would probably increase his eccentric surface area by two and maintain the identical conditions with reference to bearing pressures, crushing pressures, and like factors, the belt speed and power remaining the same.

Crushing rolls have for years been used with more or less success. They are designed to take the crushing pressures directly on the journals, and this to date has not condemned the machine as anything approaching a mechanical monstrosity.

No crusher is a great example of nice mechanical design. The work which crushers are supposed to do would hardly permit of it. However, should I look over the two machines for unmechanical features I should probably be struck with a shaft loosely hanging by its end.

Reduced head-room is not a fundamental in the design of the pillar-type machine. The discharge of the pillar-shaft gyratory is circular, and by the time Mr. Megraw builds his discharge chute to take care of this he will find that reduction in head-room is more apparent than real. In any event, any advantage in this direction is incidental.

The real advantage of shortness is a greater weight per vertical foot of machine than in the lever-shaft type machine. For instance, a typical lever-shaft gyratory weighs approximately 7,600 lb. per ft., whereas a typical pillar-shaft machine weighs approximately 10,000 lb. In this, the shortness of the machine proper in relation to the total weight is a distinct advantage in the great additional strength which it imparts to the bowl.

This is no attempt to detract from the crushing properties of the pillar-type machine, but I would like to call attention to its crushing stroke parallel from top to bottom, its therefore constant angle of nip, and the use of the general concave surface as a crushing area, instead of concentrating the wear.

R. L. SITES,
Brown and Sites Co.

30 Church St., New York, N. Y., July 31, 1919.

Packing Goods for Shipment To South America

The writer has recently returned from a short trip along the West Coast of South America, and has, as most Americans do, heard a great many complaints about the way in which American goods for foreign shipment are packed. Because of the difficult landing conditions for ocean-going steamers along the West Coast, goods have to be especially well packed if they are to arrive in a proper condition. Most of the complaints concerning inadequate packing are unquestionably well founded, and I believe you could do no better service toward the extension of foreign trade for American manufacturers than to either run an editorial or in some forceful way bring this matter to the attention of those expecting to do foreign business.

Packing is, after all, such a simple operation that it would seem only necessary to have this matter placed before manufacturers to insure American goods arriving in foreign ports in a condition as good as or better than goods from other countries.

New York, Aug. 8, 1919.

D. S. McAFEE.

[American manufacturers should take to heart the criticism made by Mr. McAfee. At frequent intervals our shippers have been admonished to pack their goods properly. A little common-sense in this regard would avoid unnecessary damage, not only to the goods but also to the reputation of our manufacturers. The last warning issued by the *Journal*, regarding the packing of goods for shipment to South America, appeared in the issue of July 19, 1919, on page 91.—EDITOR.]

Hoping for a Settlement

In the past I have asked for frequent changes in the address of my *Journal*, but this has been due to the political situation. It would appear from newspaper reading that I am again making a mistake in asking that the *Journal* be sent here, but as we are building a small mill and cyanide plant, and hope to complete the installation by the end of the year, I may as well chance the *Journal's* getting through long enough to be of considerable service meantime. We are out in the hills, have a hard time to gage the course of events, and I value

the *Journal's* political comments more than I do those of any other individual newspaper.

Those of us that suffered directly all the evil effects of the variable policy of our home government regarding Mexico during the critical moments of the revolution, and have hung on here to our properties and tried to protect them, in the hope that time would cause a change in politics, have abandoned hope of that and resolved to try to work the properties under existing conditions, and so are now again exposed to material losses if the existing situation be upset.

It is hard to define our feelings toward the present movement in the States to force an issue on old questions. We hoped and prayed for such action in the past, lost hope and decided to try to do something in spite of conditions, and now find ourselves under way again, and likely to be up against a new turmoil. As, in our hearts, we never did give up faith that eventually the American people could be depended upon to do the right thing, we reluctantly admit that we would rather suffer further troubles, so that the matter may finally be disposed of as it should have been in the first place. We have one consolation: that we know that a large part of the Mexican population feels just as we do about it, and is resigned to swallow pride and to undergo inconveniences in order that affairs in the end may be definitely settled.

A SUBSCRIBER IN MEXICO

[Signature deleted—EDITOR.]

Protection of the Potash Industry

Your editorial of July 26, on the supposed protection to be afforded the potash industry by the Germans themselves may record one of those actions which have been indulged in by the Germans so frequently of recent years as to be termed "Teutonic." It is within the bounds of possibility that the price may be raised in Germany for the very purpose of enabling the potash syndicate so much the better to pursue its usual tactics of destroying competitive business in other countries. Coming as it does just at the time when the American Congress is giving consideration to action at which from tradition American Congresses have always balked, the Teutonic nature of the possibility is all the more to be feared.

When it is so well known that the American potash industry, secured behind the impregnable wall of a license embargo, would rapidly develop to the point where American prices would be cheaper than those of any other country in the world, it seems a shame to allow foreign material to destroy this industry in embryo, or by constantly holding up the bugbear of impending floods of foreign material to prevent American development on any other than the expensive scale which constantly holds itself in readiness to be destroyed in the near future. As a matter of fact, the United States can match Germany in every single potash possibility except the present possession of more than one hundred potash mines with many years of exploitation behind them on which to base knowledge of future activities.

H. D. RUHM.

New York, Aug 2, 1919

The Dutch East Indies exported to the United States during the first three months of 1918 a total of 6,785,933 lb. of tin and 85,751 lb. of potash. In the corresponding period of 1917, the exports of tin were 8,908,595 lb., and of potash, 47,753 lb.

DETAILS OF PRACTICAL MINING

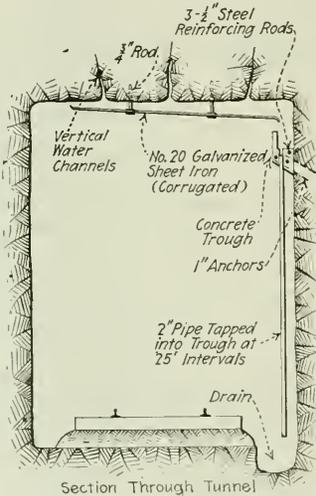
Suggestions From Practice for the Superintendent, Foreman, and Miner

Water Drain for Wet Roof

By ROY H. POSTON

In driving a drift to be used as a main haulage way at a mine in Southeast Missouri, the workmen cut several water-bearing strata that continued to flow after the drift was completed. As a means of preventing the leakage of water from the roof, a system of collecting and draining, shown in the sketch, was satisfactorily installed at a moderate cost and with little consumption of time.

As the continuous dampness made the preservation of



Section Through Tunnel
WATER DRAIN FOR TUNNEL HAVING A WET ROOF

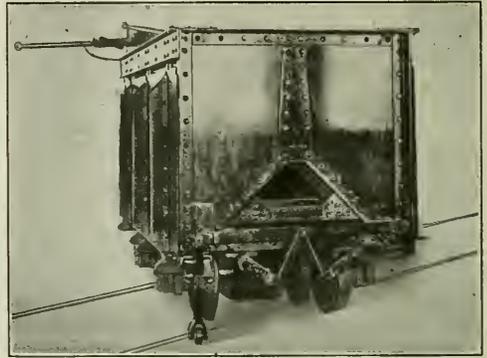
wooden construction difficult, concrete installation was decided upon. Considering that this latter type imposes practically no cost for maintenance, and that the wet part of the tunnel was short, the additional initial expense was considered justifiable and a permanent installation was provided.

Improving Top-Landing Haulage Equipment

By LOUIS C. MOORE

Several changes have been made in the last ten years in the methods used for stocking iron ore in the Lake Superior region, and few of the mines continue to use the man and car system, which is now replaced by either electric locomotive, haulage or endless-rope or gravity tram systems. The objection to electric locomotive tramping is not so much a matter of expense of equipment as it is the danger to which the operator is sub-

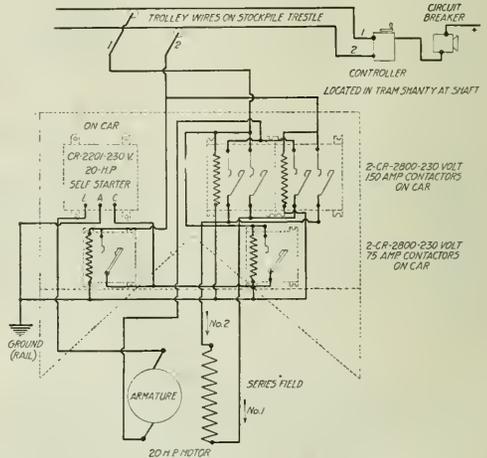
jected, for records show many instances of locomotives that have jumped poorly-constructed ore-trestle tracks and landed below, with the operator either dead or maimed for life. Furthermore, the rolling load, consisting of locomotive, car and ore, as compared with the



SEVEN-TON REMOTE CONTROL STOCKPILE CAR

weight of ore carried, is excessive. This combination has in most cases been abandoned in favor of other methods in stockpiling practice.

The endless-rope system in connection with long trams, though reliable, is expensive and inefficient. Each

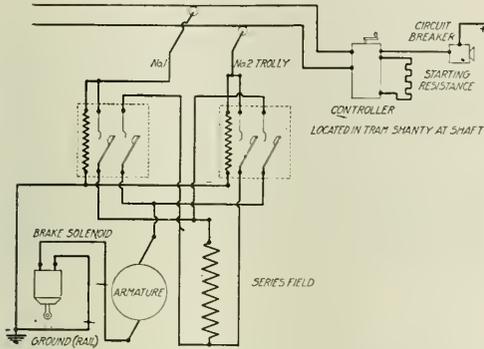


WIRING DIAGRAM FOR SEVEN-TON MOTOR-DRIVEN CAR

winter a mile of 5-in. wire rope is worn out, in addition to the spools, rollers, deflecting sheaves, and other material necessary to the installation. A 50-hp. haulage engine is required to overcome the friction of such a

system, the work of which should be done by a 15-hp. motor. Gravity trams are satisfactory for some stockpiles requiring no trestle, but are too slow and adapted for the longer trams.

As a means of eliminating the bad points of these systems, some pioneer work has been done on the Gogebic Range. In 1914 Carlos Holley, then master mechanic at the Ironton and Colby mines of the McKinney Steel Co., built a 3-ton saddle-back car. This was driven by a Jeffrey 1,080 series motor on each axle, connected



WIRING DIAGRAM FOR THREE-TON STOCKPILE CAR

through a two-trolley wire system over the haulage track, and was operated by remote control, so that the operator could remain at the shaft and start or stop the car on the trestle. The speed was about 1,000 ft. per min. and the car was equipped with brakes controlled by a solenoid placed underneath the car and between the axles. This car was put into service in 1915, it is still being used, and has given such satisfactory results that three similar cars were built, and these are still in service.

Adopting this idea, the Yale mine ordered, from the Lake Shore Engine Works, two 7-ton cars equipped with similar remote control. All brake mechanism on these was left off, each car being stopped by reversing the motor. One of these cars is shown in an accompanying illustration. Another improvement was the door-catch mechanism, which held the door at the bottom in four places, instead of at the ends, and this stopped the door from bulging and permitted lighter construction. A comparison of wiring diagrams for the two cars is shown in an accompanying sketch.

One other property, the Eureka mine, is experimenting with a similar car. In this design the motor is chain driven to the axle, and a ratchet drum controller is attached to the door-catch trip roller on the car, so that each time the door is opened the circuit is reversed at the car. By this method only one trolley wire is needed; whereas the other cars require two. A serious drawback to this method is that if the trip failed to operate on a foggy day, when the car went out the operator might run the car toward the end of the trestle when it should be coming in the opposite direction. With a two-wire trolley no such mistake can be made.

Other schemes are being developed to achieve practicable remote-control operation and control, and the final outcome should produce a car of any capacity needed, operating with a one wire trolley on either 220-

volt a.c. or 240 volt d.c. The car speed will vary from 500 ft. to 1,500 ft. per min., and a braking system will no doubt be evolved that will positively stop the car at critical points. Any manufacturing concern making such a car could develop considerable business on that product alone and such development work would require much less experimenting than more complicated machines, such as mechanical loaders.

The remote-control car, wherever tried, has given satisfaction both during the winter and summer seasons. It requires little attention to keep it in good condition, the up-keep cost is small. There are no ropes or cables to wear out, and no spools, rollers, or deflecting sheaves to replace or oil every morning. If it jumps the track and falls 40 ft., another can be substituted in much less time than with the endless-rope method, and no one is killed or injured. The necessary repairs are small compared with the repairs needed on a locomotive that had dropped the same distance. By means of lamps the operator at the shaft is advised of the position of the car at all times during the darkest night, and if a trolley wheel jumps the wire, which seldom happens, he is instantly notified and can remedy the difficulty. From every standpoint the car is a big improvement over the tram systems now generally used.

Drinking Fountain in Mine

To provide good drinking water for men working underground is most desirable. Formerly it was seldom that the men were able to obtain a drink of pure, uncontaminated water underground. In a number of instances in several districts the practice was to catch a small stream of mine water which was trickling over the wall rock, at a convenient place, in some sort of an improvised vessel. Another method was to catch the water in a



UNDERGROUND DRINKING FOUNTAIN

depression in a rock, from which the men would quench their thirst. The accompanying illustration shows an installation of a drinking fountain in one of the underground workings of the Oliver Iron Mining Co., a subsidiary of the U. S. Steel Corporation. This illustration has been reproduced from the bulletin of the Bureau of Safety, Sanitation and Welfare of that corporation.

The advantages of installing such a simple device at numerous places underground over the old system of making no adequate provision for the comfort of the miners is obvious.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Tariff on Tungsten and Other Ores

Tungsten, magnesite, and zinc are practically assured of the rates of duty proposed by the Ways and Means Committee of the House. Consideration of the emergency tariff bills has gone far enough to disclose definitely that the Republican majority will be able to carry through any plan upon which it agrees. The Democratic opposition is split on the emergency tariff measures, many members of that party being ready to vote for a duty sufficient to insure continuance of the industries built up in the country during the war. The leadership of the Democratic party is urging a license system in preference to a tariff, but is unable to muster the votes to make such a policy general. The Republicans themselves are divided as to the extent to which the licensing system should be applied to dyestuffs.

With the exception of the bill providing new duties for chemical glass and porcelain ware and scientific apparatus, none of the tariff measures, at this writing, has been passed by the House. The tungsten bill was the subject of debate on Aug. 14, and its passage, as it was reported out, is assured.

It had been planned originally to put through promptly all of the emergency tariff bills. The plan was interfered with first by the arrangement to take a six-weeks' vacation. When it was decided to hold the House in session, living-cost and Railroad Administration legislation came in for prior consideration. The Senate, in the throes of peace treaty and living-cost consideration, has made no plans for taking up tariff matters.

The tungsten bill came from the committee with only technical amendments. In urging its adoption by the House, the author of the bill, Representative Timberlake, of Colorado, made the following statements:

This bill asks for a tariff of \$10 per unit, a unit being 20 lb. of tungsten trioxide contained in a short ton, so that this tariff would bring a revenue to the Government of \$10 per unit of every 20 lb. of tungsten trioxide that is imported into this country. With the known fields, it is estimated that we can today produce from 50 to 60 per cent of all the tungsten used in this country, and we feel that with this encouragement, which will aid in the development and seeking out of new fields, it will require only a short time until this country, by reason of the discovery and developments that have been made, will become independent of these other resources for tungsten.

In the course of the discussion, Representative Baker asked the following question:

What effect would the proposed legislation have upon the approximately 5,000 tons of ore now in storage in and about New York? Would they get this raise in the tariff?

To which Mr. Timberlake replied:

I am rather of the opinion that the provisions of this bill could not apply to the product that had already been bonded in this country coming from abroad.

With regard to increasing costs to the consumer, Representative Vaile, of Colorado, endeavored to point out to the House that there would be no important in-

crease in the costs of tungsten products to the consumer. In that connection, he said:

Per pound of finished tool steel, the increase would be not more than 15c. according to my correspondents, allowing for loss in smelting, and they are making a very liberal allowance for loss in smelting. Tungsten tool steel is used in general for the manufacture of high-class steels, and I am reliably informed that only one pound of tool steel is required for the production of from two to three thousand pounds of finished steel. Assuming, therefore, that one pound of tool steel per ton of finished steel is used, it will be obvious that the additional cost of finished steel due to the tariff is entirely negligible. In other words, 15c. would be divided by 2,000, which equals seven and one-half one-thousandths of a cent per pound of finished steel, an entirely negligible addition to the cost of the finished-steel product.

Magnesite Tariff Bill

There is pending in the House a bill (H. R. 5,218) placing a duty of $\frac{1}{2}$ c. per lb. on magnesite, commercial ore, either crushed or ground; $\frac{1}{4}$ c. per lb. on magnesite, calcined, dead-burned, and grain; $\frac{1}{2}$ c. per lb. and 10 per cent ad valorem on magnesite brick.

Some of the arguments made in support of the bill in the report submitted by the Committee on Mines and Mining were as follows:

The sworn statements of six of the largest domestic producers were filed with the committee, showing the average cost per ton, without profit, of the dead-burned magnesite delivered at Atlantic ports to be \$41.20 at the present time. The testimony also showed that the pre-war selling price of the Austrian product, including profit, in the United States was \$16.15, making a difference between the present cost, without profit, of American magnesite laid down on the Atlantic seaboard and the pre-war selling price of the Austrian product \$25.05.

While the magnesite producers urged upon the committee that higher tariff rates are necessary than those provided in the amended bill, yet, owing to the lack of showing and knowledge of future conditions in Austria with respect to this commodity, and particularly with regard to the cost of the same, and having regard to all the testimony and conditions as presented, the committee resolved the matter upon the basis of the rates specified in the amended bill. They believe that under such rates the domestic producers and manufacturers will be able to compete upon equal terms with the Austrian product.

In this connection it appears that a quotation has been made for the delivery of Austrian magnesite, f.o.b. Atlantic ports, at \$26.50 per net ton, as compared with the pre-war selling price of \$16.15 above referred to.

The testimony showed that an ocean rate on Austrian magnesite has been fixed of \$7.50 per ton, as against the pre-war rate of approximately \$2 per ton, and as this material is used as ballast it is possible that the ocean rate may be subsequently reduced to approximately that of normal times. On the basis of such quotation for present delivery a differential between the present Austrian selling price, including profit, and American magnesite at Atlantic ports, without profit, is \$14.50 on dead-burned magnesite, and the tariff rate of $\frac{1}{2}$ c. per lb. provided in the amended bill is therefore deemed adequate.

A tariff of $\frac{1}{2}$ c. per lb. has been placed upon crude magnesite ore, as the testimony shows that without protecting

the crude material it would be possible to defeat the object of this bill by importing crude magnesite into this country and then manufacturing it into dead-burned or calcined magnesite at such a price as to prevent the production of dead-burned magnesite in this country.

The testimony further developed the fact that it requires two tons or more of crude magnesite to make one ton of dead-burned or calcined magnesite.

The testimony shows that magnesite brick consists only of the dead-burned magnesite to which water has been added and then pressed into the form of a brick. It was, therefore, necessary to place the same specific duty on the material in the brick as upon dead-burned magnesite, for the reason that if the brick were imported without this duty they might be broken up and we would have in fact loose dead-burned magnesite admitted without specific duty, and would thus defeat the purpose of this bill.

The Sixty-fifth Congress passed a bill appropriating \$8,500,000 to repay the net losses of American producers of pyrites, chrome and other essential war minerals. Only such minerals as the Interior Department had to urge the production of were included in the bill. These minerals were not dependent alone upon Austria, as in the case of magnesite. The shortage of magnesite was prevented by the prompt action of producers, who, knowing the United States was dependent upon Austria alone, were able to calculate a probable shortage during the war, and the Government was not compelled to stimulate production of magnesite. Had the magnesite producers failed to produce this material the Government would have had to stimulate production, and then the magnesite producers would have been included in the War-Minerals Relief Bill and have been repaid for their losses. They were not included, for the above reason. The proposed tariff will not repay their losses, but will give the magnesite producers an opportunity to endeavor to earn a profit on their war investment of \$3,500,000, and at the same time furnish an essential mineral to the steel, copper, and lead industries.

Minerals Investigations of the U. S.

Bureau of Mines

The usual monthly bulletin on Minerals Investigations was not issued for July, according to an announcement by Van. H. Manning, director of the U. S. Bureau of Mines, but such information as is available will be released at the regular time each month.

The work on minerals investigations was carried on under a special appropriation made during the war, which appropriation expired on June 30, causing a considerable part of the staff engaged in this work to be disbanded. It is expected that in the course of the next month or two the bulletin will be resumed in some form.

The Bureau believes that this work has been of value to the industries concerned, and is willing to make every effort to reorganize and maintain this work on such scale as may be possible.

Awards Under War-Minerals Act

Payment of \$219,607.90 to the Chestatee Pyrites and Chemical Co., in full payment of the company's claim against the Government, has been authorized by the Secretary of the Interior. The company's claim as filed called for \$914,172.73. It is understood that the claimant will not accept the award, except in part payment, and will continue its effort to secure the amount of damages claimed.

While the War-Minerals Relief Commission has made awards in several other claims, none other than that of the Chestatee company has been approved by the Secretary.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for June, 1919, and the figures for June, 1918, as finally revised, are as follows:

IMPORTS, JUNE, 1918 AND 1919		
(In pounds, unless otherwise stated)		
	June, 1918	June, 1919
Antimony ore, contents	360,814	Nil
Antimony matte, regulus or metal	1,951,044	1,617,098
Copper:		
Ore, contents	5,079,450	3,560,057
Concentrates, contents	4,195,525	2,985,286
Matte, regulus, etc., contents	2,349,300	1,187,607
Imported from (in part):		
Canada	2,650,674	2,452,560
Mexico	5,415,753	3,862,083
Cuba	1,613,116	632,000
Chile	1,629,185	342,383
Peru	Nil	22,804
Unrefined black, blister, etc.	13,801,332	19,842,478
Refined, in bars, plates, etc.	281,432	3,721,956
Old, etc., for manufacture	100,696	211,034
Composition metal, copper chief value	19,640	Nil
Lead:		
Ore, contents	2,302,941	1,686,453
Bullion, contents	16,479,770	4,664,488
Imported from (in part):		
Canada	1,252,460	799,805
Mexico	17,050,868	5,551,026
Pigs, bars and old	Nil	22,880
Pyrites, long tons	31,172	50,545
Imported from:		
Spain, long tons	13,881	46,787
Canada, long tons	17,291	3,758
	1,060	Nil
Tin ore, long tons		
Tin bars, blocks, pigs, etc.	15,130,205	112,000
Imported from (in part):		
United Kingdom	1,679,910	56,000
Straits Settlements	7,262,750	56,000
Dutch East Indies	1,369,615	Nil
Hongkong	2,121	Nil
Australia	577,920	Nil
Zinc:		
Ore, contents	4,053,254	2,720,726
Imported from:		
Canada	1,142,422	1,176,679
Mexico	2,910,832	1,544,047
Blocks or pigs, and old	1,425	Nil
Manganese ore, long tons	38,427	31,550
Imported from (in part):		
Cuba, long tons	1,817	321
Brazil, long tons	31,481	27,457
Br. India, long tons	4,550	1,000
Tungsten ore, long tons	656	338
EXPORTS OF COPPER, LEAD AND ZINC		
(In pounds)		
	June, 1918	June, 1919
Copper:		
Ore, contents	109,335	2,100
Concentrates, contents	129,428	Nil
Refined, in ingots, bars, etc.	1,069,737	970
	70,902,177	24,250,659
Exported to (in part):		
France	31,929,488	3,136,421
United Kingdom	26,921,159	6,085,397
Canada	1,550,962	2,078,637
Sweden	Nil	2,520,000
Composition metal, copper chief value	24,299	10,175
Old and scrap	Nil	725
Pipes and tubes	447,482	556,422
Plates and sheets	303,592	514,138
Wire, except insulated	1,758,328	4,766,354
Lead:		
Pigs, bars, etc., produced from domestic ore	12,208,228	1,519,696
Pigs, bars, etc., produced from foreign ore	5,473,282	15,263,368
Exported to (in part):		
Italy	1,299,200	Nil
United Kingdom	8,719,434	9,864,043
Canada	6,684,586	497,224
Japan	307,199	1,050,437
Brazil	484,422	3,606,400
China	131,189	323,419
Netherlands	Nil	145,814
	Nil	448,000
Zinc:		
Dross	3,761,844	581,893
Spelter:		
Produced from domestic ore	12,895,218	18,489,575
Produced from foreign ore	833,925	5,547,502
Exported to (in part):		
France	8,387,822	12,206,822
United Kingdom	1,706,189	1,377,113
Canada	2,267,296	7,970,611
Japan	1,217,339	107,246
China	Nil	111,975
Japan	Nil	246,497
Australia	Nil	1,671,454
In sheets, strips, etc.	1,919,789	

Chicago Meeting, A. I. M. E.

One Hundred and Twentieth Gathering of the Institute, Monday, Sept. 22, to Friday, Sept. 26, inclusive, 1919—Headquarters, Congress Hotel—
Program of the Sessions

THE American Institute of Mining and Metallurgical Engineers will hold its 120th meeting in Chicago, Sept. 22 to 26, inclusive. Headquarters will be at Congress Hotel. Carl Scholz is chairman of the committee on arrangements. Other members of the committee are F. G. Fabian, H. H. Stoek, L. V. Rice, J. A. Ede, G. M. Davidson, F. W. DeWolf, R. W. Hunt, F. T. Snyder, E. B. Clark, F. S. Peabody, and Mrs. C. H. MacDowell.

Technical sessions will be held on the following subjects: Mine Taxation, Iron and Steel, Sulphur in Coal, Pyrometry, Non-Ferrous Metallography, Coal and Gas, Milling, Oil, Industrial Organization, Geology, Non-Ferrous Metallurgy, Mining, and Local Resources.

Trips of inspection will be made to the Gary steel plant; zinc smelteries, coal mines, cement works, and permanganate plant in the La Salle district; mining machinery manufacturing plants, and tungsten and molybdenum reduction plants in North Chicago and Milwaukee; lead and oil refineries in East Chicago and Whiting; coal fields at Franklin and McCoupin; and varied metallurgical and manufacturing plants in Chicago.

Summary of the program follows:

SUMMARY OF PROGRAM

MONDAY, SEPT. 22

- 9 a.m. to 9 p.m., registration at convention headquarters, Congress Hotel.
- 11 a.m., special session on mine taxation in co-operation with the Internal Revenue Department (?), U. S. Treasury.
Technical sessions: Non-ferrous metallurgy and metallography. Coal and gas.
- 2 p.m., technical sessions: Coal and gas;
Milling;
Industrial organization;
Geology.
- 8:30 p.m., smoker, at Chicago University Club, Michigan Boulevard, four blocks north of Congress Hotel.

TUESDAY, SEPT. 23

Trip to Gary steel plant.
All-day excursion by steamer from Chicago, direct to the plant of the U. S. Steel Corporation at Gary, Ind.

The steel company's special observation train will convey the members and guests through the various parts of this immense and famous establishment. This will afford an opportunity to see in operation the most modern and approved methods in the manufacture of steel and large-scale production.

Luncheon will be served at the steel plant.

On this and other excursions a large attendance by the ladies is desired.

On the return trip on the boat there will be a session on Iron and Steel, with especial reference to blast-furnace work. (?)

8:30 p. m., technical session on oil.

Technical session on iron and steel, followed by moving pictures of a 240-inch plate rolling mill, the largest in the world.

WEDNESDAY, SEPT. 24

- 10 a.m., technical sessions:
Symposium on sulphur in coal;
Iron and steel;

- Mining and local resources.
2 p.m., technical sessions:
Symposium on sulphur in coal;
Pyrometry, with especial reference to steel;
Non-ferrous metallurgy.
6:30 p.m., president's reception, Congress Hotel.
7:30 p.m., banquet, followed by dancing, Congress Hotel.

THURSDAY, SEPT. 25

- 10 a.m., technical session:
Symposium on pyrometry. (A collection of papers marking an epoch in metallurgical literature.)
All-day excursion to the La Salle district.

Arriving at La Salle, the Illinois Valley Manufacturers' Club and the local Chamber of Commerce will be hosts at a luncheon at the Kaskasha Hotel.

In the afternoon, various parties of members and guests will be formed and taken in automobiles to the zinc smelteries, coal mines, or cement works. For those not particularly interested in these operations, there will be an automobile trip, of particular interest to the ladies, to Starved Rock and the beautiful Illinois Valley.

FRIDAY, SEPT. 26

Optional Excursions

A—North Chicago and Milwaukee:

The trip will be made by special train leaving Chicago over the C. & N. W. R.R. Friday morning, Sept. 26, to visit the mining machinery manufacturing plants of Milwaukee.

The train will stop at North Chicago at the Fansteel Products Co.'s plant, where the members will be shown the complete metallurgical processes in the production of metallic tungsten and molybdenum, from the purification of the crude concentrates as purchased in the market, and including the sintering of finely divided metallic powder into ingots by passing through it electric currents of enormously high amperage.

The operations include all those involved from the treatment of the tungsten ore to the finished product, which includes the chemical treatment of the ore and the purification of the tungsten material; the reduction of tungstic acid to tungsten powder; the pressing of this powder into ingots by means of hydraulic presses; the heat treatment and sintering of these ingots and their swaging to finished rod of various diameters; the cutting of the rod into disks—and the operations connected with the welding of these disks to iron screws and rivets of various kinds—and the finishing operations involved in the production of the final tungsten contact points.

In connection with molybdenum, operations can be seen involving purification of the material; its reduction to powder; sintering of the bars and their swaging to rod and wire; also the operations in producing sheet molybdenum.

Though the operations to be seen at this plant are not large in number, they are out of the ordinary and are of particular interest to most persons who see them, because of their unique character. Visitors to the plant have been much interested in the research laboratory, which is provided with all necessary equipment for carrying on research work in connection with the lines in which the company is interested.

A stop will be made at Cudahy, where the train will be switched in to the plant of the Power & Mining Machinery Works of the Worthington Pump & Machinery Corporation, where the members will be given an opportunity to inspect not only mining machinery but also a full line of internal combustion engines.

From Cudahy, the train will go direct to the plant of the

Allis-Chalmers Manufacturing Co. at West Allis, arriving there in time for luncheon, which will be served at the Allis-Chalmers Club. After luncheon, guides will be provided to pilot members through the plant, and ample time will be given to make a thorough inspection.

For those ladies who may not care to visit the manufacturing plants, automobiles with guides will be provided to take them through the parks and residential parts of the city.

For members wishing to visit any other manufacturing plants of Milwaukee which may be of particular interest to them, suitable arrangements will be made.

The train will be run from the Allis-Chalmers Manufacturing Co.'s plant to the C. & N. W. depot, at the foot of Wisconsin St., where the ladies and members visiting other plants may board the train.

B—East Chicago and Whiting:

Lead refinery of International Lead Refining Co.

Luncheon at Hammond Country Club.

Oil refineries of Standard Oil Co., Whiting, Ind.

C—Coal Trip to Franklin and Macoupin Counties, leaving Chicago late Thursday evening, and spending Friday in the coal fields.

D—Local Industrial Plants, Chicago:

Nearly every industry in the metallurgical and manufacturing line is represented by one or more modern, economical plants in Chicago. The Committee on Local Industries is preparing a list of these which can be visited, and trips for inspection will be arranged in accordance with the desires as expressed by the members.

LADIES' COMMITTEE

The wives and daughters of all members are most cordially invited to attend the Chicago meeting. The banquet and the various excursions are being planned with a special view to their enjoyment by the ladies in the party. Also a special Ladies' Committee has been appointed, of wives of members of the Chicago Section, which is arranging an attractive program for the entertainment of the women guests. They will be shown the points in Chicago which are of particular interest to them.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

The Fifth National Exposition of Chemical Industries will be in progress at the Coliseum and First Regiment Armory, Chicago, during the week, and at intervals during the meetings members of the Institute are invited to visit the exposition. The badge of the Institute will be the only pass required at the doors. Ladies are invited.

MID-WEEK BANQUET

It is thought that by having the banquet in the middle of the week a maximum attendance at this function can be obtained. Members who for some reason are unable to come to Chicago for the entire meeting will then be able to be present at the banquet, whether they come for the first or the latter half of the week. The members of the Institute and their wives will be the guests of Chicago at the banquet.

LA SALLE TRIP

From the standpoint of scenery, geology, mining, and industry, the itinerary of the trip to La Salle, Ill., is difficult to surpass. The committee has arranged all details with a view to the convenience of the visitors, and will furnish automobiles, luncheon, guidance, and other accommodations.

Viewed in the vicinity of La Salle, the appellation "Prairie" State for Illinois is a misnomer. There are scenic beauties rivaling the Appalachians. The rock structure is unique. Deep canyons abound. Starved Rock and Deep Park are the mecca of tourists. The district is rich in tradition and historic lore.

Geologically, the section is of great interest; the lower formation, or rocky base, of the state is exposed. The La Salle anticline, illustrated in a souvenir booklet, may be viewed and studied readily at first hand.

In the coal fields mining on the longwall system prevails. The room and pillar system, however, may be studied

at one property and also the operation of the panel system with modification. There is an electrically equipped mine, and most modern methods of handling the coal at surface are demonstrated. Mining and quarrying of portland cement rock, quarrying and treatment of glass sand along the escarpment of the Illinois River, mining and quarrying of hydraulic cement, clay products and gravel also are interesting features.

Cement is manufactured by the Marquette, Lehigh and La Salle companies in enormous quantity.

Three big zinc works may be seen in operation—the Matthiessen & Hegeler, Illinois, and Mineral Point companies. The first two possess the largest zinc rolling mills in America.

The Western Clock Co., manufacturers of "Big Ben," rated as one of the model factories of the Middle West, may be visited.

Among other industries that may prove attractive are the Peru Plow & Wheel Co.; the Carus Chemical Co., where the first calcium permanganate in America was produced; several zinc-plating works; a pressed brick manufactory; and the La Salle Tool Co.

The fossilized remains of what once were two breweries are among the curiosities viewable.

DEDICATION OF BUREAU OF MINES EXPERIMENT STATION

First-Aid and Mine Rescue Contest

The Bureau of Mines extends a cordial invitation to all members and guests to visit Pittsburgh, Sept. 29 to Oct. 1, to participate in dedicating the Mines Experiment Station. Accompanying this will be a nation-wide participation in a first-aid and mine rescue contest. The Pittsburgh Chamber of Commerce will co-operate. The Institute will be represented by a special delegate appointed by the president.

MONDAY, SEPT. 29

- 8:30 a.m., bureau building open for inspection.
- 10:30 a.m., dedicatory ceremonies in rear of main building, 4,800 Forbes St.
- 2 p.m., special train and automobiles to experimental mine near Bruceton, Pa.
- 3 to 6 p.m., mine explosion and inspection of experimental mine and of explosives testing plant near Bruceton, Pa.
- 6 p.m., return by special train and automobiles to B. & O. depot, Pittsburgh.
- 8 p.m., informal reception and organ recital, Carnegie Music Hall. Arranged by Carnegie Institute of Technology.

TUESDAY, SEPT. 30

- Nation-wide first-aid and mine rescue contest, Forbes Field, Pittsburgh.
- 9 to 12 a.m., elimination mine rescue contests.
- 2 to 5 p.m., elimination first-aid contests.
- 5 p.m., coal-dust explosion.
- 8 p.m., pageant glorifying the mining industry, Forbes Field.

WEDNESDAY, OCT. 1

- 9 to 12 a.m., final mine rescue contest.
- 2 to 5 p.m., final first-aid contest.
- 5 p.m., coal-dust explosion.
- 8 p.m., smoker, with award of prizes to winning teams.

Kirkland Lake Gold Mining Co., Ltd.—The annual report of this northern Ontario company for the year ended May 31, 1919, shows that a total of 5,406 feet of underground development has been completed to date, together with 898 cubic yards of station cutting. One shaft has been sunk to a depth of 500 feet and the other to a depth of 700 feet. No ore reserves are given, but development has been very satisfactory and there has been no sign of change of formation at depth. A complete 150-ton mill was put in operation this spring, and the first bar of gold bullion shipped on May 17. The total assets of the company amount to \$1,610,181, of which \$1,340,481 represents mining claims and development. The company has issued 2,000,000 shares.

Monthly Copper Production for 1919

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE-COPPER PRODUCTION, 1919

	April	May	June	July
Alaska shipments (c).....	2,153,691	1,134,272	2,374,843	3,021,912
Arizona:				
Arizona Copper.....	2,400,000	2,400,000	2,400,000	2,400,000
Calumet & Arizona.....	3,822,000	4,508,000	4,872,000	4,802,000
Cons. Ariz. Smelting.....	770,000	690,000	625,000	850,000
Inspiration.....	6,900,000	6,200,000	6,300,000	6,000,000
Magma.....	674,943	730,548	936,117	.....
Miami.....	4,489,748	4,989,580	4,385,865	4,115,452
New Cornelia (a).....	2,000,000	1,408,000	2,708,000	2,736,000
Old Dominion.....	2,389,000	2,564,000	2,015,500	1,629,000
Phelps Dodge.....	6,560,176	6,783,900	6,680,355	7,239,075
Ray.....	3,650,000	3,975,000	3,890,000	3,865,000
Shattuck Arizona.....	Nil	Nil	Nil	Nil
United Verde.....	Nil	1,250,000	3,525,000	4,040,000
United Verde Extension.....	Nil	Nil	2,806,849	4,582,372
California:				
Mammoth.....	1,386,000	620,000	Nil	Nil
Michigan:				
Calumet & Hecla.....	8,554,113	6,796,819	5,439,761	6,208,517
Other Lake Superior (b).....	6,500,000	6,500,000	5,750,000	5,750,000
Montana:				
Anaconda.....	13,750,000	13,500,000	10,530,000	11,122,000
East Butte.....	1,347,580	1,414,460	1,513,360	1,458,420
Nevada:				
Nevada Cons.....	3,763,000	3,700,000	3,715,482	3,706,103
New Mexico:				
Chino.....	3,498,747	3,583,396	3,615,458	3,626,354
Utah:				
Utah Copper.....	9,420,000	9,125,000	9,528,000	8,405,863
Eastern smelter (b).....	1,400,000	1,400,000	1,400,000	1,400,000
Total reported.....	85,428,998	83,072,975	85,011,570	.....
Others, estimated.....	13,380,000	9,580,000	10,845,000	.....
Total United States.....	98,808,998	92,652,975	95,856,570	.....
Imports: Ore and concentrates etc.....	9,773,655	7,946,560	7,732,950	.....
Imports in blister, etc.....	22,781,489	15,997,164	19,842,478	.....
Grand total.....	131,364,142	116,596,699	123,431,998	.....
British Columbia:				
Granby Cons.....	1,333,523	1,848,802	2,072,964	.....
Mexico:				
Boleo.....	1,433,040	1,322,720	1,256,640	1,256,640
Cananea.....	3,000,000	3,000,000	3,000,000	3,200,000
Phelps Dodge, Mexican properties.....	1,702,000	1,552,000	1,735,000	2,516,000
Other foreign:				
Cerro de Pasco.....	4,780,000	4,034,000	4,026,000	3,984,000
Chile.....	5,024,000	5,066,000	5,003,430	.....
Katanga.....	4,298,970	2,094,370	4,519,430	4,442,270
Backus & Johnston.....	2,036,930	1,970,064	(d)	2,174,000

(a) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smelter. (b) Estimated. (c) Official figures of the U. S. Department of Commerce; includes Kennecott production from its Alaska mines. (d) Report not received.

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 were as follows:

	1918	1919
January.....	165,431,568	135,733,511
February.....	160,011,364	111,649,512
March.....	185,525,168	102,040,460
April.....	185,207,096	98,808,998
May.....	191,070,350	92,652,975
June.....	166,723,599	95,856,570

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Granby, Cananea, Braden, Cerro de Pasco, and Chile. As a matter of record, however, the individual figures are given after the total. We also report the copper output of the Boleo and Katanga companies, which does not come to the United States.

Foreign Trade in Copper—Erratum

In the table of copper imports, published in the *Journal* of Aug. 16, the contents of the matte, regulus, etc., imported in June was given as 2,985,286 lb., instead of 1,187,607 lb. With this correction, the total matte and regulus, etc. (contents) imported during the first six months of 1919 amounts to 19,422,846 lb.

Survey Geologists Protest

Building Commission Would Crowd Staff Into Less Space Than Occupied Formerly When Public Health Service Protested

THE members of the staff of the U. S. Geological Survey in Washington recently held a meeting to protest against the order of the Public Building Commission by which the space available to the staff is reduced about one-half, or to an average of that considered to be sufficient for the clerical forces of the departments in Washington.

In a letter sent to the chairman of the commission as a result of the meeting, it is set forth that, by the proposed reduction in allotted space, about 320 geologists, engineers, and other technical employees of the Survey, with about 260 clerical workers, must carry out their official work in 44,000 sq.ft. of floor space. This is about 20 per cent less than was occupied by a similar corps of workers in the Survey's old crowded and unsanitary headquarters, which called forth a protest from the Public Health Service. The conditions at that time led to the preparation of plans for a building specially adapted to the Geological Survey's needs, and in 1913 to the passage of the bill authorizing the construction of the new Interior Building, of which the Survey now occupies about one-third.

The Divide-Tonopah Chamber of Mines

A chamber of mines has been recently formed in the Tonopah and Divide mining districts of Nevada. The purposes of this organization, which is to be known as the Divide-Tonopah Chamber of Mines, is set forth in the following:

To serve and promote the general welfare in the Divide and Tonopah mining districts, to stimulate interest in the mining industry, and to give legitimate publicity to mining activities in this section of the state.

To so advertise the Divide district, its mines, production and activities throughout the United States that treasury stock of legitimate companies will be readily absorbed, and the value of all stock, promotion and treasury, of such companies, stabilized and sustained.

To spread information concerning the Divide district and its mines and mining companies, that the market for the stocks thereof will be greatly broadened and other capital largely attracted thereto besides that of California and Nevada, which in itself, so far as it is devoted to mining, is not sufficient to fully finance and support all the worthy enterprises of the Divide district.

To discourage the formation of dishonest and fraudulent mining companies and enterprises, to expose the attempts of such concerns to defraud the public, and to investigate and report upon each and every complaint made to the Chamber of Mines that any company, promoter, broker, or other person is treating the public or any member thereof dishonestly, fraudulently, or unfairly.

To guard the interest of the people of the Divide and Tonopah mining districts in any matter requiring attention; to protect them from fraud and imposition, and to undertake any reform necessary to or desirable for their welfare and prosperity.

To stabilize business conditions in every way possible; to prevent industrial dissatisfaction, and to adjust differences, in order that there may be no interruption of the present prosperous conditions in the Divide and Tonopah districts.

To secure accurate information of mining corporations, mining activities, developments, and progress in the Divide and Tonopah districts, and to furnish the same to all persons seeking it, and to disseminate generally such information.

BY THE WAY

In a Quandary

Two men of Sierra County, California, recently located some soda springs at Parker Flat, in the same county, with the intention of marketing the waters. Further investigation of the springs resulted in the discovery of a quartz vein 15 ft. wide. Six feet of the vein assayed \$6 gold and nine feet \$4 per ton, it is said. Now the owners are in a quandary as to whether mining operations would be more profitable than the water. With gold mining as it is and a great national thirst impending, we advise them to go after the soda water.

What Some People Think

Below are quoted the words appearing on the front cover of the New Jersey Zinc Co.'s Library Bulletin, issued weekly by the company's library:

The technical or trade journal of today is the liveliest and most "up-to-now" assistant a business man has. It is carefully edited, well printed, fully illustrated and thoroughly indexed, both as to literary matter and advertisements. It is the "always ready reference" of the minute, and the official, head of a department, or even workman who does not use it to its fullest capacity is neglecting one of his best friends.

In no other way can any business man, no matter how high or low his position, keep so fully abreast of the time in his business as by early and careful perusal of his trade and technical periodical, from its front to its back cover, and from no other source can he obtain the "immediately useful" so well as he can from a well-filled and indexed present volume of those same publications.

The Dangers of Mining

Mining is one of the extra-hazardous industries employing more than 1,000,000 men in the United States, of which three or more of every 1,000 men employed are killed each year by accidents. This, according to Albert H. Fay, of the U. S. Bureau of Mines. Though complete data relating to non-fatal injuries are not available, states Mr. Fay, reports to the Bureau of Mines for all metal mines in the United States show that at least 250 men per 1,000 per year are injured sufficiently to cause loss of time. Approximately the same rate will apply to other branches of the mining industry. A reduction of 50 per cent in the number of mine accidents would mean a saving of at least 1,500 lives in the United States every year, a saving of valuable time now lost and an alleviation of much suffering now resulting from more than 250,000 non-fatal accidents that the records show occur annually in the mineral industries.

The Tenderfoot's Lease

Several years ago in the mining town of Gold Hill, Ore., a local attorney, on arriving at his office earlier than usual, found a new arrival awaiting him. The client, a tall lanky youth of probably twenty summers, was clad in a corduroy suit of tan, with high-laced boots. With a prospector's outfit at his side and a gold-pan in hand he represented the typical tenderfoot of the region. Peering through a pair of rimless lenses, the new comer eagerly addressed the attorney as he drew near. "Say

judge, what will be your charges for drawing up a mining lease?" "Five dollars, sir. If it should be an extraordinary document, it will cost you more," replied the student of Blackstone. "Well, judge," began the youth, after he had returned with the lessor, "you make this instrument good and strong—and, I want three carbon copies to post at the mine. I will pay you ten dollars for your services. I just come down from Coeur d'Alene. I had a lease on a mine up there—the blooming thing was showing up fine. Some fellows came along and told me that my lease was no good. They hung around and offered me five thousand dollars for all my right, title, and interest in and to the said premises. I said 'all right.' And—say—judge, what do you think? Well, sir! Those fellows sold that mine the next day for five hundred thousand dollars—a clear net loss to me, of four hundred and ninety-five thousand dollars. Never again—I want one of those leases, that I won't have to sell."

Curves and Nerves

The climate alone was enough to dissuade anyone from staying on the job. Surveying day after day in the rain put the entire corps in an irritable mood, and it was not surprising that the chainmen, rodman, and axemen should drift away under one pretext or another. Came a day when there remained only the fussy general manager, the transit man, and one semi-educated machete wielder to finish the location of the motor-truck road that was destined to link the mine with the river port. The transit man had looked upon his post as but a temporary stepping stone to higher tasks, so it rankled him to see the G. M. usurp his place at the instrument. And still more did it anger him to be compelled to skip about with a stadia rod in accompaniment to weird computations on a slide rule; marking and driving stakes like a mere underling. On the third day of this sort of thing, when ordered to set additional stakes to mark the P. C., P. I., P. T., etc., of various tentative curves, he ventured to argue with his superior anent the foolishness of such attempts to apply railroad survey tactics to a guess-and-by-gosh stadia line. As though by way of punishment for his *lese majesty*, his tasks that afternoon included the setting of some P. C. C. and P. R. C. stakes. By a fortunate coincidence that same day chanced to be pay day. That night some mysterious activities might have been observed at the quarters of the subordinate engineer, including the furtive nailing of boxes and whispered consultations with a couple of camp followers. The next morning he started out on the job bright and early, packing the rod and a stake of unusual dimensions. Hurrying with a halfbreed to the end of the line, he had the instrument set up by the time the G. M. arrived. Stalking on ahead through a cleared space for quite a distance, he affected to misunderstand the frantic signals of his chief. Alternately extending and lowering the rod, moving up and down the hillside but always lengthening the distance between them, he finally dragged his masterpiece into view and drove the stake firmly until it looked like a headstone on a lonely grave. Abandoning the rod, he proceeded up the hillside, mounted a waiting mule, and soon disappeared around a bend in the trail. When the puzzled autocrat reached the stake, he discovered on the hind side of it the neatly crayoned inscription

P. P. C.

PERSONALS

Ray Hardy is engineer in charge of the Divide Extension Mining Co.'s mine.

Richard Taylor is superintendent of the White Caps Mining Co., Manhattan, Nev.

Ellsworth R. Bennett, of Tonopah, recently examined a property near Eureka, Nev.

Charles L. Lawton, manager of the Quincy Mining Co., made a recent visit to Chicago.

Clyde Weed, manager of the Hancock Consolidated Mining Co., is in the East on business.

Col. O. B. Perry is inspecting dredging operations at Pritchard Creek in the Coeur d'Alene district, Idaho.

John D. Ryan has returned to New York after spending a month's vacation at Houghton, Mich.

R. A. Kinzie, of San Francisco, will have charge of mining operations for the Engels Copper Mining Co.

John L. Malm, of the Malm-Wolf Co., visited the Ferris Haggerty properties in Wyoming early in August.

Charles E. Knox is in Tonopah, Nev., in the interests of the Knox Divide Mining Co., in the new Divide district.

W. Parsons Todd, vice-president of the Quincy Mining Co., has returned to New York after visiting the property in Michigan.

Frederick J. Harper has been appointed managing director of the Nitrate Agencies Co., with residence in Iquique, Chile.

J. Parke Channing, president of the Naumkeag Copper Co., operating at Houghton, Mich., made a recent visit to the property.

Rodolphe Agassiz, of Boston, president of the Calumet & Hecla Mining Co., is making his regular visit to the mines in Michigan.

Herbert C. Hoover, head of the Inter-Allied Relief Organization, accompanied by a staff of experts, arrived in Warsaw on Aug. 11.

F. Dean Bradley is in charge of operations at the Goldfield Consolidated Mining Co.'s mill, Goldfield, Nev., for the Goldfield Development Co.

Homer Wilson, of San Francisco, has acquired the property of the Lodi Mines Co., situated some distance from Luning, Nev., and will erect a concentrating plant.

E. E. Hunner, general manager of the Hanna Ore Mining Co., has returned to his duties after a series of serious operations at Johns Hopkins Hospital, Baltimore.

F. W. Draper is in Nevada in the interest of the Louisiana Consolidated Mining Co., which is preparing to work the Tybo mine, sixty miles northeast of Tonopah.

R. M. Kellogg, mining development contractor, who is at present sinking a number of shafts in the Divide district of Nevada, is making a business trip to the Ranger oil field of Texas.

John Fowle, vice-president and general manager of the Silver King of Arizona Mining Co., who has been in California recently on professional business, has returned to Superior, Ariz.

F. G. Cottrell, assistant director of the Bureau of Mines, was delayed in sailing from Europe. Dr. Cottrell had expected to reach the United States Aug. 10, but will not be able to return before some time in early September.

Charles McKinnis, of Wallace, Idaho, manager of the National Copper Mining Co., is sinking two wells near Ranger, Tex. Myron A. Folsom, chief counsel for the Bunker Hill & Sullivan company, has a flowing well in the same field.



PLAQUE OF DR. JAMES DOUGLAS

James Douglas' memory was honored recently by the American Institute of Mining and Metallurgical Engineers by the placing of a bronze plaque of Dr. Douglas, reproduced herewith, in the Engineering Societies Building, New York. Dr. Douglas died on June 25, 1918, at the age of eighty-one years, after having devoted his entire life to the advancement of the mining industry. The inscription on the plaque denotes the distinguished honors conferred on Dr. Douglas by his fellow engineers in recognition of his valuable services to the sciences of geology and metallurgy.

Capt. Lionel H. Lehmaier, late of the 4th Australian infantry and prior to the war assayer and metallurgist with the Sulphide Corporation, Cockle Creek, New South Wales, has been appointed the representative in Australia of the Guaranty Trust Co.

C. W. Sherman, of Hamilton, Ontario, president of the Dominion Steel & Foundry Co., has completed a tour of inspection of the Mesabi and Vermilion

ranges in company with his brother, H. S. Sherman, superintendent of the Hull-Rust mine, at Hibbing.

R. R. Leslie has resigned as general superintendent of El Cuyo Mining & Milling Co., at Guanajuato, Mexico, and will devote himself to personal business. F. H. Lerchen, who has been his assistant, became superintendent on Aug. 1. Mr. Lerchen is at present in Chicago on business.

E. A. Julian, engineer in charge of the exploration department of the Goldfield Consolidated Mining Co., has assumed the management of the Tonopah Divide Mining Co. and the Brougher Mining Co., succeeding A. I. D'Arcy, who is devoting his time to the interests of the Goldfield Development Co.

A. C. D. Bothe, mining and metallurgical engineer, commissioned by the Netherlands government to inspect mining operations in America, spent several days in the Coeur d'Alene district. After visiting other mining sections of the West, he will sail in about a month from San Francisco to Batavia, Java.

Van. H. Manning, director of the U. S. Bureau of Mines, will visit Denver the latter part of August to confer with state and city officials relative to the proposed oil-shale investigations. At present, Denver and Salt Lake are competing for the Bureau of Mines proposed oil-shale plant, for which Senator Henderson, of Nevada, introduced a \$100,000 appropriation bill. Director Manning will be the guest of the Colorado Metal Mining Association and the Colorado Chapter of the American Mining Congress at an informal dinner to be held on Aug. 27.

Colonel Frederick Mears has been appointed by the President as chairman and chief engineer of the Alaskan Engineering Commission in charge of the construction of the Government railroad in Alaska. Colonel Mears was a member of this commission, but retired to return to active duty with the Army during the war. He was with General Goethals during the construction of the Panama Canal in charge of the Panama Railroad, and during the war was general manager of the American railroad lines in France. The President has appointed William C. Edes as consulting engineer to the commission.

OBITUARY

Harry T. Hobson, aged twenty-six, manager of the Marne Divide property in Nevada, was killed on Aug. 6, 1919, by falling a distance of eighty feet into the shaft. Mr. Hobson was a graduate mining engineer of Stanford University in 1917, and during the war held a commission as lieutenant, being assigned as gas instructor to the school at Little Rock, Ark. Mr. Hobson was also identified with the mining industry in Arizona and Mexico.

INDUSTRIAL NEWS

L. H. Sebbes, until recently with the advertising sales department of the *Engineering and Mining Journal*, has accepted a position as manager of the sales promotion department of the Chicago Pneumatic Tool Co. in the Chicago office.

Goulds Manufacturing Co., of Seneca Falls, N. Y., manufacturers of pumps, will open on Sept. 1 a district sales office in Detroit, Mich., in the Dime Bank Building, in charge of E. B. Gould, who has recently returned after eighteen months' service in France.

Davis-Bournonville Co., Jersey City, N. J., announces that the publication of "Autogenous Welding," devoted to the interests of the company and its employees, will be resumed regularly after having been suspended during the war. The July issue has been named the Victory Number, and is largely devoted to the part played by oxy-acetylene welding and cutting in the war.

Norton Company, since July 1, 1919, has been conducting the business of the Norton Grinding Co. which has been reorganized with the following board of directors: George I. Alden, chairman; Charles L. Allen, president and general manager; Aldus C. Higgins, treasurer and general counsel; George N. Jeppson, secretary and work manager, and R. Sanford Riley and John Jeppson.

The Sullivan Machinery Company announces the appointment of R. S. Weiner as district manager at El Paso, Tex., succeeding Don M. Sutor. Mr. Sutor has been transferred to the company's St. Louis office as district manager for Missouri, eastern Texas, Oklahoma, Kansas, western Kentucky and western Tennessee. The company's office at El Paso remains at Room 511 Mills Building, as heretofore.

Traylor Engineering and Manufacturing Co., Allentown, Pa., announces the return of R. R. Shafter to the company's sales organization after an absence of two years as general superintendent of the Traylor Shipbuilding Corporation, which completed more 3500-ton cargo carriers than any other yard on the Atlantic and gulf coasts. Mr. Shafter will have charge of the New York office, at 30 Church St.

H. Gardner, 2 Metal Exchange Buildings, Leadenhall Avenue, London, announces that he has converted his business into a limited liability company with a capital of £1,000,000, of which £650,000 has been issued and fully subscribed. All contracts and liabilities are taken over by the company, which will likewise receive all debts. Directors are: Henry Gardner, chairman; Walter Gardner, Sir Woodburn Kirby, George E. Leon, and William Murray.

Goodyear Tire & Rubber Co., Akron, Ohio, has established a week-end traveling sales school, composed of capable instructors, who will visit the men in

the various branches of the company. They have recently covered Louisville, Memphis, and New Orleans. At present they are in Indianapolis. In the eleven years of its existence, the company's relief association has paid \$78,899.10 compensation for sickness and accident to 4,164 of its members. Death benefits for the same period amounted to \$157,878, covering 158 recorded deaths.

Chicago Pneumatic Tool Co. will remove its general offices from Chicago to No. 6-8 East 44th St., New York. The company is erecting a ten-story building of combination brick and limestone, to be ready for occupancy early in 1920, at which time the transfer will be effected. The construction work will be done by Westinghouse Church Kerr Co. The purpose of the transfer



CHICAGO PNEUMATIC TOOL CO. BUILDING, 6-8 E. 44TH ST., NEW YORK

is to facilitate the administration of the company's six American plants and twenty-six sales and service branches.

TRADE CATALOGS

"C-H Mine Duty Apparatus" is the title of an 8-page 8½ x 11 in. pamphlet issued by The Cutler-Hammer Mfg. Co., Milwaukee, Wis. Special reference is made to the mine-duty apparatus installed in the plant of the St. Louis Smelting & Refining Co. at St. Francis, Mo. The method of handling the ore from three levels until it is ready for shipment is given, as well as a

description of the hoist and conveying machinery and the automatic control and safety apparatus used. The illustrations show the mine-hoist control panel, switches, overspeed governors and electrically operated brakes; also the automatic starters for the crushers and conveyors, which are controlled from push-button stations. The speed of the conveyors and crushers is governed by armature regulators.

NEW PATENTS

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

Blast-Furnace Top. Edwin G. Rust, Philadelphia, Pa. (U. S. No. 1,307,884; June 24, 1919.)

Blast Furnaces—Method of Blowing Down and Blowing Out Blast Furnaces. John W. Dougherty, Beaver, Pa. (U. S. No. 1,309,465; July 8, 1919.)

Clays and Earths, Treatment of. Frank Langford, Eureka, Cal. (U. S. No. 1,308,429; July 1, 1919.)

Crushing Machine. Eugene L. Sanborn, Milwaukee, Wis., assignor to Smith Engineering Works, Milwaukee, Wis. (U. S. No. 1,309,104; July 8, 1919.)

Drill—Electric Well Drill. Robert R. Bray, Los Angeles, Cal. (U. S. No. 1,307,847; June 24, 1919.)

Fuel—Combined Air and Pulverized-Fuel Control. William O. Renkin, Oradell, N. J., assignor to Quigley Furnace Specialties Co. (U. S. No. 1,308,368; July 1, 1919.)

Fuel—Device for Aërating Powdered Fuel. Alonzo G. Kinyon, Chicago, Ill., assignor to Powdered Coal Engineering and Equipment Co., Chicago, Ill. (U. S. No. 1,307,365; June 24, 1919.)

Furnace Linings—Protecting Refractory Furnace Linings. Howard F. Chappell, New York, N. Y. (U. S. No. 1,308,481; July 1, 1919.)

Ore Classifying and Separating Apparatus. Lewis H. Falley, Kansas City, Mo. (U. S. No. 1,307,626; June 24, 1919.)

Ore-Concentrating Machine. Frederick E. Small, Kansas City, Mo. (U. S. No. 1,309,307; July 8, 1919.)

Rare Metals—Process of Making Compounds of Rare Metals. Robert McKnight, Pittsburgh, Pa. (U. S. No. 1,308,911; July 8, 1919.)

Reducing Metal to a Finely Divided Condition, Method and Apparatus for. Everett J. Hall, New York, N. Y., assignor to Metals Disintegrating Co., Inc., New York, N. Y. (U. S. No. 1,306,060; June 10, 1919.)

Silicates—Process of Extracting Metals From Silicates. Louis L. Jackson, New York, N. Y., assignor of one-half to Odus C. Horney, New York, N. Y. (U. S. No. 1,305,969; June 3, 1919.)

Steel—Manufacture of Steel. Charles Miris Steel Co., Ltd., London, England. (U. S. No. 1,304,946-7-8; May 27, 1919.) Dear, London, England, assignor to The

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

DENVER, COL.—Aug. 16

The New York-St. Louis Syndicate, a \$1,500,000 corporation, owning 1,520 acres of oil-shale land near DeBeque, Col., and a 5,000-acre oil lease in the vicinity of the shale beds, is letting out contracts for the immediate erection of a retorting and refining plant. The plant will be erected either at DeBeque or Grand Valley, and will have an initial capacity of 1,000 tons per day. It will cost about \$250,000. A recent test of the shale was made on East St. Louis, using the Wallace process. An average of 45 gal. of oil was extracted from the shale in two and one-half hours. About 30 gal. of gasoline can be produced from "cracking" of a barrel of oil (42 gal.) in addition to other valuable byproducts. James Duce, Colorado State Oil Inspector, was present when the tests were made, as a representative of Governor O. H. Shoup.

SALT LAKE CITY, UTAH—Aug. 16

Opening of the Uintah Basin is taking definite form, with the prospect of a railroad into the section as a result of efforts on the part of the State with the encouragement of Governor Bamberger. A possible extension of the Moffatt road from Colorado into the basin has been discussed from time to time, and this may be done in the future. The road will start from a point in Utah, the route as outlined making Provo (40 miles from Salt Lake), the outside terminal, and going to Springville, through Hobble Creek Canyon, along the side of the Strawberry River to Duchesne, Myton, and other points in Uintah Basin. At a meeting held at the Commercial Club of Salt Lake City on the evening of Aug. 12, preliminary plans were outlined for the building of the railroad and for the forming of a holding company to take up and work timber, oil-shale, and coal lands in the basin. The sum of \$29,000 in individual subscriptions of \$1,000 was pledged to go for preliminary expenses. When \$100,000 has been pledged, it is planned to make a resurvey of the ground to be covered by the railroad and to undertake the necessary preliminary work of organizing companies to take up options on lands and perform other necessary preliminary work. Chicago men owning coal lands in the section have offered their support in the movement.

WALLACE, IDAHO—Aug. 15

Strike Which Has Been Threatening in the Coeur d'Alene district for several months reached the climax on Aug. 13, when, at a meeting in Wallace, the Coeur d'Alene District Union No. 14, a branch of the International Union of Mine, Mill and Smelter Workers, ordered a strike on Aug. 15 at 7 a. m. The mines affected are the Hecla, Hercules, Morning (Federal), Hunter, Interstate-Callahan and Tamarack & Custer. Practically all the employees went out in accordance with the strike, and all indications point to a long shutdown. A member of the executive committee of the international union was present at the meeting of the district union and protested against calling the strike, and warned the meeting that if the men went out it would be in defiance of the international union. General McWade was also present and protested in the name of the Government against this radical action. The Bunker Hill and Sullivan was not included in the strike order. It is expected that strong pressure will be exerted to close the Bunker Hill also.

The Finding of the Coroner's Jury, after a thorough investigation into the recent accident at the Hecla mine, resulting in four men being instantly killed and three seriously injured, one of whom subsequently died, was to the effect that the death of the man was caused by "an involuntary accident," for which the hoist man was not criminally responsible, a conclusion unquestionably justified by the facts. The men had entered the cage at the collar of the shaft, in full view of the hoist man, and the signal was given to

lower to the 2,000 level. The hoist man pushed the control lever of the electric hoist in the wrong direction and sent the cage up to the sheave wheel, with the result as stated, one of the men falling to the bottom of the 2,000-ft. vertical shaft. Later a searching investigation was made by Robert N. Bell, State Mine Inspector, the result of which confirms the verdict of the coroner's jury. His investigation went further, however, and he found that there was a contributing cause which suggests that there is further need of providing safeguards. Mr. Bell describes the hoist as a first motion, double-reel, electrically driven plant, with flat cables and massive Liven-type post brakes. The cables are 1 in. thick and 3 1/2 in. wide. The contributing cause does not in the least reflect upon the Hecla Mining Co., for Mr. Bell found that every required safety device has been adopted. It simply shows that with all the safeguards provided there is still an element of danger. Mr. Bell says: "Another factor, and a very important one I think, was the fact that two new cables had been very recently put on. These cables when first used are subject to a lengthening stretch of more than seventy ft., and while this stretch is being worked out repeated readjustments of the indicator gears are necessary, and involve the

DULUTH, MINN.—Aug. 15

Great Northern Iron Ore Properties has recently issued the 12th annual report, covering operations for the year 1918. Gross income from the proprietary companies totaled \$4,557,000; income from interest and ground rental amounted to \$37,725. Disbursements for salaries, expenses, and income taxes were \$72,221. Holders of certificates of beneficial interest profited to the extent of \$6,000,000 in dividends of \$1 per share on Mar. 15, \$1 per share on June 27, and \$2 per share on Dec. 17. Undivided profits amounted to \$602,273 on Dec. 31. One new lease was recorded in 1918, being that of the Wade property at Kinney and the Cleveland Cliffs Iron Co. and the Struthers Furnace Co. The company has profited largely by the recent improvements in washing practice and will continue to benefit, as large acreages are held in the western Mesabi district.

MINA, NEV.—Aug. 16

Recent Reports From Active Companies in the Mina district indicate that Mina may soon be a center of activity of southern Nevada. The Consolidated West Extension Simon Mines Co.'s shaft is being sunk rapidly. The two-compartment shaft is now down to the 100-ft. level, and the contractors are sinking at the rate of



Photo by Fred L. Miner, Editor "Western Miner," Reno, Nev.
SIMON SILVER-LEAD MINE, SHOWING SHAFT EQUIPMENT AND EXPERIMENTAL FLOTATION PLANT

temporary disconnection of the Welch speed controller. This is a sensitive device with which the hoist is equipped, designed to shut off the power automatically and apply the brake when the hoist exceeds the maximum fixed speed in passing a danger point near the terminals of its operation."

MORENCI, ARIZ.—Aug. 11

At Morenci, Ariz., plans have been completed and work is about to start on the new high school. Particular attention is to be paid to vocational training to encourage Mexican boys to remain in school after the state law permits them to seek employment. Comparatively few Mexicans get a high-school training, but if something can be offered in the trades, it is believed that a much larger number will continue in school. A distinct novelty of the new Morenci school is the automobile shop, which is worked in conjunction with the machine shop, forge shop, foundry, wood shop and paint shop.

3 ft. a day. The last 30 ft. is in a manganese and calcite vein, which shows signs of strong leaching action. The gangue matter shows a considerable amount of iron pyrites. Reports from the property of the Norman Silver Mining Co., situated about one and one-half miles from the Simon silver-lead mine, are to the effect that a body of ore has been opened in the bottom of the shaft at a depth of 50 ft. At present the shaft is in 3 1/2 ft. of ore. The shaft is a two-compartment one, and is in a contact between lime and granite. The management expects to sink to a depth of 200 ft. and crosscut on the 100- and 200-ft. levels. An additional discovery is reported by the management of the Pagan Mines Co. where a body of galena having a width of 4 ft. is exposed at the bottom of a 30-ft. shaft. In addition to the lead contents, it is stated that assays show silver and gold. The mine is situated about two miles south of the Simon silver-lead mine and adjacent to the Norman silver mine.

ELY, NEV.—Aug. 15

Strike of Employees of the Nevada Consolidated at Ely threatens serious privations to inhabitants of towns in that region, owing to interruptions in train service to that point, isolated in 140 miles of desert. The trouble was apparently the result of the unexpected strike of shermen and minor crafts on the Nevada Northern Ry., which quickly tied up traffic on the road between the mine and mill, making the shutdown of the mill and smelter imminent. Meanwhile, mill and smelter men announced that unless an increase of wages of \$1.25 per day, together with minor demands as to working conditions, were granted before a certain hour on July 29, they would quit at that time, which they did. The smelter management had anticipated this action, and no charges were in the furnace. The company meanwhile offered an increase of 75c per day, claiming that this brings wages to within 25c of pre-armistice levels and was all that the copper market warrants and would establish a scale equal to or greater than that in any other copper camp. The men receded to a wage demand of practically 25c higher than the company's offering, and the deadlock ensued. The company's strategic position is good, with considerable quantity of unsold copper and with the larger operations of affiliated interests at other points it can well afford to abandon operations indefinitely in this high-cost property. Though trainmen are not on strike, there is no one to keep the rolling stock in operating order, and therefore train service to Coble, the connecting point on the Southern Pacific, has been extremely erratic, causing much inconvenience and a prospect of serious famine in Ely. Announcement was made that the company will be unable to operate trains after Aug. 16. The efforts of Governor Boyle of Nevada, the Nevada Railroad Commission and Federal Judge Davis have been so far unavailing. Both at Ely and at the general headquarters at Salt Lake City both sides are holding out. The inhabitants of the district are wondering what they will do when the present limited stocks of staple groceries are consumed. Practically no dairy products are available. The San Francisco Exchange has closed because of labor troubles in Nevada.

AUSTIN, TEX.—Aug. 6

All Pipe Line Companies are held to be common carriers, and must make monthly reports to the Texas Railroad Commission, according to a ruling of the Attorney General. This ruling applies to small as well as large companies, even though handling oil from only one well or company. Pipe lines owned by refineries and used to convey oil direct from the wells to the refinery do not fall under this ruling.

Motion To Modify Injunction against Texas and Prairie companies and other oil companies was taken under advisement by the district judge. The case involves the right of the state to grant a legal lease to one Giraud, of Austin, on a strip of ground left vacant between two surveys, subsequently found to be wrong, in the Ranger field. In addition, Giraud sold to the Humble Oil & Refining Co., and that company obtained an injunction against the other companies preventing them from drilling not only on this strip but within a certain distance on either side. This case will set a precedent, and is of great importance.

COBALT, ONTARIO—Aug. 15

The Labor Situation in the Cobalt camp remains practically unchanged. Though a number of attempts have been made to bring about a settlement of the trouble, the only one that holds out any promise of success is that by the returned soldiers. A short time ago the returned soldiers of the district held a meeting, and sent a deputation to Ottawa to interview the Minister of Labor. They were informed there that the Department of Labor would appoint a board of conciliation, but that before doing this it would be necessary for the striking miners to return to work. This, of course, would necessitate a return under the old conditions and rates of pay. This was refused by the miners' union executive, who also refused to take a vote on the question, either a standing vote or a secret ballot. In the case of a standing vote, there is no doubt that a considerable number of the men would have been in favor of this, whereas, if a secret ballot had been held, there is every reason for believing that the majority would have been in favor of it.

Upon the refusal of the union executive to consider this proposal, the returned soldiers held another meeting, and decided to form another union, having no connection with an international organization, and from which aliens would be excluded. Though nothing definite has yet been done regarding the formation of a new union, and committee of the returned soldiers is meeting the mine managers of the camp to find out what their attitude would be under these circumstances. There seems to be no question that the operators would allow the men to return to work, without discrimination, at the old rates of pay and bonus system. They would be prepared to deal with and recognize a union which had no affiliation with the Western Federation. There is every reason to believe that the mine managers and the returned soldiers' committee will meet in a spirit of conciliation, and that if the returned soldiers' committee can carry out the program that it has outlined, there is a fair chance that the strike will be called off in the near future. In the meantime, none of the mines is making any attempt to work, and the lower levels are being filled with water.

VLADIVOSTOK, SIBERIA—July 17

Little Activity is in evidence throughout the country, and there are hardly any recent developments of importance to record. The dredges of the Orsk Goldfields, Ltd., continue operating in the Ochotsk Province, as they have been all through two revolutions. The Lenskole company is reported to be operating. On account of the low price being paid for gold, namely Rs. 50 per zolotnik, equivalent to about \$9 per oz. for average 800 fine placer gold at today's exchange (Rs. 50 to the dollar), the government is getting little of the output from small miners, who are selling to Chinese merchants along the border, and the gold is taken out of the country. According to reports, the Te-Tu-He zinc mine is being operated by Bolsheviks, who have possession of it.

The Far Eastern Development Co., Ltd., is planning only for work on the Pacific Coast of Siberia in regions accessible by sea transportation and by river freighting on the Amur, as it is believed the railroad will be out of operation for several years.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ARIZONA

Cochise County

SHANNON (Gleeson)—Title to company's property at Gleason and in Yaeger Canyon (Yavapai County) not included in sale of Metcalf mines railroad, and Clifton smelter and mill. Reported work will be resumed at Gleason, shipping high-grade sulphides to Arizona smelter at Clifton.

Gila County

GIBSON (Bellevue)—Mill has had successful test run. Dumps claimed to have more than 200,000 tons ore.

COLE-GOODWIN (Globe)—Work to be resumed under P. J. Hickey, of Phoenix. Property has 470-ft. shaft and 700 ft. lateral development. Mill proposed.

Pima County

W. P. COTTRELL, operating small concentrating mill of his own invention at Greaterville on ores from leases.

PAYMASTER (Tucson)—Reorganization effected under title of Paymaster-Silver-Lead Co. Charles Blenman, of Tucson, president; W. Hogan, treasurer and manager. Stock largely held by Andrew Wank, of St. Joseph, and W. T. Lawson, of New York. Property at Olive Camp, twenty-four miles south of Tucson. Profit secured in shipment to El Paso. Mill to be provided for low-grade ores.

Pinal County

MAGMA CHIEF (Hayden)—Property in Copper Creek field has copper ore in shaft at 235 ft. Will drift on orebody at 220 ft.

ARIZONA HELICOPTERS (Ray)—J. T. Shimmitt states that flotation machine referred to in the *Journal* of July 26 should

not be called the Shimmitt cell. Machine being designed to equip one section is similar to Callow machine and resembles Inspiration-type machine. Was designed to fit into present flotation building and flow sheet.

DAGGS (Superior)—Group of thirty-two claims bonded by Consolidated Holding Co., mainly comprising Hugh Daggs and J. H. Hayes, of Phoenix, to Grand Pacific Syndicate, for \$450,000. Prospective buyer, which already owns much adjoining ground, is composed of New York and Pennsylvania capitalists headed by C. C. Steinbrenner. Property has copper outcroppings. Was under bond to Calumet & Arizona several years ago.

MAGMA (Superior)—Driving service tunnel with face 127 ft. into, through newly acquired Queen Creek ground, to tap shafts at 500-ft. depth. Concentrating ores are to be trammed to mill.

MAGMATIC (Superior)—J. C. Goodwin to resume sinking of main shaft, which has cut large manganese body outside of copper vein.

SILVER KING OF ARIZONA (Superior)—The new shaft is now down 230 ft. and has cut a streak of ore assaying 120 oz. silver to the ton, at 212-ft. depth streak assaying 116 oz. silver was cut. Together four streaks have been cut, all in light-colored porphyry, the country rock. As shaft is being sunk 150 ft. outside main ore chimney in country rock, the discoveries are interesting and encouraging.

Santa Cruz County

TRES DE MAYO (Nogales)—Situating twelve miles east of Nogales, operated by

Bachman-Merritt Co. is shipping silver-lead concentrates to El Paso. Plans made for new mill to handle vanadate, of which 80,000 tons already have been blocked out in parallel formation.

Yavapai County

DUNDEE (Jerome)—Two shifts sinking shaft, now b-low 500 ft., on way to lateral connection with Extension tunnel, which will provide advantageous transportation for ores. Humboldt smelter may get ores from carbonate blanket, which has proved length of 300 ft. and width of 60 ft.

JEROME DELMONTE (Jerome)—To resume work on shaft, to sink from 450 to 1200 ft. Heavier pumping equipment and new hoist needed. Company, headed by Henry Lapham, has \$160,000 in treasury and has spent \$140,000.

JEROME MANHATTAN (Jerome)—Reported about to resume, after two years idleness.

Yuma County

SWANSEA LEASE (Swansea)—Has secured order from Corporation Commission for reopening of Swansea railroad to Bouse. Ore shipments to Commission was advised that drilling had developed much larger and richer ore-bodies than heretofore worked. Flotation mill had proved successful, and that operators' intention was increased from 50 to 200 men. Lease held by W. A. Clark interest. Railroad controlled by George Mitchell, of Los Angeles, Cal.

CALIFORNIA

Alameda County

WESTERN MAGNESITE DEVELOPMENT COMPANY (Livermore)—Five-

year lease granted to Charles S. Malby. Charles H. Spink to be retained as general manager. Has contract to furnish 20,000 tons of magnesite during the coming year. Calcining plant at Red Mountain, 33 miles southeast of Livermore, will be enlarged. Six trucks employed hauling product to Livermore.

Calaveras County

CALAVERAS COPPER (Copperopolis)—Mill including flotation plant, being made ready for early resumption of work. Smeltery now being overhauled.

NAPOLÉON MINES (Milton)—Mill and flotation plant to be operated under ten-year lease held by L. D. Adams.

SHEPHERFRANCH (Sheepcranch)—Stamps of old mill are now dropping, and electric pump with capacity of 2,000 gal. per min. installed in mine. Ore being developed by winze 200 ft. below 1,500-ft. level.

Kern County

KELLY-WILLIAMS (Randsburg)—To be operated under name of California Rand Silver, Incorporated, with fifteen owners. Since June 15, seventeen cars high-grade ore shipped. Air compressor now being installed. Ratio of silver to gold remains consistently three to one in value.

Nevada County

BULLION MINES (Grass Valley)—Transfer of property, comprising 120 acres, to Grass Valley Bullion Exploration Co., with George F. Mainhart as manager. Was developed by 1,500-ft. inclined shaft. Closed for fifteen years. Will start at first to unwater old shaft.

Plumas County

ENGELS COPPER (Engelmine)—Completed and placed in successful operation. Tailings dewatering plant with capacity of 2,000 tons per 24 hours.

WALKER MINING (Portola)—Preliminary work started on aerial tramway from mine to Spring Garden, a distance of eight miles.

Trinity County

ESTABROOK DREDGING COMPANY (Trinity Center)—New 80 cu. ft. dredge, handling 10,000 yd. per 24 hours, with good recovery. Office building being erected and five cottages for employes.

COLORADO

Boulder County

SMUGGLER COUNTY MINING CO. (Ballarat)—Now being operated by Missouri and Nebraska capitalists. Recently made discovery of gold-silver tellurium ore on parallel vein 6 ft. west of the old Smuggler lode. Extent of ore shot not yet known.

NIL DESPERANDUM (Boulder)—In Sunshine district; beginning an active development campaign. Recently purchased 11 claims which adjoin the Intercon mine, which was acquired in 1917. Will operate the whole group through the American shaft, now 525 ft. deep. Plan to sink deeper.

Clear Creek County

THEODORE R. HEINRICH, S. of New York, was in Georgetown recently and ordered new equipment for further development of the St. George property on Douglas Mountain.

SILVER PLUME CONSOLIDATED (Silver Plume)—Operating on Brown and Sherman mountains. Advancing its tunnel 100 ft. a month since installation of new compressor plant last June. Considerable ore being developed, and company has contracts for contracts for small cyanide plant for treatment of low-grade silver ores. Dump at the Snow Drift mine will also be filled.

La Plata County

HIGH PRICE OF SILVER is stimulating mining activity in this section. The following contracts have been let: Cave Basin Mining Co., small amount of development work and assaying of ores on Holbrook-Eclipse for shipping; Harry Lawson Co., a series of contracts on Mary Mine, requiring two years to complete work; Blue Grouse Co. to sink a 100-ft. shaft; Black Prince, a long tunnel to cut lime porphyry contact, which is apparently a much mineralized contact, judging from the surface indications.

Larimer County

SHOWING OF OIL has been encountered in the Rathvon well of the United Oil Co., five miles south of Loveland. Well now 1,300 ft. deep. Structure is similar to that in the Boulder field, but much shallower.

Ouray County

CAMP BIRD (Ouray)—Further development work will be suspended on main vein in the east tunnel until completion of 450 ft. ventilating raise connecting with the ninth level of the No. 3 shaft. Over 2,000 ft. of development work done on this vein. Puzzling geologic feature of vein is that of a cross cut driven 200 ft. south from it showed alternating streaks of quartz and altered andesite.

Park County

MOSQUITO GULCH SILVER (Alma)—Has opened good ore between Orphan Boy and Hook Hocking mines. Claims worked include Gold Coin, Little Eva, Fraction, and Little Edith.

San Miguel County

GOLD RUN (Telluride)—Incorporated by John L. McMenamin, W. L. Kennedy, and R. C. Wood, to treat tailings found in the river below Pandora, the accumulation of the mills from the Savage basin, Marshall basin and other companies above Pandora.

Summit County

FRENCH GULCH DREDGING CO. is making excellent progress this season. The dredge handled 150,000 cu. yd. during May and June and 9,908 cu. yd. per 24-hour day, including shutdown for cleanups. The dredge is rated for only 2,000 cu. yd.

Teller County

DEXTER (Cripple Creek)—Contractors on Anderson & Benkelman lease on Dexter and Trail mines sunk double-compartment shaft to depth of 65 ft. in ten days working two shifts. Sinking started from 15th level, with 100 ft. to go. Lease expires in November and effort will be made to extract ore on new level by that time.

MODOC (Cripple Creek)—Operating the Modoc and Last Dollar Mines on Bull Hill. Completed re timbering shaft and extensive developments being resumed. Constructing up shaft on ore-spring house, and expect to have it completed Sept. 1.

WAR EAGLE (Cripple Creek)—On Aug. 5 directors held special meeting to discuss active developing campaign they have engaged in with the Blue Flag Gold Mining Co. Directors who attended were: Samuel J. Burris, of Denver; Thomas Munson, of Sterling; Thomas Annear, of Denver; Judge Tully Scott, of Denver; T. R. Countryman, and Mollie O'Brien, secretary.

PORTLAND (Victor)—Cave-in on surface near collar of Portland No. 1 shaft seriously interfered with production. Steel trestle being constructed over cave, and within a week shipments are expected to be resumed.

IDAHO

Adams County

RED LIDGE (Landore)—Minnesota owners are said to be considering expenditure of \$1,000,000 in development, if further work confirms present indications. Diamond-drill explorations said to be satisfactory. Properties are on Idaho side of Snake River, seventeen miles from Homestead, Ore., nearest railroad point.

Bonner County

ARMSTEAD (Kootenai Lake)—Orebody 54 ft. wide out in third crosscut below No. 2 tunnel level. Lies between well-defined walls at depth of 1,394 ft. on dip of vein. Fourth and last crosscut proceeding toward vein. After this is reached in about month, development will proceed and ore will be blocked out.

IDAHO GOLD & IRUBY (Leonia)—John M. Schnatterly, president, issued statement to stockholders. Large ditch on which steam shovel has been working several years is completed. There remains to be completed a short flume and control head where water will be diverted into ditch. Also laying of large steel pipe line, setting up hydraulic giants, and construction of sluice boxes for washing gravel containing gold. Plans to sink a 100-ft. shaft.

FALLS CREEK (Sandpoint)—Two feet of shipping ore struck.

Boundary County

IDAHO CONTINENTAL (Forthill)—Ore shipments resumed with thirteen motor trucks, each making two trips in twenty-four hours, hauling four tons per trip over twenty-six-mile route. Cost of hauling averages nearly \$15 a ton. Recently shipped 400 tons to International Smeltery, Utah. In all, 150 men employed.

Custer County

EMPIRE COPPER (Mackay)—Lessees shipping 1,500 tons monthly.

Shoshone County

HYPOTHEK (Kinston)—J. H. Kern, of Moosejaw, Sask., president, recently inspected property, now idle. Will resume operations when mining costs and lead market more favorable.

TARBOX (Saltese, Mont.)—Putting in pipe line for water power. Preparing plans for mill. Large amount of lead-zinc ore available, and work suspended in mine pending mill construction.

SHERLOCK PLACER (Wallace)—Includes twelve claims on upper St. Joe River. S. H. Hayer, representative of California S. H. Hayer & Company, prospecting ground last month. Other possible dredging ground adjacent.

SUCCESS (Wallace)—M. E. Gardner has sold his lease of ground from No. 2 tunnel to surface. In eleven months he shipped ten carloads of crude lead-silver ore, which netted \$5,000. Thompson lease working ground between No. 2 and No. 7, ore from this lease being both lead and zinc, requiring separation in mill. Zinc concentrates stored, over 500 tons being on hand.

MICHIGAN

Copper District

WHITE PINE (Ontonagon)—Suspended operations last week. Expects to resume. Many former employes were employed in lumber work on contract for Ontonagon County interests.

MICHIGAN (Rockland)—Produced 39.07 lb. of copper per ton in July, highest return in Lake Superior district. Stamped 4,715 tons and 184,175 lb. copper recovered. Drifting at rate of 110 ft. per month on 4th and 7th levels east of main shaft. New shaft. Working on rock shafthouse. New payments to permit doubling rock hoisting capacity.

VICTORIA (Victoria)—Produced 6,000 tons rock in July, recovering 16,205 lb. of mineral, including 10,000 lbs. copper. Return averaged 16.5 lb. per ton, being 2 lb. better than June.

Geogic Range

DOCKWORKERS' STRIKE at Ashland continues, with no prospect of a settlement. Mines on range are consequently curtailed operations and some men have been laid off. Crews of some of the vessels at the docks have also been laid off.

MINNESOTA

Cuyuna Range

MEETING OF MANGANIFEROUS PRODUCERS of the range was held in the City Hall at Ironton on Aug. 3 for the purpose of effecting an organization to fight for a protective tariff on manganese and manganiferous ores. Temporary organization effected, and plans laid for a meeting in Duluth in the near future.

MANGANIFEROUS PRODUCERS who have put in claims under the Iron-Manganese Relief Act have their hearings before the commission at Denver, starting Aug. 13. The following Cuyuna companies have claims: Onaham Iron Co., Mines Efficiency Co., Arko Mining Co., Whitmarsh Mining Co., George H. Crosby, Oneida Mines Co., Gloria Mining Co., Northern Minnesota Ore Co., Joan Mining Co., Hopkins Mining Co.

STRIKE OF SHOPMEN on railroads was followed by strike of certain ore dock men, and placing of embargo on shipments of ore and forest products. All open pits and those underground mines which were shipping ore and had no have stockpiling arrangements were forced to close down the latter part of week of Aug. 4.

JOAN NO. 3 (Crosby)—Unwatering shaft, which was started last year and closed down about Dec. 1. Now at depth of 62 ft. and sink to 103 ft. and drift to orebody. High-grade manganiferous property.

MEACHAM (Crosby)—Sinking shaft deeper.

CUYUNA-DULUTH (Ironton)—Finished loading out of stockpile and started underground operations, Aug. 1.

ONAHAM IRON (Trommald)—Reported Algoma Steel Co. will take its 40,000 tons of manganiferous ore from these properties. Ferro and Algoma, which has contracted for under long-time contract; 50,000 tons in stockpile at both properties.

Mesabi Range

MILLER (Aurora)—Pitt Iron Mining Co. plans to install a milling system.

MADERIA (Hibbing)—State has let contract for filling old shafts and test pits on property abandoned as worked out.

NORTH EDDY (Hibbing)—New shaft now at 200-ft. level where first drifting will be started. Dean Iron Co., operators.

SOUTH AGNEW (Hibbing)—Shaft No. 2, which has encountered considerable quicksand, has been successfully ledged in broken taconite at depth of 165 ft. Ultimate depth to be 235 ft. Interstate Iron Co., operators.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT (Wise River)—Drifting on the 900 ft. level of settling conditions of milling grade, with width from 10 to 15 ft. Upper Idaho cross-cut expected to reach Central vein about the middle of the month. Ground softening.

Jefferson County

AMALGAMATED METALS (Clancey)—Showing retarded goad with occasional shipments being made to East Helena smelter.

LEGAL TENDER (Clancey)—Reported on self-sustaining basis. Installation of compressor and electrical hoist in progress.

LIVERPOOL (Clancey)—Watering of workings continuing, with retimbering of shaft, which is badly caved in places.

ANGELICA (Wickes)—Good orebodies on lower levels. Fairly regular shipments to reduction works being made.

Missoula County

POTOMAC COPPER (Potomac)—No. 4 tunnel cleaned and enlarged for distance of 500 ft. Will be necessary to drive 1,000 ft. more to attain depth of 600 ft. under Copper Cliff. The No. 4 tunnel continued will develop the Leonard group of claims at depth of 1,500 ft. No. 3 tunnel also being cleaned out.

Powell County

MONARCH (Elliston)—Compressor installed, together with sawmill. Driving main tunnel.

Silver Bow County

ANACONDA COPPER (Butte)—Outlook for early return to normal stated by officials to be poor. Scarcity of labor, water shortage, and labor troubles operating against capacity production, and little better than 60 per cent at any time this year is expected. Present output around 50 per cent. All of company's larger zinc producers have suspended, and miners have been transferred to copper properties.

BUTTE & SUPERIOR (Butte)—No. 2 shaft of Black Rock will be sunk from the 2,050 level to the 2,350 when the local labor situation clears. Ore deposit now has been opened for continuous distance of approximately 2,000 ft. east of the territory now in litigation with the Elm Orib. Production for July, 7,800,000 lb. zinc in concentrates and 150,000 oz. silver. June production, 9,750,000 lb. zinc in concentrates and 185,000 oz. silver.

DAVIS-DALY (Butte)—Twenty-one hundred drift of Colorado mine reported in good ore, indicating upward situation of rich zone in evidence on 2,300, 2,400, and 2,500. Development regarded as important and establishing a guide to finding ore on the 1,700, the 1,200, and the 1,000.

EAST BUTTE (Butte)—Produced 1,453,420 lb. copper in July; June, 1,513,360; July, 1918, 2,076,460.

NORTH BUTTE (Butte)—Production increased to more than 50 per cent of normal. Ore reserves today amount to the highest tonnage in years. Though operating at only 25 per cent of capacity since the signing of the armistice, development has been performed to the limit of the company's ability.

NEVADA

Nye County

LABOR STRIKE prevails in Tonopah and Divide districts, which, in conjunction with the Elm labor difficulties, resulted in the closing of the San Francisco Stock Exchange for one day, and, in the event of a deadlock between the miners and operators, trading on this exchange will be discontinued until the labor difficulties are settled. The miners in Tonopah are asking for \$1 increase in wages per day. However, the outlook for the prompt settlement of the differences is good, as the state officials of Nevada have been investigating the situation. Governor Boyle, D. C. Jack-

ling and C. D. Lakenan, general manager of the Nevada Consolidated Copper Co., are holding conferences in San Francisco.

UTAH

Juab County

TINTIC SHIPMENTS week ended Aug 9 amounted to 126 cars, as compared with 130 cars in the week preceding.

EAGLE & BLUE BELL (Eureka)—Net earnings for 1918, after deductions for Federal taxes, amounted to about \$104,630 less than in 1917, although more ore was mined. Falling off due to higher costs and lower price of metal. Sum of about \$150,000 on hand, and mine in good condition. Dividends thus far in present year, \$44,657, making total by company \$1,205,747 since Feb. 1, 1913.

EAST STANDARD (Eureka)—Grading under way for installation of recently ordered machinery to be used in shaft sinking.

TINTIC EMPIRE (Eureka)—Group of seven claims lying between Lehi Tintic and Tintic Paymaster to be developed by means of shaft work.

TINTIC DRAIN TUNNEL (Eureka)—Present length 400 to 500 ft.; ultimate length to be six miles. To unwater large mining area cutting Colorado at 1,900-ft. level and Iron Blossom at 2,300-ft. level.

COLORADO (Silver City)—Drifting being done southward on 1,900 level for continuation of Iron Blossom ore. Expense of work met by shipments.

IRON BLOSSOM (Silver City)—During July earnings somewhat in excess of dividend requirements. Considerable development being done.

Salt Lake County

SURVEY OF COTTONWOOD DISTRICT being made by A. S. Butter and F. C. Calkins for the U. S. Geological Survey.

EMMA SILVER MINES (Alta)—Inspection being made by George H. Derm, newly appointed manager.

SOUTH HECLA (Alta)—Shipping 75 to 100 tons of ore daily. July production 23,709 oz. silver and 122,367 lb. copper.

UTAH COPPER (Bingham)—Total gross production second quarter 1919 was 28,046,978 lb. copper, 37,523,000 lb. contained in concentrates and 523,273 lb. in precipitates from leaching plant. Total gross production quarter preceding, 29,261,209 lb. copper. Extraordinary second quarter \$1.8 per cent, as compared with 74.7 per cent first quarter. Average cost per pound of net copper produced, 12.59c, including plant depreciation and all fixed and general charges, but excluding Federal taxes and without credit for gold and silver or miscellaneous income, as compared with 13.72c first quarter.

UTAH METAL & TUNNEL (Bingham)—Work to be resumed at this mine.

Summit County

PARK CITY SHIPMENTS week ended August 9 amounted to 1,461 tons, as compared in 1,552 tons week preceding.

DALY (Park City)—Forty men working. Expected to increase output.

JUDGE MINING AND SMELTING (Park City)—Electrolytic zinc plant expected to be operating full force by first of September.

PARK-UTAH (Park City)—Reported work will be resumed in September, to be continued throughout winter.

Utah County

BELEROPHON (American Fork)—Shipment of ore of good grade made, carrying gold, silver, copper, and lead.

WASHINGTON

Stevens County

ELECTRIC POINT (Boundary)—Said to have closed contract for shipment of 2,000 tons to United States smelter, of Utah. New ore chimney struck, 30 ft. in diameter, 200 ft. from line of Gladstone Mountain Mining Co.

UNITED COPPER (Chewelah)—Value of July shipment almost equal to June, when 10 carloads shipped. One carload a month of high-grade shipped, averaging \$125 a ton.

LOON LAKE COPPER (Loon Lake)—Second carload of concentrates shipped, containing 20 to 24 per cent copper and 8 to 10 oz. silver to ton. Shipments expected to be six to eight carloads a month.

CANADA

British Columbia

MOLLY GIBSON (Paulson)—Tunnel in ore 10 ft., and continues to improve.

STANDARD SILVER-LEAP (Silverton)—Second shift added in mill now handling 100 to 150 tons daily. Intend to increase second shift to handle more zinc ore. Output now chiefly from No. 6 tunnel level.

EVENING STAR (Slocan)—Tunnel to be extended 225 ft. to connect with shaft down 135 ft. duct. Sutherland, owner. William Moore working this and the Silver Nugget.

GOLD BUG-RAMBLER (Slocan)—Reported strike made of 25 ft. concentrating ore, and 18-in. clean silver-lead ore on wall.

INDEX (Slocan)—E. J. Edwards, manager, expects to ship five to seven carloads before Christmas. States vein is 6 to 42 in. wide, carrying silver and lead.

RUTH (Slocan)—Development work has been resumed on No. 6 level.

SILVERSMITH (Slocan)—Third shift added in mill, now of about 100 ton capacity daily. Shipped three carloads in July and two on Aug. 1. Face of oreshoot on eighth level 14 ft. wide, with 4 ft. clean ore. Drift run 11 ft. to 70 ft. will be continued to end of orebody more than 400 ft. long on 10th level, 200 ft. below.

CONSOLIDATED MINING & SMELTING CO. (Trail)—Will give its farm near City scientific agricultural cultivation to demonstrate whether smoke from its smelter damages crops, as farmers claim, and may purchase fifteen acres of orchard to be used for same purpose.

Manitoba

GORDON CLAIM (Copper Lake)—Vein recently discovered traced for 6,000 ft.

Ontario

MILLER INDEPENDENCE (Boston Creek)—Arranging for installation of new refining plant and mill. Small steam-driven plant being taken in for use until large electric equipment is ready.

MONDAY (Boston Creek)—Cross-cutting on 140 ft. level has encountered well mineralized vein near shaft.

CASTLE (Gowganda)—Five veins opened on 300-ft. level and crosscutting to tap continuation of Miller Lake-O'Brien vein system.

MATACHEWAN (Matatchewan)—Drifting in two directions on 170-ft. level, and also crosscutting.

NELSON CLAIMS (Matatchewan)—Exploration resulted in discovery of gold ore, including visible gold.

ATLAS (West Shining Tree)—C. L. Hersman, engineer in charge, reports high-grade ore struck on Evelyn vein in pits at depth of 16 and 14 ft.

WASAPIKA (West Shining Tree)—Shaft down 100 ft. and crosscut in ore for 15 ft. visible gold showing over whole width.

Quebec

HUNTINGTON COPPER (Eastman)—Purchased last year by Eastern Mining & Milling Co., which has since installed a 100-ton concentrator, using the flotation process. Property has been partially dewatered to permit careful sampling. Official figures show ore reserve of about 6,000,000 lb. of copper in ore down to 100-ft. level. Ore averages about 42 per cent copper, and estimated cost of treatment is \$5 to the ton.

MEXICO

Guanajuato

CROSEY & AULD successfully operating small plant between Marfil and Guanajuato and treating tailings from patios of haciendas once owned and operated by old Spaniards.

CARMEN-GUANAJUATO (Carmen)—Operating 10-stamp mill and Carmen mine belonged to company. Also have lease Pinguico mine, owned by Pinguico Mines Co., of Guanajuato.

SAN NICOLAS DEL MONTE (El Monte)—Being worked on small scale, ore being sold locally. Owned by Rocha estate. Abel Solerzano, manager.

KOREA

ORIENTAL CONSOLIDATED (Ulsan)—Cable advices show July cleanup amounted to \$75,820.

TRANSVAAL

RAND GOLD OUTPUT in July 725,000 oz.; June, 702,000; July, 1918, 735,000.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal¹/₂ Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver		Aug.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
14	430½	112½	58½	18	425	112½	59½
15	429	112½	59	19	420	111½	59½
16	427	112½	59½	20	413	110	59½

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

Daily Prices of Metals in New York

Aug.	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	N. Y.	St. L.	St. L.	St. L.	
14	22	55	5.60@5.70	5.40	7.50	@7.55	
15	22	54¼@54	5.60@5.70	5.50	7.55	@7.65	
16	22½	54	5.65@5.75	5.50@5.60	7.55	@7.65	
18	22½@23	54@53	5.75@5.85	5.60@5.70	7.60	@7.70	
19	23	54	5.80@5.90	5.60@5.70	7.65	@7.70	
20	23@23.10	54@54½	5.90@6.00	5.60@5.70	7.65	@7.70	

The above quotations are our appraisal of the average of the major markets based generally on sales values of the metals for the deliverer and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliverer constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Aug.	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
14	92½	93½	103	280	264	25½	25½	39	40½
15	98½	99½	105	271½	266½	25	25½	39	40½
16									
18	101½	102½	107	271	265½	25	25½	40½	41½
19	100	101	107	272	267	25	25½	41	42
20	101½	100	109	274½	269½	24½	25½	40½	41½

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

Metal Markets

New York, Aug. 20, 1919

While there was no special increase in activity this week, copper, lead, and zinc each rallied very well and closed at higher prices than at the openings of the week. This movement probably reflected the completion of the liquidation of speculative accounts.

Transatlantic freight rates remain unchanged at \$18.

The rates from San Francisco to Hongkong and Kobe were advanced to \$14.

The great decline in francs and marks and sterling exchange has made export business more difficult than ever.

The stocks of metals in the hands of the British Munitions Ministry on Aug. 1, 1919, with the corresponding figures for July 1 given in parentheses, were as follows: Copper, 83,395,200 lb. (93,-

227,520); lead, 120,971 short tons (135,671); zinc, 39,540 short tons (44,140); aluminum, 23,520,000 lb. (23,874,080); nickel, 5,491,480 lb. (5,492,480); antimony, 4,940 short tons (4,892).

Copper

The firmer tendency that was already in evidence at the time of our last report continued, and the market became distinctly stronger from day to day. Without any doubt this reflected the completion of the liquidation of speculative accounts, on which realization was desired. Some consumers, including some big ones, came into the market and cleaned it up, not only for the sake of obtaining relatively cheap copper, but also to check any further decline, which might have been prejudicial to their own interests. With this powerful support, the market rallied promptly, and speculators who had gone

short on the decline had to pay higher prices to cover. A considerable part of the business this week was apparently speculative short covering.

The big producers maintained their previous prices of 23½c. asked for August-September, and 24c. for the last quarter of the year, both prices being for copper delivered. No sales were made by them this week, except a few transactions involving special conditions, but today more inquiry developed, and it seemed not unlikely that the principal producers might realize their prices presently.

Germany inquired for small quantities of copper this week, but wanted to buy in marks and at prices far below our market. It is said on good authority that Germany has more copper on hand than is immediately needed, speaking generally, but is short of some special shapes, particularly wirebars.

Copper Sheets.—The base price of copper sheets is 33½c. per lb. Demand strong. Copper wire is quoted at 26½c. in carload lots, f.o.b. mill. Market is strengthened, due to reports that second-hand supplies are pretty well sold out.

Tin

The liquidation of new arrivals produced a further decline in this metal, but at the close of the week the market was firmer. A rather active business was done right through the week.

Singapore quoted £263, c.i.f., London, on Aug. 15; £271 on Aug. 18; £273 on Aug. 19; £272 on Aug. 20.

Straits tin for shipment ranged during the week from 53c. to 52c. At the close, August-September shipment was quoted at 52½c., and September, at 52c. American electrolytic was quoted at 55½c.

Lead

As in the case of copper, consumers came into the market and cleaned up all of the speculative offerings. Being still unsatisfied, they bought also from such producers as had any to sell. Some of the larger producers were so booked up with orders, and were so embarrassed by diminished production, that they could not accept any new business. Some of the consumers who desired to buy large quantities were concerned that had taken a good deal of the Government's lead and now apparently have used it up.

Germany seems to be in great need of lead, her own production having fallen to about 3,000 tons per month. She ought to be able to buy lead from other European countries that are overstocked, but for some reason she seems

to be unable to get it. There have been German inquiries for bonded lead in this market, but the figures that have been mentioned have been too low.

Zinc

On some good buying by galvanizers, the market advanced further. There was also a better demand for high-grade zinc, which was sold at 83½¢, delivered in the East.

Germany has continued to offer zinc in the British market. The break in the latter occurred about July 21, when the Germans offered about 2,000 tons. Since then the German sales are said to have amounted to about 10,000 tons. This selling was doubtless for liquidation of the surplus existing in Germany, which at the mid-year was said to be about 50,000 tons. German production of zinc, which was maintained at a high figure during the war, has now fallen off greatly, and at present is said to be no more than 5,000 tons per month. The falling off is ascribable to the high cost of coal, to the bad labor conditions, and to the turmoil in Upper Silesia, which is the greatest zinc-producing district.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market was very quiet and was easier. Business was done at 99½¢ in the early part of the week, but at the close spot was easily obtainable at 83½¢. Futures were quoted at 9c. duty paid.

Bismuth—Quoted at \$2.95 per lb.

Cadmium—Quoted at \$1.50 per lb.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Unchanged at \$109, market quiet. San Francisco telegraphs \$105, firm.

Silver and Platinum

Silver market in London has been steady, with advancing prices on buying said to be for the Continent. New York price has been seriously affected by the severe drop in sterling exchange, with lessened demand by China buyers, and closes at 110c., with uncertain tendency.

The general stock of money in the United States on Aug. 1, 1919, totaled \$7,525,115,361; of this \$2,989,548,109 was in gold coin and bullion, \$308,978,930 in standard silver dollars, and \$242,876,099 in subsidiary silver. The money in circulation on Aug. 1 was \$5,778,565,018, or \$54.40 per capita. On Aug. 1, 1918, the per-capita circulation was \$52.44.

Mexican dollars at New York: Aug. 14, 86½; Aug. 15, 86½; Aug. 16, 86½; Aug. 18, 86½; Aug. 19, 85½; Aug. 20, 84½.

Platinum—It is conjectured that the Government has stopped selling its platinum, which heretofore it has been offering at \$105. During this week there was a strong market, and pro-

ducers realized up to \$110. We quote \$105@ \$110 for the week.

Palladium—Unchanged at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 16—Zinc blende, per ton, high, \$51.90; basis 60 per cent zinc, premium, \$48.50; Prime Western, \$47.50; fines and slimes, \$45@ \$42.50; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$48.09; calamine, \$30; all zinc ores, \$47.69.

Lead, high, \$70.25; basis 80 per cent lead, \$67.50@ \$62.50; average settling price, all grades of lead, \$66.99 per ton.

Shipments the week: Blende 6,274, calamine 84, lead 1,746 tons. Value, all ores the week, \$390,550.

Though producers gained \$5 per ton on zinc blende prices, \$5 per ton was clipped from the price of lead, closing the week \$62.50 basis.

Demand for blende was firm throughout the week, but shipments are seriously retarded because of lack of cars. Sellers, able to hold their ore, turned loose only a small tonnage on this week's price offerings, feeling that within a week or two weeks at the most, a \$50 basis will prevail.

Platteville, Wis., Aug. 16—Blende, basis 60 per cent zinc, premium blende base \$48. High lead or Prime Western grade advanced from \$45 to \$47 at the week end. Lead ore, basis 80 per cent lead, \$62 per ton. Shipments reported for the week are 1,333 tons blende, no lead, and 124 tons sulphur ore. For the year to date the totals are 62,549 tons blende, 3,675 tons galena, and 9,671 tons sulphur ore. During the week 2,727 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—The market seems to be easier, and the quoted price of \$25 per ton, f.o.b., California points, could probably be shaded.

Manganese Ore—Market is very dull. It is quoted nominally at 50c. per unit, c.i.f., Baltimore or Philadelphia.

Molybdenum Ore—Quoted nominally at 75c.

Tungsten Ore—Dull and unchanged as to price.

Other Minerals

Nitrate—Business is being done mostly for immediate delivery, average price being quoted at about \$2.95 per cwt., carload lots. Some firms are refusing to quote on futures. It is reported that Government stocks have been nearly liquidated.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace size ore, free from fines, c.i.f., New York or other Atlantic port. Market slow and unsettled; hand-to-mouth buying. Very little ore coming in. Price will decrease with ocean freights.

Sulphur—Export demand from Europe has been very good, and sales are in the main limited by high shipping rates, which vary from \$25 to \$35 from Gulf ports, according to the port of delivery. The labor situation

in the Sicily mines is still unsettled and is likely to remain so for a long time, as the miners prefer other employment and can easily obtain it. American sulphur is being sold f.o.b. Europe under prices asked for the Sicilian product. Prices quoted for export range from \$20 to \$23 per ton in cargo lots at mine in Freeport, Tex., and Sulphur Mine, La. Domestic supplies are quoted at \$18 per ton in carload lots. The latter market is dull.

Iron Trade Review

Pittsburgh—Aug. 19

Labor unrest is the outstanding feature of the iron and steel trade and also the most important market influence. Iron and steel producers are concerned not only as to their own labor but also as to the labor of their customers. On the whole, more labor is involved in the consumption of steel than in its production, and unless labor conditions are at least moderately favorable the consumption of steel cannot be at its maximum possible rate, no matter how favorable all other factors in the situation are.

Superficially, the labor situation this week is better, as the striking railroad shopmen have gone back to work, and the plants at Cleveland, Gary, and South Chicago that were closed or partly closed on account of the failure of transportation service are resuming, but as these strikes had been contrary to orders of the national officials of the union in the first place, the return of the men does not mean that labor conditions are better. In Pittsburgh the motormen and conductors of the trolley system went out on strike at midnight last Thursday, against an award of the War Labor Board which they had agreed in advance to accept, this strike also being against the orders of national officials. The best information is that the steel-mill employes in the Pittsburgh district are not organized to any extent, but it does not follow that they will not strike. A seamless-tube plant near Monessen closed last week, paying off the men and announcing that there is no work for them, as the company has no orders, but the common assumption is that labor troubles were feared. A large sheet plant at Canton, Ohio, closed last Wednesday night because the men demanded recognition of the union. Such cases are sporadic, but they may become common. The steel manufacturers are little concerned with the matter of wage rates, and not greatly concerned as to hours of labor, but as to union recognition they are very strong, believing that the efficiency of their plants would eventually be lost if any union came to dominate.

Though the report of the Bridge Builders' and Structural Society shows that bookings of fabricated steel jobs in July represented 74 per cent of a month's fabricating capacity, against 65 per cent for June and 49 per cent for May, the fabricated-steel bookings are now running relatively light, investors in construction undertakings being evidently disturbed by the unrest

of labor and the fear that construction jobs undertaken could not be carried through according to program.

Steel prices are firmly maintained all along the line, with the exception that there are some concessions on plates, but these are much less marked than a few weeks ago.

Makers of cold-finished steel bars, formerly commonly known as "shafting," have adopted a new list, whereby prices are made by naming a base price subject to extras, thus supplanting the former system whereby there was a list subject to a discount. The discount was 17 per cent, whereas the base price now in effect is 3.60c., which means the same actual price. The extras are so arranged that some descriptions of material are advanced slightly, but others are reduced, so that on the average there is a slight reduction.

Pig Iron—The market is firm, but not particularly active. Furnaces in blast being well sold up, though there is not a broad enough demand to enable many idle furnaces to get into operation. We quote: Bessemer, \$27.95; basic, \$25.75; foundry, \$26.75; forge, \$25.75, f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40.

Steel

Steel—The scarcity of sheet bars is even more pronounced, and there is considerable inquiry in the open market. Rolling billets are in poor demand, but there is a moderate amount in inquiry for forging billets. We quote: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; forging billets, \$51; rods, \$52.

Ferroalloys

Ferromanganese—English producers a few days ago made a drive for business and sold several thousand tons of 80 per cent ferromanganese at about \$105, delivered, equal to an average of about \$102, c.i.f., when their regular quotation was, and still is, \$105, c.i.f. It is not known whether domestic makers had a chance to figure on the business, their regular quotation being \$115, delivered. Inquiry is light.

Coke

Coke—The Connellsville coke market has undergone one of its sudden changes. Though two or three weeks ago there was much furnace coke on track, held at \$4, but moving at concessions when it moved at all, the whole market has tightened. Sales have been made at \$4.50 and \$4.75, and \$5 is now the asking prices for spot or prompt furnace coke. Foundry coke has continued to stiffen, the market now being \$5.50 to \$6, according to brand. For several weeks there appeared to be a trifle too much production, but in the last few days there seems to have been difficulty in maintaining previous rates of production. The stronger coal market has also an influence.

MONTHLY AVERAGE PRICES OF METALS

Table with columns for Silver, New York, and London, showing monthly average prices from 1917 to 1919.

New York quotations cents per ounce Troy, 1869 Bu London, pence per ounce, sterling silver, 92.5 fine.

Table with columns for Copper, New York, and London, showing monthly average prices from 1918 to 1919.

New York quotations cents per pound, 1869 Bu London, pence per ounce, sterling silver, 92.5 fine.

Table with columns for Tin, New York, and London, showing monthly average prices from 1918 to 1919.

New York quotations cents per pound, 1869 Bu London, pence per ounce, sterling silver, 92.5 fine.

Table with columns for Lead, New York, St. Louis, and London, showing monthly average prices from 1918 to 1919.

Table with columns for Zinc, New York, St. Louis, and London, showing monthly average prices from 1918 to 1919.

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

Table with columns for Pig Iron, Bessemer, Basic, and Foundry, showing monthly average prices from 1918 to 1919.

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

STOCK QUOTATIONS

Large table of stock quotations with columns for N. Y. Exch., Aug. 19, Boston Exch., and Aug. 19, listing various stocks and their prices.

As Reported by W. P. Snyder & Co. Bid prices. Closing prices. Last quotations.

Engineering and Mining Journal

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Number 9

A Case for Calm Judgment

ANATIONWIDE railroad strike would bring disaster to the country. The railroad shopmen have voted to strike unless their demands for increased wages are met. Here is a critical situation, requiring thoughtful consideration. The shopmen demand increases in wages which are likely to be permanent, in order to meet a temporary situation which in all probability will last only for a limited time. Increases in wages will certainly result in increasing the cost of production, and therefore the cost of living. Hasty action usually means blundering. The shopmen can well afford to heed President Wilson's request to reconsider their action, before they assume the responsibility of plunging many times their own number into suffering.

The President points out that "demands unwisely made and passionately insisted upon at this time menace the peace and prosperity of the country as nothing else could, and thus contribute to bring about the very results which such demands are intended to remedy." He urges that we should "not be guilty of the inexcusable inconsistency of making general increases in wages on the assumption that the present cost of living will be permanent at the very time when we are trying with great confidence to reduce the cost of living and are able to say that it is actually beginning to fall."

May the hot-headed and unreasonable demands born of selfishness be reconsidered and set aside, and the truly American spirit of co-operation prevail in the present crisis.

Mining Ventures In Foreign Lands

CHAMBERS OF COMMERCE, bankers, manufacturers and producers of raw material daily point to the necessity of the United States furnishing credit to European consumers. They repeatedly call attention to the advantages of stimulating commerce between ourselves and all foreign lands. Already private capital is, in a small way, attempting to make it possible for Europe to buy food and clothing in the United States. Already our banks are establishing branches in foreign countries, and our merchants are endeavoring to create transportation facilities in the aid of commerce.

Banking accommodations and steamship lines, though furnishing the means, are not the sole requisites for the establishment of foreign trade. The things that are of prime importance are the development of the resources of the country, the preparation of its natural products for sale and shipment, and the creation of wants that can be satisfied by our manufacturers. With the development of the mineral and agricultural resources of a land, trade grows and yields profit to the mother country that has sent her pioneers to the wilderness, encouraging and protecting them while getting a foothold in the new region.

As has frequently been pointed out in the columns

of the *Journal*, it is nearly always the miner who leads the way. He invests his money, his labor and his life, primarily for his own benefit, but more than incidentally for the benefit of his mother country, to which he ships his ores and from which he draws his supplies. The rancher follows the miner, cultivating, irrigating, or developing stock ranges, and adding to the supply of products to be exported, and to the demand for manufactured articles. Then follow the builders of railways and the organizers of other public-service corporations, all investing funds that are brought from abroad, all contributing to the growth of colonies and adding to the number of private investors. These are the developments that should be fostered; these are the essentials of the foreign commerce that should be encouraged; and in proportion as they are protected and cultivated, or allowed to shift for themselves, so will foreign commerce either live and expand or decrease and disappear.

In the development of trade with South America miners have already done a vast amount of work. Indeed, we commonly think of Chile, Peru, Bolivia, and Brazil as mineral-producing countries, with scarcely a thought for their other and vaster resources, which the agriculturist and the civil engineer will later develop. If we are correct in our assumption that these things must be cultivated and protected if America is to derive any national benefit, and is to have her commerce grow materially and rapidly, it is well to look around and see what the Government has done, and what it expects to do, in the way of encouraging foreign industry, before making heavy investments. Has the United States promised Americans who invest abroad that their persons and property will be protected while they obey the laws of the land? Has she promised that they will be guaranteed the same rights and privileges foreigners enjoy in America? Has she promised that no unjust laws shall be passed or decreed to deprive them of their just right?

Perhaps, as the United States has passed no laws to the contrary, it may be inferred that she considers this her duty, and needs to make no promises. That has been the assumption of many Americans when they have gone abroad to earn their living through labor or investment. We know that England, France, Germany, Japan, Italy, and some of the lesser nations, make a practice of seeing that their nationals receive fair treatment in the land of their labors, and we feel that the great United States will do no less.

As Lord Palmerston said in establishing, or at least in reaffirming, the doctrine which has made Great Britain great, it did not matter to Great Britain if it was the custom of the country to *bastinado* some man charged with a mere infraction of municipal regulations. No such municipal regulations applied to a British subject, even where the use of the *bastinado* was customary. Unfortunately, Americans have no warrant for indulging this feeling of safety, and when

the test has come we have seen the Stars and Stripes furled, and our nationals abandoned to their fate. We are asked to encourage commerce; we are asked to invest abroad. We did it in Mexico; and to what extent have our commerce and our investments, or in fact our lives, been protected there?

The soul of Mexico was in her mines, owned and operated largely by Americans. Mexico could not, and our Government would not, care for them. Hundreds of American miners are dead, thousands have gone, and mines all over the country have been abandoned. American colonists who had developed large areas of fertile land have been driven from the country. Today, Mexican lands are being withdrawn by the government and paid for with valueless state bonds. By retroactive legislation the national government of Mexico is attempting to take over the oil wells. That government has appropriated nearly all of the public utilities, which are operated according to the caprice of the federal or state functionaries.

What has the United States done for American nationals in all these years of suffering? Washington has made useless "representations" and "protestations," and the game goes merrily on. This is the protection that foreign investors are offered; this is the inducement to develop foreign commerce.

Senator Fall on March 9th, 1914, told before the Senate an experience he had had in the State Department at Washington. After talking the Mexican situation over with a certain official, it was pointed out to the Senator that "the Americans who were in Mexico were not Americans who were seeking to make homes there and help the country, but they were solely representatives of corporations, there for the purpose of exploiting the people, obtaining possessions, getting hold of dollars, and coming back to this country," and that "they had no right to demand protection for their property." The person to whom the Senator attributes this declaration is no longer in the State Department, but that such a spirit ever prevailed there, indicates significantly the risk that Americans have been compelled to take in the attempt to develop foreign commerce.

Some of the missionary work that is being done, some of the energy that is being put into foreign-commerce propaganda, might well be spent in Washington, in an effort to arouse our servants there to the realization that foreign investments made for the purpose of producing foreign commerce would be more popular if Washington would give some material evidence of its desire and ability to protect those investments.

Gold Statistics, Wars, and Prices

HERE appears in this issue of the *Journal* a carefully prepared discussion of a timely and important subject, one in which mine operators are especially interested. It might have been entitled "The Case of Gold," for it is in their relation to the production of gold that the author, J. R. Finlay, discusses wars and prices.

The value of gold as money, its power to purchase, is carefully followed for the last hundred years, and although reasoning is somewhat confused through large production following new discoveries at certain periods, the fact remains that the purchasing power of gold has diminished with the outbreak of every war of importance. Its reduced value as money has not been confined

to the period of hostilities, but has extended for years after peace has been declared, and the period of this depression has been more or less proportional to the magnitude and seriousness of the conflict. Following this line of reasoning, and showing why the depression should exist, Mr. Finlay draws the conclusion that the effect of the world war on the purchasing power of gold will be felt for at least twenty years.

Whether the period of depression is to last for twenty years, more or less, we will never know until the time has passed. The depression is with us now, and, for the reasons given by Mr. Finlay, will be with us for some years. An ounce of gold will not purchase the quantity of supplies now that it formerly purchased. Hence, gold production costs more than it did a few years ago, and it is going to continue to cost more.

To the producer of gold this is a matter of most serious moment. The man or company now owning or operating a gold mine faces a most unpleasant situation. The value of ore reserves has suddenly dropped 25 per cent to 50 per cent, and there are no known economies that may be introduced to offset this decrease in value. Where the margin was already narrow, it has entirely disappeared. Continued operation with the hope that supplies and labor may soon fall, and that losses may be avoided, means a continued drain on the resources of the mine owner, with the chances that the mine will be worked out before better times arrive.

Closing down and abandonment of properties that do not quite pay under present conditions is an equally hazardous thing to do. This means absolute loss of plant and community, where the mine is the life of a community. The conservation of the gold in a low-grade mine may be a proper course for the benefit of the generations yet unborn, but it means serious loss and inconvenience to the present generation.

In view of the decreased purchasing power of gold, and the continuance of this condition over an indefinite period, the reporting engineer has to reckon with a series of factors that have recently changed materially in value. In his eyes a 6-ft. vein of \$5 ore is not the same deposit that it was five years ago; the little 3-ft. vein of \$10 ore no longer holds the attractive features of the one-man proposition that it formerly held.

Mr. Finlay suggests that one reason for the decreased purchasing power of gold is the relatively large production of the metal during the last thirty years. The greater part of this metal went into coinage, but the use for the coin did not keep pace with the supply. The peak of this production, however, is passed, so far as we can now see, so that the man with a gold prospect or undeveloped mine has at least one optimistic aspect of his proposition,—the known supply of gold ores is gradually diminishing. This, however, is but a faint ray of hope, and it appears that gold mining must share in the readjustment of industries that is now taking place, and will continue to take place during the next decade.

When Is It Time To Intervene?

WILL a loss of \$15,000 by the Government change its policy toward Mexico? It seems an inconsequential circumstance to cause such a rumpus, and yet in this loss, and in the steps which have followed it, we can see the germ of improved conditions across the border. Sixty thousand troops on our frontier, so long

as they remain on the northern side of the border, do not in the least accentuate the protests and representations sent from our State Department. But let one troop of cavalry cross the line to inflict punishment where it is needed, and the whole of Mexico takes notice. President Carranza demands through his ambassador that our troops be recalled. Every periodical of Mexico discusses the seriousness of the situation; some publications condemn the dishonoring of their soil by the foot of the northern invader, whereas others demand a change in the policy of their government toward foreigners.

It matters little what they say. The point we would make is that a demand accompanied by the slightest show of force is understood by one and all. To a few it suggests war; to many it suggests the idea of intervention. According to a well-informed publication of Mexico City, "Intervention is to be feared by a few, by those who now rule Mexico. Eighty per cent of her population are entirely indifferent, while 90 per cent of the educated class would welcome it."

We would not care to guarantee these figures, but we are very certain that the Mexicans most antagonistic to foreigners are its present officials—those whom our Government has recognized and tried in every way to support. We are equally certain that a very large percentage of the population of Mexico has no faith in the ability of these officials to bring order out of chaos.

We are inclined to believe that Representative Kahn is right in advising armed intervention. A little of it has proved efficacious; more of it may produce correspondingly beneficial results. The *New York Times* criticises Mr. Kahn's suggestions as ill advised at this time, because the 15,000,000 people of Mexico may choose to continue guerrilla warfare; because it would take many more than 100,000 men to pacify the country, and cost a lot of money, and, again, because some of our South American neighbors might not approve of the action. We confess that we do not know how many men would be required to do the work, nor how much money it would take, but we do know that the resources of Mexico, under peaceful conditions are ample to pay for the maintenance of order and the administration of justice, and to pay all of her long-overdue obligations and damages resulting from civil strife.

The 15,000,000 natives are much more anxious to be free from heavy imposts, and to have plenty of beans and corn, than they are to engage in profitless guerrilla warfare, and although some of our Southern friends might not approve of the move, that would not alter the justice of the act.

"Armed intervention can wait awhile" says the *Times*. "There is a general agreement that something should be done, and done quickly. . . . but to make war on Mexico when a more sensible and humane method could be found to teach her the lesson needed would not be the part of wisdom." In the name of all that is good and true, what is that sensible and humane method? Foreigners and natives alike have suffered untold agonies and destruction for eight years while we have sought in vain for the humane method, and it has not been found.

The *Times* answers this question in the same editorial: "If President Carranza cannot suppress brigandage on the border, if he cannot protect our people in the Tampico region, it can be done in a thorough fashion by American soldiers and marines. A few such

lessons, and there would be order on the Mexican side of the border and peace along the coast, and at no great cost, too." The *Times* is absolutely correct, but we fail to see the difference between Mr. Kahn's suggestion and the sensible, humane method of the *Times*.

Protection to Investors In Oil and Mining Stocks

UNDER date of Aug. 4, the State Corporation Department of California issued a list of certain oil and petroleum companies that have, as the circular states, not complied with requirements of the California Securities Act ("Blue-Sky Law"), and that have offered their securities for sale in California contrary to the provisions of the act. Copies of the circular may be obtained from the California State Corporation Department at Sacramento, Cal. E. C. Bellows, California Commissioner of Corporations, in a letter which accompanies the list, says:

"It is obvious that corporations which find it necessary to evade the provisions of the Corporate Securities Act are not organized for the benefit of the investing public. An initial examination and subsequent supervision by the State Corporation Department may be obtained by a company at a nominal cost, and the aim of the department is to have corporations generally conform to the standard of integrity that has been manifest among the decent corporations of California, both before and after the law went into effect."

Mr. Bellows does not maintain that the securities of the companies listed are all of dubious value, but goes on further to say:

"The securities offered for sale by some of these companies may form an attractive investment. Others may be of doubtful value, and some of them may be entirely worthless. There is no intent on the part of the commissioner to limit the right of people to engage in speculative enterprises as long as they are fairly conceived and honestly conducted. However, the investing public has the right to be fairly informed of the hazards which may be encountered and to have such regulations enforced as will protect it from fraudulent schemes and unprincipled schemers."

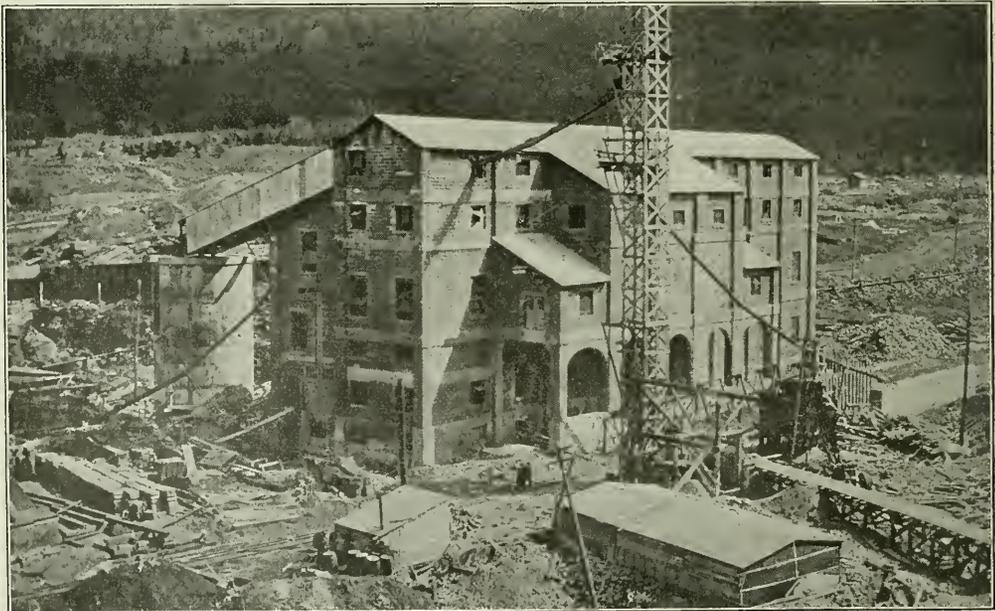
The protection of the investors from fraud, and provision for the proper spending of money in the development of an enterprise, whether highly speculative or conservative, are of great importance to the mining industry. There would be only a small industry if a widespread desire to take a chance when the opportunity is offered did not exist. It is this speculative tendency that is responsible for the opening out of new mining districts and the continued growth of old ones. Many are glad to go into an enterprise if only they can be assured that they will have an "even break" for their money.

The effective working out of the "Blue-Sky laws" has taken time, and for a considerable period there was a feeling among some that the operation of such laws would stifle enterprises of a speculative nature. Such has not proved to be the case. On the whole, they are becoming effective, and in proportion as greater experience is obtained by their administrators they will become more effective. In the specific instance that has come to our attention the possession of a list of companies which have failed to comply with the "Blue-Sky Law" in California is of great practical value to the intending investor in oil stocks.



TRANSPORTING MACHINERY ACROSS GILA RIVER FOR KELVIN SULTANA MILL, KELVIN, ARIZONA

Photographs From the Field



MAGNETIC CONCENTRATING MILL OF CHATEAUGAY ORE AND IRON CO., LYON MOUNTAIN, NEW YORK

Gold Statistics, Wars, and Prices

Industrial and Financial Disturbances Have Followed All Armed Conflicts in the Last Century—
The Relation of Gold Production to the Law of Supply and Demand—Marked
Decline in Production for the Last Decade

By JAMES R. FINLAY

THE statistics of gold production are easily obtained and on their face show remarkably little change during the last ten years. It is a commonplace that the war period, 1914 to 1919, more especially the later part of it, was unfavorable to the business of gold mining. Other commodities and labor were in acute demand at prices far above those of former years, but gold remained nominally at the same price. Actually, of course, its price went down in proportion to the decline of its purchasing power. This finally resulted in a rather abrupt decline in production.

But the decline caused by war conditions does not fully explain the position of gold. It is reasonable to suppose that the output would have declined anyway in recent years, or at least would not have increased. South Africa accounts for half the world's yearly supply. The increase of production from 1900 onward has been largely the growth of the South African industry. In fact for the last fifteen years the African production has been the one source of supply that has raised the world output; without it there would have been a considerable falling off. Thus, in 1904 the world production was \$347,377,000, of which Africa yielded \$85,913,000, leaving for the rest of the world \$261,464,000. In 1915, the year of greatest output on record, \$468,725,000, Africa yielded \$217,852,000, leaving only \$250,612,000 for the rest of the world. In 1917, Africa produced \$214,614,000; the rest of the world only \$208,976,000. It is true that disturbances in some countries, notably Mexico and Russia, had something to do with this falling off, but this was not a controlling factor. The main thing is that no new supply of gold ore has been discovered; no new process for obtaining more gold from known sources.

MAXIMUM TRANSVAAL GOLD PRODUCTION IN 1912

The output has varied with the exploitation of districts already under operation. The Boer War, 1899-1902, retarded the growth of mining in the Transvaal, but as soon as recovery had been made from that, and the district had reached full and unhampered activity, the output of that country rapidly approached its maximum, and practically reached it in 1912. Since that year, with the exception of a spurt in 1915, there has been no indication of an increase of gold production. There does not seem to be any reason to anticipate a rapid decline in the near future; but to expect the gold industry to hold its own for the next ten years is about as optimistic as one can reasonably be if reliance be placed on all factors turning out favorably.

Despite these facts, the price of gold has declined. Complaint of the high cost of living was general, even before the war. The amount of other commodities which a given amount of gold would buy has diminished steadily ever since 1894. The strange thing is that this diminution of purchasing value was accelerated during the war in the face of an apparently increased demand. These facts suggest various explanations:

1. It is not improbable that the money value of gold is governed, not by the current output, but by the total amount available in the world. Other metals, once put in use, are not available to any large extent for other purposes. Thus, iron put into railroads, buildings, machinery, tools, and like utilitarian purposes, generally stays in those allocations until it is destroyed by rust or wear. Its manufacture is specialized for certain purposes. In general, it is cheaper to make new iron for a particular use from the ore than to remelt old iron, because such iron is not generally fit for the new purpose. Lead and zinc are used largely for paints, from which recovery of metal is impracticable. Copper is not so completely fixed, perhaps, nor quite so destructible, but by far the greater part of it is put at once into permanent structures from which it is seldom removed. Silver, even, is exposed to considerable destruction by use in household ware, ornaments, corrosion and the wear of common small coins. But gold is not put to any large extent to any fixed allocation. It is merely locked up in treasure vaults to be used as standard for exchanging commodities. Some of it, of course, is used for ornaments and for coins, but even these are jealously guarded.

THE AVAILABLE SUPPLY OF GOLD

Almost all gold is capable of being remelted and put to another use. About the only means by which it is destroyed are the absorption of small amounts in chemicals, the wear of jewels and coins, and absolute loss. Thus the large output of the last twenty years has swelled the stock of available gold immensely more than similarly increased outputs of other commodities have increased the available stocks of those commodities. For instance, the available stock of manufactured or usable iron or copper or wheat ready for consumption is seldom more than a year's supply. If new supplies should be cut off, some part of these metals could be taken from the less imperative uses and put to more necessary ones; but there would be an immediate curtailment of industry, production, and comfort. The people would be headed straight for want and disaster. Of the iron and copper produced a hundred years ago, only an infinitesimal fraction is available for commercial purposes today; but, in the case of gold, a large percentage of that produced a hundred years ago is undoubtedly still subject to exchange. In view of these considerations it becomes interesting to reflect upon the following statistics:

THE RECORD OF GOLD PRODUCTION

The production of gold was stagnant and comparatively small until about 1850, when the great historic discoveries in Australia and California suddenly tapped the gold resources of two virgin continents. These supplies seemed abundant for all necessary purposes. In 1853, the output reached \$155,500,000. This remained the record output for forty years, until 1893.

Production stagnated or declined, going as low as \$90,800,000 in 1874, and to \$95,400,000 in 1883. In forty years, 1851 to 1890 inclusive, the total production was about \$4,500,000,000. About 1890 a revival of gold mining took place, the production climbed to a new maximum of over \$460,000,000 in 1912, and the total production of thirty-eight years, 1891 to 1918 inclusive, was \$9,500,000,000.

There seems to be reason to believe that the world's stock of gold is at least three times as great in 1919 as it was in 1890. Various influences are in favor of the conservation of the metal. It is reasonable to believe that between 1850 and 1890 the proportion of the annual production lost through wear and wastage was much greater than it has been since then. Gold coins were in much more common use. The population among which the metal was exposed to absorption was proportionately greater. In 1890 the new gold per capita was only about 10 cents per year; in 1915 about 30 cents. Now, suppose that at all times each person wears out 5 cents' worth of gold a year. In 1890 such wastage would have been 50 per cent of the total supply; in 1915 it would have been only 16½ per cent.

GOLD PRODUCTION DECREASING

From these observations it may be perceived that though the annual production of gold is not increasing, but actually diminishing, the amount may still be sufficient to swell the available stock of gold even beyond the proportionate demand for it. It is not unlikely that between 1860 and 1890 the stock of gold did not increase in proportion as fast as the general business of the world, and its purchasing power steadily increased, but that since 1890 the stock has increased faster than the world's business, and its purchasing power has proportionately diminished. It is probable that about 1890 the supply of gold ran so low that the demand for it would account for the low prices for commodities of the early '90's. To illustrate this, consider some hypothetical figures.

Suppose that the available stock of gold in 1850, the accumulation of all former times, was \$1,000,000,000, and that between 1850 and 1890, half of the gold produced was added to the stocks. The accumulation would be about \$2,250,000,000 in the period, and the total supply in 1890 would be \$3,250,000,000. Assume, further, that of the total gold produced since 1890, an amount equal to 80 per cent has been added to the stock. The accumulation would be \$7,600,000,000 for the period and the present total amount would be \$10,850,000,000.

RELATION OF GOLD SUPPLY TO INDUSTRIAL DEVELOPMENT

If these figures are even approximately correct it becomes probable that the stock of gold in proportion to the production of the chief staples of commerce is much greater today than it was in 1890; that is, there is more gold in existence today to be exchanged for available iron, coal, copper, wheat or cotton than there was in 1890. In this connection it may be remembered that in the latter part of the nineteenth century the expansion of the world's commerce was proceeding at a rate that perhaps has not been equaled since then. It included the opening up of the interior of America, Australia, and Africa, the construction of nearly all existing railroads, the development of mechanical manufacturing, the factory system of employment, and the

creation of most of the great industrial corporations. Since that time business and wealth have continued to expand, but more through the development of specialties and refinements, less, perhaps, through the discovery of new resources and process, and very likely not at the same rate as in the earlier period.

2. Emphasis should probably be laid upon the tendency to conserve gold more and more for the purposes of exchange. Gold for many years has been handled almost exclusively by banks and the treasuries of the leading nations. Its use as common coin has proportionately diminished. Of late years, as a war measure, all the leading belligerents have suspended specie payments, so that the ordinary citizen has scarcely been able to obtain gold for any purpose. It seems possible that this should be regarded as an additional and special factor superimposed upon the tendencies outlined. It makes gold as a medium of exchange seem distant, even imaginary; it enables governments to make gold go further than ever as a basis of money, and makes the average man use "money" with less and less thought of obtaining the metal.

GOLD MORE PLENTIFUL THAN GOODS

At any rate, whatever the relation of gold to prices, it is evident that, as a result of the recent war, gold, for the uses to which it is put, is relatively more abundant than are the principal staples of commerce. Apparently this is the result of every war to a sufficient degree to cause extensive borrowing by governments, the diversion of large numbers of men from productive occupations, the derangement and prostration of industry through interruption of supplies, and the laying waste of productive areas. If conditions were normal, considering the feverish demand for exchange, a strong demand for gold at the present time might be expected; but the feverish conditions are in themselves a proof of want, and the want of food, tools, and equipment is more consistent than the demand for gold.

A book should be written upon the effect of great wars upon prices and general economic conditions. I have inquired for such a publication, but have not heard of one. In the absence of an authoritative discussion, I am tempted to put down a few observations that I have been able to glean from various sources.

INDUSTRIAL STATUS OF NAPOLEONIC ERA

At the time of the Napoleonic wars the modern industrial world was in its infancy. Only one country—Great Britain—had made any progress to speak of in the use either of mechanical power or intensive manufacture. The population of the leading countries of Europe was from one-quarter to three-quarters of what it is today. Production was generally by handicraft and not by the factory. Transportation of staples was only beginning. Commerce, therefore, between distant points had been confined largely to rare and valuable fabrics and luxuries. Dependence upon the resources of other continents was not at all general but was confined almost entirely to the countries at the western fringe of Europe. During that war an almost complete monopoly of ocean traffic fell to Great Britain and to the comparatively feeble and loosely organized United States. Through this combination of circumstances Great Britain, although at that time producing little or no gold from her own territories, undoubtedly became the principal gold owner of the world and adopted the gold standard. It was a period of general enlight-

enment, of increased knowledge of distant countries, of progress in natural science, of bold intellectual speculation.

THE FINANCIAL PANIC OF 1819

The economic effects were chiefly the diversion of handicraftsmen into military pursuits, including the manufacture of military supplies, and a derangement of ocean commerce which, after all, deprived only a comparatively small number of people of their accustomed supplies. Furthermore, there was an increase of the public debt, which in the case of England, at least, dwarfed anything ever known before. These causes were sufficient to produce a general and prolonged rise in the price of many commodities of general commerce. It is probable that in producing those commodities that were made almost entirely from local raw materials and depended little upon trade (in which a larger part of the population was then engaged than now) the effects varied greatly from place to place, depending upon whether or not they were exposed to direct ravages. The wars themselves were confined to a period of twenty-five years, but the prices of some commodities continued high for forty years, or for fifteen years or more after the war. The economic readjustments at the close found expression in an acute financial panic in 1819, four years after Waterloo.

EFFECTS OF NINETEENTH CENTURY WARS

In the middle of the nineteenth century, between 1855 and 1870, a number of comparatively localized wars disturbed the industrial world. Of these, by far the most important was the Civil War in America. The Crimean War of 1855 and 1856, the Italian War of 1859, the Austro-Prussian War of 1866, the Franco-Prussian War of 1870-71 were either short lived or affected regions of slight industrial importance. But the combined effects were a considerable increase of public debt, very large in France and the United States. During the Civil War there was an important stoppage of one of the world's chief staples—cotton.

Again, there was a prolonged rise in the price of commodities, which culminated in 1864, but which persisted at least until 1880. It may be remarked, in passing, that the severe financial panic of 1873 had little effect on checking the high prices.

DISCOVERIES IN CALIFORNIA AND AUSTRALIA

Just preceding this series of political disturbances occurred the unprecedented discoveries of gold in California and Australia, which not only increased the supply of that metal at an extraordinary rate, but stimulated exploration, colonization, enterprise, and trade in all parts of the world. At no other period in the world's history, except, perhaps, at the time of the Spanish conquests of Mexico and Peru, was the supply of gold increased so rapidly or so generally distributed. The concurrence of this fact with a period of political disturbances and a succession of wars brings about a confusion of economic causes which it is probably very difficult to unravel; but there is certainly every reason to suppose that the increase of gold supply had a good deal to do with stimulating demand and raising prices.

After the Franco-Prussian War there supervened a period of general tranquillity among the chief civilized and industrial nations that lasted, with slight interruptions, for about forty years. In the earlier part of this period there was a general payment or reduction of

public debts and also the stagnation and decline of the output of gold, together with a great expansion of agricultural development. Prices steadily declined until about 1895. At this date the payment of public debts had ceased and the reverse tendency began. Just what caused this condition I have not inquired into critically, but it is not improbable that it was attributable to the renewal of international rivalries, the increase of armaments, and the initiation of national enterprises. At the same time the production of gold had for several years increased rapidly.

The events of the mid-century find some parallel in more recent ones. Again a greatly increased gold production concurred with a period of general prosperity. Wealth and luxuries were produced in unexampled profusion and in new forms. The gas engine, the automobile, and, finally, the airplane were developed and added much to the convenience, activity, and information of millions. Industry was organized in immense units, producing the staples of commerce with much greater facility and in many times greater volume than had ever before been known. These activities centered in certain areas which became the industrial clearing houses of the world. Those areas became populated to such an extent that the people in them were and are absolutely dependent for their prosperity and even for their subsistence upon the constant interchange of staples on an immense scale.

DEVELOPMENT OF NATIONAL RIVALRIES

Great Britain was the first of the principal nations to feel conscious of such dependence upon trade, but with the rapid increase of population, manufacture, and commerce in Germany, that nation became thoroughly conscious of it also. On the other side of the world, too, Japan found herself confronted with the same problem. Thus the principal industrial areas of the world were, by the measure of their indigenous resources, overpopulated. In Europe these areas were occupied by different nations, each imbued with jealousy of its neighbors and intensely unwilling to permit the continuance of its trade, and therefore of its life, to be in any measure at the mercy of its rivals. Thus overpopulation was certainly the underlying cause of formidable international rivalries, giving rise to innumerable schemes of expansion, aggression, and defence; and determining the tone of thought by which such schemes were supported.

The series of wars prompted by these motives has already been long. It includes numerous minor conflicts incident to colonial aggressions of the Europeans, though the collisions between great nations were avoided until the Russo-Japanese War of 1904-1905. But war in Europe was constantly brewing, and was with difficulty avoided on many occasions. Finally, a furious war, all the more violent because so long repressed, involved all the principal nations of the world.

PROBLEMS CREATED BY THE GREAT WAR

The events of the Great War have accentuated rather than mitigated, in Europe at least, the force of the economic conditions outlined. Those who take pains to look the situation in the face must be impressed with the following facts: The total white population of the world is about 600,000,000. Of these, three quarters live in Europe. The total area occupied by white populations is about 20,000,000 square miles, a good part of which is in the circumpolar regions of America and Asia and another portion in the deserts of Australia.

Of this population, half at least, both in number and in area occupied, have been thrown into a state of political revolution and social and economic chaos, and are today suffering in varying degree from all the distress incident to such terrors, from starvation, exposure and danger. Out of the ruins of the empires of Russia, Germany, Austria, and Turkey a number of small nations have been created, or resurrected, without fixed organization, all jealous of their neighbors; some already at war with each other, and each nation far less self-sustaining than the larger units from which it was broken. When it is considered that revolutions, once started, are hard to stop and frequently go on from one stage to another for generations, it is hard to look upon the general situation of the white race with much assurance of a complete return to tranquillity and prosperity.

These conditions do not affect the Anglo-Saxon world within its own territories as they affect every other white nation. The Anglo-Saxons are, as I have pointed out elsewhere, richer in resources, stronger in industry, and firmer in political organization than any other nation; and these facts have been demonstrated as much by the recent war as by anything that ever happened. But the solidity of the English-speaking countries is not the only factor in their relations with the world, unless they can shut out and ignore the rest of that world—and that is precisely what it is proposed not to do.

The economic consequences of such a cycle of events have been just such as one might expect from an attentive consideration of historical parallels. But in this case the tendencies that have been visible on former occasions have operated with multiplied intensity. Prices of staples have been forced to heights only the extreme peaks of which have been passed. It is hard to escape the conclusion that the main factor in these high prices is the tremendous national borrowings. The world has financed itself with promises. There has been a steady decline in the purchasing power of these promises.

WAR DEBT NOW \$200,000,000,000

To return to the general figures mentioned, there are 600,000,000 white people divided among various nations. These nations owe about \$200,000,000,000. At a conservative average, each individual owes about \$300 and each head of a family \$1,500. The theory is that these sums must be paid, principal and interest, not out of product but out of profit—out of savings. It is only, of course, when these debts are owed by one nation to another that these sums mean an actual transfer of goods. The debts of a nation to its own citizens can be paid only through taxes from those citizens, so that, although the process may affect individuals variously, in a national sense it is merely a transfer from one pocket to another. The overwhelming preponderance of public debts must be of this nature. But is it not true that the necessity of giving these pocket-to-pocket transfers the semblance of real money is the potent cause of marking up prices? How can it be avoided?

ACTUAL WEALTH IS IN COMMODITIES

The actual wealth is not money but goods. A nation can produce only a given amount. To repay itself vast sums of money through taxes for interest and principal can be accomplished only through adding to the value of the goods the amount of the taxes. As this addition to value is not expressed in goods, but in money, it fol-

lows that the sum total of goods must be expressed in a larger amount of money, i.e., in inflated or imaginary value, a decreased purchasing power of the dollar, or higher prices—all these expressions meaning the same thing.

Hennen Jennings has pointed out that the only effective check upon the progressive depreciation of the unit of value through these causes is free payment in gold. An ounce of gold is divided into something over twenty dollars. It costs as much effort and as much goods to produce the gold ounce or the gold dollar as it ever did. Therefore, so long as the dollar actually represents a given amount of gold it will always represent a given amount of effort. If a given amount of effort made highly efficient by improved organization and appliances can be made to produce a greater amount of goods, it is likely, also, to produce in a general way a proportionately greater amount of gold. The only influences that would permanently alter this relationship would be fundamental causes, such as the discovery or exhaustion of great sources of gold by which the metal might become relatively easier or more difficult to obtain. When it is obtained only at greater effort than is necessary in the acquisition of other commodities, or through consumption in process of its production of greater quantities of other commodities, then, if secured at all, it must be acquired through the use of greater quantities of those commodities, and it will be manifestly equal in value to a greater quantity of them—will buy more of them. Prices will then be low.

The contrary process is equally imaginable and to specify it would only be repetition.

DETERMINING INFLUENCE IN GOLD PRODUCTION

Thus gold, if freely used, is probably as dependable and fair a medium of exchange as could be devised. It may be remarked further that its equilibrium is maintained in the long run through natural causes which, of course, do not operate instantly, but which do tend to confine the oscillations of value between comparatively narrow limits. If gold is produced in quantity greater than the demand for it, people will not pay so much for it in commodities. This is equivalent to a rise in cost which will force some producers out of business. On the other hand, if the stock of gold runs short, prices will be low, and the inducement to mine more of it will return.

It is pertinent to remark that the influence of prices upon gold production is bound to be felt in the long run, regardless of the cause of the change of prices. It makes no difference in the ultimate effect on the gold industry whether high prices are brought about by the existence of an abnormally large stock of gold, or by the shortage of commodities brought about by decreased production of them for any reason—wars, disasters, disorder, or famine; the tendency will always be to curtail the production. Such influences will bring about considerable swings in the popularity of the industry. The reasons which operate to make gold mining unprofitable will discourage or diminish the search for gold. Plants will go out of business, and a considerable period will elapse before the counter-swing will have much effect.

The gist of these considerations is that in the cycles of high and low prices it is possible to discern the operation of common economic laws. An outburst of national borrowing is in itself either a diversion of labor from its usual channels of production or an evidence of

distress brought about by the shortage of production from some other cause. It will either produce high prices or be produced by them. On the other hand, the widespread liquidation of borrowings can be accomplished only during the periods of tranquillity when labor is employed in full measure for the production of private wants, when there is freedom from calamity. A war, therefore, unless it is local and insignificant, is sure to raise prices. The more general and violent the war, the wider its effect in raising prices. Moreover, the effect of war is not confined to the period of organized military effort, but will persist as long as the exhaustion of resources, the impeding of traffic, and political and social disorders prevent the resumption of peaceful industry in an efficient manner.

The inducement to produce gold will naturally follow upon these influences. Its production will be curtailed during the whole of the period of high prices and high costs, and will not be resumed with full impetus until it has been encouraged for some years by low prices, which means a glut of the chief staples.

LONG PERIOD OF INFLATED PRICES PROBABLE

It certainly is to be expected, and feared, that the present situation of the world indicates a long-continued period of high prices for reasons which may easily be summarized in the order of their importance:

1. Every new or revolutionary government is necessarily unstable. Every nation between the Rhine and Vladivostok and from the Arctic Ocean to the Mediterranean and the Himalayas is the seat of potential, even prospective, revolution. The population of this tract is as follows:

Russian Empire.....	170,000,000
German Empire (including Poland)	65,000,000
Austrian Empire.....	53,000,000
Balkan States and Turkey	40,000,000
Total.....	328,000,000

Every nation in this group is confronted with a long list of burdensome tasks which must be accomplished despite the probability, according to historical precedent, of having its projects deranged by internal disorder. It must establish, or re-establish, public and private credit. It must establish new, or re-establish old, lines of trade and traffic. It must restore or replenish its stock of staples and raw materials, and it must make provision for the payment of foreign debts. How easy it is for national and racial jealousies, actual or latent disorders, to prevent all this, not only locally but throughout the whole area!

2. The white populations unaffected by revolution are as follows:

British Empire.....	60,000,000
United States.....	100,000,000
France.....	40,000,000
Italy.....	35,000,000
Spain, Portugal, Netherlands, Scandinavia.....	45,000,000
South America—Brazil, Argentina, Chile.....	20,000,000
Total.....	300,000,000

These countries are in control of the resources of the greater part of the world, but by a very unequal division. Of the chief resources, the Anglo-Saxons control the preponderance. On the whole, however, there is nothing to prevent this group from resuming, or even increasing, its former prosperity. By returning to peaceful industry, the major portion may soon replenish its warehouses. The chief difficulties are the curtailment of national expenditure and the liquidation of foreign debts. To whatever extent these operations are

dependent upon the prompt payment of obligations and a resumption of good feeling by the great disturbed populations of central and eastern Europe, northern Asia (and it may be added, perhaps, of China and Japan), their success can hardly be regarded at present as other than doubtful.

Even if it is reasonable to believe that the recent cycle of political, social and economic disturbance has passed its acute stage, it still remains certain that these distractions have operated upon a scale and with an intensity scarcely ever known before; and the time required for recovery should logically be at least as long as at any former period. On this reasoning one might expect that the present cycle of high prices will not have fully subsided until about 1940, at the best.

If one were looking for an example of the comparative instability of precious-metal mines, and the dependence of the world for its supplies upon a constant search for deposits in all parts of the world, one would need go no further than to note the changes in the list of representative gold mines, selected particularly because they seemed the most substantial of their type. In the short interval of ten years the Alaska-Treadwell group has practically gone out of existence. So has the Camp Bird, El Oro and Esperanza, the Robinson, the principal Kalgurli mines, and the Goldfield Consolidated. Of those still running, in some cases with a marked decrease of prosperity, one may name only the Homestake, the Liberty Bell, the Kolar mines, and the Portland. Thus the operations that have practically vanished are about ten out of seventeen, about 60 per cent.

DECLINE IN PRODUCING DISTRICTS AND LITTLE PROGRESS IN METALLURGICAL METHODS

This is not all. In the interval two great projects in Alaska for mining the low-grade gold ores of the Juneau district have been initiated, supported enthusiastically, and have proved themselves dismal failures. Districts have not been so roughly treated as individual mines, but even districts have so nearly lost their importance that it is scarcely an exaggeration to say they have vanished. To specify such vanishing districts one may name Douglas Island, Juneau, Ouray, Goldfield, El Oro and Kalgurli. In Cripple Creek and Kolar the output is steadily on the decline. Only at the Homestake and the Transvaal has there been an increase. The latter district produces half the gold of the world, but substantially from a new group of operations, which, however, merely represent a migration, enforced, of course, to lower levels and outlying tracts.

So far as I can learn, not a single radical or even important change in the processes of gold mining has taken root during the last ten years. The appliances are the same to all intents and purposes, although there has been a considerable substitution of ball mills for stamps, some improvements in drilling machines, and some changes in cyanide practice. But the ground work is the same, and results are about the same. The grand feature of the history of the business has been the progress of an economic cycle unfavorable to gold mining.

The Stollberg Mining, Lead, and Spelter Works has been obliged to permit the company's spelter plant at Dortmund to remain idle, and in view of the losses involved in present working conditions expect the closing down of further works, according to the *Ironmonger*, of April 16, 1919.

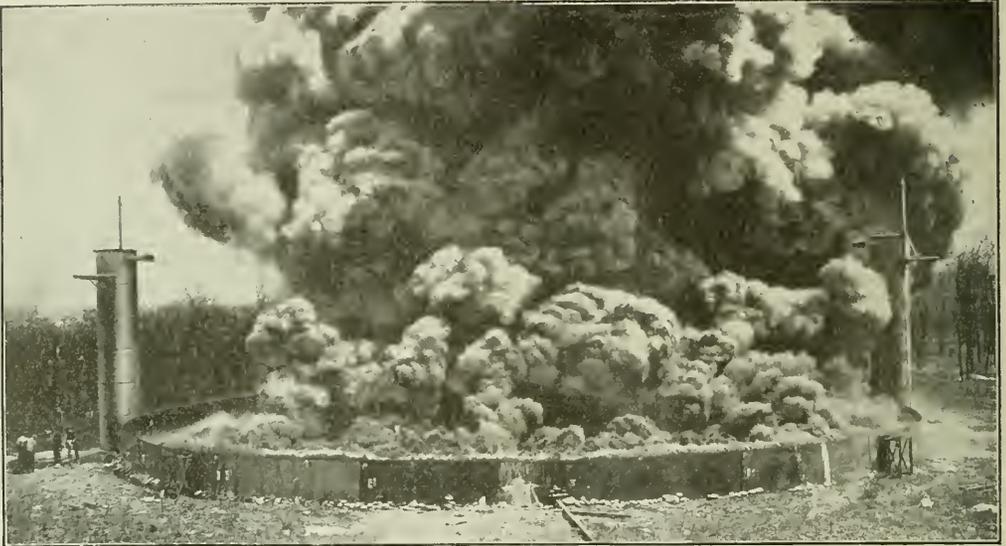
Fire Protection for Oil Tanks

Description of a Method for the Extinguishing of Disastrous Oil-Tank Fires by Using Bubbles Containing Carbonic-Acid Gas To Form a Blanket Covering on the Surface

THE storage of oil or gasoline has always been accompanied by great fire risk, owing to the difficulty in extinguishing the flames by ordinary means. The use of water results in a further spread of the blaze over a larger area on account of the well-

known property of oil to float on water. The use of carbonic-acid gas is ineffective, because of the great diffusion in the atmosphere by the rising currents of air and other natural conditions. Both of these difficulties are reported as being remedied by a method which has

been recently introduced into practical use. The process is based upon the principle of applying a froth or blanket of bubbles containing the carbonic-acid gas, which thereby concentrates the gas so as to make it most effective. It is also said that, by this means, not only



A 55,000-BBL. TANK ON FIRE, WITH A STRONG WIND BLOWING



FIRE EXTINGUISHED WITHIN FORTY-EIGHT SECONDS AFTER THE APPLICATION OF CARBONIC-ACID GAS BUBBLES

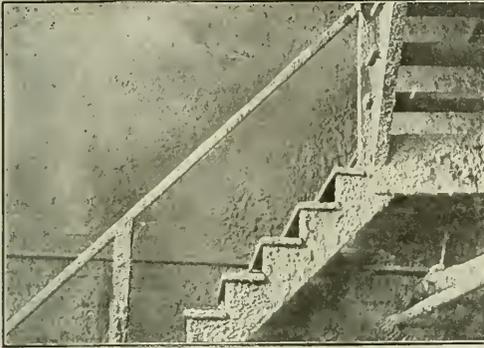
known property of oil to float on water. The use of carbonic-acid gas is ineffective, because of the great diffusion in the atmosphere by the rising currents of air and other natural conditions. Both of these difficulties are reported as being remedied by a method which has

are the flames extinguished but the smoke and fumes are also smothered.

Another advantage stated is the comparative dryness of the foam compared to water, as it possesses no tendency to soak into the material, which results in less

damage. The bubbles are minute in size and hold the gas efficiently. The composition of the solution used for the formation of the bubbles has not been revealed by the inventors. The froth resulting from the release of the liquid from the extinguisher is eight times in volume that of the original liquid, which therefore gives it a large area-covering capacity. The physical properties show the froth to be heavy, tenacious and lasting. Portable means for the application of the method have been provided by the use of fire pails, hand extinguishers, and portable engines. For large storage tanks permanent installations are used.

The first illustration depicts a 55,000-bbl. tank fire at its height, with a strong wind blowing, and the



CARBONIC-ACID GAS BUBBLES ADHERING TO A VERTICAL SURFACE

lower is an illustration of the same tank forty-eight seconds later, showing how the foam blanket smothered the blaze. The tank was 114 ft. in diameter, presenting 10,200 sq.ft. of surface. The method of projecting the liquid is shown by the two containers on opposite sides of the tank. According to the experiments conducted, the amount of the foam required can be calculated in accordance with the nature of the fire risk and the number of square feet of area requiring protection. The distance of discharge is a maximum of 50 ft.

The last illustration shows the great covering capacity of the liquid and its tenacity in clinging to any surface.

This system of fire protection is designed and installed by the Foamite Firefoam Co., New York, and the illustrations reproduced herewith are presented through the courtesy of that company.

United Engineering Society Honors Carnegie

At a recent meeting of the United Engineering Society the following resolution was ordered spread upon the minutes:

Andrew Carnegie's death on Aug. 11, 1919, at Lenox, Mass., brought to its close a career which greatly advanced all the engineering arts and sciences. By the introduction into the United States of the bessemer process for the production of steel, and by the establishment and development of steel plants which became the greatest in the world, he made available for engineers the most useful modern material for engineering construction. In the successful conduct of many industrial enterprises, he amassed great wealth, the possession of which he came to regard with

deep seriousness as a public trusteeship. He devoted himself to the distribution of large portions of his fortune to projects for the benefit of mankind. He distributed his wealth not only in many directions, but also with the exercise of great wisdom based on careful investigation. His munificence provided large funds for the building of a home for the great national engineering societies and many associate societies. He was an honorary member of the American Institute of Mining and Metallurgical Engineers and American Society of Mechanical Engineers. He was personally known and loved by many engineers. In view of these facts, be it

Resolved, That the American Societies of Civil, Mining, Metallurgical, Mechanical and Electrical Engineers, the United Engineering Society, and the Engineers' Club herein express their condolence to the family of Mr. Carnegie and record their sincere appreciation of the great contributions of Andrew Carnegie to the advancement of engineering, and of his friendly assistance in making possible beautiful homes for the Engineering Societies and the Engineers' Club, thus fostering the spirit of unity in the profession.

Shattuck Arizona Copper Co.

The report of the Shattuck Arizona Copper Co. for the quarter ended June 30, 1919, states that development work aggregating 459 ft. was prosecuted on all levels between the 100 and 700-ft. levels, but did not result in finding any new ore. In the fire area below the 700-ft. level, bulkheads have been opened up, and air courses have been opened above the fire zone. Flooding operations have been successful in extinguishing the fire. No smoke or gas can be detected in the fire section, and the work of unwatering the mine below the 700-ft. level will soon be undertaken.

During the quarter, minor alterations were made in the lead mill, and milling tests started again June 15. The tonnage handled is approximately 250 daily. During the quarter, 931 tons of copper ore and 2,578 tons of lead ore were shipped; 2,138 tons of lead ore was smelted, and 65,148 lb. of lead was recovered. The operations for the period reviewed show a loss, exclusive of depletion, of \$93,010.67.

Negligent Track Construction in Mines

BY A. L. H. STREET

To the end of minimizing danger of injuries to his employees, a mine operator is bound to construct parallel tracks in a mine far enough apart to avoid contact between cars on the two tracks, taking into consideration the likelihood of contact due to a moving car being tilted laterally by spreading or other condition of the track, or obstructions, such as rock, on the track.

This point was decided by the Utah Supreme Court in the case of Johnson *vs.* Silver King Consolidated Mining Co., 179 *Pacific Reporter*, 61, involving defendant's liability for fatal injury to a miner while he was working in a tunnel, claimed to have been caused by a car on a main track shoving a car on an adjoining side track against him.

The court recognized the rule that before an employer can be held liable in damages for injury to an employee there must be some reasonable identification of a negligent cause for which the employer is responsible. If the injury can equally well be attributed to any one of several causes, one or more of which would be the employer's fault and one or more of which would not be his fault, there can be no recovery.

Geology of Platinum Deposits—Part I

Increasing Use of the Metal in the Electrical and Chemical Industries and a Shrinkage in Output From Russia Stimulate Study of Sources—Principal Formations and Occurrences

By W. L. UGLOW

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PLATINUM is derived primarily from two main sources—placer workings and lode deposits. Until comparatively recently the entire world's supply of the metals of the platinum group was obtained from the former source, but in the last few years valuable deposits of these metals have been discovered in certain of the Western states and in British Columbia. Though the output from these deposits is as yet small, there is reason to believe that similar occurrences will be found elsewhere, provided sufficient attention is given by prospectors to the geology of these types of platinum occurrences. This paper is a review of the salient geological features of the world's platinum deposits, which are divided into the two before-mentioned classes.

LODE DEPOSITS

Lode deposits of platinum may be conveniently divided into several groups, based on mineralogical and lithological similarities. Such groups are not necessarily genetic. As far as is known at present, platinum occurs in lode deposits in two forms, as native platinum or as sperrylite. In the former case it is found associated with characteristic rock types the world over. It is usually alloyed with palladium, iridium, osmium, and other members of the platinum group, and is accompanied by chromite. Sperrylite, the arsenide of platinum, PtAs₂, occurs in many types of deposits, but generally in those associated with basic igneous rocks. It is usually accompanied by palladium in some form not yet determined, and frequently by the sulphides of copper and iron. In many cases platinum occurs in ore deposits in such small amounts that the character of the mineral has not been recognized, but it is believed to be either native metal or the arsenide.

The source of the platinum metals in many placer workings has been traced to lode deposits containing the metals in the native form, but in no case yet reported have these lode deposits been successfully mined and the precious metals recovered. On the other hand, deposits containing platinum in the form of sperrylite have been mined on a commercial scale, but no instance is recorded in which deposits of this type have given rise to placers of commercial value. Platinum and other metals of the group have been detected in the following types of deposits:

DUNITE AND SERPENTINE

These are the types of deposits in which the platinum metals are known to occur in the form of native metals or alloys. Few serious attempts have been made to recover the metals from these sources, although in some cases such deposits have been tested and results of an interesting scientific nature obtained.

In many places where platinum metals have been derived from placer workings, careful search has revealed the presence of dunite, serpentine, or related types

within the drainage basins of the river systems which carry the precious metals, and analyses of these rocks have demonstrated the presence of platinum. Rocks of this type consist essentially of olivine, serpentine, pyroxene, chromite, and magnetite, with their alteration products, magnesite, hematite, limonite, and kaolin. They are the characteristic home of chromite; and the frequent association of the latter mineral with platinum in placer ground points to the origin of the precious metal in those rocks in which chromite most commonly occurs.

SOURCES OF PLATINUM

A few of the most important districts containing deposits of this type are mentioned below:

Ural Mountains, Russia—The streams in Russia whose drainage basins have produced the greater part of the world's platinum cross during their courses large areas of dunite and serpentine in which grains of platinum have been recognized. Experiments have been carried on by V. N. Chorzhevsky¹ with the dunite of the Nizhni-Tagilsk district in the Urals, which occupies about twelve square miles, in an endeavor to concentrate the contents of platinum metals into a recoverable form. The method adopted was to grind the rock finely and collect the chromite concentrates by tabling. Platinum was leached from these concentrates. A representative sample of the concentrates derived from 9,720 lb. of material gave, after being cleared of all visible metal, 200 oz. of platinum; and the gray fines, consisting of tailings and undecomposed dunite, assayed 11 gm. (about $\frac{1}{2}$ oz.) of platinum from 3,600 lb. of material.

Tulameen District, British Columbia, Canada—Large dike-like masses of dunite considerably altered to serpentine and containing lenticular masses of chromite are found in this area, cutting older sediments and volcanics, and associated with pyroxenite and augite syenite. Several investigations of these dunites have been made in recent years with regard to their platinum content, but no attempts at a commercial extraction have been undertaken.

The best results were obtained from the rock in which alteration had taken place to serpentine or in which the rock was rich in chromite². Assays of serpentine veins in peridotite yielded platinum varying in amounts from a trace up to nearly two ounces to the ton, but this distribution was found to be irregular. Masses of chromite also gave good results, which varied up to $\frac{1}{2}$ oz. to the ton. Here again the distribution was found to be uneven.

*Ronda Mountains, Spain*³—In this new platinum district of southern Spain, which stretches along the Mediterranean coast eastward from Gibraltar, the origin of

¹Mineral Industry, 1916, p. 596.

²U. S. Geol. Surv., Bull. 193, 1901, p. 48. Geol. Surv. Can.,

Memoirs 26, 1913, pp. 153-154.

³U. S. Geol. Surv., "Mineral Reserves of the U. S., 1915," p. 147.

the extensive platinum placers is said to be in central masses of dunite and serpentine, with which are associated small bodies of chromite. Platinum has been identified, associated with the chromite, scattered in small particles through the mass; and investigations have recently been made by the Spanish government to determine the commercial value of this lode deposit.

United States of Colombia—Specks of platinum have been found in olivine-bearing rocks of the Choco district of Colombia, from which a large part of the output of placer platinum is being derived.¹

Tasmania—The platinum content of the Tasmanian placers has been traced to a ledge of sheared serpentine which is found to contain minute particles of platinum.²

California—It is believed that the ultimate source of the platinum of California gold placers is in the serpentine and the olivine-bearing rocks of the Sierra Nevada and other ranges, which are in portions of the drainage basins of the streams.³

NICKELIFEROUS DEPOSITS IN BASIC IGNEOUS ROCKS, AS GABBRO, OLIVINE GABBRO, NORITE, PERIDOTITE, SERPENTINE

In Sudbury, Ontario, Canada, the following important occurrences are summarized:

Vermilion Mine⁴—The arsenide of platinum, sperrylite, was identified by Wells and Penfield in the ore of this mine in 1889. It is a silvery-white metallic mineral, occurring in minute cubes apparently associated with the chalcopyrite-rich portions of the ore. The

in the main of augite, hypersthene, and labradorite. The ore-bearing minerals are chiefly pentlandite, pyrrhotite, and chalcopyrite, with small amounts of pyrochlore and dymite.

Until recently the only information available as to the actual content of platinum metals in these ores was derived from the analysis of nickel-copper mattes. The International Nickel Co. reported the average content of precious metals per ton of matte for three years ending in 1915 as follows:⁵

	Ounces per Ton		Ounces per Ton
Platinum	0.10	Gold	0.05
Palladium	0.15	Silver	1.75

Assays of roasted mattes gave results as follows:⁶

	Ounces per Ton		Ounces per Ton
Platinum	0.1235-0.988	Gold	0.64-0.296
Palladium	0.197-0.984	Silver	1.04-6.156
Iridium	0.046-0.065		

From such data as these it was estimated that one short ton of Sudbury nickel-copper ore contained:⁶

	Ounces		Ounces
Platinum	0.01	Silver	0.2
Gold	0.01	Palladium	Not given

The analyses given in Table I have recently been published by Roberts and Longyear.⁷ They are the only figures available showing the actual amounts of the platinum metals in specific samples of ore. The samples were taken by diamond drilling through large undeveloped orebodies.

The average content of these sixteen analyses is 0.0068 oz. of platinum metals per ton.

The ore in the Alexo Mine, Ontario, consists chiefly

TABLE I. ANALYSES OF COMPOSITE ORE SAMPLES FROM DIAMOND-DRILL HOLES

Hole No.	23	24	25	85	115	115	144	146	193	302	303	304	306	307	308	310
Cu, per cent.	1.45	1.27	0.87	1.59	0.98	0.61	0.90	0.74	0.80	1.56	1.20	1.79	1.31	0.91	0.90	0.88
Ni, per cent.	1.45	1.79	1.19	1.55	1.55	2.97	1.72	1.96	1.14	1.43	2.57	2.22	2.41	2.60	2.75	2.15
Ag, oz. per ton	0.20	1.00	0.20	0.30	0.15	0.04	0.19	0.20	0.30	0.15	Tr	0.22	0.10	0.20	0.13	0.18
Au, oz. per ton	0.012	0.21	0.014	0.002	0.007	0.004	0.007	0.005	0.003	0.013	0.003	0.008	0.023	0.007	0.093	0.037
Pt metals, oz. per ton	0.004	0.02	0.006	0.004	0.005	0.004	0.003	0.009	0.003	0.007	0.01	0.006	0.013	0.004	0.004	0.037

deposit consists of a number of small veins and irregular bodies of ore from a few inches to fifteen feet in diameter, enclosed in greenstone, quartzite, and norite. The minerals of the ore deposit are pyrrhotite (nickeliferous), chalcopyrite, bornite, chalcocite, native copper, cassiterite, gold, millerite (NiS), polydymite (Ni₂S₃), sperrylite, and quartz. Platinum and palladium both occur, the latter in the greater amount. The valuable minerals were found both in the gossan and in the unaltered ore. A. P. Coleman⁸ states that 198.23 tons of ore mined in 1902 carried the following amounts of precious metals per ton: 4 oz. palladium, ½ oz. platinum, ½ oz. gold, 4 oz. silver. The figures are far above the average.

Nickel-Copper Ores of the Main Sudbury Basin—Platinum and palladium have been known to occur in these nickel-copper ores for several years, but whether the platinum is present as sperrylite, as in the case of the Vermilion mine, has not been determined. The highest platinum returns have been derived from the copper-rich portions, whereas the palladium seems to favor the nickel-rich portions of the deposits. These orebodies occur as marginal differentiation products at the base of a thick sill of intrusive norite, consisting

of nickeliferous pyrrhotite, chalcopyrite and pentlandite in a gangue of altered peridotite and serpentine. In 1915 a shipment of between 5,000 and 6,000 tons of this ore showed 0.03 oz. of platinum and palladium per ton.¹²

In the Great Eastern and Key West Mines, Clarke County, Nev.,¹³ large basic dikes 10 to 50 ft. wide cut an older series of granitic gneisses, interlaminated with green and black schists, and associated with pegmatite and aplite. The Great Eastern dike is essentially an enstatite-mica perite, consisting of augite, olivine, biotite, enstatite, with accessory magnetite, pyrrhotite, and chalcopyrite. Assays from portions of the dike are given in Table II.

TABLE II. ASSAYS AND ANALYSES OF PORTIONS OF THE GREAT EASTERN DIKE

	1	2	3
Cu	1.5%	1.5%	2.01%
Ni	0.26%	0.9%	5.38%
Pt Metals	Tr.	0.25 oz.	J. 17 oz.
Co	0.04%		
Au			Trace
Ag			Trace

¹ Made by U. S. Geological Survey; ² made by R. H. Officer, Salt Lake; ³ made by Ledoux & Co., New York.

Another portion of the Great Eastern dike proved to be a fresh holocrystalline hornblende, showing no signs of metallic contents, but giving a trace of plati-

¹U. S. Geol. Surv., "Mineral Resources of the U. S., 1913," p. 455.
²Mineral Industry, 1914, p. 609.
³U. S. Geol. Surv., "Mineral Resources of the U. S., 1916," p. 9.
⁴Royal Ontario Nickel Commission Report, 1917, pp. 41, 155.
⁵Mines Branch, Dept. of Mines, Canada, "The Nickel Industry," 1913, p. 45.

⁶Royal Ontario Nickel Commission Report, 1917, pp. 484, 486.
⁷Ibid., Appendix, p. 39.
⁸Trans. Can. Min. Inst., 1918, p. 99.
⁹Royal Ontario Nickel Commission Report, 1917, p. 485.
¹⁰U. S. Geol. Surv., Bull. 430, pp. 192-199. Mineral Industry, 1909, p. 602.

num. The Key West dike, which is believed to be a continuation of the above, is much hydrometamorphosed, and fresh portions were not available for study. Small amounts of pyrrhotite and considerable pyrite are present. Assays and analyses are given in Table III.

TABLE III. ASSAYS AND ANALYSES OF PORTIONS OF KEY WEST DIKE

	1	2	3	4	5
Cu.....	1.47%	5.6%	4.66%	2.30%	3.50%
Ni.....				1.79%	1.86%
Co.....				0.08%	
Pt Metals.....	0.1 oz.	0.12 oz.	0.55 oz.	0.15 oz.	0.15 oz.
Au.....	Nil	Nil	Trace	Trace	Trace
Ag.....	Nil	Nil	Nil	Trace	0.35 oz.

1 From decomposed dike near surface; 2 from specimen showing high percentage of sulphides; 3 from picked sample of ore from dump, which came from orebody between levels 2 and 3; 4 represents carload shipment of 91,600 lb. of ore assayed by the North American Lead Co.; 5 from same shipment assayed by Ledoux & Co.

From the nickeliferous pyrrhotite of the Insizwa Range, Griqualand, South Africa, platinum may be commercially extracted.

The ore contains:¹⁴ Cu, from 1.5 to 20 per cent, with an average of 4 per cent; Ni, from 1.5 to 10 per cent, with an average of 4 per cent; Pt, between 2 and 3 pwt. per ton. Some samples show several ounces per ton. Norwegian nickel ores yield about 50c. per ton in platinum and palladium.¹⁵ One large parcel of nickel ore from Tasmania is stated to have contained 0.06 oz. platinum per ton.¹⁶ Platinum occurs in a copper-nickel gossan at Mulga Creek Springs, near Broken Hill, N. S. W., associated with gabbro and decomposed gneisses and schists.¹⁷

DIKE-LIKE MASSES OF PYROXENITE, HORNBLENDITE, OR DIORITE, WITH OR WITHOUT OLIVINE

This type of deposit differs from that of the preceding group chiefly in the absence of nickeliferous pyrrhotite. Platinum is present in one of the occurrences in the form of sperrylite, and this mineral may be the chief platinum carrier in deposits of this class. Chalcopyrite is usually present. According to the available descriptions the rocks containing the platinum do not occur in the shape of large irregular intrusions, but tend to take on an elongate form, simulating dikes. The following are specific occurrences:

*Rambler Mine, Near Laramie, Wyo.*¹⁸—Basic dikes, consisting of green hornblende, brown biotite, and Labradorite or bytownite feldspar, and accessory apatite, pyrite, and magnetite, and called diorite by J. F. Kemp, intrude a country of granite gneiss with some quartzite and massive granite. Near the Rambler shaft the rock is a hornblende peridotite, consisting of green hornblende, olivine, and hypersthene. Outcrops are not common, as the area is covered with a loose wash. These dikes appear to have been originally charged with sulphides of iron and copper, and with some platinum minerals, and to have undergone considerable hydrometamorphism. Covellite (CuS), chalcocite (Cu₂S) and chalcopyrite (CuFeS₂) seem to replace the diorite, and the outcrop consists of limonite, azurite, malachite, and kaolin.

Sperrylite, arsenite of platinum, has been separated from the covellite by Professor Penfield, and seems to

constitute the source of the platinum. During 1917, about 350 tons of concentrates were refined, which carried considerable palladium and about one-third as much platinum. It is reported that recent work at greater depth in the mine has disclosed a new orebody that carried both platinum and palladium in workable amounts.¹⁹

Franklin Camp, Grand Forks Mining Division, British Columbia—The presence of platinum was detected in the "Black Lead" of the Franklin camp in 1918. This rock is described as a shonkinite-pyroxenite, and is a marginal phase of the augite syenite intrusion. It is black to dark green in color, and a microscopic measurement of the relative amounts of constituent minerals in a typical specimen gave the following results: Augite, 73.13 per cent; orthoclase and microcline, 17.06 per cent; hornblende, 1.47 per cent; magnetite, 6.06 per cent. Accessory minerals consist of titanite, pyrite, chalcopyrite, bornite, and apatite.²⁰ Various portions of this "Black Lead" were sampled by the Canadian Munition Resources Commission and the Geological Survey of Canada in 1918, and the assays, given in Table IV, were obtained.²¹

TABLE IV. PLATINUM ASSAYS OF "BLACK LEAD"

Property	No. of Samples	Ounces of Platinum Metals per Ton
Maple Leaf	3	0.15, 0.17, 0.38
Lucky Jack	3	0.04, 0.06, 0.08
Mountain Lion	2	0.02, 0.09
Golden Age	1	0.06
Averill Group	2	0.09, 0.09
Buffalo	2	0.08, 0.19
Ottawa	1	0.06
Columbia	1	0.04

A sample of pure chalcopyrite taken from the "Black Lead" by J. J. O'Neill for the Geological Survey of Canada assayed 0.38 oz. of platinum metals per ton. Most of the samples represented minable widths and were taken from portions of the lead which showed small amounts of metallic minerals.²²

Tulameen District, British Columbia—Platinum has been detected by assay in samples from pyroxenite dikes, cutting through the peridotites of Olivine Mountain. The assays showed from a trace to 0.25 oz. per ton.²³

Walhalla Copper Mine, Victoria—Platinum occurs here in a lode formation in a hornblende diorite with chalcopyrite, gold, and silver. The ore contains from 0.1375 to 0.392 oz. of platinum per ton, the payable minimum being about 0.017 oz. per ton.²⁴

La Plata Mine, Liberty Hill District, Nevada County, Cal.—Samples of platinum-bearing ore from this mine were received by the U. S. Geological Survey in 1916. The orebody is reported to occur in gabbro, west of the main serpentine area, but outcrops of serpentine rich in chromite and olivine are said to lie near the vein. Associated with the ore are pyrrhotite and chalcopyrite in a greenish siliceous gangue.²⁵

Other Occurrences—At the Thompson River copper mine, Victoria, platinum is found in a hornblende rock rich in chalcopyrite.²⁶ At the Goodro Mine, Prince of Wales Island, Alaska, platinum occurs in diorite, associated with bornite, chalcopyrite and chalcocite.

¹⁴U. S. Geol. Surv., "Mineral Resources of the U. S., 1917," p. 26.

¹⁵Geol. Surv. Can., *Memoir* 56, 1915.

¹⁶Western Can. Min. Eng. & Contracting, Jan., 1919.

¹⁷Geol. Surv. Can.

¹⁸U. S. Geol. Surv., *Bull.* 193, 1901, p. 49.

¹⁹Mineral Industry, 1917, p. 543.

²⁰U. S. Geol. Surv., "Mineral Resources of the U. S., 1916," p. 3

²¹Mineral Industry, 1917, p. 543.

¹⁸Inst. Min. & Met., *Bull.* 147, Dec. 14, 1916.

¹⁹Royal Ontario Nickel Commission, Report, 1917, p. 485.

²⁰Ibid., p. 486.

²¹New South Wales Geol. Surv. Rec., Vol. 8, Part IV, 1909, pp. 287-292.

²²U. S. Geol. Surv., "Mineral Resources of the U. S., 1902," pp. 211-250.

Boss Mine, Yellow Pine Mining District, Nevada—In 1914 platinum and palladium were found in certain ores in the Yellow Pine Mining District, Nevada. The ore deposit on the Boss claim was discovered about thirty years ago, having been located for copper, the presence of which is plainly indicated by chrysocolla and other oxidized minerals. The deposit consists of a fine-grained quartz mass, which in the main replaces irregularly the Carboniferous dolomites along a series of vertical fractures. A small mass or dike of granite porphyry intrudes the dolomite about 600 ft. north of the mine, but no basic intrusives occur; in fact, none are known to occur in the Yellow Pine Mining District, is the most productive lead-zinc district in Nevada.

The orebodies so far developed may be briefly described as oxidized copper shoots and gold-platinum-palladium shoots. The copper ores consist largely of chrysocolla and other oxidized compounds, but these ores carry only minor quantities of the precious metals. The gold-platinum-palladium shoots consist of a fine-grained quartzose ore containing a small quantity of a bismuth-bearing variety of the rare mineral plumbojarosite (a hydrous sulphate of iron and lead). The principal ore shoot disclosed by the present workings forms an irregular pipe pitching at a low angle to the northeast. In this shoot at the time of visit from 1,000 to 2,000 tons of ore had been developed, averaging in ounces per ton, Au, 3.46; Ag, 6.4; Pt, 0.70; Pd, 3.38. The precious metals are associated especially with the plumbojarosite; pockets of the pure mineral carry 100 oz. or more of platinum and palladium and several hundred ounces of gold per ton. This great richness points to a concentration of the precious metals in the oxidized ore by surface solutions, so that in depth the pockets of extremely high-grade ore, such as are now being extracted, will give place to ore of moderate grade. The only sulphide so far found in the mine is chalcocite, and this is probably of secondary origin.²⁷

According to *Mineral Industry* for 1914, plumbojarosite is a lead-potash-iron alum, $Pb(Fe(OH)_2)_2(SO_4)_2$. This mineral probably originated from some such mineral as bournonite, which has oxidized in the presence of potash. Plumbojarosite is a yellowish green earthy mass, noticeably heavy and inclined to form soft lumps. The average amount of precious metals recovered from one ton of ore is, according to this authority, as follows: Cu, 80 pounds; Au, 31.1 gm.; Ag, 62.2 gm.; Pt and Pd, 46.65 gm. Such ore has a valuation of over \$250 per ton. It is said that the platinum ore has been developed to a vertical depth of 1,500 or 2,000 ft. on the dip of the vein.²⁸

During 1917, there were recovered 107 oz. of platinum and 400 oz. of palladium, which was derived from 442.54 tons of copper-gold-platinum ore.²⁹ A sample of high-grade ore sent to Ledoux & Co. assayed as follows:³⁰ Au, 111; Pt, 99.08; Pd, 16 oz. per ton. This occurrence is exceedingly interesting, on account of the absence of the association with basic igneous rocks, and also because of the possibility of the plumbojarosite being an alteration product from some such mineral as bournonite. See "Associations with Tetrahedrite."³¹

*Roll Call Mining Co., Near Villa Grove, Colorado*³¹—

²⁷U. S. Geol. Surv., *Bull.* 620, 1915, pp. 118.
²⁸U. S. Geol. Surv., "Mineral Resources of the U. S., 1915," p. 144.
²⁹U. S. Geol. Surv., "Mineral Resources of the U. S., 1917," p. 20.
³⁰U. S. Geol. Surv., "Mineral Resources of the U. S., 1913," p. 450.
³¹*Mineral Industry*, 1917, p. 541; *Salt Lake Min. Rev.*, Mar. 15, 1917.

Assays of material from a two-foot vein, 410 ft. from the tunnel mouth and 1400 ft. beneath the surface workings, gave Au, 3.20 oz.; Pt, 5.09 oz.; Ag, 3.05 oz. per ton; Cu, 3.5 per cent. This ore is worth over \$500 per ton. Details as to the geology of the deposit are not available.

Associated With Tetrahedrite, Bournonite, Malachite, Arsenopyrite—At Guadalcañal,³² a few miles northeast of the Rio Tinto District, Spain, platinum occurs in ore resembling tetrahedrite in a gangue of calcite, barite, and quartz in a country rock of mica schist. The amount of the platinum varies between a trace and 10 per cent. Platinum occurs in tetrahedrite in metamorphic limestone, above Chatelard,³³ in the Valle du Drac, Hautes Alpes. The gangue is dolomite, quartz, and barite. At St. Arey, near La Mure (Isere), France,³⁴ platinum occurs in bournonite, in dolomite, and altered limestone. Near Presles in Savoy, France³⁵, platinum occurs in argentiferous tetrahedrite and malachite. Platinum is found in a quartz vein with gold and arsenopyrite in the Lucknow and Alma auriferous reefs at Gympie, New South Wales.³⁶

GOLD-QUARTZ VEINS

A picked sample of ore from the shaft of the Northern Manitoba and Development Co.,³⁷ near The Pas, Manitoba, gave \$49 in gold and \$17 in platinum per ton. Platinum is also reported from McCafferty's Prospect³⁸ about five miles from the above locality. Five assays of ore from the Quinn claims near the Croesus mine, Munro Township, Ontario,³⁹ gave platinum values between \$180 and \$1,800 per ton (with a value of \$40 to \$50 per oz. for platinum). Platinum has been found in a gold-bearing quartz vein on the Mother Lode claim, Burnt Basin, B. C., of the Contact Consolidated Mines, Ltd.⁴⁰ Samples of ore sent to Baker & Co., Newark, N. J., gave from a trace to 0.25 oz. of platinum per ton. The quartz carried free gold, chalcopyrite, pyrite, galena, sphalerite, molybdenite. Other occurrences have been reported from Beresovsk mines, Ural Mountains, Russia,⁴¹ from the Esperanza veins, Minas Geraes, Brazil⁴²; from a vein near Boyertown, Pa.,⁴³ from the Choco district, Colombia⁴⁴ and from the Thames and Tenarakau Rivers, New Zealand.⁴⁵

(To be continued)

Two Types of Classifiers are in use at the Washoe Reduction Works of the Anaconda Copper Mining Co., the hydraulic hindered settling type, for partially desliming the feed to Wilfley tables, and mechanical classifiers, for separation of the coarse and finer particles in the trunnion discharge of the regrind conical mills. The hydraulic classifier used is the No. 7 Anaconda deslimer and its operation has proved satisfactory. For the mechanical separation of coarse and fine particles in the conical-mill discharge, the Dorr classifier has met all requirements.

³²U. S. Geol. Surv., *Bull.* 193, 1901, p. 81.
³³U. S. Geol. Surv., *Bull.* 193, 1901, p. 66.
³⁴U. S. Geol. Surv., *Bull.* 193, 1901, p. 66.
³⁵U. S. Geol. Surv., *Bull.* 193, 1901, p. 66.
³⁶*Mineral Industry*, 1917, p. 543.
³⁷*Can. Min. Journ.*, Nov. 15, 1916.
³⁸*Ibid.*
³⁹*Eng. & Min. Journ.*, Vol. 101, Jan. 15, 1916, p. 161; *Min. & Sci. Press*, Jan. 22, 1916.
⁴⁰*Geol. Surv. Can., Summ. Rep.*, 1901.
⁴¹J. A. Phillips, "Ore Deposits" p. 671.
⁴²U. S. Geol. Surv., *Bull.* 193, 1901, pp. 60-61.
⁴³U. S. Geol. Surv., *Bull.* 193, 1901, p. 59.
⁴⁴U. S. Geol. Surv., *Bull.* 193, 1901, p. 65.
⁴⁵*Mineral Industry*, 1917, p. 543; *Ibid.* 1913, p. 604.

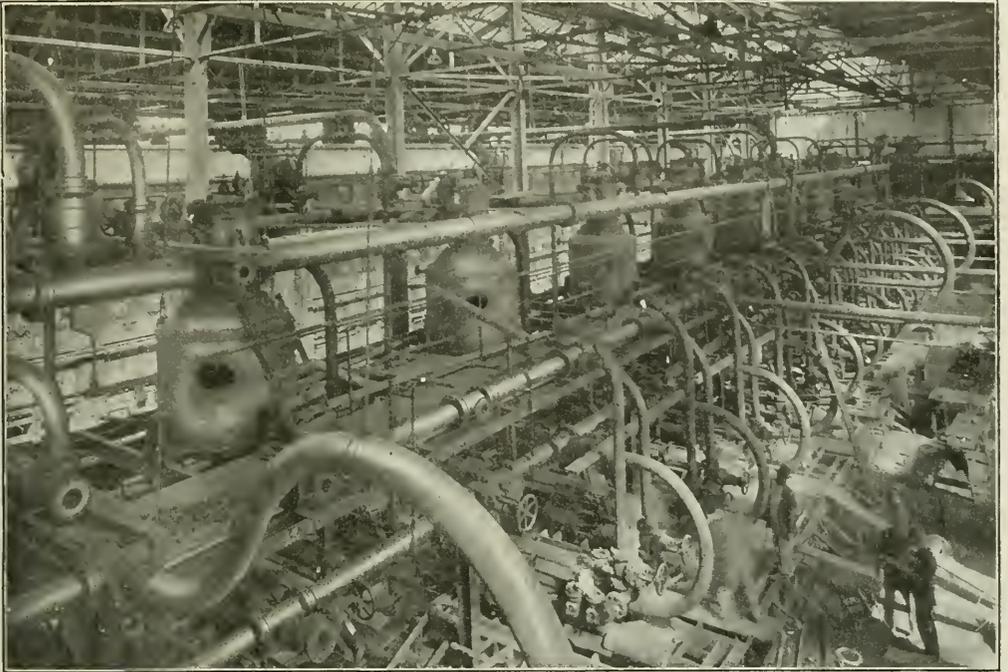
The Texas Gulf Sulphur Co.



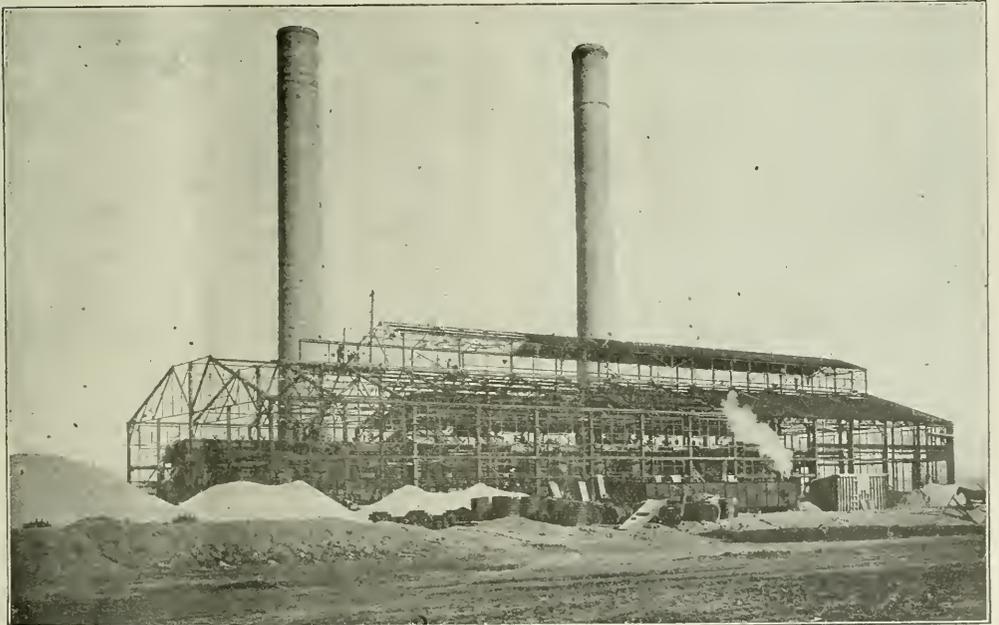
STEAM PLANT, WAREHOUSE, AND SHOPS OF THE TEXAS GULF SULPHUR CO.



GULF, MATAGORDA COUNTY, TEXAS, SHOWING HOUSES OF TEXAS GULF SULPHUR CO.



INTERIOR OF STEAM PLANT, SHOWING HEATERS AT TEXAS GULF SULPHUR CO. PLANT



TEXAS GULF SULPHUR CO. PLANT AT GULF, MATAGORDA COUNTY TEXAS, UNDER CONSTRUCTION

Application of Air Drills to Mine Sampling

Making Narrow, Deep Channels by Drilling a Row of Shallow Holes and Cutting Out the Intervening Ribs Results in the Saving of Both Labor and Time—
Jackhammers With Ordinary Crossbits Used

By JOHN H. EGGERS

Mining Engineer

AT THE suggestion of several well-known mining engineers who witnessed a part of the operation of cutting the samples, and all of the results of the sampling, a record of the operations is here presented. Some years ago, a short article appeared in one of the mining periodicals which described a method of taking samples with the non-rotating jackhammer, or plugger type of machine drills, with whichmoil bits were used. In the instance at hand, the work was done with ordinary jackhammer drills and also, though to a less extent, with the stoping drill, using both the regular cross and Carr bits.

Special small non-rotating jackhammer or plugger type of jackhammer drills andmoil bits should be of decided advantage in place of hammers and moils in cutting out channel samples, but such special equipment would probably not be available at a property under investigation, whereas the method herein described makes use of the jackhammer and stoping drills, which are more likely to be found as part of the mine equipment.

This method of sampling has probably been used by others, but it is not known that any articles have been published about it, and this description is offered in the belief that it may contain information of service to other engineers, as it represents a successful application of ordinary machine drills and bits to the sampling of a mine. In the instance at hand, a preliminary inspection of the ore to be sampled, as well as trials by two crews at cutting the samples with hammers and moils, indicated that the rock was extremely hard, and that either a larger crew than desirable or some other method would have to be employed, if the necessary number of channel-cut samples were to be taken in the limited time available.

It was thought best to attempt to apply machines in place of hand labor. At first it was planned to try the jackhammer drill andmoil bits, as this method was understood to have been previously used. However, after a consideration of various suggestions (some made by the working crew, for which credit is due), it was decided to use the jackhammer drills and the ordinary crossbits; the plan being to drill two rows of shallow plug holes along the line of the channel to be cut, and to then chip,moil, and break out the undrilled rock remaining between the holes, saving the drillings and the chips as the sample.

As the work progressed, it became apparent that one row of holes drilled sufficiently deep (several inches) would be adequate for the sample, and also that, if the holes were drilled closely enough, the rock between the holes in the row would break out during the drilling. This served to shorten the time required in taking the samples, for one row of holes was found to be sufficient, where at first it had been thought that two rows would be required. It also saved the labor and

time necessary to cut out the rock that remained between the two rows of holes.

The channel cut by drilling one row of holes was rather irregular in outline, being the full width of the drill bit opposite the center of each hole, but only about two-thirds of this width between the holes, so that, instead of being represented by two parallel straight lines, the sides of the channel were represented by two wavy lines that diverged opposite the holes and converged between the holes. This resulted from the shoulders or corners which were left between the holes, and which were difficult to drill out.

The first cuts were greatly improved upon, when, as the men became accustomed to the work, it was found that by moving the drill and bit from one side to the other, or back and forth along the line of the sample, a channel could be cut out that would be uniform and regular. The final result was a channel, slightly wider than the drill bit, that could be cut to any desired length and depth. The latter dimension would be determined by the character of the ore, and by the requirements of the sampling, and other considerations.

CHANNEL CUT IS NARROW AND DEEP

The channel cut as described may be made practically identical, as far as dimensions go, with the usual channel cut in sampling; the only difference being that the greater dimension of the cross-section of the channel, which is usually the width (of from three to six inches), becomes, instead, the depth of the channel, and is dependent on the depth to which the drill is driven into the rock. This may be considered, ordinarily, as an advantage than otherwise, for, owing to the decreased area of the usual irregular surface of the face to be sampled, it allows an approach to a more ideal section or channel. In fact, the face or surface of the rock or ore to be sampled may be cleaned and evened off by drilling a shallow preliminary channel along the line of the sample. The drillings from this preliminary cut would be discarded, and the sample would be taken by deepening the preliminary channel and saving the drillings therefrom as the sample, as described in the details which follow.

Though nearly all of the samples were taken in very hard ore or rock, some samples were also cut in softer material with satisfactory results. There seems to be no reason why the use of machine drills should not be possible in the sampling of many types and structures of rocks and ores, where the employment of the apparatus is justifiable from an economic point of view, as the practice is dependent largely on the accessibility of the air line, hose and machine drills, and the comparative time required to make the necessary connections. It is obvious that it is of more advantage in a place where a number of samples can be taken from one air-line connection than where the entire apparatus

must be moved and a new connection made for each sample cut.

Though the samples taken in the work described were comparatively small, they were sufficiently large for the purpose at hand, and it is apparent that much larger samples can be cut, with equal and possibly greater advantage, when desired. The use of the machine drills in this particular examination resulted in the securing of a greater number of necessary samples, at less cost per sample, and with a greater degree of accuracy, than would have been possible had hammers and moils been used, and it is believed that these advantages will hold in a large number of examinations, particularly where the ore to be sampled is very hard, and much time and labor are required in cutting each sample.

PERSONAL EQUATION IS LARGELY ELIMINATED

An additional advantage is to be found in that, as the work of the crew becomes largely mechanical, the matter of the personal equation and its possible effects on the sample is largely eliminated. It was also found that practically all of the chips and drillings cut from the channel were saved in the sampling, whereas it is not uncommon, when using hammers and moils, and catching the chips in a candle box, to lose at least a small percentage.

Possibly the greatest advantage is that the method permits the use of power drills instead of hard manual labor. It is significant that though machinery has been adopted for use over a wide range of operations about the mines, most of the work of sampling is still done by manual labor, and there is little reason why the advantages in the use of machinery should not, at least to a considerable degree, be also applicable to this work. Modifications in the apparatus and method would undoubtedly be necessary under varying conditions, as in any method of sampling, but the process and equipment described can often be used to good advantage.

The same procedure applies to the use of the stopping drills in taking overhead samples across the roofs of levels or other workings. However, the action of the stopping drill does not allow of moving the drill backward and forward along the channel, as when using a jackhammer in taking a face sample. For this reason it is necessary to plug holes along the line of the sample; but it is also readily possible to cut out the intervening or undrilled rock remaining between the holes, as well as to cut out all corners, so that, when completed, the channel may be considered as fairly regular and uniform. If the channel is cut sufficiently deep, the sample secured should be an accurate one. Greater speed is obtained in using the stopping machine in cutting overhead samples than in using the jackhammer on a face sample, but more care is required to prevent the inclusion of pieces of extraneous ore or rock that might fall from the roof.

SAMPLING DETAILS

The details of the use of the machine drills in sampling in this instance are more fully described in the following paragraphs. The accumulated muck or dust sticking on the walls and roofs of the workings to be sampled was first cleaned off with water under pressure, and also with a broom, and all loose pieces of rock or ore were knocked off. The thorough cleaning of the walls or places before sampling is advisable, not only because the accumulated muck along the channel does

not belong with the material to be sampled, but because it is generally necessary at the completion of the sample to brush off the drillings and chips from the channel that fall and stick or hang on to the slightly inclined portions of the rough wall below the channel. Under such conditions it is of advantage to the accuracy of the sample to have had a clean wall in the beginning, so that any foreign material will not become mixed with the sample.

The portion of the face to be sampled may be further cleaned by drilling a preliminary channel, say about half an inch deep. In the work described the preliminary channel was not cut, owing to the hardness of the rock and the limited time available, but it would be advisable under certain conditions.

Two pieces of canvas, each about six by eight feet, were then laid down on the floor of the level, in such a manner that one piece overlapped the other several inches. Two pieces were used instead of one large piece of canvas, because they are more easily handled. The area of the canvas should be sufficient so that all of the drillings, say from a 5-ft. sample, can be caught on it, thus avoiding any loss of time that would otherwise result if the canvas had to be moved before the completion of the cutting of the sample.

In the case of the wall samples, the edge of the canvas was turned up along the wall. A third strip of canvas was then placed against the wall and supported by inclined pieces of drill steel or other means, in such a manner that it covered the lower several feet of the wall, reaching from just below the line of the sample and overlapping the floor canvas. This was found to be necessary, as, without the third strip of canvas, much of the sample might be lost by falling down under the edge of the floor canvas.

TWO MEN ON DRILL ADVISABLE

Though it is possible for one man to operate the jackhammer without a support, it is advisable, particularly in hard rock or ore, to use two men and to furnish a support for the drill, as it is not as tiring, and a greater amount of work and a higher degree of accuracy will result. Two supports were used at different times. One was a short piece of ladder and the other a cross-stand. The stand was made of two pieces of 2-in. pipe about 4 ft. long and two pieces of 2-in. pipe about 6 in. long, screwed into a 2-in. cross, forming an X, in which the two longer pieces were the legs of the stand and the two shorter pieces on top formed the saddle or crotch, in which the jackhammer was placed in an approximately horizontal position, and at right angles to the plane of the stand. Elbows should be screwed on to the lower ends of the legs, as otherwise the sharp edges of the pipe will cut through the canvas. Though 2-in. pipe was used, it is thought that lighter and smaller pipe will serve the purpose as well; if not better.

The cross-stand support, with the longer lengths of pipe down, was placed on the canvas parallel to the wall, and the jackhammer was then placed in the upper crotch between the short pieces of pipe, at such a distance from the wall that the drill-bit would rest at the rock or face.

The driller operated and directed the jackhammer with the assistance of the helper, who at times was required to hold the drill bit at the working face when starting a cut. In addition, the helper had at all times to hold a sack saddled over the drill and against the

face, covering the channel sufficiently above and below, so as to prevent the chips and drillings from being lost through flying or scattering off the floor canvas. The sack of cloth was about 12 x 16 in. in size. On one of the longer edges a light stick was nailed, and from the other long edge of the sack a cut or slit was made at right angles for about 8 in. and toward the edge on which the stick was nailed, so that when held horizontally and lowered over the drill, the sack would saddle the drill and permit it to be operated through the slit, the sack covering the face of the rock or ore being sampled. It serves the purpose of a buffer, against which the chips and drillings strike, and then fall to the floor canvas. This was found to be necessary, for, without it, the chips and drillings scattered off the canvas to a considerable extent, and the accuracy of the sample was consequently impaired.

Upon the completion of a cut or channel, the walls (which at the start had been washed clean) were lightly brushed down, so that all drillings or chips which had clung to parts thereof were collected with the remainder of the sample on the floor canvas. To eliminate as much as possible of the error that might be caused by pieces of rock or ore falling off the face or walls, it was decided that all such pieces should be discarded, and that the samples should consist only of the drillings and chips actually cut from the channel. This was considered more advisable than to attempt to make proportional allowances in the channel for pieces of ore or rock that would fall from the face, as the latter course would probably have introduced additional errors. Therefore if any pieces of rock or ore had fallen off the wall, these pieces were picked out of the samples, cleaned off, and thrown away. The sample was then transferred from the canvas to a powder box, and then to a sack, which was labeled by tags inside and out, and sealed.

The holes in the ends of the drill bits may be plugged with wood, so as to decrease the amount of dust and possible loss therefrom. The cross bit has the advantage over the Carr bit, at least when starting a cut, but both kinds were used, as some of the crews preferred the Carr bit, whereas others preferred the cross bit. Several check samples were taken toward the end of the work, and the results showed a close comparison with the original samples.

Portable Electric Arc Welder

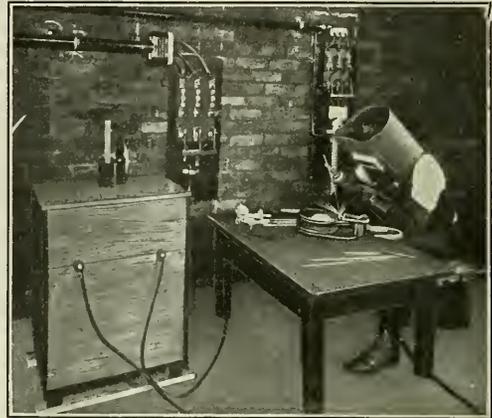
Electric arc welding of the past has been thought of in the light of large installation of considerable cost. It has further been understood that since the installation consists of a motor generator set entailing moving parts, there might be some difficulty in connection with its operation from time to time. It has always been understood to be inefficient on cast iron and in connection with over-head welding.

The new "Zeus" arc welder manufactured by the Gibb Instrument Co., of Detroit, Mich., consists of a simple transformer with no moving parts. It has been found that the current consumption is from 20 to 40 per cent less than the motor generator type. One feature is its adaptability to overhead welding, which class of welding has given considerable trouble in the past. It has further been found to be adaptable to the welding of cast iron.

This type of welder is comparatively small, and, because of its convenient size, it is portable. It is built on a unit system whereby a 150-ampere machine

may be installed, and when the work becomes heavier a duplicate may be connected in parallel with the original machine.

One of the features of the welder is its arrangement for regulation. It is not necessary to change the connections in any way in the regulation of the



PORTABLE ELECTRIC ARC WELDER IN USE

arc. A wheel connected with the secondary and extending through the top of the case, raises and lowers the secondary and provides for the regulation of the current necessary for different sizes of electrodes. The inherent reactance automatically stabilizes the arc for different arc lengths.

Nechi Mines, Ltd., (Colombia)

The annual report of the Nechi Mines, Ltd., Colombia, for the year ended Sept. 30, 1918, states that 1,076,558 cu.yd. were dredged from Nechi ground during the first six months of the year, the gross value of gold recovered being \$253,787, averaging 23.57c. per cu.yd., with an average depth of 45.3 ft. The field costs averaged 4.9c. per cu.yd. During the previous twelve months, 1,883,659 cu.yd. was dredged, the gross value of the gold recovered being \$489,959, averaging 26.01c., with an average depth dredged of 55 ft. The field costs averaged 5.55c. per cu.yd. The sum of \$1,000 per month for rental was paid to the Pato Co. for the use of its plant.

During the second half of the year, 1,066,371 cu.yd. was excavated by the Nechi dredge from Pato grounds, the field costs averaging 6.7c. per cu.yd. The dredge operated 76.1 per cent of its full time, as compared with 61.8 per cent for the previous year. The original estimated gross value in the Nechi prospected area was \$4,926,600. There has been extracted by dredging operations since the formation of the company \$1,287,985. The year's extraction for 1917-18 was \$253,787, making the extracted value since the beginning of operations \$1,540,872, and leaving available for dredging on the tested areas \$3,385,728.

The net receipts, including gold returns, £50,229, platinum, £225, and the company's share of the profit from the working of the Nechi dredge on the Pato ground, £8,320, amounted to £64,199. Field costs were \$18,552.

The War Minerals Relief Scandal

UNDER the above caption, in the *Mining and Scientific Press* of Aug. 16, 1919, beginning on page 219, appeared the following editorial:

We return to this subject because it is vital to a large number of miners in the West and concerns a matter of public policy that ought to interest every citizen. We regret to observe several signs of an effort on the part of Government officials to over-zealousness, verging on cheap smartness, in the interpretation and administration of the Act passed by Congress for the purpose of compensating those who, in response to a patriotic call, engaged in the production of chrome, manganese, pyrite, and tungsten, and who, in their attempt to fulfil a national duty, suffered financial loss, chiefly through the bungling of the Ferro-Alloys Section of the War Industries Board last year. In our issue of July 19 we criticized the way in which the Secretary of the Interior, in whose hands the administering of the Relief Act was placed, "passed the buck" to the Attorney-General, and the latter's technical interpretation of the Act in such a way as to exclude from relief a large number of miners who were importuned to produce the needed minerals by the press propaganda of Secretary Lane himself. We note that the Relief Commission, now in session at Medford, Oregon, has received a letter from Mr. Henry M. Parks, the Director of the Oregon Bureau of Mines, in which he testifies to having ordered the field staff of his bureau "to do everything possible to encourage new development, and speed up the production of manganese and chrome." According to the Attorney-General's ruling, the fact of engaging in the mining of these minerals at the instance of the Oregon Bureau of Mines will not suffice to justify the award of compensation, because the claimant cannot prove that he had been "asked specifically by one of the five Government agencies named in the Bill." Yet Mr. Parks testifies that in October, 1917, he received a letter from Mr. George Otis Smith, Director of the U. S. Geological Survey, requesting him "to exert every effort to increase the domestic production of chrome ore" and "to this end," Mr. Smith added, "the hearty co-operation of your organization is earnestly invoked." Is the Government to go back on Mr. Parks and the members of his staff, stultifying and dishonoring them in the eyes of the men who trusted in them and believed them to be authorized in their efforts to stimulate the production of chrome and manganese in Oregon? Legal gentlemen say that "good conscience" should determine the validity of claims; we ask what kind of conscience has an official who distinguishes between a request made by "one of the five Government agencies named in the Bill" and a request made known by persons to whom the said agencies appealed for help in advertising their urgent demands, whether it be the director of a State bureau in Oregon or the editor of a respectable paper in San Francisco. In our issue of August 2, we criticized the nature of the cross-examination to which claimants are being subjected by the Relief Commission. There is this further point to be made, that the claimants for larger amounts are able to present briefs prepared by a competent lawyer and they go before the Commission accompanied by a lawyer, so that the amiable attempt to subject them to a crude and misleading psychological test does not succeed, although it does succeed in raising an entirely false issue when applied to the less sophisticated claimants.

Now we come to another unpleasant phase of this affair. We are informed that Mr. J. E. Spurr, Chief Engineer for investigative work under the Act, insists upon having all reports sent to him direct at Washington. When the Relief Bill was passed, a corps of examiners was organized for the purpose of scrutinizing the correctness of the claims presented to the Commission. The reports of these examiners are essential to the adjudication by the Commission, yet the Chief Engineer has refused to allow this necessary information to be given promptly to the Commission, insisting upon the reports being sent to Washing-

ton, to be abstracted by him, thereby further delaying the awards, which in any event are going to be unconscionably belated. What is worse, he has seen fit to dismiss an engineer for telling the truth. We regret to make this strong criticism, because the Chief Engineer has just arranged to become the editor of our competitor at New York, but this is a matter too important to be set aside on personal grounds; it concerns the profession deeply, as will be shown. Among the engineers retained by Mr. Albert Burch, acting for the U. S. Bureau of Mines in its campaign to promote the production of war minerals, was Mr. R. H. Toll, whom we have known for 20 years as an intelligent, trustworthy, and honorable mining engineer. In the performance of his duty he told Mr. L. R. Payne, of Fresno, of the need for intensifying the production of chromite and of the Government's intention to protect the producer by market control. At Mr. Payne's request, he confirmed his verbal statement by a written one to the same effect. This letter was submitted by Mr. Payne as part of his evidence when he presented his claim for compensation to the Commission. Meanwhile Mr. Toll had been again engaged by the Government, this time as an examiner under the Relief Act, and he was doing his work when he received the following telegram from the Chief Engineer: "With reference to claim 480 L. R. Payne & Co., Fresno, California, on March 12, 1919, you wrote the manager a letter in which you state 'In addition to patriotic motives in doing this you had the assurance of the Government through me that you would be protected at least a year on the prevailing market price.' You must be aware that no branch of the Government ever gave such assurance or had the authority for so doing and that you have no authority to make this statement; under the circumstances it would evidently be better if your present temporary appointment, which expires July 31, should not be renewed; will you turn over the claims and data which you have on hand to Mr. Hyder, who will leave for San Francisco within a few days." Whereupon Mr. Toll replied by quoting from two statements made by the Chief Engineer himself and now to be found in the records of the Relief Commission. The first was a telegram of August 8, 1918, to Mr. Burch, as follows: "War Board in Washington are all agreed that California chrome production shall be maintained and are ready to take whatever steps are necessary. Just what these steps [are to be] will be determined promptly." The second was a letter of September 30, 1918, to Mr. Charles H. Holbrook, as follows: "Reply to your letter of September 12th has been delayed pending a survey of the chromite situation by various Government departments. The War Industries Board telegraphed to Mr. Burch of San Francisco as follows: 'It may be announced that it is the present intention of the War Industries Board to arrange for continued production in the United States for the first half of 1919 at the rate proportionate to the rate of 1918 production, and the trade will be asked to purchase chromite produced in the United States during the first half of next year at this rate.' No doubt machinery for carrying this program into effect will be devised by the War Industries Board." On September 27, 1918, Mr. H. W. Sanford, chief of the Ferro-Alloys Section of the War Industries Board, telegraphed a little more explicitly: "It is the present intention of the War Industries Board to arrange for continued chromite production in the United States for the first half of 1919 at a rate proportionate to the rate of 1918 production, and the trade will be asked to purchase chromite of suitable grade produced in the United States during the first half of next year at this rate. No announcement can be made regarding prices. Believe tonnage of domestic chromite produced during the balance of this year can be sold at the average prices paid this summer by the California Chrome Company. If unable to find ready market for ore, wire this office, giving tonnages ready for immediate delivery and guaranteed analysis and prices wanted and to whom already offered and refused. Chemical refractories and steel trades likely buyers." This

telegram was addressed to the President of the San Francisco Chamber of Commerce. The references to 'market' and 'rate' made in the statements of Government agents have no meaning, of course, unless they signify a price at which the products mentioned could be sold remuneratively. It seems to us that Mr. Toll was justified in the statement he made to Mr. Payne in June, 1918, and confirmed by letter subsequently. Mr. J. S. Diller and other representatives of the Geological Survey told the Californian miner to start the mining of chrome before the War Minerals Bill was passed; the miner in the hills was told that it was "as good as passed"; in the Bill it was stated: "The Secretary of the Interior, with the approval of the President, is authorized from time to time to enter into contracts for necessities for periods not exceeding two years," which was an implicit guarantee of a profitable market for at least two years. One of the oldest games in the world is for a superior to tell a subordinate to do something and then fail in moral courage to back him up later. Mr. Toll's statement to Mr. Payne was based on what he had been told by those in charge of the chrome propaganda; it was made in good faith both to the Government and to the chrome miner. Is a professional man expected to say one thing to the buyer and another to the seller? Is he a mere hireling?

These people at Washington do Uncle Sam small honor if they suppose that so frank, big-hearted, and honorable a gentleman could desire his servants and assistants to employ such pawky tactics. It appears that the new editor of the 'Engineering and Mining Journal' is to follow in the tradition of his predecessor, who opposed both the War Minerals Bill and the Relief Bill, which was its logical sequence, and, not content with such opposition, has seen fit to sneer at the miner of the West as a 'profiteer' and 'patrioteer'. One word more, to summarize the whole affair: what would be the attitude of the mine, not to the Government, but to the representatives of the Bureau of Mines, Geological Survey, and Department of the Interior, if the United States became involved in another war, calling again for an intensive production of sundry minerals? What would the miner say to these gentlemen? His language, like that of Bret Harte's hero, would be, we venture to guess, "painful and free."

Under date of Aug. 20, 1919, reply to the above editorial was made as follows:

Editor, *Mining and Scientific Press*,
San Francisco, California.

Dear Sir:

I note your editorial on the War Minerals Relief "Scandal" in your issue of August 16, and it apparently calls for a reply. I will not attempt to follow the sinuosities of your article, but will go straight to the point and give certain information which you could have had before if you had wanted it.

1. It may interest you to know that on May 9, 1919, I submitted to the proper authorities a plan to interpret the provision which Congress had inserted in the War Minerals Relief Act (limiting the possibility of compensation to those who had produced certain minerals "in compliance with the request or demand" of certain Departments and War Boards), by assuming that the *general Government campaign of stimulation* could be interpreted as such a request or demand. There follow extracts from my presentation, which was a long one and contains much that is not germane to the point I wish to make:

"The proper application of the Act and the correct interpretation of the phrase above quoted can only be made through a close knowledge of the history of the situation which led miners to feel that the Government had enlisted assistance in a program of which the Government itself failed to carry out its part, and led Congress to see the justice of their complaint and

to provide for compensation at the Secretary's discretion.

"The activity of the Government which gave rise to the situation on which the claims of the miners for compensation were based, was that of the Shipping Board and the War Trade Board, which, in accordance with the Executive Order of the President to secure ships for military purposes by cutting down imports, formulated and put into effect a program for the restriction of imports of pyrites, chromite, and manganese, and called on the country in unmistakable and vigorous terms to produce enough to make good the deficiency as an act of patriotism.

"The general active stimulation and vigorous encouragement which amounted practically to a general 'request or demand' by the Government concerning these minerals warrants, in my opinion, a general plan of compensation for the losses entailed in mining these minerals as a consequence of this governmental campaign of stimulation; and is a far stronger justification for compensation by the Government than the representations or informal advice, opinion, or encouragement of any minor official or officials of the Government."

2. You must know, however, that in the United States the only body or individual authorized to dip its hand into the public Treasury is Congress. The question was, therefore, not what I or you, the Commission or the Secretary, would like to pay out of the Treasury, but what Congress had authorized to be paid out; our personal opinions do not warrant our tapping the public funds, whether for our own enrichment or that of our friends, or of attempting to do so; and, fortunately for the public, there would be little guarantee of personal safety to anyone thus attempting to carry out his convictions. The matter was finally referred to the Attorney General, as the official interpreter of legislative language, and he rendered on July 1, 1919, a decision, in which he clearly showed from the language of the act and its history, the intent and authority of Congress. He stated, "The language used could hardly be more clear or allow less room for construction. No claim based upon a general solicitation or appeal is recognized by it, but to come under the statute the claimant must have been asked specifically by either the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation to produce or prepare to produce one or more of the four named minerals."

Even the Attorney General, you must know, has no authority to modify legislation. Your editorial would indicate that you thought he had.

3. The work done by Mr. Burch and his assistants in stimulating the production of chromite and other war minerals on the Pacific Coast was of the most effective and valuable character, and their patriotic services have always been fully appreciated by their colleagues in Washington. The stimulation was of the most vigorous kind which circumstances and their authority permitted; not only individuals were exhorted, but addresses were made by the engineers at public gatherings in mining districts. (Entirely similar activity, it may be noted, was carried on by Government engineers and geologists in the East.) It was on account of this most valuable work and their familiarity with the field that on the organization of the War Minerals Relief field examinations as many of the old

staff as could be secured were re-engaged. Only Messrs. Shonts (in Oregon) and Cameron and Toll (in California) could be secured.

4. All decisions relative to War Minerals Relief are in the hands of the Commission. On request, I undertook (dare I say for patriotic reasons?) to prolong my war time connection with the Government long enough to organize the investigative force, but no longer. The function of this force is to provide the Commission with such facts as they may request, whereon to base their decisions. Therefore, I do not know what their attitude may be on any question, but personally (not officially) I have always felt that the case of the Pacific Coast chrome miners was one of the strongest which they will have to consider on this very point of "request or demand," and precisely on account of the requests presented by our field engineers. And in the case of each claim which comes up for examination (this applies to the whole United States) the field engineer or other Government official who is named by the claimant as having made upon him a request or demand for production, is immediately interrogated by special letter as to the facts, and such testimony is very influential in determining the order of examinations. In the case of large numbers of claims, we have the written testimony of engineers, nearly all of them now on our staff or on that of the Geological Survey, that they made such request or demand, and, in my personal opinion, these represent a very strong class of claims for the Commission to consider.

5. The claim of L. R. Payne & Co., No. 480, was judged on the basis of Mr. Toll's testimony to belong in the above class, and a field examination was ordered July 18, 1919, by Harry Sheafe, engineer (employed on recommendation of Mr. Burch) and E. L. Fleming, auditor.

6. What, then, was the basis for discontinuing Mr. Toll's services as field examiner, of which he and you make a national issue?

You state that he was dismissed "for telling the truth." Judged on the basis of this statement alone, you would have been in little danger of dismissal had you been in Mr. Toll's place.

In the interval between his engagements as Government engineer he made reports and affidavits for various claimants, whose mines he had examined while in the Government's employ in order to assist them in collecting from the Government. But I find no valid reason for criticising him for this. The reasons why his attitude might be considered by some as having become slightly unjudicial were:

a. He made these reports, letters, and affidavits for the claimant for a monetary consideration, as I was advised by the Commission when in San Francisco.

b. In his letter written for the Payne Co. to exhibit he overstated the facts. He stated that he gave claimant certain sweeping Government guarantees on June 7, 1918. When his authority for this was challenged he cited first a letter written by me to another party on September 30, 1918, second a clipping from the San Francisco *Examiner* of October 1, 1918, and third a telegram from myself to Mr. Burch dated August 8 or 9, 1918. In my reply to Mr. Toll I summed up as follows:

"All of this would seem to indicate to me that you derived your impression from the above letter and telegram, but at a subsequent time from that which you assign in your letter of July 23 to me and refer

to in your letter of March 12, 1919, to the L. R. Payne Co., and that accordingly your letter to the L. R. Payne Co. was an error of recollection. This would indicate a zeal in supporting the claimant which is hardly judicial."

It was felt that, to be above criticism, any question as to the judicial attitude of any examiner should be settled by relieving him of further responsibilities. Examiners must be prejudiced neither for nor against claimants. All appointments are temporary, as is (let us hope) the character of our work. No onus was involved, and it is too bad that Mr. Toll decided to rush into publicity and that you were hasty enough to take it up. Several other examiners have had their terms of employment terminated, but so far have not appealed to the President to be put on the payroll again.

Having given you a deal of information, I should like to have some myself:

1. What is your motive in rushing into a personal attack, without trying or apparently wanting to ascertain the facts? Many months ago, touched by your editorial efforts to comment intelligently on what was going on in Washington, I wrote you, offering to write or telegraph information whenever you wished it. You have never called for any.

2. This is a psychological problem. Why is it that an editor who hates the daily yellow press as laudably as you do should himself tend so strongly in the direction of technical yellow journalism?

I shall be glad if you will publish this letter in full.

Yours very truly,

J. E. SPURR.

Federal Taxation of Mines

The mines of the country are called upon to bear a large part of the enormous taxes which must be raised. The Internal Revenue Bureau, which is charged with the assessment and collection of these taxes, desires that the taxation laws shall be administered in a fair and businesslike way. The application to mines, however, which have wasting assets, involves questions of particular complication and difficulty. To meet this situation, there has been established in the income-tax branch a section of mine valuation, in which these specific problems of the industry will be handled by competent engineers. It is realized, however, that something more than this is required for the satisfactory application of the tax laws to the mines, namely, as complete understanding as possible between the Government and the taxpayer, a spirit of co-operation as between the two, and every possible assistance and advice from mine owners and mining engineers.

At the Chicago meeting of the A.I.M.E., Dr. L. C. Graton, a member of the valuation section of the Internal Revenue Bureau, will outline the general problems involved in the mine-taxation program, and will present the methods for accomplishment of that program which are now under consideration and which it is hoped may be improved and made authoritative by the suggestions which may come from the members of the Institute. In this way it is hoped that fundamental principles may be established and individual settlements reached that will be so reasonable and fair that they will be final. The Government entertains the earnest desire, and a similar wish is shared by the institute, that the fullest discussion may be given to this subject at the Chicago meeting.

Chicago Meeting, A. I. M. E.

Papers To Be Presented Include Great Variety of Subjects—Special Arrangements Made for The Entertainment of Wives and Daughters of Members—Informal Talks At Smoker—Programs of the Sessions

THE program of the technical sessions to be held at the 120th meeting of the American Institute of Mining and Metallurgical Engineers, Chicago, Ill., Sept. 22 to 26, includes a large number of papers covering a wide variety of subjects. These, arranged by sessions, are as follows:

SESSION ON NON-FERROUS METALLOGRAPHY†

MONDAY, SEPT. 22, 11 A.M.

- "Manufacture and Electrical Properties of Manganin." By J. E. Bash.
- "Grain Growth in Alpha Brass." By F. G. Smith. Illustrated by lantern slides.
- "Five Foundry Tests of Zinc Bronzes." By C. P. Karr.
- "Manufacture and Electrical Properties of Constantan." By J. E. Bash.
- "In Fusible Boiler Plug Manufacture and Testing." By L. J. Gurevich and J. S. Hromatko.
- "Heat Treatment of Aluminum Alloy Castings." By Zay Jeffries and W. A. Gibson.
- "Influence of Heat Treatment on Gun Metal." By C. F. Smart.
- "Deterioration of Nickel Spark-Plug Terminals in Service." By Henry S. Rawdon and A. I. Krynitzky.
- "Heat Treatment of Duralumin." By Paul D. Merica, R. G. Waltenberg, and H. Scott.
- "Mechanical Properties and Resistance to Corrosion of Rolled Light Alloys of Aluminum and Magnesium With Copper, Nickel and Manganese." By Paul D. Merica, R. G. Waltenberg, and A. N. Finn.
- "Simplification of Inverse-Rate Method for Thermal Analysis." By Paul D. Merica.
- "Constitution and Metallography of Aluminum and Its Light Alloys With Copper and With Magnesium." By Paul D. Merica, R. G. Waltenberg, and J. R. Freeman, Jr.
- "Some Properties and Application of Rolled Zinc Strip and Drawn Zinc Rod." By C. H. Mathewson, C. S. Trewin, and W. H. Finkeldey.
- "Physical Properties of Certain Lead-Zinc Bronzes." By Homer F. Staley and C. P. Karr.
- "Physical Properties of Nickel." By David H. Browne and John F. Thompson.

SESSION ON MINE TAXATION

MONDAY, SEPT. 22, 11 A.M.

- "Mine Taxation." By Dr. L. C. Graton.

SESSION ON COAL AND GAS

MONDAY, SEPT. 22, 11 A.M.

- "*Research in the Coal-Mining Industry." By E. A. Holbrook.
- "*Some Factors That Affect the Washability of a Coal." By Thomas Fraser and H. F. Yancey.
- "A Use Classification of Coal." By George H. Ashley.
- "Distribution of Anthracite." By A. S. Learoyd.

SESSION ON COAL AND GAS

MONDAY, SEPT. 22, 2 P.M.

- "*Height of the Gas Cap in the Safety Lamp." By C. M. Young.
- "*Engineering Features of Modern Large Coal Mines in Illinois and Indiana." By C. A. Herbert and C. M. Young.

†These papers, which will be presented at the Philadelphia meeting of the Institute of Metals Division, Sept. 29-Oct. 2, will be read here by title only to afford opportunity for discussion. Papers marked * will be presented by the authors; ** by the authors' representatives; all others by title only.

- "*Gas-Producer Practice." By G. S. Brooks and C. C. Nitchie.
- "*Testing of Coals for Byproduct Coking and Gas Manufacture." By Horace C. Porter.
- "*Coals of Ohio and Their Limitations for Byproduct Coke." By Wilber Stout.
- "*Outdoor Substations in Connection With Coal-Mining Installations." By H. W. Young.

SESSION ON GEOLOGY

MONDAY, SEPT. 22, 2 P.M.

- "*Chrome-Ore Deposits in Cuba." By Ernest F. Burckhard.
- "*Recent Studies of Domestic Chromite Deposits." By J. S. Diller.
- "*Manganese-Ore Deposits in Cuba." By Ernest F. Burckhard.
- "*Correlation of the Formations of the Huronian Group in Michigan." By R. C. Allen.
- "*Mud Volcanoes in Colombia." By Stanley C. Herold.
- "*Magnesite; Its Geology, Products and Their Uses." By C. D. Dolman.
- "*Titaniferous Iron Sands of New Zealand." By V. W. Auhel.
- "*Recent Studies of Domestic Manganese Deposits." By E. C. Harder and D. F. Hewett.

SESSION ON MILLING

MONDAY, SEPT. 22, 2 P.M.

- "*Chilean-Mill Practice at the Portland Mill." By Luther W. Lennox.
- "*Graphic Metallurgical Control." By H. M. Merry.
- "*Mill Operations at the United Eastern During 1917-1918." By Wheeler O. North.
- "*Crushing Practice at New Cornelia Copper Co." By W. L. Du Moulin.

SESSION ON INDUSTRIAL ORGANIZATION

MONDAY, SEPT. 22, 2 P.M.

- "*Method of Curtailling Forces at the Copper Queen." By Charles F. Willis.
- "*Educational Methods at the Copper Queen." By Charles F. Willis.
- "*Physical Examination Previous to Employment." By Charles F. Willis.

SESSION ON IRON AND STEEL

TUESDAY, SEPT. 23, 2 P.M.

- "*Blast-Furnace Refractories." By Raymond M. Howe.
- "*Effervescing Steel." By Henry D. Hibbard.
- "*Aircraft Steels." By Albert Sauvour.
- "*Determining Gases in Steel and the Deoxidation of Steel." By J. R. Cain.
- "*Effect of Time and Low Temperature on Physical Properties of Medium-Carbon Steel." By G. A. Reinhardt and H. L. Cutler.
- "*Erosion Tests of Rifle Barrels." By A. E. Bellis.
- "*Metallography of Rifle-Barrel Steel." By G. F. Butterworth.

SESSION ON IRON AND STEEL

TUESDAY, SEPT. 23, 8 P.M.

- "*Industries of the Chicago District." By T. W. Robinson. Illustrated with lantern slides.
- "*Manufacture of Steel Rails." By Robert W. Hunt.
- "*The World's Largest Plate Mill." By C. L. Hunter.

SESSION ON OIL

TUESDAY, SEPT. 23, 8 P.M.

- "Irvine Oil District, Kentucky." By Stuart St. Clair.
 "Petroliferous Provinces." By E. G. Woodruff.
 "Investigations Concerning Oil-Water Emulsion." By A. W. McCoy, H. R. Shidel, and E. A. Trager.
 "Essential Factors in Valuation of Oil Properties." By Carl H. Beal.
 "Application of Law of Equal Expectations to Oil Production in California." By Carl H. Beal and E. D. Nolan.
 "Value of American Oil Shales." By Charles Baskerville.

SESSION ON IRON AND STEEL

WEDNESDAY, SEPT. 24, 10 A.M.

- "Cooling Properties of Technical Quenching Liquids." By N. B. Pilling and T. D. Lynch.
 "Differential Crystallization in Cast-Steel Runner." By Francis B. Foley.
 "Manufacture and Properties of Light-Wall Structural Tubing." By H. J. French.
 "Oxygen in Cast Iron and Its Application." By Wilford L. Stork.
 "Graphitization of White Cast Iron Upon Annealing." By Paul D. Merica and L. J. Gurevich.
 "Experimental Data Obtained on Charpy Impact Machine." By F. C. Langenberg.
 "Heat Treatment of Cast Steel." By John H. Hall, Arvid E. Nissen, and Knox Taylor.
 "Deep Etching of Rails and Forgings." By F. M. Waring and K. E. Hofamann.

SESSION ON SULPHUR IN COAL

WEDNESDAY, SEPT. 24, 10 A.M.

- "Geographic Distribution of Sulphur in the West Virginia Coal Beds." By I. C. White.
 "Occurrence and Origin of Finely Disseminated Sulphur Compounds in Coal." By Rheinhardt Thiessen. Illustrated by lantern slides.
 "Mechanical Separation of Sulphur Minerals From Coal." By J. R. Campbell.
 "Sulphur in Coal—Geological Aspects." By George H. Ashley.
 "Forms in Which Sulphur Occurs in Coal." By A. R. Powell.
 "Effect of Sulphur in Coal Used in Ceramic Industries." By C. W. Parmelee.

SESSION ON SULPHUR IN COAL

WEDNESDAY, SEPT. 24, 2 P.M.

- "Removal of Sulphur From Illuminating Gas." By W. W. Odell and W. A. Dunkley.
 "Low Sulphur in Coal." By H. M. and T. M. Chance.
 "Low-Sulphur Coals of Kentucky." By Willard R. Jillson.
 "Low-Sulphur Coal in Illinois." By Gilbert H. Cady.
 "Sulphur in the Coking Process." By S. W. Parr.
 "Commercial Recovery of Pyrite From Coal." By S. H. Davis.
 "Sulphur in Producer Gas." By F. Crabtree and A. R. Powell.

SESSION ON MINING AND LOCAL RESOURCES

WEDNESDAY, SEPT. 24, 10 A.M.

- "Wisconsin Zinc District." By W. F. Boericke and T. H. Garnett.
 "Mineral Resources of the La Salle District." By J. A. Ede.
 "New Angles to the Apex Law." By John A. Shelton.
 "Mining Methods of Alaska Gastineau Mining Co." By G. T. Jackson.
 "Tunnel Driving at Copper Mountain, B. C." (Columbia Section Paper). By Oscar Lachmund.
 "Geology and Mining Methods at Pilares Mine." By W. Rogers Wade and Alfred Wandtke.

"Wedging Diamond-Drill Holes." By O. Hall and V. P. Row.

SESSION ON NON-FERROUS METALLURGY

WEDNESDAY, SEPT. 24, 2 P.M.

- "Electric-Resistance Furnace of Large Capacity for Zinc Ores." By Charles H. Fulton. Illustrated by lantern slides.
 "Water and Chlorides in Cement Copper Briquettes." By Edward Keller.
 "Chemical and Electrochemical Problems Involved in New Cornelia Copper Company's Leaching Process." By Henry S. MacKay.
 "Electrolytic Zinc." By C. A. Hansen.
 "Treating Antimony Ores." By George P. Hulst.

SESSION ON PYROMETRY WITH SPECIAL REFERENCE TO IRON AND STEEL METALLURGY

WEDNESDAY, SEPT. 24, 2 P.M.

- "Report of Committee on Pyrometry of National Research Council." By George K. Burgess.
 "Pyrometry in Blast-Furnace work." By P. H. Royster and T. L. Joseph.
 "Pyrometry and Steel Manufacture." By A. H. Miller.
 "Electric Open-Hearth and Bessemer Steel Temperatures." By F. E. Bash.
 "Some Thermal Relations in the Treatment of Steel." By Charles F. Brush. Illustrated by lantern slides.
 "Pyrometry in the Tool Manufacturing Industry." By J. V. Emmons.
 "Rate of Heating and Cooling of Large Ingots for Forging." By F. E. Bash.

SYMPOSIUM ON PYROMETRY¹

THURSDAY, SEPT. 25, 10 A.M.

- "Temperature." By J. S. Ames.
 "Standard Scale of Temperature." By C. W. Waidner, E. F. Mueller, and Paul D. Foote.
 "Metals for Pyrometer Standardization." By C. W. Waidner and George K. Burgess.
 "Fundamentals of Pyrometry." By C. E. Mendenhall.
 "Thermoelectric Pyrometry." By Paul D. Foote, T. R. Harrison, and C. O. Fairchild.
 "Potentiometers for Thermoclement Work." By Walter P. White.
 "Self-Checking Galvanometer Pyrometer." By H. F. Porter.
 "Some Factors Affecting the Use of Base-Metal Thermocouples." By O. L. Kowalke.
 "Tables and Curves for Use in Measuring Temperatures With Thermocouples." By L. H. Adams. Illustrated by lantern slides.
 "Reference Standard for Base-Metal Thermocouples." By N. E. Bonn.
 "Alloys Suitable for Thermocouples and Base-Metal Thermoelectric Practice." By J. M. Lohr.
 "Recent Improvements in Pyrometry." By R. P. Brown.
 "Automatic Correction for Temperature of Cold Junctions." By F. Wunsch.
 "Hot Wire Anemometer With Thermocouple." By T. S. Taylor. Illustrated by lantern slides.
 "Porcelain for Pyrometric Purposes." By F. H. Riddle.
 "Pyrometer Porcelains and Refractories." By R. W. Newcomb.
 "Porcelain Pyrometer Protecting Tubes." By F. A. Harvey. Illustrated by lantern slides.
 "Porcelain Tubes for Thermocouples." By R. B. Lincoln.
 "Melting Point for Refractory Materials." By Leo I. Dana.
 "High-Temperature Scale and Its Application in the Measurement of True, Brightness, and Color Temperature." By Edward P. Hyde.
 "Theory and Accuracy in Optical Pyrometry With Particular Reference to the Disappearing-Filament Type." By W. E. Forsythe. Illustrated by lantern slides.

¹Presented at the June, 1919, meeting of the American Society for Testing Materials, and read here by title to afford opportunity for discussion.

²In co-operation with the National Research Council and the U. S. Bureau of Standards.

"Optical and Radiation Pyrometry." By Paul D. Foote and C. O. Fairchild.

"Industrial Application of the Disappearing-Filament Type of Optical Pyrometers." By F. E. Bash.

"Use of the Optical Pyrometer for Control of Optical-Glass Furnaces." By C. N. Fenner.

"Emissive Powers and Temperatures of Non-Black Bodies." By A. G. Worthing. Illustrated by lantern slides.

"Recording Thermocouple Pyrometers." By Leo Behr.

"Recording Pyrometry." By C. O. Fairchild and Paul D. Foote.

"High Temperature Control." By C. O. Fairchild and Paul D. Foote.

"Resistance Thermometry." By F. W. Robinson.

"Tin; an Ideal Pyrometric Material." By E. F. Northrup.

"Resistance Thermometry for Industrial Use." By Charles P. Frey.

"Thermocouple Installation in Annealing Kilns for Optical Glass." By E. D. Williamson and H. S. Roberts.

"Annealing of Glass." By A. Q. Tool and J. Valasek.

"Pyrometry Applied to Bottle-Glass Manufacture." By R. L. Frink.

"Pyrometry in the Manufacture of Optical Glass." By Albert J. Walcott.

"Pyrometry as Applied to the Manufacture of Optical Glass." By Carl W. Keuffel.

"Pyrometry Shortcomings in Glass-house Practice." By W. M. Clark and Charles D. Spencer.

"Pyrometry in Manufacture of Clay Wares." By F. K. Pence.

"Application of Pyrometry to the Manufacture of Gas-Mask Carbon." By K. Marsh. Illustrated by lantern slides.

"Pyrometry in the Ceramic Industries." By C. B. Thwing.

"Pyrometry in Rotary Portland Cement Kilns." By Leo I. Dana and C. O. Fairchild.

"Pyrometry in the Ceramic Industry." By John P. Goheen.

"Temperatures of Incandescent Lamp Filaments." By Benjamin E. Shackleford. Illustrated by lantern slides.

"Temperature Measurements of Incandescent Gas Mantles." By H. E. Ives.

"Applications of Pyrometry to Problems of Lamp Design and Performance." By I. H. Van Horn. Illustrated by lantern slides.

"Use of Modified Rosenhain Furnace for Thermal Analysis." By H. Scott and J. R. Freeman, Jr.

"High-Temperature Thermometers." By R. M. Wilhelm.

"Temperature of a Burning Cigar." By T. S. Sligh and H. R. Kraybill.

"Teaching Pyrometry in Our Technical Schools." By George V. Wendell.

"Teaching Pyrometry." By C. E. Mendenhall.

"Teaching Pyrometry." By O. L. Kowalko.

"Present Status of Radiation Constants." By W. W. Coblenz.

"Pyrometer Protection Tubes." By Otis Hutchins.

The program of entertainment which has been arranged for the benefit of the wives and daughters of Institute members includes the following:

Monday: Theater party at the Riviera.

Tuesday: Trip to Gary, Ind.

Wednesday: Trip to Great Lakes Naval Station, leaving Congress St. station at 11 o'clock and returning from station at 3.45 p.m.

Wednesday evening: Banquet.

Thursday: Trip to La Salle, Ill.

Friday: Luncheon at the South Shore Country Club. Sears, Roebuck & Co. have extended an invitation to visit their plant, and guests are to be given a luncheon while there.

At the smoker to be held on Monday evening, Sept. 22, at 8.30, at the Chicago University Club, George S. Rice, F. G. Cottrell, and Frank H. Probert will speak on

their investigations and experiences in the war area. Mr. Rice will talk on coal and other features in the north of France, in the Cologne district, southern France, Westphalia, Belgium, and Great Britain, and will take up the subject of liquid oxygen as he observed it in Germany. Dr. Cottrell will talk of his own metallurgical observations in Germany and Austria as well as France, and Mr. Probert will speak on destroyed iron mines and steel plants in France.

The Sulphur Trade of Norway

The greater part of sulphur imported into Norway is used in connection with the sulphite paper-pulp industry, according to a recent consular report. The following table shows the imports and exports of sulphur by Norway from 1910 to 1918, inclusive, in metric tons:

NORWEGIAN SULPHUR IMPORTS AND EXPORTS, 1910-1918

Years	Imports	Exports	Years	Imports	Exports
1910	10,279	618	1915	6,804	41
1911	8,782	166	1916	7,262	..
1912	13,911	1,003	1917	4,071	..
1913	15,411	117	1918	3,036	..
1914	10,347	334	1919 (January and February)	116	..

From this table it is seen that the use of sulphur before the war was almost twice as large as the use since 1914. This was probably due in part to the substitution of pyrites for sulphur at the pulp mills, and also to the use of substitutes in other lines, because of the advancing prices. Also, there is a probability that the stocks of sulphur in the country have been almost completely wiped out since 1914, and thus the actual use since that date has been somewhat greater than the figures indicate.

In connection with the use of pyrites, the report states that, though pyrites constitute one of the leading exports from Norway, they are also extensively used in the paper-pulp industry. The introduction of the pyrite process has been progressing rapidly since 1904, and now it is reported that the greater number of the mills are so equipped, and hence normally use pyrites instead of sulphur. In this connection the following figures showing the production of pyrites are interesting: 1911, 369,055 metric tons; 1912, 464,326; 1913, 441,291; 1914, 414,886; 1915, 513,335 metric tons. The statistics subsequent to 1915 are not available, but the annual production has been at least as great as in that year, as the demand has been large, and at relatively high prices.

During the war, exports of pyrites did not keep pace with the increased production, this signifying that the domestic use of pyrites increased soon after 1914. Exports of pyrites during the last five years were: 1914, 350,228 metric tons; 1915, 466,759; 1916, 253,362; 1917, 242,909; 1918, 240,774 metric tons.

Prior to the outbreak of the war the principal sources of supply of sulphur were Great Britain, Italy, and Spain, whereas in 1915 and 1916 Great Britain and Italy furnished almost the entire supply. Detailed statistics are not available since 1916, but it is known that in 1918 the United States furnished more than 50 per cent of the imports.

The present condition of the sulphur market in Norway is uncertain. The sulphite mills are facing difficulties with respect to marketing their products, and there are rumors that extensive shutdowns are probable, which, of course, will affect the market. Until these conditions become settled, conservatism in buying large quantities of supplies may be expected.

The Chemical Exposition at Chicago

Fifth National Congress of Chemical Industries Will Surpass Former Accomplishments in The Display of Attractive Exhibits—Program of the Sessions and of Papers and Entertainment Features

THE forthcoming Fifth National Exposition of Chemical Industries at the Coliseum and First Regiment Armory, Chicago, during the week of Sept. 22, promises, with the attendant society meetings, to be an assemblage worthy of the past accomplishments of this exposition. The managers report that there are as many exhibitors as at the last exposition, and that there are several who have never before been exhibitors and for whose displays visitors may look forward with interest. The old-established exhibitors have nearly all newly developed products, in which the chemical profession and industries will be interested.

The following program is of course subject to addition and revision, but from it the comprehensiveness of the meetings and discussions may be discerned.

The exposition hours are from 12 noon to 10:30 p.m.

MONDAY, SEPT. 22, 1919

12 m.—Opening of exposition.

2 p.m.—Meeting American Institute of Mining and Metallurgical Engineers at Congress Hotel.

8 p.m.—Opening addresses at Chemical Exposition Auditorium. Governor Frank O. Lowden of Illinois will make the address of welcome. Charles H. Herty, chairman of advisory committee, will respond. John W. O'Leary, president Metal Trades Association of Chicago, "The Relation of the Chemist to the Manufacturer."

9 p.m.—Motion pictures, in Chemical Exposition Auditorium.

TUESDAY, SEPT. 23, 1919

8 a.m.—Departure of members of the American Institute of Mining and Metallurgical Engineers and American Electrochemical Society on an excursion to the steel mills at Gary, Ind.

2 p.m.—Symposium on "America's Case in Chemistry," at Chemical Exposition Auditorium, Ellwood Hendrick, chairman.—Chairman's address.—"Dyestuffs," J. Merritt Matthews, editor *Color Trade Journal*.—"Chemical Porcelain," Herman S. Coors, of Herold China and Pottery Co.—"Laboratory Supplies," lamp-blown glassware and general apparatus, C. G. Fischer, of Scientific Materials Co.—"Instruments of Precision," J. M. Roberts, secretary Apparatus Makers' Association of U. S.—"Fine Chemicals," H. T. Clarke, of Eastman Kodak Co.—"Glassware," "Optical Glass," Harvey N. Ott, of Spencer Lens Co.—"Essential Metal Minerals" and "Pharmaceuticals" will be discussed.

8 p.m.—Motion pictures in Chemical Exposition Auditorium.—"History and Utilization of Coal": 1, "Story of Coal" (four reels accompanied by discussion by M. F. Leopold, of U. S. Bureau of Mines); 2, "The Manufacture of Beehive Coke" (one reel); 3, "Byproduct Coking With Koppers Ovens" (three reels).—Joint Technical Meeting of American Institute of Mining and Metallurgical Engineers and American Electrochemical Society at Congress Hotel.

WEDNESDAY, SEPT. 24, 1919

10 a.m.—Meeting at Chemical Exposition of American Electrochemical Society, for reading and discussion of the following papers: "The Effect of Amalgamation Upon the Single Potential of Aluminum," by Louis Kahlenberg and John A. Montgomery; "Depreciation in Small Dry Cells With Age," by A. J. Helfrecht; "Manganin," by A. Hunter and J. W. Bacon.—Registration and meeting at Chemical Exposition of Technical Association of Pulp and Paper Industry, in officers' room, First Regiment Armory. Address

of welcome. Opening address by president. Report of executive committee. Report of secretary-treasurer. Reports by standing committees.—Meeting at Chemical Exposition of American Ceramic Society.

12:30 p.m.—Adjournment for luncheon of all societies and for inspection of exhibits.

2 p.m.—Joint technical session American Electrochemical Society with American Institute Mining and Metallurgical Engineers at Chemical Exposition Auditorium. Subject: "Ferrous and Non-Ferrous Metallurgy." Among the papers to be presented are: "Electric-Resistance Furnace of Large Capacity for Zinc Ores," by Charles H. Fulton; "Electrolytic Zinc," by C. A. Hauser; "Treating Antimony Ores," by George P. Hulst; "Water and Chlorides in Cement Copper," by Edward Keller; "Chemical and Electrochemical Problems Involved in the New Cornelia Co.'s Leaching Process," by Henry S. Mackay; "Radiant Resistor Furnace," by A. J. Fitzgerald; "Electric Heat in the Typewriter Industry," by A. M. Clark; "Electric Furnace for Experimental Work," by A. J. Fitzgerald. Other papers are in the hands of the American Electrochemical Society Paper Committee for acceptance for these meetings. After meeting is adjourned, the electric furnace exhibits will receive careful inspection.

2:30 p.m.—Adjourned meeting at Chemical Exposition of American Ceramic Society resumed.

3:30 p.m.—Adjourned meeting at Chemical Exposition of Technical Association of Pulp and Paper Industry resumed.

6:30 p.m.—Dinner of Technical Association of Pulp and Paper Industry at Union League Club.

8 p.m.—Motion pictures in Chemical Exposition Auditorium: 1, "Resistance-Type Furnaces for Melting Non-Ferrous Metals"; 2, "Electric Furnaces in the Heat Treatment of Essential War Materials" (both films by courtesy of Electric Furnace Co.); 3, "The Detroit Rocking Electric Furnace in Operation" (courtesy of Detroit Electric Furnace Co.); 4, "Shawinigan Power Development and the Shawinigan Industries" (courtesy of Shawinigan Water & Power Co.); 5, "The American Chemical Society Meeting, April, 1919, at the National Aniline Chemical Co.'s plant, Buffalo, N. Y." (courtesy Community Motion Picture Bureau); 6, "The Making of Cut Glass"; 7, "Manufacture of Glass."

THURSDAY, SEPT. 25, 1919

9:30 a.m.—Meeting at Chemical Exposition of Technical Association of Pulp and Paper Industry, general business meeting.

10 a.m.—Meeting of American Electrochemical Society jointly with American Institute of Mining and Metallurgical Engineers, Symposium on "Pyrometry" at Congress Hotel.

12 m.—Technical Association Pulp and Paper Industry adjournment for luncheon as guests of Sears, Roebuck & Co., to be followed by visit to the paper mill plant.

2 p.m.—Meeting at Chemical Exposition Auditorium. H. E. Howe (Division of Industrial Research, National Research Council), "The Organization and Plans of the National Research Council, With Special Reference to the Industries"; Price Green (Industrial Commissioner, Canadian National Railways), "Fields for Industrial Development, Canadian National Railways"; Henry B. Faber (Industrial Filtration Corporation), "Filtration"; Thomas W. Pritchard (vice-president Fuel Products Corporation), "Destructive Distillation of Bituminous Material With Reduced Vapor Tension and Complete Temperature Control."

4 p.m.—Committee meetings of Technical Association Pulp and Paper Industry at Chemical Exposition.

8 p.m.—Motion pictures at Chemical Exposition. Jam Handy (vice-president Bray Studios), address during show-

ing of first two films: 1, "Formation of Coal Made Visible"; 2, "Chemistry of Gas Engines Made Visible."—American Electrochemical Society smoker at Congress Hotel.

8:30 p.m.—Technical Association Pulp and Paper Industry smoker at Union League Club.

FRIDAY, SEPT. 26, 1919

9 a.m.—Technical Association Pulp and Paper Industry will visit Forest Products Laboratory at Madison, Wis.

9:30 a.m.—Meeting American Electrochemical Society at Chemical Exposition Auditorium. Subject: Symposium on "Catalysis."

12:30 p.m.—Adjournment for luncheon.

2 p.m.—Meeting resumed on "Catalysis" by American Electrochemical Society.

8 p.m.—Motion pictures. Jam Handy (vice-president Bray Studios), "Art Exposes the Invisible in Chemistry," during the showing of special films: 1, "Chemistry in Munitions"; 2, "Chemistry of Photography"; 3, "Invisible Chemistry of the Electric Battery"; 4, "Invisible Phases of Crystallization." Price Green (Industrial Commissioner of Canadian National Railways), "Natural Resources on Canadian National Railways," during showing of stereopticon and motion pictures.—Award of Willard Gibbs Medal to W. A. Noyes, of University of Illinois, by Chicago Section of American Chemical Society.

SATURDAY, SEPT. 27, 1919

9:30 a.m.—Meeting at Chemical Exposition Headquarters of Technical Association of Pulp and Paper Industry for adjourned business session in Auditorium.

Afternoon—Technical Association Pulp and Paper Industry official visits of inspection to exhibits at Chemical Exposition.

2 p.m.—Meeting at Chemical Exposition Auditorium. Symposium on "Safety in Plant and Mine," under chairmanship of M. F. Leopold, safety engineer, U. S. Bureau of Mines.

8 p.m.—Motion pictures, depicting safety work in the plant and mine, by courtesy of U. S. Bureau of Mines.

During the week at the Chemical Exposition there will be shown upon the motion-picture program the following films not already placed by definite dates on this program:

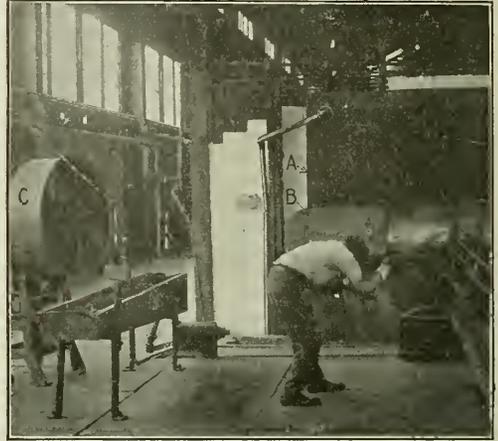
1. "Operation of Koppers Byproduct Coke Plant." (Courtesy the Koppers Co.)
2. "Continuous Motion Conveying, Stacking, Elevating, Loading and Unloading by Brown Portable Handling Machines." (Courtesy Brown Portable Conveying Machinery Co.)
3. "The Manufacture of Zinc Oxide." (Courtesy New Jersey Zinc Co.)
4. "The Making of Matches."
5. "Gold Mining in Canada."
6. "Building a Great Nitrate Industry at Muscle Shoals, Ala., by American Cyanamid Co."
7. "Quarrying Canadian Asbestos."
8. "Manufacturing Rubber Hose."
9. "Making Lime."
10. "The Silk Industry."
11. "The Steel Industry."
12. "The Iron Industry."
13. "The Oil Industry."
14. "Silver Mining in Bolivia."

These are all recently completed films. Others now being made will be finished in time for the exposition. The U. S. Bureau of Mines is completing a large series of films, on the metal and mineral mining and manufacturing industries, showing the progress of the mineral from its situs in the earth to the finished commercial metal or article. The titles of these films were not announced at the time of going to press.

The registration badges of all society members meeting at the exposition will admit them at the doors without other tickets.

Protecting Workmen From Heat

A heating furnace equipped with a water-cooled door, AB, in combination with an electric fan, C, which is designed to provide ample means for the protection of workmen compelled to work in an exposed position as shown, is illustrated herewith. The increased efficiency from the installation of such devices to alleviate the fatigue resulting from alternate exposure to the furnace heat and comparatively cool room atmosphere has warranted their more general adoption.



USING A WATER-COOLED DOOR AND ELECTRIC FAN FOR HEAT PROTECTION

The photograph is reproduced from the Bulletin of the Bureau of Safety, Sanitation and Welfare of the United States Steel Corporation, and shows the arrangement used at the works of the National Tube Co.

Brass Cartridge Cases for Sale

A million and a half brass cartridge cases are to be offered for sale by the War Department at 20 per cent above the current market price of their metal content. Aircraft manufacturers have advised the Director of Sales that there are many novelty and souvenir uses for these condemned shells.

The offering includes artillery cases of the following sizes: 75-mm., weight 2.61 lb.; 4.7-in., weight 8.25 lb.; 6-in., weight 7.03 lb.; 3-in., anti-aircraft, weight, 6.75 lb.

The Weight Per Rated Horsepower of a combined steam turbine and alternating-current generator is materially less than for a unit made up of a reciprocating steam engine and a generator of equivalent capacity. The floor space and volume space per unit of rated power are also less than for the reciprocating engine generator set. The following table gives approximate figures for a compact steam turbine and generator unit:

Size of Unit, Kw.	Equip. Hp.	Weight Per Kw.	Weight Per Hp.	Cost Per Kw.	Cost Per Hp.	Cost Per Lb.
200	264	82.5	62	\$45.60	\$34.3	\$0.55
300	402	59.0	44	35.00	26.1	0.393
500	670	43.6	32	27.70	20.7	0.6

The weight of the heaviest piece of the first unit is 4500 lb.; of the second unit 5100 lb.; of the third unit 7500 lb. when prepared for sectionalized shipment. In figuring a given unit, the weight and cost of a condenser of sufficient capacity must also be figured in. The cost figures give first cost only, and do not include freight.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Tungsten Tariff Bill Passed

By a vote of 171 to 133, the House of Representatives, on Aug. 21, passed the tungsten tariff bill. The measure provides a duty of \$10 per unit of tungstic trioxide contained in crude tungsten, ores, and concentrates. On metallic tungsten, tungsten powder, ferrotungsten and other compounds containing tungsten, a duty of \$1 per lb. on the tungsten content is provided.

Amendments to the bill reducing the rate of duty were offered at every opportunity by Democrats. Finally on a motion to recommit, the Democrats suggested a 10 per cent ad valorem duty on tungsten ores of all kinds and a 20 per cent ad valorem duty on tungsten powder and ferrotungsten. The motion to recommit was lost, 170 to 138. An important amendment by Representative Green, of Iowa, was adopted. It reads:

That there shall be levied, assessed, and collected upon all tungsten ore and concentrates which have been imported prior to the passage of this act from any foreign country and held or kept within the United States, when such ore has been purchased by the owner thereof at a price less than \$17 per unit of tungsten trioxide therein contained, a tax equal to the difference between the purchase price so paid by the owner and the price named above in this section.

This amendment was inserted to meet the most effective Democratic argument made against the bill. It was claimed by the Democrats that millions in profits would be made by the owners of stocks of imported tungsten.

Senate Discusses Leasing Bill

Far more opposition than had been expected developed during the more consideration of the General Leasing Bill. Senator La Follette, of Wisconsin, hears that the West is ablaze against the measure as being in the interest of foreign ownership and control of mines. Senator Kenyon, of Iowa, told the Senate that he had been advised that the bill would place the Standard Oil Co. in possession of practically all of the land covered by the bill. Senator Walsh, of Montana, contended that exactly the opposite would be the case and that the Senate would play into the hands of the Standard Oil Co. by failing to pass the bill. Senator Thomas, of Colorado, voiced the feeling of many Western Senators when, in describing his own position, he said:

I am for the bill because I cannot help myself. I am for the bill because it is the only thing that justice can wring from this Congress. It is the only thing the approval of which we can expect upon the part of the Executive. It is the only thing which stands between a good many honest people of the West and bankruptcy. It is the only thing under whose provisions the oil reserves of the West can be developed and the oil itself added to the constantly increasing stream of demand. It is the only source, in fact, to which we can look for an increasing supply of an element which in these days is perhaps more essential to the material well-being and progress of the nation than anything else, unless it be the item of coal.

In view of the feeling that some improvement over existing conditions would be brought about by the bill, and the fact that Senator La Follette, its chief opponent, will be satisfied when he has done his best to get through his amendment, the enactment of the bill into law at this session is practically assured. In the course of the discussion, Senator Ashurst, of Arizona, said:

For ten years it has been utterly impossible for a man of modest means to get an oil claim or a coal claim; it has been utterly impossible for a man, unless he were a millionaire, to get hold of any oil land; and why? A citizen goes out upon the public domain and locates a claim with his strong arm, puts up his monuments, and begins work. It now costs \$60,000 to drill an oil well, and one-third of the holes drilled even in proven ground are failures. Moreover, when the citizen locates a claim and complies with the law the Executive power withdraws the land. President after President seem to fall under the same baleful view that we must conserve the resources of the country by taking them from our people.

Records of the War Industries Board

All records of the War Industries Board have been transferred to the Council of National Defence. These records will be available to those interested. This excepts, of course, the data submitted to the War Industries Board in confidence. The policy in regard to the records is outlined by the council as follows:

The War Industries Board was originally created by the council, and remained under its direction for nearly a year. Since the records deal in such a vital way with the American industrial and economic capacity for war, they are naturally reassigned to the council, which, as a permanent body, is charged by the Congressional act creating it with the coordination of industries and resources for the national security and welfare. It is the intent that these and similar war records shall, as material bearing directly upon the national defence, be carefully studied and catalogued by the council, not only to preserve in the most coherent form the lessons learned from the war on the industrial and economic side, but to make the data quickly and effectively available against future emergency. It is also the intent to make the records available to American business wherever proper to do so, though, of course, all confidential information given to the council and the War Industries Board throughout the war days will be scrupulously safeguarded. The director of the council has initiated steps to organize these records for their most efficient use.

Assessment Bill Signed by the President

The President has signed the bill providing for the suspension of annual assessment work during 1919. As already reported in the *Journal*, this provides that no such suspension shall be granted to any one claimant for more than five claims. It is also provided in the bill that "every claimant to obtain the benefits of this resolution shall file or cause to be filed in the office where the location notice or certificate is recorded, on or before Dec. 31, 1919, a notice of his desire to hold his mining claim under this resolution."

BY THE WAY

Fluorspar and the Liberty Loan

The steel industry obtains a large percentage of its fluorspar requirements from the district of which Marion, Ky., is the center, says *Iron Trade Review*. In Crittenden County, in fact, of which Marion is the seat, the principal industry is the mining and shipping of fluorspar. In the Victory Loan campaign, the Crittenden County Liberty Loan committee obtained a huge oversubscription, with the result that it was given the privilege of naming a vessel to be launched from the huge Government yard at Hog Island. Accordingly, the committee decided to name the vessel "Fluorspar." The ship took the water at Hog Island on June 16, its sponsor being Miss Frances Gray, of Marion, Ky.

A High Turnover

"I once had a partner," wrote Dan De Quille, "whose one dream of life was to be able to turn a flapjack. If he could only flip one into the air and catch it all right, he thought he would be happy, whether the diggings paid or not. One day he announced he would turn one in the air or die. Taking hold of the handle of the frying pan with both hands, and getting out into the middle of the floor, he hustled the cake about in the pan until it was loose on all sides. Then, squatting nearly to the floor and giving a mighty heave, he sent the pancake flying upward. This done, he stood, frying pan in hand, ready to catch the cake. But that pancake never came down; it struck batter-side against the ceiling, and there it stuck as fast as the wafer on a love letter."

Passing of the Single Jacker

The revolutionary effect of the machine drill upon the mining craft was strikingly illustrated at the Fourth of July celebration held in Wallace, Idaho, last month. "A few years ago," writes our Wallace correspondent, "the big event of Independence Day in the mining districts was the rock-drilling contest. It was typical of the industry, and among all the sports and contests received the largest purse. Every mine had its crack drill team, and the entire force turned out to back it with noise and cash. Generally, a liberal purse was offered for 'single jackers' also. This year the people of Wallace decided to revive this old-time contest and offered a purse of \$500, open to all comers, believing that it would attract many contestants from the Coeur d'Alenes and from Montana and more distant places. In this they were disappointed, for only two local teams entered. Ten years ago there would have been a dozen entries. The machine drill has done its work. No more purses will be offered in Wallace for hand-drilling contests."

The Deepest Well

Named in the order of depth, the four deepest wells in the world are the J. H. Lake, 7,579 ft.; the Goff, 7,386; a well at Czuchow, Germany, 7,348; and the R. A. Geary, 7,248 ft., according to the U. S. Geological Survey.

The R. A. Geary well, of the People's Natural Gas Co., is about four miles northwest of McDonald, Pa.,

and about twenty miles southwest of Pittsburgh. The mouth of the well is about 1,050 ft. above the sea level. The well penetrates the Gordon stray sand, the last of the usual gas sands in this region, at a depth of 1,971 ft. From this point to a depth of 6,700 ft. the strata penetrated are alternately "lime" and "slate," and from 6,700 ft. to the bottom, 7,248 ft., they are "sand" and "lime" interspersed with about 60 ft. of rock salt. The second deep well was drilled by the Hope Natural Gas Co. on the farm of M. O. Goff, about eight miles northeast of Clarksburg, in northern West Virginia. Its mouth is 1,164 ft. above sea level. The well begins 200 ft. below the level of the Pittsburgh coal and penetrates the usual oil-bearing and gas-bearing sands, the lowest being the Bayard, which lies at a depth of 2,210 ft. The strata in the remainder of the well are alternately "lime" and "slate." The J. H. Lake well, of the Hope Natural Gas Co., is about eight miles southeast of Fairmont, W. Va. It is about twenty miles north of the Goff well and about sixty miles south of the Geary well. The mouth of the well is about 1,300 ft. above sea level. The Bayard sand, the lowest of the gas sands, was found in this well at a depth of 2,050 ft. The remaining strata are alternately "lime," "slate," and "sand." A bed of ocean water was found in the Geary well at 6,260 ft.

Food for Thought

"Well, Mister Clancy," said Bill, licking the broken wrapper of a near-Corona, "what do ye know about profiteerin'?" The shift-boss flushed guiltily as he denied any complicity with the timekeeper. "Ye misunderstand me intirely;" replied the super, making a mental note of the bit of circumstantial evidence. "'tis about this here food question I'm talkin'. Some fellies wud have it that a boonch av these warehouse speculators an' delicatessen clerks ought to be taken out in front av a firin' squad. Wan sez that the big manipulators keep storin' up a heavy surplus; while another sez the middlemen an' retailers are pullin' down all the crooked graft; an' still another sez the blame shud be put on a minin' ingineer that tuk pity on the poor downtrodden farmers. Now, mebbe they're all right an' all wrong to wanst. Have ye not rayficted that patriotism is at the bottom av it all. Ye'll raymimber that the dimmycrats, foreseenin' the need av plinty av work, figured out the income tax to eddicate us in complex arithmetic an' cut down our dhrink money. Whin insults made us forget the kind of mollycoddle pride that had kept us out av war, the need av more pork was noticed. More income tax an' folks began to holler. Some hollered that food wud win the war, some hollered that patriotism wud win the war, an' some just began to feel holler. The pathriots that knew how to figger the best saw that the more profits they cud make, the bigger percentage the guv'mint wud get on the income tax; so they kept gettin' more an' more pathriotic. Food seemed the nacheral way to make the surest profits, for every wan must eat. A man can go barefute, he can wash his last year's straw hat, but food he must have or he can do no work. Speakin' av food, the keeper av the boardin' house tells me that thim six new muckers ye've had on the graveyard shift for the last tin days niver ate but the wan meal. Pork is all right in its place, but sometimes it's hard to digest. Whin there's anny surplus av it around this mine, I'll start a little cannin' factr'y."

NEW PUBLICATIONS

The Kantishna Region Alaska. By Stephen R. Capps. Paper, 6 x 9; pp. 116, illus. Bull. 687, U. S. Geological Survey, Washington, D. C., 1919.

Contributions to Economic Geology (Short Papers and Preliminary Reports) 1918. Part I.—Metals and Non-metals Except Fuels. F. L. Ransome, E. F. Burchard and H. S. Gale, Geologists in Charge. Paper, 6 x 9; pp. 147, illus. Bull. 690, U. S. Geological Survey, Washington, D. C., 1919.

Mexico Under Carranza. By Thomas E. Gibbon. Cloth, 5 x 7½; pp. 270. Doubleday, Page & Co., Garden City, N. Y., 1919.

Mr. Gibbon's book could not have been more timely, but what is more to the point, the subject is handled in such a manner that the contents appeal to one as bearing the stamp of accuracy as to statements of fact, and the conclusions have been carefully and logically reached, and as convincingly presented. A mass of intensely interesting data is condensed into a small space. One who knows Mexico will find the book of interest, in that it will confirm and strengthen the views he already has, adding much to his knowledge of the history of the country and its people. We would recommend the book more particularly to those who do not know Mexico and care little about it. One evening spent with this volume would convince the most disinterested that the United States has a duty to perform, a duty that is pressing and of immediate importance.

The Iron Hunter. By Chase S. Osborn. Cloth, 5½ x 8; pp. 316, illus. The Macmillan Co., New York, 1919.

The over-critical reviewer might take exception to the title assumed by Mr. Osborn in the presentation of his autobiography, but viewed in the light of a narrative embracing the life story of a virile, active man, a lover of the great out-of-doors, and a keen observer of human nature, the title is aptly given, and could well be applied, even supposing all references to iron ore were omitted. Interspersing his personal experiences, adventures, and opinions, Mr. Osborn has included a wealth of information concerning the formation, mining, and treatment of iron ore in many districts, and has produced a happy combination which carefully avoids the dryness of a strictly technical publication, although partaking of the nature of a valuable addition to the history of iron and steel. Though disclaiming the expert knowledge of the astute technologist, Mr. Osborn displays in all of his references to iron ore a well-founded knowledge of the subject. Of particular interest to the iron-ore student is the chapter dealing with the mining and treatment of siderite at the Magpie mine, in the Michipicoten district.

Timber, Its Strength, Seasoning, and Grading. By Harold S. Betts. Cloth, 6 x 9; pp. 234, illus. McGraw-Hill Book Co., New York, 1919.

This book is intended for engineers, manufacturers, users of lumber, and students of engineering and forestry. The author presents in readily accessible form much technical information regarding wood, similar to that available on other structural materials.

The data given are derived mostly from tests and investigations on the mechanical properties of wood made by the Forest Service of the U. S. Department of Agriculture. Various bulletins, circulars, and papers of the Forest Service, especially those prepared by the author and those with the preparation of which the author was closely concerned, have been drawn upon freely. Most of the diagrams have already appeared in Department of Agriculture publications.

The book contains a review of the timber resources of the United States, and data on the strength of wood, with results of tests on North American woods, relations indicated by the tests, and the methods of conducting them. The author discusses the effect of moisture and of pre-

servative and conditioning treatments on the strength of wood, the seasoning of wood, and the strength of wooden products. A chapter is devoted to the principles of lumber grading, and the presentation of the rules governing the grading of lumber by manufacturers' associations. Statistics on lumber produced and used in the United States, in the manufacture of wooden products, form a valuable feature of the work, which is well written, and profusely illustrated with halftones, line cuts, diagrams, graphs, and tables.

Graphic Methods for Presenting Facts. By Willard C. Brinton. 7½ x 10½; pp. 371; illus. The Engineering Magazine Co., New York.

The engineer accustomed to the construction and interpretation of curves will, on glancing through this book, be impressed with how little he knows about the graphical presentation of facts. We are familiar, of course, with the picture of the big market basket showing what a dollar would buy before the war, standing alongside the diminutive cut of what we can buy for the same amount today. Few of us realize, however, how many different ways there are of picturing information and how much better some of them are than others. This is Mr. Brinton's object in publishing his book, which is illustrated by over 250 examples of various graphical methods of stating facts.

The mining or metallurgical engineer must not expect a book at all like "The Construction of Graphical Charts," by Peddle. Mr. Brinton's work is intended for the advertising man, for the social worker, the business man, the legislator, and the statistician. Mathematics has been entirely eliminated. At the same time there are many valuable suggestions in the principles here discussed.

The author says: "We daily see facts presented in the hope of creating interest and action for some really worthy piece of work to benefit the people as a whole. In many of these cases the attitude of the person presenting the matter seems to be that the facts will speak for themselves and that they need little or no assistance. Ordinarily, facts do not speak for themselves. When they do, the wrong conclusions are often drawn from them. Unless the facts are presented in a clear and interesting manner, they are about as effective as a phonograph record with the phonograph missing."

There is some information directly applicable to the engineer. For example, Mr. Brinton states: "For most statistical work it is much better to join the points (of a curve) showing the observations by straight lines without any attempt to draw smooth curves. Smooth curves would, by their smoothness, imply a degree of accuracy in the data much greater than would ordinarily be justifiable. By using the straight lines instead of the smooth curves to connect points, the reader is warned that the chart represents facts as found, rather than facts which are assumed to be in accordance with any definite laws."

Emphasis is also placed, and rightly, on the fact that too often statistical data are given to the unit figure and sometimes even to decimals, thus implying an accuracy far greater than it is possible to obtain. A report which states that your mine contains 874,367 tons of ore of an assay value of \$11.26 shows that the one who made the report, to say the least, has not much idea of the general fitness of things.

It is hard to discern, in such a mass of material drawn from so many different sources, how examples of such familiar things to the mining fraternity as contour maps, mine models, and metallurgical flow sheets should have been omitted from the book. However, these would not be missed unless one were looking for them. The book is really very complete and well arranged, considering the character of the subject.

A feature to which the author does not refer, but which the casual reader is bound to notice, is the interesting and varied character of the information given by the charts. Graphical methods are used to show everything, from the production of copper in different countries for one year to the probable span of a daughter from finger-tip to finger-tip for any given span of the mother. The book is a veritable illustrated "World Almanac."

PERSONALS

CHARLES M. SCHWAB was recently decorated as a chevalier of the Legion of Honor by the French Government in recognition of his services during the war. The event took place on Mr. Schwab's estate in Loreto, Pa., and was attended by a large gathering. M. Casenave, French Minister Plenipotentiary, conducted the ceremonies.

Frederick W. Foote left for Cuba recently on professional business.

A. P. Watt has returned to New York after a trip to Canada.

Charles A. Chase was in Silverton, Col., recently on professional business.

Herbert S. Kohlberg is in New York. His address is 108 West 43d St.

C. J. Carvin has returned to Arvada, Col., after an extended trip through the Northwest.

Robert A. Bryce, of Toronto and Cobalt, recently examined placer properties in Cariboo, B. C.

S. F. Shaw is inspecting properties at Zacateca City, Mexico, and Asientos, Aguascalientes.

Van. H. Manning, director of the U. S. Bureau of Mines, was in San Francisco Aug. 15-18.

Bulkeley Wells arrived in Ouray, Col., on Aug. 5, en route to the Genesee mining group, near Red Mountain, to inspect that property.

Fred G. Farrish, geologist of the Smuggler Union Mining Co., Telluride, Col., left for Durango during the early part of August.

R. P. McLaughlin has been reappointed as California State Oil and Gas Supervisor for a term of four years.

Leonard Wojomir Orynski, lieutenant in Engineer Reserve Corps, has returned to San Francisco from France, where he served fifteen months.

J. P. Hutchins has been at Constantinople since May 22. Mr. Hutchins has made two trips to Baku, and intends to go to Odessa soon.

Major D. G. Irions, mining and metallurgical engineer, has accepted a position in the mail-order circulation department of *Engineering and Mining Journal*. Major Irions has recently been discharged from military service.

W. M. Drury, M. B. Stewart, and H. Cooper are visiting properties of the American Smelting & Refining Co. at Angangueo, Michoacan; Asientos, Aguascalientes; Charcas, S. L. P.; and Matehuala, S. L. P.

S. G. Blaylock, assistant manager of the Consolidated Mining & Smelting Co., has been appointed general manager, in the place of J. J. Warren, who was recently elected president of the company.

Arthur D. Lakes and Roy E. Clark, of Spokane, are in the Republic district in Washington in connection with the suit of the Northport Smelting and Refining Co. vs. Last Chance Mining Co., involving apex rights.

Major R. A. Black, mining engineer, who was with the Australian forces in France, has gone to Northern Manitoba to inspect and report on properties owned by the Produce Trust & Loan Co., of London, England.

Vincent Ferguson, who for eighteen years has been manager of the Bessemer plant of the U. S. Cast Iron, Pipe, and Foundry Co., resigned his position on Aug. 12. Mr. Ferguson will be succeeded by Gordon E. Jones, manager of the company's Anniston, Alabama, plant.

Carl A. Davis has resigned his position as general manager of the Brakpan Mines, Ltd., to accept the appoint-



Photo by Underwood & Underwood.
CHARLES M. SCHWAB

ment as consulting engineer to the Consolidated Mines Selection Co., Ltd., and the Anglo American Corporation, Ltd., both of Corner House, Johannesburg, South Africa.

Leonard B. Miller, of the ore firm of Oglebay, Norton & Co., Cleveland, Ohio, has returned to his duties after an illness of two and one-half years. Mr. Miller was in charge of the company's mining operations when taken ill.

Joseph Keele, of the Canadian Geological Survey, is examining the area north of Cochrane, Ont., along the proposed extension of the T. & N. O. Ry. to Hudson Bay, to ascertain if conditions are favorable to the occurrence of oil.

S. Harbert Hamilton, mining geologist, of Overbrook, Pa., is engaged in studying the magnetic iron ores of east Tennessee. The results will be published as a monograph by the State Geological Survey of Tennessee under the direction of Wilbur A. Nelson, State Geologist.

A. W. Carroll, G. E. Fulton, and M. H. Merriss, of the Raritan Copper Works, Perth Amboy, N. J., recently made a business trip through the West lasting several weeks, in the course of which they visited many of the large mines and smelteries.

Horace B. Patton announces that he has removed his office from his residence at Golden, Col., to 911 Foster Building, Denver, where he will continue the practice of his profession as geologist, devoting special attention to examination of oil and gas properties, and to ore deposits.

OBITUARY

J. P. Johnson, formerly of the staff of the *South African Mining and Engineering Journal*, died recently at the age of thirty-eight years. Mr. Johnson was educated at Duwich College and at the Royal School of Mines. After leaving there, he was employed at the Dolcoath and Tincroft Mines, Cornwall, leaving in 1903 to go to South Africa, where he was connected with the Jumper's Deep Mine and subsequently with the Saxon group of mines. Later he was engaged in surveying the Roberts Victor Diamond mine and in prospecting certain areas in Orange River Colony for the Vindex Diamond Syndicate. Mr. Johnson eventually established himself in Johannesburg as a consulting mining engineer and geologist. He came to be an authority on diamondiferous properties, and was frequently engaged in expeditions in various parts of South Africa, north of the Transvaal, in Griqualand West, and elsewhere. His mining experiences were published in a series of monographs, and his books on "The Ore Deposits of South Africa" and "The Mineral Industry of Rhodesia" are standard works. He was on the Council of the Geological Society of South Africa.

SOCIETIES

Spokane Association of Engineers will inspect the mines of Stevens County, Wash., on the annual excursion Sept. 12 and 13.

Northwest Mining Association will hold a session Sept. 4 in Spokane. Frank C. Bailey, secretary, says the proposed establishment of a National Department of Public Works will come up for indorsement.

National Safety Council will hold the eighth annual safety congress in Cleveland, Oct. 1 to 4. Approximately 3,000 men and women are expected to attend, and 160 speakers are scheduled to make addresses. There will be four general sessions and thirty-five sectional meetings. The metals and mining sections each hold three meetings.

American Petroleum Institute held a meeting of the board of directors in Colorado Springs on Aug. 26 in connection with research work being conducted in the laboratories, in methods of refining oils and in perfecting field operations. Among those present were Henry M. Blackmer, president Midwest Refining Co., chairman of the meeting; Captain John Barneson, president of the General Petroleum Co.; Walter C. Teagle, president of the Standard Oil Co., of New Jersey; A. C. Bedford, chairman of the board of trustees of the Institute; E. L. Doheny, president of the Pan-American Petroleum Co.; Henry L. Doherty, president of the City Service Co.; J. W. Van Dyke, president of the Atlantic Refining Co.; Harry F. Sinclair, president of the Sinclair corporations; Van. H. Manning, director of the U. S. Bureau of Mines; Thomas A. O'Donnell, who served as assistant director of the Petroleum Division of the U. S. Fuel Administration during the period of war; and K. R. Kingsbury, president of the Standard Oil Co. of California.

INDUSTRIAL NEWS

The Jeffrey Manufacturing Co., Columbus, Ohio, has opened an office in the Book Building, Washington St., Detroit, Mich., in charge of O. B. Westcott.

The Denver Engineering Works Co. has recently contracted for the exclusive manufacture and sale of commercial sizes of the Sanson crusher.

Walter E. Becker, formerly of Becker & Smith, contracting engineers and sales agents, has completed arrangements to assume the position of general manager of the Layne & Bowler Co., pump manufacturers, and will be situated at Memphis, Tenn.

The Lunkenheimer Co., Cincinnati, Ohio, announces its intention to increase its manufacturing facilities by the erection of a complete plant at a cost of about \$2,000,000. The site comprises about 70 acres situated in Carthage, a suburb of Cincinnati.

Eugene P. Reading, having severed his connection with Hubbard-Floyd Co., of 90 West St., announces the formation of an organization under the firm name of Reading Engineering Co., Inc., for the purpose of carrying on a general equipment business, with offices in the Tribune Building, New York City.

Richardson-Phenix Co. announces the appointment of L. E. Strothman as vice-president and general manager. J. W. Peterson will become president and treasurer. Mr. Strothman was formerly connected with the Allis-Chalmers Manufacturing Co. and the Nordberg Manufacturing Co. He was appointed associate member of the Naval Consulting Board in 1916.

Western Research Corporation, Denver, Col., has issued a pamphlet describing the field of activity covered by

the organization in laboratory research, ore testing, and mine examination. A financial department has been organized to act as a clearing house in selecting mining properties of merit and to prepare properties for investors. Various engineering tables and other technical data are included.

The R. D. Nuttal Co., Pittsburgh, Pa., has carried on considerable experimental work in order to perfect mine locomotive gearing having the requisite hardness to withstand long wear, together with a sufficient toughness to avoid breakage. It is claimed these qualities are combined by special heat treatment, resulting in better gears.

TRADE CATALOGS

Jeffrey Straitfluo Ventilators. Jeffrey Manufacturing Co., Columbus, Ohio. Bulletin 270; 7½ x 10½; 8 pp.; illustrated. Describes a mine fan which is claimed to eliminate the back flow when operating against pressure, with consequent loss of power.

United States Civil Service Commission announces open competitive examinations for the positions of superintendent of melting shops and superintendent of forge shops at a salary of \$5,000 a year each. Applicants should apply for Form 1,312 to the Civil Service Commission, Washington, D. C.

Condenser Tubes. Wheeler Condenser and Engineering Co., Carteret, N. J. Pamphlet entitled "What Worried Admiral Jellicoe Most," which discusses the importance of condenser tubes. Several tables of dimensions and weights of seamless brass and copper tubing, and a price list, are included.

Holbeck Pulverized Coal Systems. The Bonnot Co., Canton, Ohio. Catalog; 8½ x 11; 136 pp.; illustrated. Describes the use of powdered coal as a fuel, using air as the carrying agent, and various mechanical arrangements required in the system. Some installations in large plants are also described. Fuel and labor saving are discussed.

Refractories. Los Angeles Pressed Brick Co., Los Angeles, Cal. Catalog; 4 x 6½; 48 pp.; illustrated. Describes various standard and special shapes of fire brick manufactured by the company, including general information on refractories. Tables for the calculation of brick work and on high temperatures involved in metallurgical processes are also given.

Pelton Water Wheels. Pelton Water Wheel Co., San Francisco and New York. Bulletin No. 12; 7¼ x 10½; pp., 48; illustrated. Describes impulse water wheels of the Pelton type and in general the Pelton system of power. A section is also devoted to a discussion of hydraulic pipe lines and their construction and to Pelton centrifugal pumps. A table of working heads and weights of riveted steel pipes is included, as are pipe-friction tables.

NEW PATENTS

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

Belt Conveyor. William Kingman Page, assignor to Chile Exploration Co. (1,313,111; Aug. 12, 1919.)

Blast Furnace—Method of Preventing Gas Explosions in Blast Furnaces During Temporary Stops. John W. Dougherty. (1,309,466; July 8, 1919.)

Blasting—Safety Cartridge for Mining Purposes. Emmanuel Lemaire. (1,310,666; July 22, 1919.)

Classifier. Edward F. McCool. (1,310,917; July 22, 1919.)

Converters—Attachment for Forming Tuyère Openings in Converters. Michael Zippler. (1,310,230; July 15, 1919.)

Crusher—Jaw Crusher. Ray C. Newhouse, assignor to Allis-Chalmers Manufacturing Co. (1,309,807; July 15, 1919.)

Crushing—Gyratory Crushing Apparatus. Joseph E. Kennedy. (1,310,798; July 22, 1919.)

Dewatering—Apparatus for Dewatering and Separating Ores, Sands, Etc. Lewis H. Falley. (1,312,027; Aug. 5, 1919.)

Dredge-Bucket Lip. Lewis D. Hopfield. (1,310,570; July 22, 1919.)

Dredge Buckets, Latch for. Eugene J. Moynihan. (1,310,030; July 15, 1919.)

Drill—Underground Portable Drill. Willie F. Branning. (1,310,274; July 15, 1919.)

Electrode. E. A. C. Smith. (1,311,096; July 22, 1919.)

Electrolytic Method of Recovering Metals From their Ores. Dell F. Harbaugh. (1,306,480; June 10, 1919.)

Excavator Bucket. Eugene J. Moynihan. (1,307,747; June 24, 1919.)

Filtration—Process of Treating Mixtures of Liquids and Solids. Michael H. Kuryla, assignor to Merrill Metallurgical Co. (1,302,814; May 6, 1919.)

Fuel—Apparatus for Storing and Handling Pulverized Fuel. William Oran Renkin, assignor to Quigley Furnace Specialties Co. (1,308,367 and 1,308,369; July 1, 1919.)

Magnesium—Electrodeposition of Magnesium. George O. Seward, assignor to American Magnesium Corporation. (1,310,449 and 1,310,450; July 22, 1919.)

Magnetic Separator. Robert A. Manegold and George H. Fobian, assignors to Dings Magnetic Separator Co. (1,310,802; July 22, 1919.)

Manganese Steel. Manufacture of. R. A. Hadfield. (1,310,528; July 22, 1919.)

Mica From Feldspar, Process of Separating. George J. Bancroft. (1,310,939; July 22, 1919.)

Molybdenum-Tungsten Alloy, Manufacture of. Frederick G. Keyes, assignor to Cooper Hewitt Electric Co. (1,308,907; July 8, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

DENVER, COL.—Aug. 23

Mining Activity in Park County is rapidly increasing and the old silver producers of this district are attracting attention. A sale of the Russia Mine has just been consummated and a substantial first payment has been made. This property has a record in production of over \$1,000,000 in high-grade silver ore and the dumps and old stopes are filled with good grade milling ore. Recent work has opened another orebody which may prove of considerable importance. The property, which was owned by the estate of G. W. Brunk has been purchased by K. C. Huston, who represents a large Eastern company which will undertake extensive operation at once and will build a mill for the treatment of the lower grade ores. The work on the property of the Reserve Mining Company has progressed to the point of production. The lower tunnel has been reopened and retimbered and ore for shipment to the smelter is now being saved.

The Louisiana-Colorado Mining Company is operating both the mine and the mill—a force of about forty men is employed in and around the mine and the mill is working at its full capacity of 150 tons per day. A carload of high-grade concentrates is now ready for shipment to the smelter. These concentrates carry a high percentage of lead and in the neighborhood of 200 oz. of silver to the ton.

The Commonwealth Mining Company has a small force of men working on the Magnolia Mine on North Star Mountain. The London Mining and Milling Company, driving a new crosscut tunnel, will reach the vein with 100 ft. of additional driving. The work is being pushed as rapidly as possible with two Leeper drills working abreast in the tunnel heading. About thirty-five lessees are employed in the old South London workings and are keeping the teaming of the district busy hauling the ore to the railroad. The Victory Mining Company, having leased the entire North London workings, is remodeling the mill into a granite plant. A large force of men is employed and the work is being rushed with all possible speed.

Joseph Castle and associates, of Denver, have purchased from George Shelton, of Alma, a lease and option on the Sweet Home Group in Buckskin Gulch. Operations have been started and a good showing of ore is reported.

The Silver Gem Group on Mount Cross adjoining the Dolly Varden and Moose properties has been taken over by Ernest Montgomery and associates, of Denver. This property covers the same contact as the neighboring properties and has a good record as a silver producer.

The Sacramento mine is being equipped with machinery in preparation of continuing the sinking of the shaft. The ore showing at present is said to be excellent. The Silver Mine on King Mountain has a large force of men employed on the Hill Top, and a mill for the treatment of the low grade ore is in contemplation. A large body of high-grade ore has recently been opened, from which a steady production of smelting grade ore will be maintained as soon as the railroad between Fairplay and Leadville is repaired and put into shape for operation.

The Whale mine and mill at the head of Halls Valley are being operated with a full force. The milling of the last three years is proving a decided success. Lessees are now operating in a small way the Atlantic and Pacific, Champaign, King Oscar, Kennebec, Paris, Red Lion and other properties throughout the district.

The Yuba Dredging Company, which has been testing the ground near the town of Fairplay for the last three years, has now contracted for the excavation of a dredge pit, which is to be 150 ft. square and 10 ft. deep. It is rumored that three dredges are to be installed as rapidly as possible, all of which are to be boats of larger capacity than any now in operation in Colorado.

Hessrs, Rhoades and Goldberg, of Chicago, who have purchased the placer and lode mines formerly owned by the Green

Mountain Mining Company, are at Alma planning for extensive operations to be started next spring. Plans are also being formulated for testing by churn drills the placer ground between the towns of Alma and Fairplay for the purpose of installing dredges.

OURAY, COL.—Aug. 23

Revival of Mining in the San Juan district is making progress; though somewhat slow, it is none the less apparent in the new operations around Silverton, Telluride and Ouray. At Ouray, the Ironton-Red Mountain section is showing considerable activity. The Summit Copper Mining Co., Red Mountain, has a considerable quantity of copper-silver ore which has long needed a milling plant. The property was recently

winter a good strike of heavy copper-silver ore was made, and some good shipments resulted.

Recently, the A. E. Ackerson lease on the Guadeloupe struck more of the high-grade ore, 600 ft. further south than the first strike, and indications are good for a considerable production. The company expects to have its mill operating this autumn, when the tram is completed, treating not only Guadeloupe but several other ores in the vicinity, taking some custom ore.

The White Cloud Mining Co. has unwatered its shaft and is now diamond drilling from the shaft in search of the orebody, which is one of the old Red Mountain "chimney" type.



BILLION TUNNEL, SMUGGLER UNION MINE, TELLURIDE, COL. LOOKING WEST ACROSS MARSHALL CREEK

ISHPEMING, MICH.—Aug. 23

The Dock Workers Refuse to Work at Marquette, Escanaba and Ashland, despite the fact that E. D. Brigham, of Duluth, who is in charge of ore, grain and coal movements for the Government in the Northwest, has informed them that if they do not return to their places the docks might be closed indefinitely. Most of the men employed at Duluth, Two Harbors and Superior went to work after Brigham issued his statement, but the men at the Michigan docks followed the advice of the union officials and refused to go to the docks until their claims had been satisfied. It is difficult to state what action will be taken by the Railroad Administration. A few men were engaged for work on the L. S. & J. dock at Marquette, and two boats were loaded there with Marquette range ore this week. Only a few shipments have been made from the mines in over two weeks, and most of the mines are again stocking. The extra cost to the operators will be high, as it requires considerable money to stock ore and then load it again for shipment to the Lake ports, and this must be done or discontinue operations underground. The dock workers are demanding 64c an hour, with

examined by Kirby Thomas, of New York, and mine repair and development work is now in rapid progress. Some milling apparatus was recently bought and hauled to the property, and it is understood that the company will probably build a mill this autumn or next spring.

The Red Mountain Mines Co., Ironton, in charge of George E. Collins, of Denver, has been developing and repairing some of the famous old Red Mountain copper-silver mines, notably the Genesee, Yankee Girl, and Joker Tunnel. The Yankee Girl shaft is now being unwatered, being open to the 11th level. A small mill has been about completed and may operate this season. An examination by Eulikeley Wells, with Fred Parish and Wilbur Grant, his engineers, has resulted in the announcement that Mr. Wells has taken an active interest in this company.

The Barstow mine, Ironton, continues shipments of high-grade gold concentrates made on the property, from the recent strike of gold ore.

The Ouray Consolidated Mining & Refining Co. has bought an interest in the company operating the old Guadeloupe mine, and is completing a mill at Ironton. A line has been cleared for an aerial tram and a compressor was placed at the mine. Last

time and a half for overtime, and recognition of the union. Mr. Brigham stated that their claims would be presented in Washington and that the men could just as well be working while a settlement was being made as to have their boats tied up in port. Three wheelmen had to be discharged at Marquette because they refused to sail on a boat which had been towed by a had little difficulty in getting three men to fill their places. The outlook is certainly not encouraging for the operators of the mines, as they have not succeeded in disposing of a great deal of ore this season, sales from the Michigan field being exceptionally light, and they want to at least move what has been sold. It is to be hoped that the strikers will soon awake to the realization that they can gain nothing by remaining away from work, and that shipments can be resumed.

DULUTH, MINN.—Aug. 23

Shipments of Iron Ore from the Lake Superior district had fallen off 1,427,885 tons on Aug. 1, 1919, as compared with a corresponding date in 1918. The embargo imposed on ore shipments Aug. 8 because of the strike of the railway shopmen has been raised slightly and speedily by the cause of the coal dock men occurring at the same time is still in effect and is threatening to tie up both the roads and is shipping such ore as is required to care for boats tied up at the head of the Lakes, but the Steel Corporation has shipped practically no ore since the placing of a meeting held in St. Paul on Aug. 21, decided to bring suit against Local No. 24 of the International Brotherhood of Electrical Workers, alleging conspiracy to prevent men from working on the coal docks of those cities. Granting an early adjustment of all claims, the season will have to become stagnant, the season will have to approach one of great activity in order to approach the tonnage moved in 1918.

Shipments in tons to Aug. 1, 1919 and 1918, follow:

Doek and Harbor	Shipments, 1918	Shipments, 1919
C. & N. W., Escanaba.....	2,012,271	1,804,424
C. M. & St. P., Marquette.....	83,096	617,139
D. S. & A., Marquette.....	387,891	236,568
L. S. & I., Marquette.....	1,296,128	655,158
C. & N. W., Ashland.....	2,844,102	2,489,675
Soo Line, Ashland.....	523,190	455,172
Soo Line, Soudan.....	5,768,718	4,602,112
C. N., Superior.....	863,968	649,087
N. P., Superior.....	418,558	235,269
D. & M. N., Duluth.....	9,157,087	9,821,136
D. & I. R., Two Harbors.....	4,744,591	3,616,110
Totals.....	29,608,933	25,181,848

SALT LAKE CITY, UTAH—Aug. 23

Metal-Mine Insurance Rates for Utah operators under the Workmen's Compensation Act have been lower than the first year fixed by the insurance companies for the present year. The rate of increased payments to injured workmen provided for by amendments to the law. The multiplier 2.7 will be used, instead of 3.15, and in the former as in the latter case, 1c. per hundred dollars of payroll added. Last year \$622,000 was paid in premiums, according to the Insurance Commissioner for the state; and although this year more companies are self-insuring, last year's premiums for this self-insuring with the multiplier 3.15 would, it is estimated, amount to about \$740,000. The multiplier of 2.7 will be a reduction of \$85,000 from the latter figure. Insurance companies are making arrangements to settle in various ways matter of excess premiums already paid this year.

SPOKANE, WASH.—Aug. 23

Metal Production in Washington will probably increase as conditions adjust themselves to normal times, but the output during the first half of 1919 was seriously curtailed by the drop in prices, according to the U. S. Geological Survey. The metal output in 1918 was \$1,467,421. A decrease from \$2,288,285 in 1917. The present rate of output indicates that there will be a decided decrease in the output of gold, silver and lead in 1919.

BOISE, IDAHO—Aug. 22

Laws and Regulations Pertaining to Surveying in the State of Idaho were changed by the last Legislature only in respect to the law now stands. The Department of Law Enforcement assumes the duties of the old Board of Examining Surveyors. The examination for licensed land surveyors will be held here on Tuesday in September. Robert E. Jones is the Commissioner of Law Enforcement, with office at Boise.

JOHNSON, ARIZ.—Aug. 23

Revival of Operations in this district is expected in the near future and indications are that a large tonnage will be shipped there. With the exception of two small properties doing development work, this camp has been shut down for the last six months, and the town was almost deserted, the miners going to other places to secure work. On July 20th, the Arizona United Mining Company put a few men to work cleaning up and getting the machinery in shape for operation. In a few more men have been put on each day. The railroad which connects with the main line of the Southern Pacific at Dragon, and hauls ore and supplies in, is in good condition, owing to the six months' idleness and recent heavy rains. A force of men are repairing the road bed and putting the track in condition for hauling. The Arizona-Michigan property has been taken over by the Mines and Development Corporation and mechanics have been overhauling the machinery which this company owns at the mine. This property will start as soon as the railroad begins operating which will allow shipments of fuel oil to be hauled in. The company has the collar of its main shaft. Connections will be made with this shaft from the old incline and all hoisting done in the perpendicular shaft.

BIRMINGHAM, ALA.—Aug. 23

United Mine Workers of America, Alabama District No. 20, are choosing delegates to represent this district at a convention to be held at Cleveland, Ohio, on Sept. 9. Fifty delegates are expected to go from this district. It is believed that the matter of a 6-hour day, for a week will be the cause of much discussion.

Production of Iron in Alabama showed a decided increase for July as against June, 142,772 tons of pig iron being produced, a gain of about 14,000 tons over June. Production in 1920 is not looked for so much. August is expected to show a corresponding gain over July, as several furnaces are being prepared for operation. Pig iron is expected to advance another dollar a ton soon, and manufacturers in the Birmingham district are paying little attention to further orders for last quarter delivery and no effort whatsoever is being made to get orders for 1920 delivery. Production was affected somewhat during the second week in August by the strike of railway shopmen, but before the situation became much more serious.

The shipbuilding industry in Mobile is calling for considerable Birmingham iron and steel, particularly fabricated steel, plates, girders, bolts, rods and other materials. The building of concrete ships at Mobile calls for large quantities of steel rods, and the Birmingham district will be required to furnish these. The Chicago Steel Building Company has three steel boats under way and this company is said to have contracts for eight more large ships from the Federal Shipping Board. This and other orders at Mobile depend on the Birmingham district for the greatest part of their steel products.

TORONTO, ONTARIO—Aug. 23

Vocational Training for Returned Soldiers will be given in accordance with the request of many war veterans of northern Ontario, and a class will be established at the Halesbury School of Mining. The course will include milling and assaying, and the veterans will receive full pay and allowances while they are receiving instruction.

The Consolidated Iron & Steel Corporation, Ltd., a new company representing Toronto and Detroit interests, and capitalized at \$8,000,000, has opened an office at 5 King St. East, Toronto, and is developing two large iron-ore deposits. One of these is a hematite mine situated at Furnace Falls, Leeds County, and the other is a magnetite mine at Brockville, comprising 1,500 acres, where several thousand tons of ore are now ready for shipment. The other property is situated at Mileage 150 on the Algoma Central R. R. where diamond drilling has been carried on since November, 1917, proving large deposits of ore to a depth of 500 ft. Engineers estimate that tonnage at high figures. Work on both properties is being actively prosecuted.

In the Development of the Peace River Oil Field of Alberta, a critical stage has been reached, the future of the field appearing to be dependent upon whether the difficult occasions by a heavy flow of salt water can be successfully overcome. So far, every well sunk into the Devonian sand formation beneath the Peace River in the established field below Peace River

crossing has produced the oil-bearing stratum. But directly beneath this is a stream of salt water subjected to an enormous pressure of wet gas, the upward flow of which has necessitated the use of several promising wells. It is now realized that the success of operations depends upon finding oil below the salt water and overcoming the menace of flooding. Dr. J. D. McArthur, has been working continuously since 1916, in which year well No. 2 was sunk about fifteen miles downstream from Peace River. It reached a depth of 1,125 ft., at which point the drill was in the recognized oil stratum, when the water suddenly gushed up 300 ft. about the derrick, driven by an enormous pressure of gas and putting an end to operations. The well was abandoned, and in July last struck at 962 ft. The oil sands were upstream from its 365,000 gal. When a depth of 1,032 ft. was reached the oil had risen to a depth of 425 ft. in the well. But at 1,085 ft. the salt water was encountered and the flow under the enormous pressure submerged the derrick and rendered all attempts to resume operations futile. Last year the company began sinking for the first time on a site on the west side of the river five miles below the town. The operators had to face practically the same conditions as those previously encountered. The salt water difficulty was overcome satisfactorily to a depth of 1,200 ft., its objective being the oil deposit believed to occur below the salt-water stream.

The Canadian Island Oil & Gas Co. is operating almost opposite well No. 2 of the Peace River Co. on the opposite bank of the river. The company has had to contend with the same hindrance from the flow of salt water, but has succeeded in checking it and is now drilling to reach the lower oil stratum. The Three Creeks Oil Co. is operating on the west side of the river, about 1,155 ft. Drilling has been suspended for some months by reason of the flow of salt water, which it is hoped to shut off soon.

VICTORIA, B. C.—Aug. 19

The Complex Ore Reduction Co., which was organized a few years ago to operate the French process for the extraction of zinc from complex ores and for its electrozinc from complex ores, has closed down. The British Columbia government fathered the process, guaranteeing the company's bonds to the extent of \$85,000. The government of course, will lose the money guaranteed.

The Granby company is shipping quartz ore from the mine to the Portland cement works to be blown in again, at any rate, so far as the Granby company is concerned. The Boyle Brothers have undertaken a contract for extensive diamond drilling on the Big Missouri, Salmon River district. Development work is said to be well up to a good point. The Standard mine, owned by Silverton, is developing a new ore body. Carl C. Hand, of Los Angeles, and A. W. McClune, of Salt Lake City, have made an examination of the Queen mine. The tunnel is 1,200 ft., and it is expected the Queen vein will be cut at 1,500 ft. The Yellowstone vein was cut at 700 ft.

GUANAJUATO, MEXICO—Aug. 14

Returns from the gubernatorial election held on July 20 were delayed considerably. Contrary to expectations, election returns did not bring the Anahuacites who had been anticipated owing to the friction that had manifested itself among the followers of the two principal candidates, Montes and Madrazo, a change in the local government is always associated with great interest to operators; because, with Bolshevism and labor agitation in other countries, a conservative administration is greatly desired. As all mills in the Guanajuato district are treating very low-grade ore, the strictest economy must be practiced, and excessive demands on the part of the laborers would cause a cessation of operations. What this means to the camp was clearly illustrated by the famine and pestilence which followed the closing down of the properties in 1915, which conditions have also helped to bring about the present dearth of skilled workmen in the district. There are, at present, approximately from 3,000 to 4,000 men at work in the various mines and ranches. During the last week, the rains have abated somewhat. It is hoped that the men who have refused to work in the mines, owing to the present conditions, and those who have left for ranches, will return and relieve the labor shortage, which has caused curtailment of operations.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ALASKA

ALASKA SHIPMENTS of domestic copper ore, matte, etc. to the United States in June totaled 3,021,912 lb., valued at \$483,580.

ALASKA GOLD (Juneau)—Milled 153,000 tons in July, averaging 97.4c. per ton. 75 per cent extraction, 81.32. Tailings loss, 18c. per ton. In June milled 159,510 tons, averaging 94c. In July, 1918, milled 74,830 tons, averaging \$1.319.

ARIZONA

Maricopa County

DRAGON (Wickenburg)—The Dragon Mining & Development Co. purchased two carloads of mining and milling equipment from Butress & McClellan, of Los Angeles, which is being shipped to the property, twelve miles east of Allah and about sixteen miles southeast of Wickenburg. Equipment includes 28 hp. Western gas engine hoist, a 12 x 14-in. Laidlaw Dunn Gordon compressor, a 60 hp. Commercial gas engine, a No. 2 Cameron sinker pump, and complete equipment for 50-ton concentrating plant.

Final County

RAY BOSTON COPPER (Kelvin)—Has been organized to take over the property formerly owned by the Kelvin Sultana Cop. per Co. New company capitalized at \$5,000,000, is in part a reorganization of the old Kelvin Sultana stockholders. A. H. Westfall, of Phoenix, president of the old company, is president of new company. C. E. Hart, of Miami, will be consulting engineer and general manager. E. F. Worthington will be superintendent. Has planned extensive diamond-drilling campaign to further prove property. Is well equipped with modern mining equipment, including steam-driven power plant, furnishing electric power. A 250-ton concentrator is on the ground. Considerable amount of development work has been done. Main shaft is 500 ft. deep, with lat-done. Closed down in September, 1916, at the instance of the bondholders. A. L. Flagg was then appointed receiver. Was purchased by the bondholders at foreclosure sale in January of this year. Reorganization being carried out by the Baldwin Syndicate, of which G. P. Baldwin is president.

WHITE METAL (Kelvin)—Most of the recently purchased mining equipment has been moved to the camp. Heavy rains damaged the roads and held up this work. Expected active development work on large scale will be begun by Sept. 1. J. C. Devine is in charge.

BROKEN HILLS (Ray)—L. D. Hutton, president, is on the property laying out further development work on the original holdings and on some of the recently acquired properties adjoining. Lower tunnel is still being driven to the eastward.

Yavapai County

McMAHON GROUP (Kirkland)—Leased to J. F. Hildner, of Phoenix, Ariz., who will do some development work.

CALIFORNIA

Calaveras County

MORGAN MINE (Carson Hill)—Clean-up for July said to exceed \$100,000. Good results obtained in developing 675-ft. level.

El Dorado County

MOUNT HOPPE (Placerville)—Being operated by J. Baring Good. Contracted for crosscut tunnel. Mine fully equipped with stamp mill, air compressor and hoist.

WHITE ROCK (Placerville)—Large deposits of white quartz being operated by the Drake Company, of San Francisco, under management of G. G. Frasier. Dry ton estimated 6,000 ft. long and 20 ft. thick, averaging approximately 99 per cent silica.

Kern County

CALIFORNIA RAND SILVER, INC. (Randsburg)—Shaft is now 24 ft. deep and twenty cars of ore have been shipped. Syndicate of Bakersfield men headed by L. V. Olcese is reported to have purchased a one-eighth interest for \$100,000.

Nevada County

GOLDEN CENTER MINE (Grass Valley)—Struck new vein in 500 west crosscut.

KENOSHA (Grass Valley)—New electric pump with capacity of 500 gals. per min. has been installed. Mine now being pumped and equipment being completed. Expected that operations will soon be resumed. Loyd Root is in charge.

MOUNTAINEER MINES CONSOLIDATED (Nevada City)—Purchased by Peter Bender at auction sale for amount of judgment and costs.

BROWN BEAR GRAVEL MINE (St. Charles Hill)—Gravel found in raise 40 ft. above main tunnel, which is being driven ahead to get under next channel.

Plumas County

ENGELS COPPER (Engelmine)—By appeal to Railroad Commission power bill has been reduced \$40,000 a year.

COLORADO

Boulder County

SMUGGLER (Bellara)—C. E. Schultze, of St. Louis, recently acquired large interest. Recent developments are promising.

BLUE BIRD MINES (Caribou)—W. S. Jennings, of New York, who recently examined the mines, stated he and his associates have decided to develop. If production warrants they will build complete reduction plant. Property is an old-time high-grade silver mine.

Clear Creek County

GEORGETOWN TUNNEL COMPANY has a large force engaged in excavating for mill-site. Construction will be pushed as rapidly as possible. In addition, a large force is at work in mine on development, and small force engaged in stopping high-grade silver ore from Clara E. lode. As result of high price of silver, a great amount of active work is going on in region, and numerous old properties are being reopened and examined.

Gunnison County

GUNNISON A-1 OIL CO. (Gunnison)—Composed of local men, has begun drilling first hole of Dollar branch on site selected by geologists as being centre of dome on Ohio Creek anticline. Several operators in locality have recently developed small amounts of oil on this anticline. It is expected that this well will be drilled to much greater depth than any of the other holes.

Lake County

CRESCENTIA (Leadville)—One of the shafts belonging to the old Emmet Mining Co. has just been reopened by Rogers & Co. Now down 600 ft. and has developed good body zinc ore, from which shipments will be made.

MATCHLESS (Leadville)—New York owners have begun a vigorous development campaign. Operations will be confined to lower ore horizons. Dr. Bailey, of New York, is in charge. Surface plant has already been repaired and placed in operation, and when shaft is repaired sinking will begin.

Park County

THE COLORADO POWER CO. is extending one of its lines to Hilltop mine, a lead producer. Property is inaccessible and fuel scarce, and expected that with electric power will become important producer.

Saguache County

EAGLE MINE (Bonanza)—On Kerber Creek, two miles east of Bonanza, has recently been taken over by C. M. Glasgow and associates, of St. Louis, Mo. Last year C. K. Kelso unwatered the mine, thoroughly sampled it, and conducted experiments on the method of treating the ore. A 50-ton flotation mill is being built, and a power line of the Colorado Power Co. has already been extended from the Shawmut mine, near Bonanza, and unwatering of mine is again about to be undertaken. Last year 200 tons of 12-in. fair-sized tonnage of argentine in a rhodocrosite gangue available. Ore averages 10 oz. in silver. Dump of 5,000 tons will also be treated.

Summit County

NORTH LONDON (Alma)—Mill expected to resume operations soon. Considerable activity going on, and believed that no difficulty will be encountered in maintaining sufficiently large ore reserves to keep operating continuously.

IDAHO

Bogday County

IDAHO CONTINENTAL (Port Hill)—Shipped 60 tons concentrates daily since July 23, when road became good enough for hauling. Using 12 motor trucks for the 26-mile haul. According to Robt. N. Bell, state mine inspector of Idaho, the "smel'er returns from several thousand tons recently shipped show general average of 60 per cent lead and 22 oz. of silver. With 1,700 tons of finished product in bins, mill treating 250 tons daily making 25 to 30 tons concentrates, a large output of shipping ore is assured if metal market is maintained. Estimates of 80,000 tons above No. 4 level were ultra conservative and reserves now indicate ten times that amount of probable and possible ore."

LOUISIANA

SOUTHWEST LOUISIANA DEVELOPMENT COMPANY has been organized to lease lands in this state and sublease them to drilling companies. Possible oil land, 26,000 acres in extent now under lease. Contract closed with Shreveport and Chicago company to drill. Work will begin soon.

LARGE ACREAGE IN ALLEN PARISH leased to Oklahoma company and drilling will begin at once. Land, known as West Bay, covers several thousand acres.

Catibone County

WILD-CAT WELLS being drilled in Bienville, Claiborne, DeSoto, Red River and Webster parishes. Good well recently brought in on Bull Bayou at 2,500 ft. Gas found in several of North Louisiana parishes, and oil boom is expected.

STANDARD OIL CO. (Homer)—No. 2 Oaks well came in recently flowing 6,000 bbl. a day. It is reported, from depth of 2,100 ft. Oil is 38 BE, exceptionally high as Gulf Coast oil is usually about 22. Number of smaller wells in this district making good production from depths of 1,100 to 1,200 ft.

MICHIGAN

Copper District

WOLVERINE (Kearsarge)—Produced in July 331,736 lb. refined copper from 24,038 tons of rock, being 13.8 lb. per ton.

MOHAWK (Mohawk)—Shows extraction of 23.73 lb. refined copper per ton stamped. Largest producer is No. 6 shaft, which is turning out more than 45 per cent of the total. No. 1 produces nothing. No. 5, 20 per cent of total and No. 4, remainder. No. 3 being sunk below 20th level and No. 6 below the 16th.

MINNESOTA

Cuyuna Range

DRILLING being done on Section 20-126-26, north of the Mississippi River and three miles north of Mangrove.

MINE RESCUE STATION to be established at Crosby, is proposed by B. O. Pickard, district representative of the Bureau of Mines. Plans have been prepared. Building and equipment estimated to cost \$20,000. Four men would be maintained, and present plans call for the expense of building, equipping and maintaining to be assumed by mine operators.

BWANAGO (Crosby)—Drilling NE-NW Section 12-46-29, in platted portion of Crosby by immediately south of the Croft mine.

IDA MAE (Crosby)—Sinking shaft 30 ft. deeper. Will put under contract and change main haulage drifts to permit of large output. Let contract to McCoy, of Trommald, for digging ditch to drain chain of lakes, some of which lie over or body.

NORTH RANGE IRON (Trommald)—Property on Section 4-46-29, on which shaft was sunk and underground development done last year, being again drilled by Abdar Development Co.

Meabi Range

BOURNE (Hibbing)—New property of Cleveland-Chiffs Iron Co. grading for shaft. Not yet announced whether property will be open pit or underground. If open pit, shaft will be for drainage purposes only. When developed will complete the circle of mines surrounding the present site of the village of Hibbing.

PHILBIN (Hibbing)—Oliver Co. completed shipment of 70,000-ton stockpile.

SARGENT (Keewatin)—Big new open pit of Wisconsin Steel Co. had just prepared to enter shipping list when shut off by embargo on ore shipments. Will probably ship heavily with lifting of embargo. Established record for development, having been stump-covered wilderness one year ago.

VEGA (Mesaba)—Report sale of 30,000 tons manganiferous ore guaranteed 10 per cent manganese. Vega Mining Co. operators. Formerly known as Mayas and operated by Coates & Tweed.

FRANKLIN (Virginia)—Property, opened by Franklin Rockefeller and associates in 1893, has made final shipment. Total shipments, 2,233,000 tons.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT (Wise River)—Drift on 900-ft. level on Idaho vein continues in ore maintaining width of 10 ft. of good milling grade. Rails of Montana Southern Ry., designed as outlet for ores, now laid to within ten miles of Elkhorn mines.

Missoula County

POTOMAC COPPER (Potomac)—No. 2 tunnel in 500 ft., with country rock well seamed. Chiefly a drift, one of best grades working, ahead approximately 1,000 ft. No. 2 tunnel also will cut Leonard group of claims at depth of 1,500 ft. Preliminary development in Leonard zone 30 ft. wide of milling grade and with streaks up to a foot in width.

Powell County

CHAMPION (Deer Lodge)—Crosscutting for fissure under, with breast in softer ground. Now believed to be near vein.

Silver Bow County

ANACONDA (Butte)—Labor situation gives evidence of clearing, with period of stability to follow. Metal crafts s-like slowly disintegrating; other organizations declining to walk out. Development work being pushed. Scarcity of miners prevents return to normal capacity for some months. Cold weather expected to cause return of miners from the fields and forests.

BARNES-KING (Butte)—Quarterly report of opening drift, one of best ending June 30 shows earnings for North Moccasin of \$223, Shannon \$50,402, and Kendall \$1,530. Loss on the Peigan-Gloster operations, \$20,637. Net profit for quarter, \$27,371.26.

DAVIS-DALY COPPER (Butte)—High-grade ore zone northwest on the 2,100, corresponding with that on the 2,300 and other levels below, appears to be coming in. Rock is showing marked improvement, and there is believed to be little doubt that lower zone will be found to extend upward. Significance of improvement indicates now, it is thought, location of the ore bodies nearer the surface in the Davis-Daly.

NORTH BUTTE (Butte)—Produced 1,005,810 lb. copper in July; June, 767,468; July, 1918, 1,835,551.

NEW JERSEY

Middlesex County

UNITED STATES METALS REFINING (Chroma)—Plant has shut down, owing to labor troubles.

OREGON

Baker County

HUMBOLDT (Greenhorn)—A. R. Sweet and associates purchased this gold property under foreclosure and will work it if they do not sell it. Mine equipped with three-stamp mill, crushers and concentrating tables.

TEXAS

REPORTS OF OIL COMPANIES to Texas Railroad Commission must show all business, including capitalization, amount of stock sold, price obtained and seepage paid for selling and promotion costs, also production, situation of wells, amount of oil sold, price obtained and the purchaser.

PROHIBITING OF STORAGE in earth tanks of North Texas light crude oil, because of loss by evaporation, commission will probably be first conservation step taken by Texas Railroad Commission under

authority granted it by Oil & Gas Conservation Act.

Brazoria County

HUMBLE OIL & REFINING (West Columbia)—No. 4 Giraud well brought in recently at 2,200 ft. Making large production by flowing in heads. Liquid about 60 per cent oil and 40 per cent water.

TEXAS CO. (West Columbia)—No. 18 Hogg well brought in, flowing from 3,000 ft. has sanded. Now being washed in attempt to recover.

Dallas County

SALE OF ASSOCIATED PETROLEUM COMPANY'S holdings to Keystone Ranger Development Co., of Pittsburg, Pa. for sum of \$3,000,000, reported here; cash payment of \$750,000 made. Associated Petroleum Co. was local organization holding leases on 284,702 acres, and had twenty-nine producing wells.

REPUBLIC OIL & REFINING CO. (Dallas)—Announced construction of 5,000-bbl. oil refinery will commence Sept. 1. Has purchased tract west of city, capitalized for \$2,000,000; has two producing wells, and is drilling others. J. A. Jones, Jr., manager.

Hardin County

RIO BRAVO OIL CO. (Saratoga)—No. 34 Jordit well brought in at 1,300 ft., now making fair production by pumping.

SUN CO. (Saratoga)—No. 133 McShane well being tested.

TEXAS CO. (Sour Lake)—Arranging to pump 250 Fe. at Saratoga, No. 4 Ogden well is 2,900 ft. deep.

Harris County

NEW SURVEYS AT GOOSE CREEK of lands formerly leased from state, forfeited on account of non-compliance with terms, will be made at once. Surveys will materially change size and shape of tracts, an effort being made to make all submerged tracts accessible from the shore line. As soon as the surveys are completed, the Goose Creek tracts will be open for bids.

SEVERAL ABANDONMENTS OF WELLS made recently. Taylor Lake Oil Co., abandoned No. 2 Curry; Gandler Oil Co., No. 1 Mowry; Crosby Petroleum Co., No. 1 Fleming; Clear Creek Oil Co., No. 1 Tarson, temporarily.

CUCU REFINING CO. (Houston)—Purchased 500 acres on Houston ship channel at Deepwater, and will build refinery and tanks of large storage capacity. First tank to be 10,000 bbl. capacity. Reported that chief source of crude oil supply will be Central and South America, where contracts already made.

Liberty County

TEXAS GULF (Hull)—Morris Phillips well flowing by heads from 2,500 ft.

SUN (Hull)—No. 1 Joseph Carr well flowing by heads from 1,800 ft.

Orange County

BIG SIX OIL (Orange)—Will drill test well 8 miles west of town on Chesson farm. Rig on ground. Company locally financed.

Sterling County

TEXAS ELKHORN OIL CO., drilling on Richardson ranch, has well 3,350 ft. deep. Has penetrated 83 ft. of Gray Marble Falls sand containing oil throughout. Casing set and cemented at 3,746 ft. Leases in district still being acquired, although little activity within three miles is open for lease or purchase.

UTAH

Juab County

TINTIC SHIPMENTS, week ended Aug. 16, amounted to 127 cars.

CHEF CONSOLIDATED (Eureka)—Produced about 2,500,000 oz. silver in 1918.

NORTH BECK (Eureka)—Amendment of articles of incorporation permitting increase in capitalization to \$1,600,000. Property in northwestern part of Tintic, adjoining Centennial-Eureka, Gemini and Ridge and Valley. E. J. Raddatz and associates interested.

YANKEE (Eureka)—Shaft down, 1,100 ft.; making 2½ ft. daily. To be continued to 1,800 ft.

Salt Lake County

EMMA SILVER MINES (Alta)—Statement by trustees covering finances up to Aug. 12, 1919, issued. Shows receipts from assessments of \$176,613; from underwriting, \$74,609; subscriptions and underwriting stock, \$47,893; claims into stock for credit or stockholders, \$28,825; a total of \$327,952. Disbursements—including cash plus securities of \$100,000 held as trustee for Emma Silver Mines Co.—were of like amount. Probable that operations will be

resumed soon and that water in workings below Bay City tunnel will be pumped out.

MICHIGAN-UTAH (Alta)—Shipping up to a car of ore daily. About fifty men employed.

MONTANA-BINGHAM (Bingham)—Smeltery settlements of eight cars of ore recently shipped brought \$16,448, or about \$2,000 per car net. The ore is a pyritic copper ore carrying small amounts of gold and silver, allantanyte is president and general manager.

Summit County

SILVER KING CONSOLIDATED (Park City)—Reported silver-lead ore opened in raise in Electric Light claim. Raise starts from 1,625 ft. level up about 200 ft. Property has shipped no ore since August, 1918, and has made no regular shipments since May, 1918. During last year long drain tunnel in process of being driven in 10,000 ft.

WASHINGTON

Okanogan County

TIP TOP (Nespelem)—F. C. Hammond has taken a bond and reports ore at bottom of 100-ft. shaft, carrying silver, lead and gold. Vein said to extend 1,000 ft. on surface.

Stevens County

CONSOLIDATED COPPER (in Cedar Canyon district)—Shipped 208 tons, silver, copper and gold ore this year.

REARDO COPPER MINES (in Cedar Canyon district)—Shipped 137 tons this year.

AICHEN BEE (in Deer Trail district)—Has driven tunnel 103 ft. at cost of \$16.44 per ft. during this year. Said to have gone through 33 ft. of ore averaging 44 oz. silver and 32 per cent lead.

QUEEN AND SEAL (in Deer Trail district)—Reported sold to New York interests for \$60,000 by Charles Turner and associates of Davenport, Wash.

CANADA

Alberta

THE IMPERIAL OIL CO.'S geologist, Charles E. Taylor, announces that as the result of a geological survey by twelve crews in the foothills area, the company will soon start drilling southwest of Lethbridge. The drilling campaign includes a series of test holes in the first anticline east of the mountains all the way from the international boundary to the Mackenzie River basin.

British Columbia

LUCKY JIM (Slocan)—Senator Lendrum McMeans, of Winnipeg, contemplates foreclosing second mortgage, but will protect interests of stockholders if possible.

SILVER BELL (Slocan)—Second car, 26 tons, shipped and returned 237.4 oz. silver to ton, lead 31.1 per cent, zinc 7.1 per cent.

Ontario

CROWN RESERVE (Cobalt)—Purchased two claims in Larder Lake situated to the northeast of the Harris Maxwell.

MOND NICKEL (Coniston)—Cable advice received from the head office in England to ship bessemer nickel-copper matte at the rate of 3,000 tons per month. A large quantity has been stored at Coniston during the war, on account of lack of shipping facilities.

AVOUB CLAIM (Kirkland Lake)—Vein 6 to 8 ft. in width showing visible gold has been opened up.

ASSOCIATED GOLD FIELDS (Larder Lake)—Crosscutting at 100-ft. level of Dr. Redick property struck what is believed to be the Kerr-Addison deposit of low-grade ore 300 ft. wide. This orebody is 1,200 ft. long, on the Kerr-Addison, and the new strike, if supposition is correct, will lengthen it to 2,000 ft.

CLIFTON (Porcupine)—Drift on first level now 100 ft. in; ore showing visible gold in places.

MEXICO

BRITISH INTERESTS, according to official figures of the Mexican government, have acquired 2,431,000 acres of oil lands in Mexico. The Doherty group is second, with 586,692 acres. Total acreage owned or leased by foreign corporations is 5,436,271. During May, 6,897,962 bbl. of oil was shipped out of Mexico, the largest quantity for any month of the current year.

INDIA

Upper Burma

BURMA CORPORATION, LTD. (Bawdwin)—Cable advice received in London report ore found in raise above No. 5 level shows 31 oz. silver, 39 per cent lead, 23 per cent zinc and 4 per cent copper. Width, 66 in.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver		Aug.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
21	417	111½	60½	25	419	113½	60½
22	418	112½	60½	26	419½	114	61½
25	420½	113½	60½	27	420½	115½	61½

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

Daily Prices of Metals in New York

Aug.	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	Spot	N. Y.		St. L.	St. L.
				St. L.	St. L.		
21	23½	54@54½	57@6	5.60@5.70	7.55@7.60		
22	23½@22½	54@54½	57@6	5.60@5.70	7.50@7.55		
23	22½@22½	54@54½	57@6	5.60@5.70	7.50@7.55		
25	22½@22½	54@54½	57@6	5.60@5.70	7.45@7.50		
26	22@22½	54@54½	57@6	5.60@5.70	7.45@7.50		
27	22@22½	54@54½	57@6	5.60@5.70	7.40@7.45		

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Aug.	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
21	101	102	110	273	269	247	251	40	41
22	99½	100½	110	273½	269½	247	251	40	41
23	98	99	110	272½	268½	247	251	39½	40
25	96	97	110	271	268	247	251	38½	39½
26	98½	99½	110	271½	268½	247	251	38½	39½

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

Metal Markets

New York—Aug. 27, 1919

The metal markets this week were dull, save for a few large and interesting transactions, and exhibited a good deal of irregularity. Copper was distinctly weaker, owing to the reappearance of resale lots.

Transatlantic freight rates are unchanged at \$18, and transpacific at \$14.

Copper

In our last report we said that "it seemed not unlikely that the principal producers might realize their prices presently." At that time business was pending, which was consummated on the following day. A brass manufacturer placed a very large order, which was divided among three producers, whose price was paid. Presumably this buyer had contracts to cover and could

not obtain so large a quantity of copper from any other hands. Following this transaction, however, producers did no other business worth mentioning, and copper immediately began to be offered down by some of the smaller agencies and by second-hands. On Aug. 22 a round lot was sold at 22½c. As the week wore on, offerings through brokers, in lots of considerable size, increased, and it appeared that the liquidation of copper held by speculators and others, which was supposed to have been absorbed, had by no means been completed. Toward the end of the week one very large lot was offered, and at the close copper was freely offered at 22c., with the probability that it could be bought for considerably less. Even at such a concession buyers showed no interest.

Other important features of the week were the offering of copper in round lots by Japanese houses. It is known

now without any doubt that some of the copper bought by the Japanese a few months ago was taken speculatively. None of that ordered from the Export Association has come back, but there was a good deal of Japanese buying outside of the Association. British houses this week offered ingot bars for import from Great Britain.

The Director of Sales announces that the War Department is preparing to offer for sale under sealed bids its surplus of brass, totaling approximately 192,347,057 lb. The material embraced in the proposed offering includes anvil brass, brass rods, brass bars, brass billets, cast bars, component parts of ammunition, disks, "gilding brass," leaded brass, primer metal, sheets and coils, spring brass, tubing, and scrap. The material to be offered is divided into two general classes, namely, that known to the trade as "70-30," which was used in the manufacture of small arms and field artillery cases, and that known as "60-40," which was used in the manufacture of fuses for sharpnel and high-explosive shells.

Copper Sheets—The base price of copper sheets is 33½c. per lb. Demand strong. Copper wire is quoted at 26@26½c. in carload lots, f.o.b. mill. Market is quiet.

Tin

A fair business was done at not much change in prices. Tin of 99 per cent grade was steady at 54@54½c. throughout the week. Straits was quoted at 56c. up to Aug. 26, when it declined to 55½c., rallying to 55½@56c. today. Straits for shipment was quoted at 52½@52½c. Singapore quoted £279, c.i.f. London, on Aug. 22; £276 on Aug. 25; and £275½ on Aug. 27.

Lead

Some producers reported a good deal of inquiry, including some from abroad, especially from China and South American countries. Other producers had very little inquiry. However, all of the principal producers were quite indifferent, owing to the full extent to which they are already booked. Consumers bought some round lots from independent producers in the early part of the week, paying 6c., New York, and that price was realized on smaller business right through the week. At the same time second-hands were making offers of lead in lots of 100 to 300 tons at around 5c. right through the week, and considerable business was done on that basis. The only explanation of this difference is that some consumers refuse to accept contracts with some of the concerns that are offering

lead cheaply. Just as speculators often have to pay a premium on purchases, at other times they have to accept a discount on sales. Larger interests that might clean up the market may be disinclined to do so, owing to the size of the accumulations that they have already.

Zinc

The market was dull and easier, declining a little from day to day. High-grade zinc quoted at about 87c., with only small business done.

Zinc dust is at 10c. for ordinary prolonged dust, 10½c. for atomized.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market was again dull and declining. We quote spot at 85½@87c. Some of the Chinese houses have refused to meet these prices, saying that they are not justified by the economic conditions of the industry.

Bismuth—Unchanged at \$2.95.

Cadmium—Quoted at \$1.40.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Opening the week at \$109, sales were made at declining prices, \$103 being quoted on Aug. 25. On Aug. 26 a sharp cut to \$95 was made. Light demand and freer arrivals and the throwing of a large quantity on the market are given as the explanations. San Francisco telegraphed \$102, firm.

Silver and Platinum

Silver market has continued firm, with steadily advancing quotations from London, which closed at 61½d., a figure that had not been touched since July, 1866. With firmer market for sterling exchange, New York quotations have kept pace with London, and close at 115½c. China demand has fallen off, as Chinese exchanges have not risen in proportion to the London market. Market closes steady.

Mexican dollars at New York: Aug. 21, 85½; Aug. 22, 86½; Aug. 23, 86½; Aug. 25, 86½; Aug. 26, 87½; Aug. 27, 88½.

Platinum—The advance to \$110 last week was maintained, the metal being in strong demand.

Palladium—Unchanged at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 23—Zinc blende, per ton, high, \$51.30; basis 60 per cent zinc, premium, \$48.50; Prime Western, \$47.50; fines and slimes, \$45@42.50; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$47.65; calamine, \$30; all zinc ores, \$46.79.

Lead, high, \$65.25; basis, 80 per cent lead, \$62.50; average settling price, all grades of lead, \$63 per ton.

Shipments the week: Blende, 5,685; calamine, 299; lead, 1,274 tons. Value all ores the week, \$360,120.

Shipping is in a most deplorable condition. One smelterman reports 2,400

tons between the purchase and delivery. At the Ottawa station of the Frisco railway there are reported between 260 and 300 carloads of ore that the railroads are not attempting to move. Today it is reported the switches down near the mines, at Tar River and other points, are filling with loaded cars of ore. It is roughly estimated that there are over 400 cars of ore loaded and on sidetracks in Ottawa County alone.

Platteville, Wis., Aug. 23—Blende, basis 60 per cent zinc, \$48.50 base for premium grade and \$46 to \$47 base for high lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$62.50 per ton. Shipments reported for the week are 2,242 tons blende, 127 tons galena, and 444 tons sulphur ore. For the year to date the totals are 64,791 tons blende, 3,812 tons galena, and 10,115 tons sulphur ore. During the week 2,852 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Quoted nominally at \$25, f.o.b. California points, but that price can be shaded sharply.

Manganese Ore—Unchanged. Consumers seem to be well supplied.

Molybdenum Ore—Dull and unchanged.

Tungsten Ore—Business has naturally come to a standstill pending consummation of tariff legislation. The House of Representatives has passed a bill putting a large duty on the importation of tungsten ore.

Other Minerals

Nitrate—Conditions reported dull. Spot supplies are quoted at \$2.90 to \$2.95 per cwt., carload lots. According to an estimate received from one trade source, Government stocks remaining unliquidated amount to as little as 5,000 tons.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace size ore, free from fines, c.i.f., New York or other Atlantic port. Market slow and unsettled; hand-to-mouth buying. Very little ore coming in. Price will decrease with ocean freights.

Sulphur—No change has occurred in the general situation during the week. Prices are still quoted \$18 per ton, carload lots, domestic delivery, and \$20 per ton, cargo lots, for export shipments. Both quotations are at mines, Freeport, Tex., and Sulphur Mines, La.

Iron Trade Review

New York, Aug. 27, 1919

Nothing in the events of the week has changed the judgment of the steel trade that the strength of the strike movement engineered by the American Federation of Labor has been greatly overstated, according to *The Iron Age*. The number of men voting has been carefully suppressed. The President's stand against a sweeping railroad wage advance has not helped the steel strike drive. If steel works mechanics strike, they may shut down some departments,

but the large majority of mill workers are opposed to being thrown idle.

A significant development was the action of representatives of Midvale Steel & Ordnance Co. employees, gathered in their quarterly meeting, in declaring against a shorter day's work and an increased wage, and calling for "increased production and the stabilization of prices in conformity with wages now being paid."

Neither manufacturers nor consumers of steel appear to be taking any of the safeguarding steps as to stocks or shipments of material that are commonly seen when a strike is considered imminent.

At one Eastern and one Western steel plant eight-hour turns have just been granted, but at the former the output went down because enough men could not be found for three shifts.

Export trade, made up of so many kinds of material in moderate and small tonnages that its magnitude is scarcely appreciated, is still expanding.

Pittsburgh—Aug. 26

Up to the time of the President's general statement to the public, given in Washington dispatches published this morning, there was no small possibility of a strike being called in the steel industry by the representatives of the American Federation of Labor who have been attempting to organize the industry, and there were also possibilities of plants being closed in anticipation of labor troubles. The so-called "strike vote" ordered July 20 by the representatives of twenty-four unions affiliated with the Federation, and having more or less membership in the iron and steel industry, was announced on the evening of Aug. 20 as having been 98 per cent affirmative, and a special committee of six of the general organizing committee was instructed to approach the iron and steel manufacturers, seeking a conference. Failing to make arrangements within ten days, or by Saturday, Aug. 30, the committee had authority to call a strike. "Though the attitude of the steel producers as to engaging in a conference has not been made known, it has been absolutely certain that unionization of the mills and furnaces would be resisted, the issue presented being that of recognizing the union and establishing principles such as the check-off.

The President's public statement calling plainly upon everyone to declare a truce in labor matters until conditions are settled, and stating that wage advances would make futile the present efforts to reduce the cost of living, is generally received in the steel trade today as laying down a clear course of conduct, and it is believed that in the circumstances the Federation committee of six, under the chairmanship of Samuel Gompers, will not make any radical demands.

The entire iron and steel market situation has been under the domination of labor conditions and prospects. Though some buyers have been less disposed to place orders, others have

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The Potash Situation

THE hearings before the Ways and Means Committee respecting legislation for the protection of the potash industry brought out some interesting points in regard to the potash resources of the United States. Perhaps the most important information is that even in the opinion of the high-cost producers, within a period of five years an American potash industry could stand upon its own merits in competition with foreign sources.

Much of the time allotted to the hearing of the potash question was consumed in an endeavor to solicit answers that could be used to political advantage, while the main question was often entirely overlooked. It is regrettable that partisan politics took such a prominent part in the hearing, for the heart of the matter is not a partisan question.

From our point of view the question at issue is this: Is it to the interest of the American people at large that there should be maintained within the United States a new industry, the raw material for which is here in abundance, and the finished product of which is essential to our welfare? Or is it to the interest of Americans generally that we should continue to derive our potash from foreign sources, save the public the expense of establishing a new industry, lose the experience and money already invested in the business, and remain dependent upon foreign supplies?

That potash is the substance under consideration is only incidental to the foregoing issue. A national policy is involved that with justice should be applied to all new industry. It is exactly similar to the glass, porcelain, chemical, and dye industries, and involves the possibility of high costs, until the new industry is strong enough to compete with foreign offerings.

There are two sides to the question, with more or less reason on both. However, history has proved that the prosperity of this country is built largely upon our industries, for a time artificially cultivated. This is admitted by the free trade advocates, and that the majority of the people believe it is evidenced by the various tariff laws that have been put in force to encourage the growth of industry.

What advantage would accrue to the American people through the establishment of a successful potash industry in the United States, and what would it cost them to establish it? While these questions were incompletely answered, the following points bearing upon them were brought out at the hearing: The normal consumption of potash in this country under pre-war conditions was approximately 250,000 tons, worth at Atlantic ports about \$10,000,000. Very little of this was brought to the country in American-owned vessels. Hence, approximately \$10,000,000 was spent by the United States for the benefit of foreign labor and capital. In these days when the public thinks of bil-

lions as it used to think of millions, this may not appear to be a very large sum, and yet if expended in labor, transportation and interest on invested capital, it means considerable industrial development.

At the hearing the opinion was expressed that in the post-war period the price of the imported material lacking domestic competition might be expected to reach nearly double the above sum, or \$20,000,000, assuming that imports would be practically the same. And it is fair to assume that they would equal former imports even at double the figure, because our farming districts have suffered materially for lack of potash salts during four or five years. Hence it appears to be a question of either spending at home or abroad \$20,000,000 and no economist could say that it would be disadvantageous to have this amount of money working in America rather than abroad.

However, it is believed that protection should not be so complete as to prevent all importation, but preferably that a portion of our normal supplies be permitted to come from abroad. Under these circumstances the whole of the estimated figure, \$20,000,000, would not be retained for home industries. Some competition is necessary, but should the industry be developed to a degree permitting of competition with German and French potash, we may ourselves begin to export to those countries favorably situated geographically, so that the ultimate aim is not merely that of supplying a portion of our own needs, but rather the cultivation of an industry that will do this and at the same time expand continuously, supplying both home and foreign markets.

The second gain of importance to America in the development of domestic supply is scarcely measurable in dollars. It is being independent of imports at a time when imports are impossible. We never expect to see that day, but it is just as possible to come in the days ahead as in those that are past. The price paid for potash during the war, when it reached more than ten times the normal figure, is an indication of the importance of such a domestic supply. But this is not the true index of the necessity, for it remained practically unobtainable for agricultural purposes for a long time. The money loss to agriculture cannot be calculated, but it is probably large.

The third advantage in establishing the industry lies in the conservation of the capital that has already been spent in building plants, in the preservation of the experience that has been gained and the skill that has been developed.

There may have been unwise or dishonest promotions in the potash industry, but there has been a very large amount of money spent legitimately and intelligently in an endeavor to make our resources of commercial value. Valuable experience has been gained and labor has acquired skill in conducting operations. Loss of these means national loss. The fact that a few plants

have been able to write off a portion or all of their invested capital does not make the national loss any less if those properties must now be abandoned.

The fourth point of advantage lies in the fact that the encouragement of the domestic industry would form the basis for further investments of a legitimate nature in this country. There will undoubtedly be further fraudulent or unwise promotions, but probably no more than in any other line of business.

One great difficulty a Ways and Means Committee or a Tariff Commission always encounters in its efforts to appraise correctly a manufacturing situation is that the high-cost producers are most vociferous in their demand for protection, while the low-cost producers sit back and take whatever Congress will give them as so much added margin. A policy acceptable to a great proportion of thinking men is that which provides tariff protection equal to the difference in cost of production here and abroad. Theoretically this is simple; practically it is most difficult to get an idea of correct costs at home, and almost impossible to appraise foreign conditions.

Here lies the difference between the potash industry and the glass, porcelain, chemical, and dye industry. With an almost unlimited amount of raw material, with a market absorbing potash by hundreds of thousands of tons, with the well-known American faculty toward quantity production, the potash industry as a whole has yet to demonstrate to a critical observer that with sound financing and correct technology it cannot *now* put potash on cars in quantity and at a profit at the same price Europeans can put it aboard ships. If this be true, cannot we reduce our post-war costs as rapidly as can they? And do we then need a higher tariff than would equalize rail and water freights?

We have learned that potash probably cannot be produced commercially from kelp. The Nebraska potash men now admit that they can get their salt more economically than in the past. Potash recovered as a by-product at cement plants promises to amount to a very respectable tonnage, and in our opinion will eventually command the local market. We have in many feldspars percentages of potash almost equal to that contained in the German and French salts as mined, and though their commercial use in quantities has not yet been realized, the question of their utilization may soon be solved, to the great advantage of the United States.

Danger!

MINE-OWNERS and refiners of metal, you are paying 35%* of all the money that is collected from the public for railway service. You are more vitally interested in low railway tariffs and adequate service than any other class of producers in the United States. What steps are you taking to see that your interests are protected? Are you prepared to see the Government take over the railways and place them in the hands of those who are now asking that this thing be done?

You may ridicule the idea as grotesque, as inconceivable for a sane people, as impossible; but it is no more impossible than that a wave of prohibition swept over the land, to the astonishment of millions; no more impossible than that we were at war with Germany

in a few short months after it was positively asserted that civilization would not permit such a thing. You are not facing what is for the moment a popular fancy. You confront a well-organized body of determined men, backed with the force of numbers.

This is not an imagined danger—it is a real one that threatens you, demanding active resistance, as active and as aggressive as the force that is contending to destroy our present industrial life. Can you imagine that with the railways in the hands of a labor party, your industries, so dependent upon transportation facilities, can thrive as they have done in the past? Your industries and those depending upon them are sure to suffer. The fact that your laborers are going to cast their votes for Government ownership and suffer in consequence is no reason for your not making every effort to protect yourself and to protect them from their own acts due to ignorance or misinformation. You face something worse than increased costs and decrease of business. Raising transportation charges will not be the end. From the ownership of inter-state railways and their management by their workers it is only a step to the ownership of other public utilities; only two steps to the national ownership of our fuel supplies, coal mines and oil wells; only three steps to the nationalization of all mines and of all private industry.

The boasted strength of the labor unions is not a vain boast. Theirs is a real organization, supplied with money, votes, and misguided but able brains, which can be overcome only by abler men acting in harmony for the safety of their country. Unfortunately, the latter will be supported by an indifferent public united by no bonds, and recognizing and supporting no leaders.

Though this soviet idea will be supported by the votes of many laboring men it must not be regarded as a class contest. It is a national question, a contest for the preservation of individual rights, for the fundamental principles that have made America what it is today. If the railway labor organizations insist upon making government ownership a question of party politics, and any party makes this one of the main planks of its platform, then the contest will have to be fought on political lines. This would be unfortunate and should be avoided if possible, as it will inevitably develop a labor party and a class spirit in respect to a matter wherein the true interest of laborer and investor are identical.

The avoidance of a class contest can best be accomplished through the enlightenment of labor, by showing labor what line of action will be to its advantage and what to its disadvantage. The average American laborer is not stupid; he will take the right course if he can be shown what is the right course. If it is pointed out to the miner that his leaders in Washington have made the threat that under certain circumstances "the railways will be shut down so tight that not a wheel will turn," he may wonder what is going to happen to him and his family while no trains are moving. If it is drawn to his attention that those leaders are opposed to the right of a man to will his savings to his children, the miner can see that he is following a leader who is opposed to one of the dearest privileges that the human being possesses, the right to care for and protect his offspring.

Above all other things, that one for which labor should strive, or even fight, is the opportunity to do honest work and accumulate a fund as a protection to old age,

*Bureau of Railway News and Statistics, year ending June 30, 1911.

or for dependent children. Any device conceived by man to interfere with this the workingman should fight with vigor, and the proposal now made by the leaders of the railway organizations is a long step toward the removal of the privilege of every worker to be the master of his own destiny.

Mining Investments

A FEW years ago it was not uncommon when speaking of mine investments, even to those who made a business of mining, to hear the idea expressed that the investor preferred gold mining to the mining of any other metal because he could safely count on the market value of his product. The prices of coal, iron, petroleum, copper, and silver all varied with the rapidly varying demands and new discoveries, while gold was always worth \$20.67 per ounce. We confess to having shared to some extent in the wisdom or fallacy of this attitude and to have thought that gold was not exactly a commodity in the sense that other useful metals are so regarded. However, conditions in the gold mining industry today are such that, so far as marketing is concerned, there is a very close resemblance between gold and any other natural product.

We are learning that \$20.67 is only a yardstick. It means no more than "an ounce of pure gold"; that the value of the metal is not to be gaged in dollars but in the amount of necessities, happiness or luxuries that a unit of it may be traded for. Our faith in gold has been shaken. We can no longer say that a vein of \$10 gold ore is just as good as money in the bank, or that a 50c. placer makes an absolutely safe dredging proposition. We are learning that in the discussion of new business it is not so important to consider what the element is which is to be mined, but the important point is to determine the market for it.

We may not wish to consider petroleum, potash, or copper mining for some real or imagined difficulty inseparable from the business, and yet any one of them may be good or poor business, depending upon the amount that can be produced per unit of endeavor—capital or labor—and the amount of necessities a unit of product may be traded for. The same argument applies to gold mining.

It may be suggested that we are simply calling attention to the fact that gold mining should no longer be set upon a pedestal as being without risk, and should be placed upon the same plane as other mining ventures, with all their attending uncertainties. That is not quite the idea. We would rather say that the business of mining other elements does not occupy an inferior position to that of gold mining. The prices of other natural products may rise or fall more rapidly, but all are influenced more or less by the same laws, the laws of supply and demand.

In mentioning uncertainties, we would not give the impression that there are more uncertainties in mining than in industrial enterprises generally, for there are not. And this is another thing that we are learning: The gilt-edged security is something that is passing into history. Not long ago the securities of public utility corporations were classed as safe investments for trust funds. Today your banker is reluctant to mention any investment as safe. Not long ago we believed that there was at least one thing that the American people would continue to do forever, that was to ride to and from their business and pay for

the accommodation. Hence we thought that shares in transportation systems (some of them) would form gilt-edged securities. People will always ride, but at the present day they are not paying for it. Our reasoning was slightly at fault. Today we believe that for years to come people will be moved by gasoline, hence the economical production of gasoline must be good business, and better and safer than the building of railways. But some day people may decide not to pay for this privilege, as is now the case with railways. If so, Standard Oil shares will be flat.

Whether it be manufacturing, building or mining, and whether it be the business of pumping oil, mining coal, iron or other metal or gem, no product can be considered to have a permanent value. The value of the product and the success of the business, other things being equal, will depend upon the market for the output. If the value in trade is above the average cost of production the business may succeed; if below, it will fail. Gold is no exception.

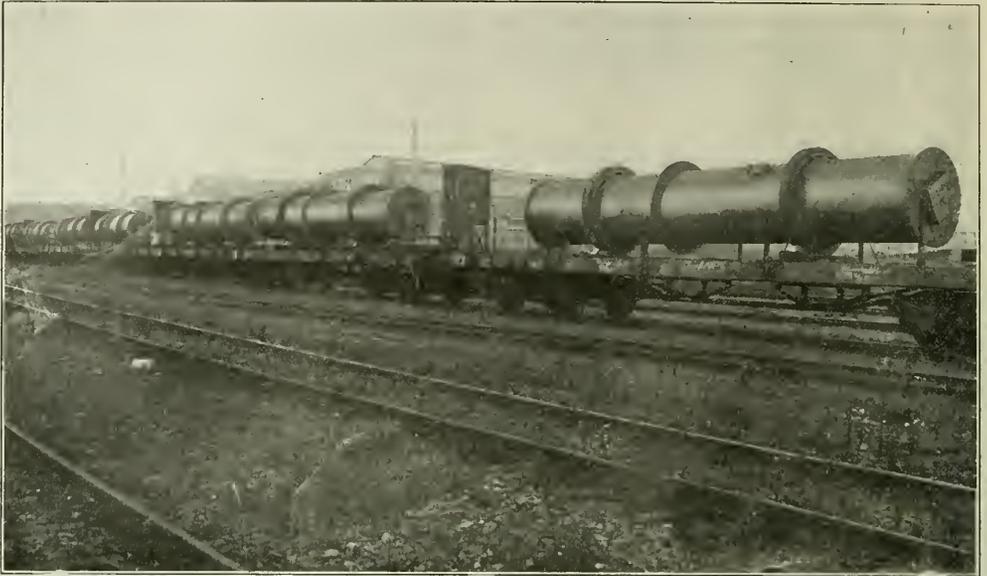
Industrial Corporation Schools

THE success that has attended the establishment of trade schools in various industries offers sufficient argument for their continuance. As applied to the mining field, the results obtained in the few instances where such systems have been put into practice have proved of such value that there is every reason to believe that further development is to be expected. A general analysis of the labor situation will serve as additional argument in their behalf. Foreign labor, upon which mine operation has been largely dependent, will undoubtedly be restricted, and its supply, plentiful in the past, will for some time be only irregular and intermittent. The increasing interest in labor-saving devices in the last few years suggests that operators anticipate the time when labor will be at a premium. In many instances machine-performed work has been done at a saving; in others it has been found that the costs parallel those obtained by hand labor, and in some cases the former resulted in a loss; but the work has been necessary regardless of cost.

Assuming, then, that there is to be a general adaptation of mechanical devices and the utilization of modernized machinery, it is to be expected that their operation will require the services of highly skilled labor. The rising costs of supplies make conservation necessary, and this is obtainable only through the employment of labor that is thoroughly familiar with the methods that effect efficient mine operation. The further education of men in subordinate positions assures a future supply of executives which will in turn demand higher intelligence from the men under them.

So-called trade schools must necessarily differ from institutions of ordinary learning. In the first place, their requirements demand specialization of thought. The success of a practical mining course depends on the selection of a schedule that will encourage independent thinking and co-ordination of ideas.

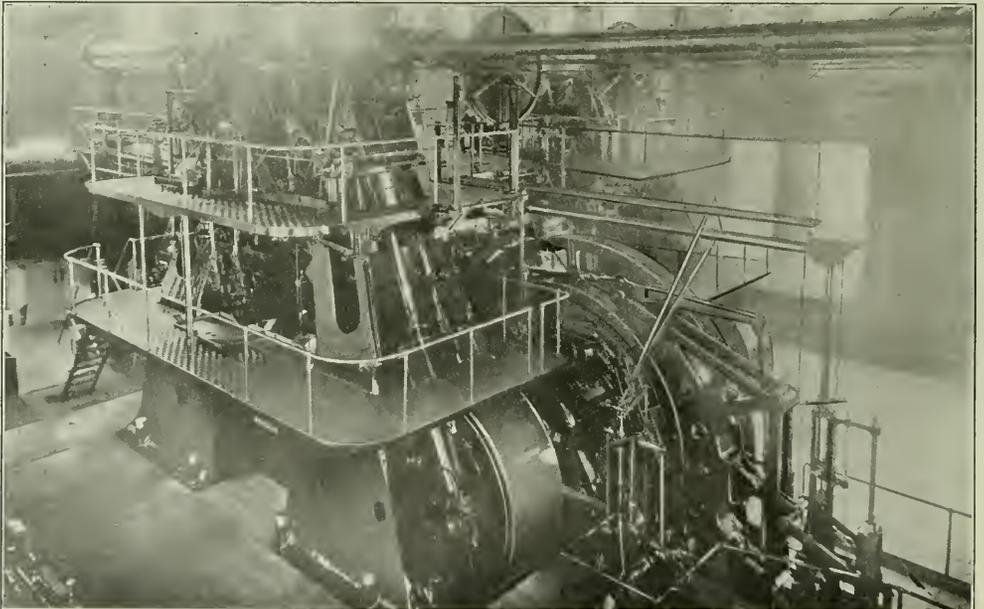
The opinions of capital and labor are not infrequently at variance with each other, but such institutions as industrial trade schools will greatly aid them in a better understanding. A common point of contact is established. Capital, on the one hand, acquires a better understanding of the capabilities and capacities of labor, and the latter receives a clearer insight to the requirements demanded in the operation of enterprise.



LEACHING DRUMS PREPARATORY TO SHIPMENT TO THE CHILE EXPLORATION CO., CHUQUICAMATA, CHILE, FROM PLANT OF THE HUMBOLT ENGINEERING WORKS CO., COLOGNE-KALK, GERMANY
(Photo taken in 1915 and just received)

Photographs From the Field

HOIST AT THE B AND M SHAFT OF THE HOMESTAKE MINING CO., LEAD, S. D.



The Discovery of the Klondike

A New Version of the Story—Great Strike Principally Due to John McDougall, Though He Had No Part in the Gold Rush—Carmack, Actual Discoverer, Established a Unique Record, After Camping Five Years on Rich Ground

BY HENRY BOURSIN
Ozone Park, N. Y.

ABOUT the last of February, 1895, the Steamship "Alki," David Wallace commanding, left Puget Sound and British Columbia ports on her regular northbound trip to Sitka and way ports. Her passenger list included a few old-time Yukoners: a half-dozen or more French-Canadians, owning claims on Miller and Glacier creeks, in the Sixty-mile district, and a pioneer Yukoner named Sam Lansing. Of the chechakos, there were three with whom this story deals—a tinsmith who had sold his business in Butte, Mont.; John McDougall, originally from Bruce County, Ontario; and Dan Hart, a Scotchman.

McDougall's first mining experience had been gained in the Cariboo district in British Columbia, in 1879. Later he had been a subcontractor on the construction of the Canadian Pacific Ry. through British Columbia, and, after the completion of that road, had been a general contractor in British Columbia and Washington. Hart had quit his vocation as carpenter on a British warship, and was going North in search of gold. These three were strangers to each other, but having the same destination and purpose, they had agreed to go into the Yukon country as partners before the "Alki" reached Juneau.

The party disembarked at Juneau, which was then the jumping-off place for Yukoners. In those days two pioneers of Juneau, John Olds and Morris Orton, were running the Occidental Hotel. The three gold seekers put up there, and, a few days later, having purchased Yukon outfits, were impatiently awaiting favorable weather for crossing Chilkoot Pass.

When a man intends prospecting a country new to him, he acquires in advance such information as he can gather concerning it. McDougall had been doing this on the way up the coast and at Juneau. He learned that the Stewart River bars were worked out, and that there was small chance of locating pay ground in Forty-mile and Sixty-mile districts; further, that the latter districts were on the same gold belt; and finally, that the country rock there was schist and slate, trending seemingly toward the Stewart River diggings.

McDOUGALL HAS A BRIGHT IDEA

McDougall had not gone far into these details when there occurred to him a suspicion which rapidly grew to the dimensions of a theory. It was this: Perhaps those three districts were on the same gold belt; if so, between Sixty-mile and Stewart River was a good place to prospect.

One day while loafing about the hotel, McDougall searched out Lansing, who had mined in all the districts mentioned, to renew their talks about Yukon diggings. To get his fragmentary information straight in his mind and keep it so, and to focus that information on a definite place, he had gone to Dick Nelson's Post Office stationery store and procured a sheet of paper. Returning to the hotel, he put the paper on a

billiard table, and, in the presence of fifteen or twenty men, with Lansing dictating the position of diggings and streams, he made a map to jibe with Lansing's idea of the lay of the land. It was not a pretty map, but it is not often that a Geological Survey cartographer with a string of initials trailing after his name can make one that leads to more gold.

After getting Lansing's ideas on paper, McDougall drew a line from Forty-mile diggings to Stewart River diggings, and asked: "Where's the highest ground along that line?" "There," said Lansing, indicating a place between the Yukon and Stewart rivers. "Has anybody prospected there?" was the next question. "No," was the reply. "That's where the fresh meat for Forty-mile comes from; it's called the 'moose pasture.'" McDougall drew half an oval, which with the straight line inclosed the north half of the "moose pasture," and, turning to his partners, said: "Boys, we will prospect on the north slope of the 'moose pasture.'"

In reaching this conclusion McDougall put to astonishing use what he knew of the occurrence of placer gold near Barkerville, B. C., where the extremely rich creeks flow northerly from a prominent mountain, whereas the south creeks are comparatively poor, though all are in schist and slate country rock.

The map was handed to Hart, who stowed it away in an inside pocket. Surely, not a man present had the least suspicion that on it was exactly shown one of the richest placer fields ever discovered, and that it would be found by following that crude sketch. They saw only a tall, quiet, big-boned man making a map of a country he had not seen.

FATE SPOILS THE GOLD SEEKERS' PLANS

Before the end of this recital of mining history is reached, it will be seen that Fate never intended McDougall, Hart, and the tinsmith to reap fame and fortune as the discoverers of the Klondike; that will stick out like an ounce nugget in a spoonful of black sand. Those men fully intended prospecting there and nowhere else. Their outfit had been bought, and they awaited only favorable weather for crossing Chilkoot Pass. It is at this fair-seeming stage when Fate first shows a contrary, even malevolent, disposition toward McDougall and Hart.

Although the calendar said "spring," the weather belied it. There were frequent and heavy snowfalls on the pass, and the danger from snow-slides was great. Some of the Frenchmen boarded a steam launch every week or ten days and went to Dyea to see how the pass looked. With disgusting frequency the report was the same. They were as eager as any to cross the range; their courage was undoubted, and they were learned in the treacheries of sullen mountains; so when they returned and said, "She's bad; better we go bam-bye," the unanimous opinion prevailed that a start bye and

bye was soon enough. Thus the start was delayed until the middle of April.

In the meantime other things conspired with the weather to sidetrack McDougall. A mild mining excitement developed at Juneau concerning the beach diggings at Latuya Bay, where gold had been found a few years before. It was reported that George Wheelock and Captain Cole were working fifteen men on ground seven miles west of the bay and were clearing \$150 a day; and that Dave Spurgeon, working alone on ground four miles east of the bay, was washing out from \$7 to \$20 a day.

MCDUGALL URGED TO GO TO LATUYA

These rumors sounded good, and three men from Portland, Ore., were seized with a strong desire to try their luck in that region. The little schooner "Seagull" lay in the harbor at the time; so the Portland men tried to induce the owners, two cousins named McKinnon, to take them to Latuya, transportation free, the McKinnons to share and share alike with the prospectors in any locations made. The McKinnons were tempted but not stampeded; it cannily occurred to them that they knew nothing of the gold-finding capability of the Oregonians, whereas, there was a man in town in whom they had large confidence. So they agreed to go if McDougall joined the party.

The reason why the McKinnons wanted McDougall to go dated from 1889, when the latter was a contractor at Port Townsend, Wash., and the McKinnons were halibut-fishing out of that port. About twenty or more years before, a Mexican had found gold on the beach at Port Townsend, where, tradition says, he worked out a small patch which paid \$2 a day with a rocker. This beach gold was supposed to have been thrown up by the sea, until McDougall, in 1889, found that it came from the bluff above. The result was a brief but vivid mining excitement on ground which had been trodden by the feet of countless thousands. Wherefore, McDougall's judgment on beach-diggings was held in high esteem by these schoormen. Of course, McDougall was strongly urged Latuya-ward.

During this time of delay and of doubt as to which of two contrary courses promised the fairest, McDougall had in mind the probability of securing a contract in British Columbia the following autumn, and that in case he found nothing surely profitable in the meantime, he would return to British Columbia in the hope of securing the contract. At that time there was no railway from tidewater to the Yukon. The miners who crossed the range hand-sleighed their outfits from Dyea to the lakes at the head of the river, where they whip-sawed lumber and built boats in which the journey was continued down-stream to some tributary, then up-stream to diggings or failure. It all consumed time, as may be imagined. To come out in the autumn by the same route they poled a boat up-stream six hundred miles. To go in and out of the country the same season left but a fraction of a Yukon summer for prospecting. In the McDougall case, every day of delay in starting was a day off that fraction.

The conspiracy of events succeeded. It would have fooled anybody. McDougall sold his share in the Yukon outfit to Hart and the tinsmith, and went to Layuta. There he found opportunity only for more capital than he had, and returned to Juneau the latter part of June, thence going to British Columbia. He was in Cariboo,

B. C., when the news of the Klondike strike reached him.

Hart and the tinsmith had left Juneau the middle of April in company with Lansing and the Frenchman. Lansing pointed out the "moose pasture" to them on the way down river, but instead of stopping to prospect, they continued on to the town of Forty-mile to replenish their stock of provisions, a part of which had spoiled from getting wet. At Forty-mile the tinsmith abandoned his prospecting notions on finding that he could earn \$20 a day as the town tinker, which seemed a good-enough gold mine to him. In after years he owned a hardware store at Dawson, and later was in the same business in a large way at Nome. Perhaps he is there yet. The reason his name is not mentioned is because McDougall has forgotten it.

One man can go nowhere up-stream poling a boat on the upper Yukon and tributaries. Consequently, the brisk demand for a tinker having deprived him of his partner, Hart cast about for another, and found one in a Scandinavian named Hansen.

These two then poled up the Yukon to prospect the north slope of the "moose pasture." The river now known as the Klondike is the stream they should have turned into on leaving the Yukon. The east side of the Yukon along that part of the river is bad poling, so that all up-river boatmen hug the west shore, which is the opposite one from the Klondike side. So, when their goal, the hills now known as Dome Range, was neared, they were on the opposite side of the Yukon, where the poling is good, and failed to see the mouth of the Klondike, which was hidden by wooded islands. Here was an error in judgment. When they finally crossed over to the east side they had passed the mouth of the Klondike; and, instead of dropping down, they continued upstream and pulled into the Indian River, the first tributary south of the Klondike.

HART AND HANSEN MISS THE BIG STRIKE

The boat was taken up the Indian River to the mouth of Quartz Creek and left there. Both Hart and Hansen could see before this that they were south of where they wished to go—that they were on the south slope of the "moose pasture." So they began packing their outfit up the valley of Quartz Creek. On coming to its second tributary, since known as Little Blanche Creek, they headed up that valley which runs from the south side of the Dome Range, as the easiest way to reach the north side. Unfortunately, at a place near the mouth of Little Blanche Creek where they camped, a coarse-gold prospect was found in shallow ground. It was the first native gold Hart had ever seen, and he told McDougall years after, "It looked good to us." There they stayed, washing out gold, until a shortage of supplies should compel a return to Forty-mile.

Although Hart still had the map, it had ceased to pull him along. Several times he suggested going over the range to the north side, but Hansen always demurred, arguing that they ought to stay at work and wash out enough gold to buy their outfit for next year. They never knew how much gold they washed out that summer, having no scales with which to weigh it, but they guessed the total at \$2,000. Had they gone five miles further, just across the Dome Range to the northern slope, they would have found Eldorado Creek, world-wide fame, and a million dollars to the five-hundred foot claim. When most of their food had disappeared, and

the remainder was nearing an end, and when the frosty nights hinted at winter's swift approach, and their raiment was a time-worn joke, they took the back track for Forty-mile.

They arrived there, agreed on a crafty plan, namely, to tell no one about their diggings, and to expend their joint capital so as to put in a year of prospecting in the "moose pasture."

*The best-laid plans of mice and men
Gang aft a'gley.*

It seldom falls to the lot of man, however, to miscalculate by so wide a margin as did Hart and Hansen. If they had agreed to go on a \$2,000,000 spree, the plan would not have gone awry, for that is about what happened. Just how it occurred is, of course, somewhat hazy, but Hart remembers that Carmack was there. Anyway, when their exhilaration had passed, they had splashed their dab of dust into the channels of trade, and where it came from was no secret.

GEORGE CARMACK "DISCOVERS" THE KLONDIKE

George Carmack, assisted by his two Indian brothers-in-law, supplied the town with moose meat; which they obtained, as has been said, in the "moose pasture." Hence, when Carmack and family went to the "moose pasture" the next spring, they had pick, pan and shovel with them. Also the same spring, Bob Henderson began prospecting on the north slope of the pasture, and found pay diggings on a creek which he named Gold Bottom.

Not until 1897 did Carmack take out enough gold to convince the old-timers that he actually had struck something good in the "moose pasture." Cheechakos were more credulous; they believed the impossible—and found themselves rich.

As a gold discoverer George Carmack has a record that is absolutely unique—it probably never will be beaten. For five years he camped every summer where the very spot occupied by his tent was underlaid by some of the richest gold gravel ever found. Following his "discovery" other men found gold in plain sight on the bare bedrock of Big Skookum Gulch, about 1,000 ft. from his camp. At about the same distance, on No. 2 above Carmack's Discovery claim, three pans of gravel, averaging \$1,100 to the pan, were taken from a depth of one foot below the surface. Gold Hill, also but a few hundred feet distant from his camp ground, had a string of claims averaging \$500,000 to the claim. Year after year he camped on and walked over gold galore without the shadow of a suspicion crossing his mind that the country was worth a tinker's dam except for moose meat.

Hart was several hundred miles down the Yukon, repairing a river steamer for Jack McQuestion, when the news of Carmack's Klondike strike became known. From sheer disgust with himself, no doubt, he never returned to the Little Blanche diggings or went to the Klondike, but continued on at his trade during the gold excitement. In 1901, when McDougall first went into the Yukon country, he met Hart at Forty-mile. The latter was then in charge of the mining operations of the North American Transportation & Trading Co. in the Copper River country. He said: "If you had been with me, we would have got there." What became of Hansen is unknown.

McDougall was in the Yukon country off and on from 1901 till 1904, but found no claim which paid well. The best he did there was \$7 a day on a claim on Clear

Creek. As late as 1904, Lansing was in charge of the mining operations of the Ladue company in the Klondike.

It is probable that gold would have been found in the Klondike region years before 1895 but for the presence of Carmack there. It works out thus: The district was known for years to all Yukoners as his hunting ground; and, although he was not a prospector, it would seem inconceivable that anyone could camp and roam in a gold country for years and never see a sign—this in a land where every man and woman was supposed to be a bit of a prospector and the very babes played at mining. To most men it would appear as if there were too many impossibilities to consider that one. Again: By the time two men poled store-grub up a river or two, then packed or sleighed it over a divide or two, the cost of that grub-pile in money and hardship was such that its use as food might almost be classed as a luxury. In fact a man and his dog-team would devour \$1,000 yearly. Consequently, what game and fish he could get was a matter for serious consideration, for under the most favorable circumstances he could cut 75 per cent from the cost of his provender. Therefore not only was the Carmack presence in the "moose pasture" regarded as conclusive evidence that it contained no rich diggings, but his business there was distinctly harmful from the prospector's point of view, for by every moose he killed the probability of a prospector going there was thereby lessened.

Increase in Steel-Ingot Output

The output of ingots by steel works in the United States in the month of July amounted to 2,984,858 gross tons, or 114,802 tons a day for twenty-six working days, as compared with 2,640,984 tons, or 105,639 tons daily, in June, according to *Iron Age*. The July output was at the rate of about 35,473,886 gross tons a year, based on 309 operating days and on reports to the American Iron and Steel Institute from thirty companies, which in 1918 made 84.03 per cent of the total production.

The accompanying table gives the tonnage of steel ingots produced in 1918 by twenty-nine companies, making in 1917 about 85.10 per cent of the entire

MONTHLY PRODUCTION OF STEEL INGOTS, IN TONS

1918	Open-Hearth	Bessemer	All Other	Total
January.....	1,763,356	429,588	10,901	2,203,845
February.....	1,805,233	454,457	14,051	2,273,741
March.....	2,531,048	763,255	16,078	3,110,381
April.....	2,377,974	769,249	16,187	3,163,410
May.....	2,475,131	796,244	15,858	3,287,233
June.....	2,281,718	786,380	15,348	3,083,446
July.....	2,311,545	784,997	17,093	3,113,635
August.....	2,299,177	766,860	17,643	3,083,680
September.....	2,407,993	772,863	16,802	3,197,658
October.....	2,527,776	807,043	17,377	3,352,196
November.....	2,591,720	753,409	15,631	3,060,760
December.....	2,273,189	706,844	12,273	2,992,306
Total.....	27,145,860	8,591,189	185,242	35,922,291
1919				
January.....	2,351,153	749,346	7,279	3,107,778
February.....	2,043,635	655,206	5,282	2,704,683
March.....	2,100,528	555,332	6,405	2,662,265
April.....	1,732,447	500,770	6,494	2,239,711
May.....	1,506,015	414,392	8,617	1,929,024
June.....	1,692,257	521,634	5,328	2,219,219
July.....	1,875,630	625,246	7,300	2,508,176
Seven months.....	13,301,665	4,021,856	47,265	17,370,856

amount, and for the last seven months figures from thirty companies making 84.03 per cent of the production in 1918.

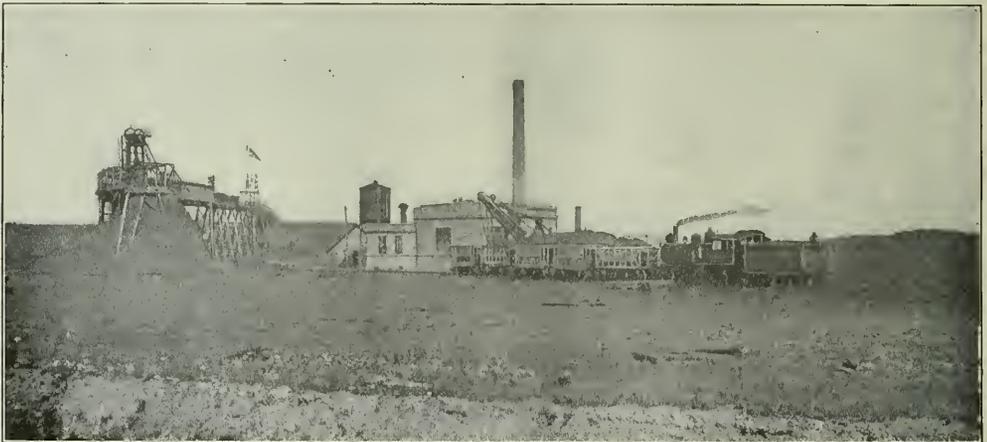
Transvaal Gold Production in July was 725,497 oz., compared with 736,199 oz. in July of last year. The total for the first seven months of the year is 4,872,981 oz.

Minnesota State-Owned Iron Mines

Administration of Commonwealth Lands, Leased to Operators on a Royalty Basis, With Minimum Yearly Shipments Specified, Vested in State Auditor and an Organized Mines Department—Official Report Pronounces System a Success

EARLY in its history as an organized state, Minnesota, under Federal grant, became possessed of 8,402,046 acres of land, or one-sixth of the total area of the commonwealth. With the advance of settlement, new acreages became valuable and passed to private ownership in fee simple until in 1889, when the increasing number of iron-ore discoveries in northern Minnesota caused the Legislature to enact laws reserving to the state mineral rights in all state lands thereafter sold in St. Louis, Lake, or Cook counties. This enactment was later amended to include all state lands, and by virtue of these statutes the State of Minnesota is the largest single fee owner of iron-ore deposits in the United States.

from the date of its execution, provides that the lessee shall be permitted during that period the privilege of removing all the "merchantable, shipping, iron ore" which is to be procured "in such manner only as is usual and customary in skillful and proper mining operations of such character." It is provided, also, that within five years after a railroad has been laid within one mile of the property the lessee shall ship therefrom at least one thousand tons of iron ore, and that each year thereafter he shall ship a minimum of five thousand tons annually. Failing this provision, the lessee shall pay the state a minimum ground rental equivalent to the income which would have been derived from royalties on such shipment. The royalty so paid



THE PHILBIN MINE, NEAR HIBBING. ONE OF THE STATE-OWNED MINES IN MINNESOTA

The property comprises 31,560 acres on the Mesabi Range, 4,640 acres on the Vermilion Range and 4,200 acres on the Cuyuna Range, according to the limits of these districts as now recognized by the best authorities. In addition, there are large acreages in the prospective Gunflint, Highland, and Ottertail districts, and about 520 acres in the magnetic formation at the eastern extremity of the Mesabi Range. The proved tonnage on such portions of these tracts as are already under lease is estimated by the Minnesota State Tax Commission at 173,137,125, as compared with 1,430,711,297 tons which the commission recognizes as the total amount of merchantable iron ore now proved to exist in the state. The same Legislature which reserved to Minnesota the mineral rights of state lands also established the state as a fee owner and determined its duties as such. Laws were enacted making provision for a standard lease, stipulations were made covering the necessary mine inspection, and adequate distribution of the income was arranged.

The state lease, which is operative for fifty years

is 25c. per ton, and payment of such money in the failure to ship iron ore has been held by the courts to be in no sense an advance royalty, but merely a ground rental, and is forever lost to the lessee. Under this law, 373 leases have been made, of which all but 91 have been canceled, and of these 33 have been developed and become active shippers.

The question of ownership of iron ore underlying lake bottoms was in dispute for some time, but has been decided in favor of the state, and the 1917 Legislature enacted laws covering the leasing of these properties. It is provided that all such leases shall be sold at public auction to the highest bidder, but that the minimum bid acceptable shall be at least 50c. per ton royalty. The other terms of the lease are to be decided for each property thus disposed of by a committee consisting of the Governor, the Attorney General and the State Auditor. A proved orebody of 3,000,000 tons lying under Syracuse Lake, at the eastern end of the Mesabi Range, has been leased for the minimum under this law.

Shipments from state properties to Aug. 1, 1918, totaled 25,546,168 tons, the royalties from which had yielded the state \$6,386,542. Based on the present estimated tonnage, and assuming that none of the state properties excepting those now under lease will ever yield any iron ore, the ultimate return to the state from royalties alone will amount to \$49,670,883.

The following is a list of state-owned properties which have been developed and have entered the shipping list:

STATE-OWNED IRON-ORE PROPERTIES IN MINNESOTA

Mine	Operator	Tons Shipped in 1918
Missabe Mountain	Oliver Iron Mining Co.	1,173,312
Leonidas	Oliver Iron Mining Co.	656,735
Pool	Oliver Iron Mining Co.	191,434
Grant	Interstate Iron Co.	117,407
Hanna	Consumers' Ore Co.	116,082
Woodbridge	Fort Henry Mining Co.	209,414
Wacontah	Consumers' Ore Co.	279,442
Wacoutah "B"	Consumers' Ore Co.	947
Seranton	Pickands, Mather Co.	947
Helmer	Cleveland-Cliffs Iron Co.	207,643
Duncan	Oliver Iron Mining Co.	5,159
Minnewas	Oliver Iron Mining Co.	7,703
Fay	Virginia Iron Mining Co.	251,989
Shiras	Oliver Iron Mining Co.	128,402
Frantz	Consumers' Ore Co.	169,777
Seville	A. B. Coates	7,203
Hill Annex	Interstate Iron Co.	559,727
Kevin	Butler Bros.	21,601
Philbin	Oliver Iron Mining Co.	233,484
Prindle	Oliver Iron Mining Co.	251,989
Majora	Hobart Iron Mining Co.	251,989
Morton	Dean Iron Co.	39,292
Smith	Butler Bros.	4,067
Margaret	Oliver Iron Mining Co.	175,587
Wanless	Oliver Iron Mining Co.	175,587
Draper	Draper Iron Co.	175,587
Pilot	Hanna Ore Mining Co.	175,587
Tompson (Cuyuna Range)	Inland Steel Co.	152,648
Martin (Cuyuna Range)	Whitemarsh Mining Co.	1,421
Northland (Cuyuna Range)	Northern Minnesota Iron Co.	1,421
Total		4,638,283

The following properties have been abandoned as being worked out:

STATE-OWNED MINES NOW EXHAUSTED

Mine	Operator	Total Tonnage Shipped
Alberta	Lily Mining Co.	136,534
Cavour	Cavour Mining Co.	177,952
Section 17	A. B. Coates	20,802
Eaton	Eaton Mining Co.	3,547
Yates	Consumers' Ore Co.	678,990
Silver	Virginia Ore Co.	174,813
Maderia	Maderia Mining Co.	195,494
Deacon	Oliver Iron Mining Co.	347,511
Total		1,735,643

Under the law, each parcel of iron-ore land is credited to one of three funds: either the permanent school fund, the permanent university fund, or the swamp-land fund. The income from each lease is placed in a permanent accumulation and credited to its particular fund. The principal remains forever inviolate, the interest only being applied to the purposes designated. Through the fiscal year ending July 31, 1918, the permanent school fund had accumulated \$5,514,962, the swamp-land fund, \$646,986, and the permanent university fund, \$224,593. Investments are made by a committee composed of the Governor, the Treasurer, the Attorney General, the Auditor and the President of the Board of University Regents, and are limited by law to state and municipal bonds.

ORGANIZATION OF THE STATE MINES DEPARTMENT

The entire detail of handling the properties, from the execution of the lease to the collection of the last dollar of royalty, is in the hands of the State Auditor, with headquarters in St. Paul. Under him, and in direct charge of all mine inspection, is the Superintendent of Mines, with offices in Hibbing. This office is maintained by an appropriation from the general

fund which amounts at the present time to \$80,000 annually. The personnel, in addition to the superintendent, comprises ten mining engineers, two chemists, and an adequate office force, besides several practical mining men, who are employed as inspectors. The activities of the office extend throughout the three ranges (Mesabi, Cuyuna and Vermilion), and, owing to the variegated character of the mines under their inspection, it is safe to say that the work of the mines department includes every phase of mining activity now found in Minnesota. The office has on file complete and up-to-date surveys of all mines under lease, keeps accurate account of all ore shipped, and by means of its laboratory facilities is able quickly and satisfactorily to settle any dispute which may arise as to the merchantability of any particular deposit of ore. Beneficiation of iron ore is of interest to the department because the state owns large tonnages of every known variety of lean ore, and considerable experimentation with washing, drying, screening, sintering, or briquetting of low-grade ores has been performed.

At the request of the State Auditor, the Bureau of Mines recently completed an extended investigation of the method of conducting Minnesota-owned properties. J. R. Finlay and H. T. Eddingfield, mining engineers, were selected for this work, and their report, submitted to the last Legislature, contains a detailed study of the entire iron and steel industry in the state. After going over the drill records, recalculating the ore reserves, observing the manner in which engineers in the State Auditor's office have kept a record of the extraction of ore, and making a close study of the schedules of ore prices which determine the merchantability of iron ores, both investigators declared themselves convinced that the state-owned iron mines have been well and properly administered.

Government Soon To Make Armor
And Heavy Forgings

The new naval ordnance plant at South Charleston, W. Va., is soon to begin the manufacture of armor plate and forgings for guns of large caliber, entirely new lines of work for Government plants. The South Charleston plant is a \$19,000,000 enterprise occupying more than 200 acres of land. It will be ready soon for making armor and heavy forgings.

Engineers, metallurgists, and mill and machine shop men will be interested in the positions which are to be filled in the supervisory and subordinate forces. The U. S. Civil Service Commission has announced for this plant the need of a superintendent of melting shops at \$5,000 a year, a superintendent of forge shops at \$5,000 a year, foremen of heat treatment of armor plate at from \$10 to \$14.40 a day, foremen of heat treatment of large guns at from \$8 to \$12.56 a day, foremen of 14,000-ton presses for armor and large caliber guns at from \$11.84 to \$13.28 a day, foremen of small guns at \$8 a day, and foremen of heat treatment of projectiles at \$8 a day.

Detailed information and application blanks may be obtained from the U. S. Civil Service Commission, Washington, D. C., or from the secretary of the local board of civil service examiners at the post office or custom house in any of 3,000 cities. Journeyman workmen and helpers should apply direct to the labor board at the South Charleston plant.

Geology of Platinum Deposits—Part II

A Surprising Number of Occurrences in Association With Other Minerals Has Been Discovered
—Placer Deposits of Platinum Constitute the Most Important
Source—Production of Various Districts

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PLATINUM occurs in graywacke, slate, shale and mica schist. Investigations have been made regarding the platinum content of a graywacke rock near Wenden, Westphalia, Germany, by means of borings. According to Paul Krusch,⁴⁶ the graywacke is an elastic rock which consists mainly of quartz and slate, which is bound with a clay cement. It is therefore made up of the fragments of other rocks. The fragments were laid down by water with imperfect separation by specific gravity. The graywacke contains, besides small particles of platinum, small amounts of gold, copper, lead, zinc, silver, nickel, and chromium. In borings in an area of 500 acres, platinum was found in nine different holes. The amounts so far obtained vary from a trace to 33.5 gm. (31 gm. = 1 oz. troy) per ton, and consequently make certain portions of the rock a valuable commercial source of platinum.

It is suggested that the deposit may represent a fossil placer, whose values were originally derived from the breaking down of former platiniferous terranes, such as dunite, peridotite, or serpentine. This is one of the newer discoveries, and the platinum content was not suspected until 1913.

At *American Localities*. The occurrence of platinum has been noted in assays of clay slate containing pyrite, chalcopyrite, and galena, and mica schist from Lancaster County, Pa.⁴⁷; in black Triassic shale from Boyertown, Pa.⁴⁸; and from shales in the Grand Canyon of the Colorado.⁴⁹

Platinum has also been discovered in connection with certain vanadium-bearing coals from Australia, whose ultimate analysis⁵⁰ showed 3.8 per cent sulphur and 1.7 per cent ash. Two analyses of the ash from this coal are given in Table V.⁵¹

TABLE V. ANALYSIS OF ASH FROM AUSTRALIAN COAL

	1 Per Cent.	2 Per Cent.
Vanadium.....	25.1	2.90
Platinum metals.....	3.6	0.23
Oxygen with above.....	44.0	5.10
Sand, earthy matters.....	27.3	91.77
Totals.....	100.0	100.00

No. 2 represents an analysis of the ash of the coal in bulk. The No. 1 analysis is equivalent to 14.7 oz. platinum metals and 102.3 oz. vanadium per short ton of coal.

The presence of platinum has been detected in contact metamorphic deposits in association with rhodolite, garnet, biotite and iron sulphides at the top of Mason Mountain, Macon County, N. C.;⁵² and with wollastonite on the island of Sumatra.⁵³

Platinum has been found, in quantities varying from a trace to one-eighth of an ounce per ton, in shear zones in granite, from Siwash Creek, Tulameen District, B. C.⁵⁴

Occurrences of platinum in association with pyrite and limonite have been reported from Westland, New Zealand,⁵⁵ and from the Departments of Charaste and Deux Sevres, France.⁵⁶

IN BULLION, BLISTER COPPER, AND COPPER MATTE

Refiners of bullion and blister copper from the gold and copper ores of the Western United States report the presence of platinum in these substances in amounts varying from 0.3 to 1.8 oz. per 100 lb. of copper. In Table VI, the data of which were compiled by the Ontario Nickel Commission,⁵⁷ the presence of platinum and palladium in blister copper from various localities is indicated. The amounts are given as ounces of platinum and palladium per 100 lb. of blister copper:

TABLE VI. PLATINUM AND PALLADIUM IN BLISTER COPPER

	Ounces per 100 Lb. Blister Copper	
	Pt	Pd
Garfield, Utah.....	0.342	1.183
Steptoe, Nev.....	1.016	4.402
Omaha, Neb.....	1.825	6.486
Mountain, Cal.....	1.320	0.607
Tacoma, Wash.....	0.710	3.327
Agua Prieta, Mexico.....	0.416	0.226
Cerro de Pasco, Peru.....	0.319	0.589
Mount Lyell, Tasmania.....	0.624	1.374

This table shows an apparently genetic association of platinum and palladium with copper ores, and the advisability of adopting careful methods for their detection. The growth in the practice of electrolytic refining should work in the direction of increasing the supply of the metals of the platinum group from ores of this type. They are so sparsely disseminated in the ores themselves, that only careful analytical work would give a fair idea of their relative amounts.

PLACER DEPOSITS

Up to the present, over 99 per cent of the world's supply of platinum has been derived from placer workings, chiefly in Russia and the United States of Colombia. In these deposits the metal is found entirely as native platinum, which appears to be a natural alloy containing, besides platinum, the associated metals palladium, iridium, osmium, and rhodium, and important amounts of iron. The analyses given in Table VII indicate in general the composition of this mineral.

Sperrylite, the arsenide of platinum, is unknown in placer deposits. Native platinum occurs in these deposits as small flakes, grains, points, pellets, and nuggets, the largest record nugget weighing 252 oz. and coming from the Ural Mountains, in Russia. It is as-

⁴⁶Min. & Sci. Press, Vol. 109, Dec. 5, 1914, pp. 879-881.

⁴⁷U. S. Geol. Surv., Bull. 193, 1901, p. 59.

⁴⁸Ibid.

⁴⁹Ibid. p. 51.

⁵⁰U. S. Geol. Surv., 17th Ann. Rep., Part III, p. 282.

⁵¹U. S. Geol. Surv., Bull. 193, p. 85, 1901.

⁵²Ibid. p. 59.

⁵³Trans. Inst. Min. & Met., Vol. 13, 1903-1904.

⁵⁴U. S. Geol. Surv., Bull. 193, pp. 49-50, 1901.

⁵⁵Mineral Industry, 1913, p. 604.

⁵⁶U. S. Geol. Surv., Bull. 193, 1901, p. 65.

⁵⁷Royal Ontario Nickel Commission, Report, 1917, p. 463.

sociated with black sand, consisting of magnetite, chromite, and ilmenite, and with other heavy or hard minerals such as gold, iridosmine, diamond, argentite,

TABLE VII. COMPOSITION OF NATIVE PLATINUM ALLOYS

	1 Per Cent.	2 Total, Per Cent.	3 Magnetic Portion, Per Cent.	4 Non-magnetic Portion, Per Cent.
Platinum.....	85.50	72.07	78.43	68.19
Palladium.....	0.60	0.19	0.09	0.26
Iridium.....	1.05	1.14	1.04	1.21
Rhodium.....	1.00	2.57	1.70	3.10
Copper.....	1.40	3.39	3.89	3.09
Iron.....	6.75	8.59	9.78	7.87
Gold.....	0.80	.....	.....	.....
Osmiridium.....	1.10	10.51	3.77	14.62
Black sand.....	2.95	1.69	1.27	1.95
Totals.....	101.15	100.15	99.97	100.29

1 California Crude Platinum Sand (U. S. Geol. Surv. Bull. 193, p. 56). 2 to 4 Tulameen Crude Platinum Sand (U. S. Geol. Surv., Bull. 193, p. 50).

cassiterite, and garnet. Chromite and sometimes olivine are characteristic associates.

A study of the various platinum placer fields of the world leads to the conclusion that the original source of most of the placer platinum was in rocks of the dunite, peridotite, or serpentine type, consisting essentially of olivine, chromite, magnetite, serpentine, and some alteration products. No occurrence is known where the source of the metal may be traced to lode deposits of the other types described, which contain sperrylite, accompanied by the sulphides of iron and copper. Despite the rather widespread distribution of rocks of the dunite, peridotite and serpentine type, new placer districts are being discovered infrequently.

Placers are derived by the erosion of materials from the deep secular decay of rocks containing the precious metals, which become concentrated in the gravels. It is most important, therefore, in the search for new deposits, not only to investigate areas containing rocks of the type described, but to pay strictest attention to those which have undergone at least one physiographic cycle, and have hence been subjected to periods of long-continued weathering and erosion.

Short descriptions of the chief platinum placer fields of the world, showing their relation to the physiography and geology of their respective districts, may tend to emphasize these salient features.

DISTRICTS IN WHICH THE DRAINAGE BASINS OF THE PLATINIFEROUS STREAMS ARE KNOWN TO CONTAIN ROCKS OF THE DUNITE, PERIDOTITE, SERPENTINE, OR OTHER OLIVINE-BEARING TYPES

*Ural Mountains, Russia*⁵⁸—The platinum fields of Russia are in a comparatively limited area on the eastern and western flanks of the Ural Mountains, almost entirely within the confines of the Government of Perm. The entire area is comprised within a block of country extending less than 400 miles north and south and about 300 miles east and west. There are seven chief producing areas, known as (1) the South Verkhotur, comprising the districts of Nizhne-Tagil, Nizhne Turin, and Verkhne Turin, which is the chief producer; (2) the Perm area, east of the city of Perm, comprising the Iss, Veeva, and Tura river systems, which is the second largest producer; (3) the North Verkhotur area; (4) the Cherdyn area, about 100 miles northwest of the last named; (5) the South Ekaterinburg area, in the neighborhood of the city of Ekaterinburg; (6) the new Nikolae-Pavdinsk and Rastes area, north of the

North Verkhotur area; and (7) the drainage system composed of the Vagran, Lobva, Aktai, Talits, and other rivers.

Along the crests of the Urals and near the headwaters of many of the present streams are outcrops of dunite, peridotite, and serpentine, in which have been identified small particles and specks of platinum. The topography of the country is mature, and consequently these platinum-bearing rocks have undergone a great amount of disintegration and decomposition. In this way the precious-metal particles have been released for concentration in the gravels.

Some of the rivers are platiniferous for over 100 miles, and workable deposits have been found at distances of 800 ft. on either side of the present stream courses. The gravels which have been worked vary from a few feet to sixty feet in depth, and the chief platinum recoveries have been obtained from thin paystreaks close to bedrock.

Estimates have been published by various writers of the platinum content of these gravels. According to one authority⁵⁹ the product of the Iss River up to 1897 had averaged 60c. per cu.yd. (the platinum being valued at \$10.18 per oz.) for an average width of 350 yd., and a depth of 3½ yd. from the grass roots to bedrock. Two dredges working on the Iss River gravels in 1911 recovered 77.7c. per cu.yd. in platinum (the platinum being valued at \$37.80 per oz.). The average tenor of the ground worked has been gradually decreasing, as shown in Table VIII, and it has been estimated that unless new productive fields are soon opened up, the rich platinum deposits of the Urals would be exhausted in 8⁰⁰ to 12⁰¹ years from 1916, if mined at the pre-war rate.

TABLE VIII. SHOWING DECREASING AVERAGE TENOR OF RUSSIAN PLATINUM PLACERS⁶²

Years	Ounces per Cu.Yd. Gravel	Years	Ounces per Cu.Yd. Gravel
1829-1838.....	0.50	1883-1894.....	0.10
1838-1850.....	0.40	1894-1907.....	0.09
1850-1883.....	0.33		

Tulameen District, British Columbia, Canada—Platiniferous gravels are found throughout portions of the Tulameen drainage basin, which is about 100 miles directly east of the city of Vancouver. Small rich workings have been located on portions of Granite and Slate creeks, which are tributaries of the Tulameen, and along certain portions of the Tulameen and Similkameen rivers.

The platinum is found in the form of small points and grains, and in small nuggets rarely exceeding half an ounce in weight, associated with black magnetic sand, carrying chromite and olivine. The gravels vary in thickness from a few feet up to 60 or 70 ft., and in the shallower portions the paystreak is concentrated on bedrock.

It has been fairly well demonstrated that the original source of this platinum is in the dunite and pyroxenite rocks of Olivine and Grasshopper mountains,⁶⁰ especially where they are rich in chromite. The richest platinum gravels have been found in those stretches of the valleys immediately below the localities in which the dunite or pyroxenite has been tapped by the drainage systems.

⁵⁸F. W. Horton, *Mineral Industry*, 1911.

⁵⁹Bull. A. I. M. E., June, 1919, p. 7.

⁶⁰U. S. Geol. Surv., "Mineral Resources of the U. S.," 1916, p. 12

⁶¹*Mineral Industry*, 1916, p. 596.

⁶²U. S. Geol. Surv., Bull. 193, 1901.

⁵⁸U. S. Geol. Surv., Bull. 193, 1901, pp. 67-81. *Jour. Ind. & Eng. Chem.*, Vol. 10, No. 11, Nov, 1918, p. 920. *Mineral Industry*, 1916, pp. 594-596. *Min. Jour.*, London, Sept. 20, 1916.

A great deal of the shallower ground of the narrow stream valleys has been fairly well worked out during the last thirty years, by small hand operations; but there are still great stretches of almost virgin ground in the valley flats of the larger streams, which, judging from the results of preliminary investigations by the Canadian government in 1918, may supply considerable amounts of the white metal.

The region lacks the condition of mature topography, and consequent deep secular decay, which, if present, would no doubt make it one of the world's important platinum producers. Nevertheless, sufficient platinum has been taken out of the Tulameen district, particularly during the last fifteen years of the last century, as shown in Table IX, to maintain for it the position of premier platinum producer of North America.

TABLE IX. PLATINUM PRODUCTION OF THE TULAMEEN DISTRICT⁶⁴

Year	Ounces	Year	Ounces
1887.....	2000	1894.....	160
1888.....	1500	1895.....	633
1889.....	1000	1896.....	266
1890.....	1100	1897.....	125
1891.....	2000	1898.....	100
1892.....	500	1899.....	137
1893.....	257		

*Ronda Mountains, Spain*⁶⁵—Platinum-bearing sands and gravels have been recently found to occur in the river systems in the region of the Ronda Mountains, Province of Malaga, southern Spain. The area comprises twelve or fourteen river systems, and the deposits are loose peridotite sand found in the river beds at depths of ten to fifteen meters. The platinum is associated with magnetite, chromite, ilmenite, gold, zircon, and brookite. The topography of the area is youthful, and the platinum-bearing streams flow through steep-walled, narrow valleys.

After the announcement of the discovery, the Spanish government took possession of the ground, prohibited prospecting in the vicinity, and arranged for financing the necessary drilling and testing to determine the extent and value of the deposits. Reports indicate that this work has been completed on the rivers Verde and Quadaiza, and that platinum has been found to be present in reasonable quantity. One report states that the platinum content of part of the Verde bed varies between 0.002 and 0.006 oz. per cu.yd. There is a gradation from coarse to fine gravel from surface to bedrock, and though there is slightly more platinum near bedrock than in the upper part of the gravels, there is no sharply marked pay streak.

The geology of the area is not essentially different from that of the Ural Mountains, Russia, or the Tulameen District, B. C. It lacks, however, the mature topography of the Russian districts. The rock system of the Ronda Mountains has been the subject of careful study, and it has been found to consist in part of peridotite, with central cores of dunite containing masses of chromite, through which minute particles of platinum are disseminated. This, no doubt, is the mother lode of the placers.

New South Wales, Australia—The most important of all the Australian occurrences of platinum are at Fifield and Platina, districts about a mile and a half apart and about fifty-four miles west of Parks, in New South Wales. The associated rocks, principally slates, are

the same in both localities, and the platinum appears in a gravelly wash, together with osmiridium and gold. The beach sand deposits of the northeast coast of New South Wales furnish platinum just as do those of the southwest coast of Queensland. In these black sands, platinum, osmiridium, gold, cassiterite, and monazite are found in very fine grains, associated with chromite, magnetite, ilmenite, garnet, and zircon. Though the sources of all these minerals are not easily determinable, the platinum and osmiridium are believed to have come from the serpentine area forming part of the western edge of the Clarence Coal measures.⁶⁶

The total production of New South Wales up to 1911 was 11,500 oz. of crude platinum. Most of the material has come from Fifield, where the shafts to bedrock are from 50 to 60 ft. deep, and the thin paystreak, 6 in. to 13 in. thick, on the bedrock yields one part of gold to seven parts of platinum.⁶⁷

Borneo—Platinum is found with gold in the gravels of certain streams in the southeast of Borneo, in the Tanath-Laut region. The streams rise in the Bobaris Mountains, which are formed of crystalline schists and gneisses that have been intruded by basic dikes ranging from dunite with chromite to olivine gabbro. These rocks have been altered to serpentine. In the gravels which have been formed from these rocks, olivine, chromite and platinum are found with gold. The locality has yielded at least a few thousand ounces.⁶⁸

California—The principal occurrences of platinum in the United States are in California. Here a small amount of crude platinum occurs in the principal placer mines of the gold belt of the Sierra Nevada, but in no place is the metal so abundant that the deposit can be worked for platinum alone. The source of the metal is undoubtedly in the serpentine and peridotite or pyroxenite, which occur as intrusive masses throughout the gold belt. In many cases, silvery white scales of iridosmine are more common than the platinum itself. Little or no platinum was recovered until the beginning of dredging operations on a large scale along the foothills of the mountains.⁶⁹ The most productive counties are Trinity, Siskiyou, Calaveras, Yuba, Butte, Humboldt, Merced, and Del Norte.

DISTRICTS IN WHICH THE MOTHER LODE ROCKS OF THE PLATINUM ARE NOT DEFINITELY KNOWN TO OCCUR

United States of Colombia, South America—The gold-platinum alluvial deposits cover an area of more than 5,000 square miles, which lies west of the central ridge of the Colombian Andes, in the Atrato and San Juan drainage basins, and extends south of the mouth of San Juan River along the coast to Mira River. The richest deposits and those most worked in the past are near the headwaters of San Juan River, principally on the Condoto River. The platinum is found in greatest abundance in the present stream channels, but it is also found in conglomerates of Tertiary age. Platinum is found in the streams only where the conglomerate has been eroded. Stream beds above the areas underlain by that formation are barren. The stream deposits are reconcentrations from the older gravels. The Tertiary conglomerate is composed of rounded boulders of basic rocks, among which diabase, melaphyre, peridotite, and dunite have been recognized.

⁶⁴Geol. Surv. Can., "Memoir 26," 1913, p. 143.

⁶⁵*Mineral Industry*, 1916, p. 596; U. S. Geol. Surv., "Mineral Resources of the U. S.," 1915, p. 147, and 1916, p. 16; *Mineral Industry*, 1915, p. 579.

⁶⁶*Mineral Industry*, 1917, p. 543.

⁶⁷U. S. Geol. Surv., "Mineral Resources of the U. S.," 1911, p. 14.

⁶⁸U. S. Geol. Surv., "Mineral Resources of the U. S.," 1916, p. 12.

⁶⁹U. S. Geol. Surv., "Mineral Resources of the U. S.," 1911-1917.

In the gravels of the San Juan drainage basin there are about equal quantities of platinum and gold, but in the Atrato basin platinum constitutes approximately 15 per cent of the value, the remainder being gold. What appears to be a conservative estimate gives a total of 336,000,000 cu.yd. of gravel that can be considered as reserves, with 68,000,000 cu.yd. as proved ground, capable of producing at a profit under present working conditions. It is well understood that prospecting in the Choco is difficult, and these estimate reserves may be revised in the light of future work.⁷¹ Chromite is present in the sand with the platinum which points to a peridotite as its original home.⁷¹

A promising new source of platinum was discovered in Colombia in 1917. This was in the Caceres district, in the basin between the Cauca and Nechi rivers, in the department of Antioquia. The tract covers 12,096 acres, extending for 144 miles along the Caceri River, principally on the north side, where it reaches back for about a mile and a quarter. On the south side the width is about 300 ft. The loose gravelly soil would make extraction easy, and the sands extend downward to a depth of 25 ft.⁷²

California and Oregon Beaches—The presence of platinum is characteristic of the beach sands along the Pacific Coast from San Bernardino County northward to the mouth of the Columbia. The richest beaches are in Humboldt and Del Norte counties, Cal., and in Coos County, Ore. Bullard, in Coos County, and Port Orford, in Curry County, have proved, perhaps, the richest beaches. It is difficult to give the percentage of platinum occurring in the sand, as the fine scales are concentrated into thin paystreaks on the beach.⁷³

North Saskatchewan and Peace Rivers, Canada—Gold and platinum-bearing gravels have been found in the bars and benches of the North Saskatchewan River, in the vicinity of Edmonton, Alberta, and also of the Peace River and its tributaries, the Finlay, Omineca and Ingenca, in northeastern British Columbia. The platinum is usually in the form of fine flakes and grains, associated with gold, magnetite, chromite, and garnet. No mining operations of any account have yet been carried on in these areas.

The original source of the platinum is unknown. No basic rocks of the peridotite or olivine-chromite-bearing type have been identified anywhere in the vicinities of these gravels. It is possible, however, that the precious-metal particles might exist in the form of fossil placers in the sediments of the Rocky Mountains, where they were deposited in earlier geologic eras. The rivers are now eroding these sediments and may be concentrating therefrom such precious metal particles as they contain.

Cariboo District, British Columbia, Canada—Platinum is known to occur in certain of the river systems of the Cariboo districts, chiefly in association with the gold-bearing placers, and along the Quesnel River. Owing to the small amount of geological investigation that has been carried on in this region, it is not known whether or not basic rocks of the olivine-bearing type occur in the neighborhood.

Inferences from the study of the foregoing classified descriptions of platinum deposits should direct at-

tention to the following types of rocks and orebodies, as possible new sources of the platinum metals:

Lode Deposits—(1) Basic intrusive rocks, of dark green to black color, consisting chiefly of pyroxene, hornblende, basic feldspar, or olivine, and containing appreciable amounts of chalcocopyrite, pyrrhotite, pyrite, bornite, and covellite. Preference should be given to those areas in which such rocks occur as the smaller intrusive masses, like sills, dikes, and sheets. (2) Copper-gold veins, especially if they contain such minerals as bournonite, tetrahedrite (gray copper), chalcocopyrite, arsenopyrite, and covellite. (3) Nickeliferous orebodies in general, especially those of the magmatic segregation type. (4) Rocks of the dunite, peridotite, and serpentine types, especially where they are known to contain chromite in disseminated or massive form. (5) Sedimentary beds, of the fragmental type, which might be fossil placers. (6) Bituminous deposits the ash of which carries appreciable amounts of vanadium.

Placer Deposits—(1) Gravels, with which are associated particles of chromite and olivine. (2) Gravels, found in watercourses which drain, or drained at the time of their formation, areas containing rocks of the olivine-bearing type, such as dunite, peridotite, and serpentine, in which chromite occurs. (3) Gravels, in areas of such basic rocks, which have passed through at least one physiographic cycle, during which mature topography has developed, resulting in the deep decay of rock and the consequent release of the precious metal particles. The richest deposits of the world are found, as stated, in areas in which these types of rock occur, and where the valleys are broad and mature, and the river gradients low.

Eight-Hour Day in Metal and Mining Industries in France*

Representatives of the metallurgical, mining, mechanical construction, electrical and manufacturing employers' union, and of the Federation of Metal Workers of France have agreed upon the following articles:

There shall be an eight-hour day in all these industries. The employees will adapt themselves to the modern development in machinery and to reasonable methods of work in order that production may early resume its former status and attain the proportions necessary to the general welfare. The employers recognize that in order to maintain and develop production it is expedient to establish piece rates, premiums, and bonuses, and they agree to guarantee a wage based upon production under normal conditions; and if, by reason of the activity and efforts of the employees, production exceeds this base, the employees are assured that their intensified production shall not be considered as a reason for a reduction of wages.

The reduction of the hours of labor to eight per day shall not work a decrease in wages. Employees working by the hour shall have compensating increase of hour rates, but changes in piece rates shall be demanded only when such rates, without change in equipment, do not afford, with normal effort, an opportunity to earn the usual wages. Foreign workmen having equal occupational skill as French workmen may be employed when industrial conditions demand it and shall receive equal wages and remunerations.

*From July issue of *Monthly Labor Review* of U. S. Department of Labor; translated from *La République Française*, Paris, April 19, 1919.

⁷⁰U. S. Geol. Surv., "Mineral Resources of the U. S.," 1915, pp. 145-146.

⁷¹U. S. Geol. Surv., "Mineral Resources of the U. S.," 1911, p. 15.

⁷²*Mineral Industry*, 1917, p. 546.

⁷³U. S. Geol. Surv., "Mineral Resources of the U. S.," 1911, p. 12.

A New South Wales Lead Smeltery

The Cockle Creek Silver-Lead Works of the Sulphide Corporation, Ltd., Treat Complex Ores By Roasting and Blast-Furnace Smelting, Followed by Refining of the Base Bullion—Sulphuric Acid Also Made

A COMPLETE description of the silver-lead smelting works of the Sulphide Corporation, Ltd., at Cockle Creek, New South Wales, was recently published¹ in Australia. Through not as large or as modern in all respects as some other plants, the company has prospered in the face of many difficulties. The works are of interest from the standpoint of the complexity of ores treated, which include lead, antimony, arsenic, silver, gold, copper, bismuth, and zinc, and also because of the diversity of the products. In addition to the metals, there is produced in a year 19,000 tons of chamber sulphuric acid, from which is made 25,000 to 30,000 tons of superphosphate, together with smaller quantities of coal gas, fuel oil, sulphate of ammonia, pitch, nitric acid, and other byproducts.

ROASTING

Most of the ore treated comes from the company's Broken Hill mines, although custom ore of the most complex character is accepted from outside sources. Ores containing over 3 per cent sulphur are crushed by jaw crushers and Krupp mills to pass a ¼-in. screen. Should the ore or concentrates be high in sulphur, a preliminary roast is given in gas-fired Godfrey furnaces to bring the sulphur down to about 10 per cent, and also to agglomerate the fine particles for subsequent treatment in the Huntington-Heberlein pots. A typical charge to the roasting furnaces would contain: Pb, 50 per cent; SiO₂, 7; FeO, 7.5; CaO, 6; MnO, 2.3; ZnO, 10; S, 15 per cent.

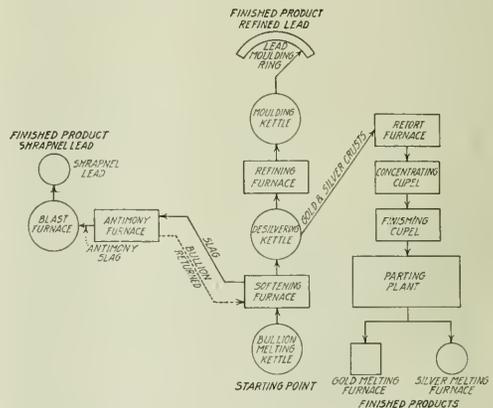
There are twenty-four cast-iron H.-H. pots of elliptical form, hung on hollow trunnions. Each has a capacity of five tons, the charge resting on a horizontal perforated plate set 6 in. from the bottom of the pot. The 10 to 12 oz. air blast passes through the hollow trunnion, down a pipe outside of the pot, and thence into the wind-box. The ore charged is red hot, as it comes from the Godfrey furnaces, so that no fuel is needed, roasting throughout the charge beginning as soon as the air is turned on. After six to eight hours the pot is turned over, and the sintered mass dumped out and cooled by a water spray, and then broken up into 6-in. lumps.

SMELTING

The H.-H. product, along with about one-third of its weight of reverts and fluxes, after proper bedding and mixing, is charged, along with coke, to the blast furnaces, of which there are three. No. 1 has a crucible area of 49.5 sq.ft., measuring 11 ft. 6 in. by 5 ft. at the tuyères. Blast enters through thirteen 3-in. tuyères at 60-oz. pressure. Working normally, this furnace is capable of treating 300 tons of charge per day, exclusive of returned slag and coke, with an output of 100 tons of lead.

Tapped slag flows into a cast-iron forehearth mounted on wheels, where the lead and matte is caught, the slag

overflowing into a 3-ton cast-iron pot, from which it is poured on the dump, the sculls being re-smelted. Forehearth are replaced several times a shift, the full ones being taken to the matte shed, where they are drained of matte and lead, and the shells knocked out. Any slag tapped out of these forehearth, together with the shell, is returned to the blast furnace. Nos. 2 and 3 furnaces are similar to No. 1, but are smaller. On account of the large variety of ores treated, the slags are of varying composition. As an illustration, however, the following analysis is given: Pb, 0.7 per cent; FeO, 36; MnO, 1.6; CaO, 17; SiO₂, 24; ZnO, 12 per cent.



FLOW SHEET AT COCKLE CREEK REFINERY

The lead, tapped from the forehearth in small cast-iron pots, is run across to the dropping furnace. This is a small reverberatory of about seven tons' capacity, from which is obtained lead bullion (carrying most of the gold and silver) and dross. The dross, on being removed from the top of the lead, is still fairly "wet," and is transferred to a liquating furnace, where most of the lead is sweated out and returned to the dropping furnace, the more or less "dry" dross being re-smelted in the blast furnaces after a sufficient amount has accumulated. Lead matte, caught in the forehearth, is cast, cooled and ground in the Krupp mills for subsequent incorporation in the H.-H. charge. The lead from the dropping furnace is cast into bars of about 85 lb. each and sent to the refinery.

REFINING

The flow sheet of the refinery is shown in the accompanying cut. The bars of base bullion are first charged into the 50-ton copper-drossing kettle, where they are melted at a low temperature and the copper dross is skimmed. This dross is treated in a small liquating furnace, the liquated bullion being returned to the refinery, and the copper dross going to the copper smelters. The molten metal in the kettle is then transferred

¹Proceedings of the Australasian Institute of Mining Engineers, Melbourne, No. 31, pp. 1-39; joint authorship.

to the antimony softener by means of a direct-coupled electrically driven Rumsey centrifugal pump. This type of pump is an innovation in Australian refinery practice. It is permanently fixed in a frame which rests on the circumference of the kettle, and immersed to the full depth of the latter. Forty tons can be pumped in twenty minutes.

The antimony softener is of the usual reverberatory type, lined with magnesite brick at the litharge level. An oxidizing atmosphere is maintained, the resultant litharge, carrying the antimony and arsenic, being constantly run off. After eight to twelve hours, which is required to remove the antimony and arsenic, the "clean" metal is tapped into one of two desilverizing pans and the gold and silver separated by the Parkes process.

The skimmed litharge is mixed with fine coal to reduce the metal, and is charged intermittently to one of the blast furnaces reserved for the purpose. The slag from this furnace carries the antimony and arsenic. After further treatment, the antimony is recovered in a final product mixed with lead, which is sold as shrapnel lead. Two zincings are made, regardless of the gold and silver content. The first zinc alloy is pressed off by the Howard press, which is worked by pneumatic pressure, the second zincing being skimmed by hand. The desilverized lead is then syphoned to the usual jacketed type of reverberatory, where the remaining zinc and antimony are skimmed by hand, the refined lead being cast for shipment.

The pressed silver-zinc alloy is charged to retort furnaces for the volatilization of the zinc. There is one four-bottle regenerative gas-fired furnace, and there are two single-bottle oil-fired tilting furnaces. The latter are fired with a heavy distillate made from coal tar, which has proved efficient. The life of the retorts in the tilting furnaces is good, and the furnaces are simple to operate. The retorted bullion, assaying from 2,000 to 2,500 oz. Ag per ton, passes to the concentrating cupels, where the lead passes off as litharge and the concentration is brought up to 16,000 oz. of silver and gold per ton. Further cupeling results in a pure doré, which is molded into anodes of approximately 100 oz. for the parting operation.

The electrolytic parting plant is furnished with thirty-six earthenware cells of the Balbach type. Each cell contains two wooden paraffined cradles with inner frames holding the 10-oz. linen duck cloths. The anodes lie horizontally on the cloths and are just immersed in the electrolyte. This solution is essentially silver nitrate, containing a considerable quantity of copper nitrate, with some lead nitrate and about three grams per liter of free nitric acid. The silver is deposited on carbon cathodes lying on the bottom of the cell, which are raked forward periodically, drained, washed, and dried. When comparatively dry, the silver is put in very light calico bags, melted, and run into bars of 1,050 oz. This silver is remarkably pure, assaying 999.9 fine, and carrying not more than 0.2 oz. of gold per ton. The gold remains as a sludge on the cloths. This is dried, inquarted with three times its weight of silver, and re-parted to give a denser product. Any remaining silver is dissolved by boiling with concentrated sulphuric acid, the gold washed and melted and cast into 600-oz. bars.

Two separate units for the manufacture of sulphuric acid are in operation, one utilizing the gases from py-

ritic ores roasted for the purpose in Herreshoff furnaces, and the other utilizing the gases from the Huntington-Heberlein pots. The latter presents several unusual features. The plant consists of four chambers and seven towers, including two Glovers, two inter-chamber towers, one regulator, and two Gay-Lussacs.

The Glover towers do not function as concentrators, on account of the low temperature of the entering gases, but, by observing several conditions, they serve as efficient denitrators. The chief function of the inter-chamber towers is to keep alive rapid chemical action by thoroughly mixing the gases, and so minimizing the retarding effect of the CO₂ present as an impurity in the gas. The regulator is placed between the last chamber and the Gay-Lussacs. Its chief function is to prevent any SO₂ entering the Gay-Lussacs on account of sudden variations in the gas supply. The Gay-Lussac towers absorb the nitrogen oxides and operate in series. The chambers are built narrow and high to keep the gas moving rapidly. Their dimensions are as follows: Two chambers in parallel, each 30 in. high, 20 in. wide and 80 in. long; following chamber, 30 in. high, 20 in. wide and 80 in. long; last chamber, 30 in. high, 20 in. wide and 40 in. long.

The gases are drawn from the H.-H. plant through the dust chambers and Glover tower by the suction of a lead fan. The casing and impellers of this fan are made of antimonial lead, the impellers being mounted on a 3-in. steel shaft covered with lead sleeves on that part of its length exposed to the acid gases.

British Imports and Exports

The following figures of British metal and ore imports and exports for June, 1919, and the first six months of the year have been reported by the Board of Trade, and published in the *Ironmonger* of July 19, 1919.

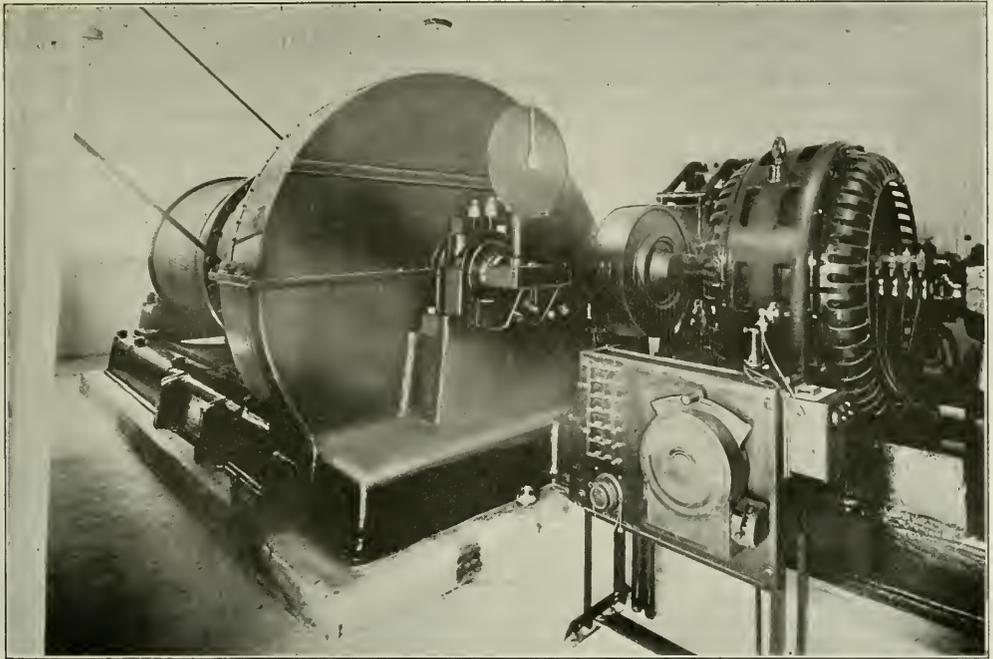
BRITISH IMPORTS (In long tons)			
	June, 1919	Jan.-June 1919	
Iron ore, manganeseous.....	7,527	88,154	
Iron ore, other sorts.....	316,156	2,467,730	
Pig iron, basic.....	848	65,468	
Pig iron, forge and foundry.....	1,759	7,326	
Pig iron, hematite.....	3,115	11,349	
Pig iron, other grades.....		1,964	
Steel blooms, etc.....	2,828	6,417	
Iron bars, angles and rods.....	1,905	9,263	
Copper ore.....	417	8,760	
Copper, regulus.....	140	5,895	
Manganese ore.....	15,380	194,601	
Pyrites of iron and copper.....	14,064	136,005	
Copper, unwrought and part wrought.....	5,002	68,861	
Lead, pig and sheet.....	22,773	152,258	
Tin ore.....	2,852	20,774	
Tin, blocks, ingots, slabs.....	1,467	8,585	
Zinc, crude.....	4,577	54,805	
Zinc, manufactured.....	321	1,184	
BRITISH EXPORTS (In long tons)			
	June, 1919	Jan.-June 1919	
Pig iron, basic.....	25	155	
Pig iron, forge and foundry.....	12,849	74,762	
Pig iron, hematite.....	9,955	41,981	
Pig iron, other grades.....	4,987	37,596	
Iron bars, rods, shapes, etc.....	3,963	17,675	
Iron ore.....	105	1,029	
Copper ingots, etc.....	564	1,950	
Lead, pigs, etc.....	1,073	6,016	
Tin, unwrought.....	689	4,491	
Zinc.....	334	1,111	

Directors' Report of the Lobitos Oil Fields, Ltd., shows that production amounted to 85,213 tons for 1918, compared with 91,548 tons in 1917. The net profit, after deduction of all charges and depreciation, amounts to £74,587, making a total credit to profit-and-loss account of £109,296. A dividend of 15 per cent less income tax is recommended.

Ray Consolidated Copper Co.



NO. 4 SHAFT AT RAY CONSOLIDATED, USED EXCLUSIVELY FOR HOISTING AND LOWERING MEN AND CARRYING POWER LINES



ELEVATOR AT NO. 4 SHAFT, USED FOR HOISTING AND LOWERING MEN. RAY CONSOLIDATED COPPER CO., RAY, ARIZ.



GENERAL VIEW OF SURFACE EQUIPMENT NO. 4 SHAFT, RAY CONSOLIDATED, SHOWING CHANGE HOUSE AT RIGHT

Old Diamond-Drill Hole as Cableway For New Churn-Drill Hole

From a Churn Drill on the Surface a Cable Is Lowered Through an Old Diamond-Drill Hole to Workings, Where Bit and String Tools Are Attached

BY ROY H. POSTON
St. Francois, Mo.

AT ONE property in the southeast Missouri lead district, a complete system of drinking-water lines is maintained separately from the main mine drainage and fire system, for the plant employees and the adjoining towns. The original system drew its water from several small underground diamond-drill holes scattered through the various mine stopes, the water from these several holes being piped to a central drinking-water pump. Increased demands for more water from the growing towns, and mine development that

tion, clean them out, and start operations. Two holes were used, one to serve as a cableway and the other as a conduit for a signal cord to be used for conveying signals between the men underground and those on top while the work was in progress. At first a whistle cord, as shown in Fig. 1, was tried as a signalling device, but later a telephone line that gave more satisfactory service was installed in its place.

The method of operation was simple, the churn drill being set up in the usual manner over the selected hole on the surface and the drilling cable dropped through the hole to the mine workings below, where the bit or "string of tools" was attached. The mine stope selected for the churn-drill hole had, of course, to have sufficient head-room to permit the changing of bits, bailing out of sludge, and other necessary work, and was examined carefully as to "loose" roof, every morning before work was started. A "sleeve," or piece of pipe a little larger in diameter than the gage of the bit was properly set in place to guide the bit in starting and to maintain its true course downward.

No unusual difficulty was encountered in the course of putting the hole down in the usual manner to a depth of 105 ft., where it was considered bottomed. It was feared that the steel rope attached to the bit would wear rapidly because of its rubbing on the side of the diamond-drill hole, and to counteract this, the rope was well greased with a heavy cup grease before being lowered into the hole, and thereafter a gallon of black oil was poured into the hole from the surface at eight-hour intervals, while drilling. Either as a result of this treatment or because of the soft limestone rock encountered, the rope was subjected to no extraordinary wear during the entire drilling.

The services of three men were required for the drilling operations. The motive power for the churn drill was supplied by a gasoline engine, and consequently an operator on the surface was required to look after this engine, to oil the rope, and perform other duties, while two men were employed underground to guide the bit, change bits, and bail out the sludge. Several holes

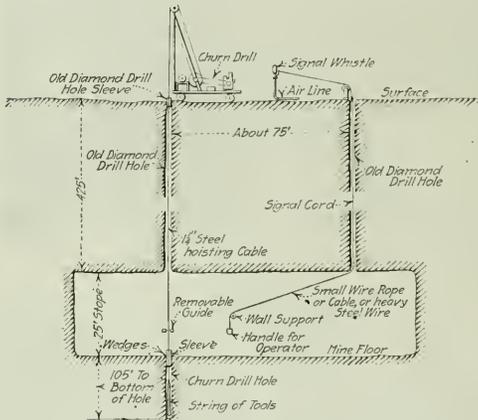


FIG. 1. GENERAL ARRANGEMENT OF DRILLING EQUIPMENT

seemed to diminish the existing supply, made it necessary to find a more dependable source of water.

As it was an established fact that the sandstone formation underlying all the mine workings carried the necessary water supply, it was only necessary to provide suitable wells to make this water available. Previous experience having demonstrated that underground diamond-drill holes were inadequate for this purpose, because of their small diameter, it was decided to sink wells by means of churn drills, thus making one hole produce as much water as the combined efforts of several small ones. However, as the beginning of the sandstone formation was about 400 ft. below the surface, this proposal meant drilling through 400 ft. of ground that contained no available water for the desired purpose, and the project accordingly hung fire on account of the excessive cost, until the idea was evolved of using a previously drilled prospect hole as a cableway for the new churn-drill hole.

All the country over and adjoining the mine in question had been previously prospected by surface diamond drills, and as these holes were in no case more than 100 ft. apart, and practically all were cut by the the mine workings it was only necessary to select two holes near the underground pumping sta-

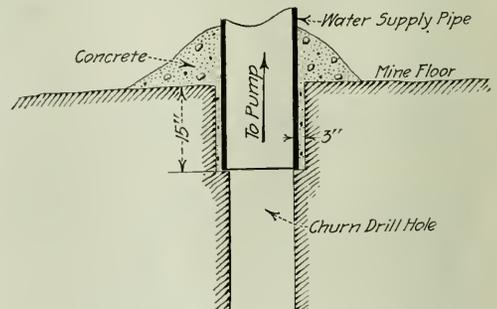


FIG. 2. METHOD FOR MAKING WELL WATER-TIGHT

were sunk in this manner, without serious problems of operation arising.

Fig. 1 presents a general sectional view of both surface and underground, and shows the general arrangement of the drilling equipment and the existing conditions at both places. Fig. 2 shows how the top of the well is made water-tight, when finished, in such a manner that no water may get either in or out at the collar of the well.

Zinc for Roofing

Used for That Purpose on New Plant of Central Foundry Co. at Joplin, Mo.—Other New Uses for Zinc

JOPLIN CORRESPONDENCE

THE Central Foundry Co. of Webb City, Mo., lost its plant by fire about a year ago. A site was secured in Joplin, and a new plant completed early this summer. H. T. Hornsby, president of the company, determined to try zinc for roofing, and decided upon a roof of sheet zinc, with standing seams to allow for the



ZINC ROOF ON CENTRAL FOUNDRY AT JOPLIN, MO.

expansion and contraction of the metal. The seams are about one inch in height, and the sheets are approximately 12 ft. long and 18 in. wide. The new roof was constructed by local tinsmiths, who had no previous experience in working with zinc.



STANDING SEAM THAT PERMITS CONTRACTION AND EXPANSION OF ZINC SHEETS

The seams are about one inch in height, and the sheets are approximately 12 ft. long and 18 in. wide.

It is now planned to put a new roof of ornamental zinc shingles on a church at Commerce, Okla., the money having been raised for the purpose. The shingles, it is expected, will be purchased from a firm at Nevada, Mo. A zinc-products factory has been established at Quapaw, Okla., which will manufacture numerous household

articles of zinc. One firm has made an offer of \$50 for the first zinc washtub, and another an offer of \$5 for the first zinc cup.

The Oklahoma-Kansas-Missouri branch of the American Zinc Institute is planning to arrange an exhibit of different articles now made of zinc with the idea of loaning it to county fairs and other public expositions.

Roosevelt Memorials Planned

Monument To Be Erected in Washington and Park Created in Oyster Bay—Popular Subscriptions To Finance the Project

THE ROOSEVELT MEMORIAL ASSOCIATION has been organized by a number of friends of the late Colonel Roosevelt, and a campaign for subscriptions to a fund of at least \$10,000,000 will be prosecuted during the week of Oct. 20 to 27 of this year. These dates have been selected because Oct. 27 was Colonel Roosevelt's birthday.

The object of raising the fund is to erect in Washington, seat of the Government and scene of Colonel Roosevelt's most important labor for the public good, a national memorial monument; and to create at Oyster Bay, his home for so many years, a park which may ultimately include his estate of Sagamore Hill, to be preserved in the same manner that Mount Vernon and the Lincoln home at Springfield have been.

Of the thousands of suggestions for fitting memorials that came from Roosevelt's friends and admirers, it seemed that these two forms were most nearly significant of his life and personality. Washington, the capital of the country, where Roosevelt had spent so many of his years in work that left its impress on the history of the nation, could be left out of no plan for a permanent memorial to him.

Equally fitting for a memorial to Roosevelt as a man and as a lover of nature is the scene of his ideally happy home life at Oyster Bay. In his lifetime he loved it all—its woods and fields, the shores of Long Island Sound, the flowers and the birds. He loved the outdoor life and he wanted others to love and share and benefit by it. During his lifetime in fact he endeavored to obtain an outdoor park for his friends and neighbors at Oyster Bay, but did not live to see the accomplishment of his wish. With his passing, a wider significance will be given to this cherished aim. The creation of a park will give his fellow-citizens opportunity for rest and recreation and upbuilding of mind and body; the inclusion of his home, with its fields and woodlands, its furnishings, its library and trophies and gifts from all over the world will make it particularly a spot associated with his memory and a Mecca for all Americans.

A memorial to Colonel Roosevelt will not so much honor him as honor America and the citizens who raise it to him. Checks may be sent to Albert H. Wiggin, Treasurer, Roosevelt Memorial Association, 1 Madison Ave., New York City.

Oil-Shale Refinery Established at Elko, Nev.

In co-operation with the Southern Pacific R.R. Co., the Bureau of Mines has established, at a cost of \$40,000, an oil-shale refinery for the purpose of carrying on experimental work on a commercial scale with oil shale from different deposits of the West. The plant has a capacity of forty tons per day.

The I. X. L. Copper Prospect

Property in Heath Mining District, in Adams County, Idaho, Described as a Possible "Porphyry Copper" Deposit, Though Evidence of Zone of Surface Oxidation Is Lacking—
Natural Features of District Favorable To Operation

BY ROBERT N. BELL

State Mine Inspector of Idaho, Boise, Idaho

TO DATE, Idaho has been of little importance as a copper producer, but nevertheless it presents certain geological advantages that favor the discovery of copper deposits of merit. One of the most interesting copper developments recently made is that of the I. X. L. prospect, in the Heath mining district, in Adams County, Idaho. This property, which is owned by the

which has a maximum elevation of 8,000 ft. The central boss of this mountain is probably about five miles in diameter, and consists of a formation resembling quartz hornblende diorite, but which has been classified as monzonite. The strike is generally north and south with a slight dip to the east. The mountain is bordered on the north, south, and east by almost horizontal flows



VIEWS OF I. X. L. PROPERTY IN HEATH MINING DISTRICT, ADAMS COUNTY, IDAHO

(A) PROPERTY FROM UPPER CAMP SHOWING NEARLY HORIZONTAL LAVA FLOWS ON MONZONITE ON NORTHEAST RIM OF BASIN. (B) SADDLE IN SOUTH RIM OF BASIN THROUGH WHICH LOWER ZONE PASSES UPPER ZONE. SADDLE SITUATED BEYOND TREES. (C) LOWER CAMP OF I. X. L. PROPERTY. (D) DUMP AND PORTAL OF 750-FT. CROSSCUT TUNNEL IN UPPER ZONE

Idaho Copper Mines Co., is situated seventy-five miles north of Boise, ten miles from the Huntington branch of the Oregon Short Line, and sixteen miles over an easy grade from the Pacific & Idaho Northern Ry., which branches off from the Short Line at Weiser. The I. X. L. property now suggests the possibility of its turning out to be a large disseminated "porphyry copper" deposit.

The Heath mining district embraces the flat top circular summit and adjacent slopes of Cudday Mountain,

of Columbia basalt lava. Near the crest, an old erosion channel is filled with several hundred feet of undisturbed flows of the same formation which are unmineralized.

The western exposure of Cudday Mountain toward Snake River Canyon shows a range 6,300 ft. in elevation above the river at the highest point. A cross section of the mountain, beginning a mile below the summit, and running toward the river, shows, besides the

monzonite, large bodies of old greenstone porphyry, with included reefs of marbleized limestone, accompanied by contact metamorphic minerals and characteristic sulphide ore lenses. On the lower slopes are found extensive exposures of slate, shale, and limestone reefs, with dikes and intrusions of andesite, basalt, and other igneous rocks. The sediments range in age from Carboniferous to Jura Triassic.

TWO WELL-MINERALIZED ZONES ON PROPERTY

The I. X. L. group, embracing about sixty lode claims, covers a large part of a steeply inclined, circular erosion basin, two miles in diameter and facing west. The middle slopes are well timbered, and several low rib-like ridges divide the tributaries of Brownlee Creek, which meet at the lower west end of the group. Traversing the property along its eastern border, near the crest of the mountain, there is a well-defined zone, 400 ft. wide and nearly a mile long, of more altered monzonite, striking N 30° E and dipping slightly to the southeast. Numerous shallow surface cuts show copper carbonate stain and threads of chalcopyrite within a few feet of the surface. The mineralization is also indicated by large patches on the surface where the rock is stained brown with iron oxide. These patches lie between bounding reefs and bluffs of less altered monzonite.

Lower down the slope, a second zone traverses the middle of the group. This is approximately 800 ft. wide and is traceable at the surface with prospect pits for fully a mile. Here the formation strikes due north and south, with a flat dip to the east. This zone is also well mineralized, with both carbonate and sulphide ore showing wherever the surface has been cut. The two zones are entirely in the monzonite area, and, aside from magnetite, show limited evidence of the contact metamorphic mineralization so conspicuous in the greenstone a little further north. The rock is granitic, of medium grain, and shows small but conspicuous hornblende crystals and biotite with both orthoclase and plagioclase. The ore-bearing zones differ from the general formation, especially near the edges, in displaying a splashy bluish segregation of quartz and a chalky phase of the feldspar. Few of the crystals reach half an inch in length.

EVIDENCE OF SURFACE OXIDIZED ZONE LACKING

I have repeatedly called attention to the possibilities of this prospect as a "porphyry copper" in my annual reports for the last fifteen years. The deposit has been examined by some well-known engineers during this period, including several of the leading "porphyry copper" people of the country. Engineers of the latter opposed the idea of its being a "porphyry," for the reason that evidence of a surface zone of oxidation is lacking. As the sulphides can be knocked off the surface croppings, they were thought to be confined to shrinkage and cleavage planes. M. R. Staight, of New York, was probably the first to give the deposit serious consideration. Mr. Staight enlisted the interest of some local stock men of means who are pushing development at present on the property with a small gas-driven compressor plant. The most important part of this work is a crosscut tunnel starting at the foot wall of the upper zone and striking directly across its course. The tunnel is now advanced 750 ft., the face being 550 ft. below the surface. In the first 350 ft. driven, the ore is largely confined to the joints and bedding planes.

Careful soil sampling in ten-foot sections which I made along the succeeding 300 ft. of the tunnel to the face on June 15, 1919, gave an average result of a little over 1 per cent copper, with 50c. per ton in gold and silver. Combined samples from one forty-foot section gave nearly 3 per cent copper. This section may conform to some of the lens-like brown-stained patches on the surface. The last 100 ft. driven has not been sampled at the date of writing.

CHALCOPYRITE THE PREVAILING MINERAL

The prevailing mineral is almost pure, soft chalcopyrite, which occurs in kidneys and in seams up to two inches thick along shrinkage and bedding planes and is also fairly well disseminated in the grain of the rock. It is associated with a smaller amount of marcasite, and, throughout the last 100 ft. driven, magnetite was conspicuously mixed with the chalcopyrite. Incidental seams of green carbonate and rusty gossan lines are met, and, recently, a narrow water course was penetrated that exhibited rich stringers of malachite and bornite. The rock of the formation is generally hard.

The bedding planes of the formation dip flatly to the east about 20 degrees, and are fairly uniform. They conform to the main bedding of the monzonite through an east-and-west cross section of the mountain. At the summit they become nearly horizontal and give the formation the appearance of a flat anticlinal dome, with a faulted or eroded western face. Some small foils and blunt crystals of molybdenum are occasionally found with the ore; also, as depth is gained, the coarser chalcopyrite shows black facings of secondary chalcocite.

CONJECTURES AS TO ORIGIN OF DEPOSIT

It was suggested recently by a prominent engineer from Butte that the deposit was an aplitic differentiation in the form of a thick sill. The lower zone also has the same appearance. The occurrence of the mineral suggests primary magmatic diffusion and segregation, but there are also some interesting associated intrusives. One big fault cuts the zone in a northwesterly direction.

Between the two zones at the surface there is a belt, several hundred feet in width, of highly altered and disintegrated rusty brown granite, that is well seamed and fractured. This looks like a more favorable gangue for disseminated ore than the ore zones themselves, but shallow surface cuts show no conspicuous evidence of copper.

Between this belt of brown granite and the lower zone is a thick bed of felsite, or fine-grained aplite, probably 300 ft. wide and of undetermined length and shape. There are two conspicuous outcrops of siliceous black rock on the lower zone indicating a dike from two to ten feet thick, which carries copper carbonate where it has been opened with surface cuts.

Above the upper zone and intersecting it is a narrow dike of white aplite; also a dike of basic rock ten feet wide, which strikes northwest, with a flat northeast dip roughly parallel to the big fault. The latter dike appears at a distance like a steep trail on the bare mountain side near the summit. It is composed of a greenish-gray rock resembling altered diabase. The fault crosses the upper zone at an oblique angle, but does not interrupt the mineralization, which is exhibited in surface cuts on each side of its course.

It is the plan of the present operators to crosscut the

upper zone, then drift 500 ft. each way on the best center of mineralization, and crosscut again at the end of each drift, before deciding on milling equipment or undertaking the development of the lower zone. The latter, owing to a flat dip and a little easier slope of the mountain side, lends itself admirably to churn-drill sampling.

It is possible, judging from the greater dissemination of the sulphide mineral in the rock as the crosscut advances toward the hanging wall of the deposit, that the average value may be sufficient to warrant working the deposit on a large scale, over a width of several hundred feet.

The I. X. L. ore is similar to that of the Iron Dyke mine, at Homestead, Ore., occurring under related geologic conditions. The chief difference between the two ores is that the I. X. L. ore contains a larger proportion of magnetite and a smaller amount of pyrite.

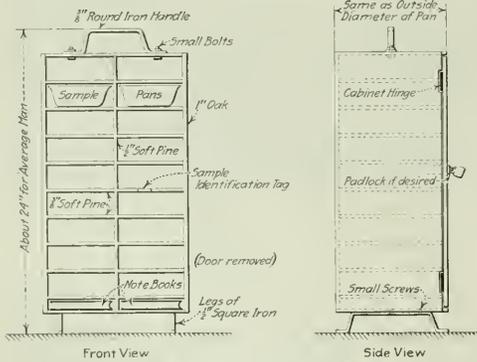
Among the natural advantages of the locality favoring future operation are several million feet of yellow pine and red fir timber growing on the middle slopes of the company's holdings. A good mill site is afforded at the lower end of the property, with a minimum flow of a little over three second-feet, or 150 miner's inches of water. Conditions readily permit of opening the property by means of a crosscut tunnel. A preliminary railroad survey has been made from Cambridge, on the Pacific & Idaho Northern Ry., to the mine, over a route sixteen miles long, with a maximum grade of 2½ per cent, which will make the property reasonably accessible.

Carrier for Mill Sample Pans

Wooden Cabinet Designed for Transportation of Samples From Mill to Testing Laboratory and To Obviate Loss by Overturning

BY ROY H. POSTON
St. Francois, Mo.

A WOODEN cabinet designed to be used for the transportation of pan samples from the mill to the testing laboratory is illustrated in the accompanying sketch. It is apparent from the cut that the chest



WOODEN CABINET FOR CARRYING MILL SAMPLES

is in no way elaborate and may be quickly constructed by the average mill carpenter at trifling cost.

As shown it is designed and dimensioned to be carried by hand, but if other means of transportation are available, it may be adapted thereto, though in

either case the legs should be retained, in order to keep it off the wet mill floor.

Each sample and pan are allotted a separate compartment, which may be permanently indicated on both the pan and its respective compartment, if the sampling is of the used routine nature. Separate compartments are also added for notebooks, pencils, and other articles.

If the cabinet is neatly joined together, and the several compartments are made absolutely tight, an accidental overturning will not mix the various samples if the door is closed, it being only necessary after such an accident to turn the cabinet on its back, open the door, and remove the spilled samples one at a time. Dimensions of the box must of course be made to conform with size and number of pans, distance to be carried, size of sample, and other operating and practical considerations.

California Mineral Production in 1918

The accompanying table shows the mineral production of California, in 1918, as compiled from the final returns to the California State Mining Bureau. The 1917 figures are given for comparison.

MINERAL PRODUCTION OF CALIFORNIA, 1917, 1918

Substance	Unit	1917	1918
Antimony ore	Tons	158	229
Asbestos	Tons	156	100
Barytes	Tons	4,420	2,561
Bituminous rock	Tons	5,590	2,561
Borax	Tons	109,944	88,772
Cement	Bbl.	5,790,734	4,722,921
Chromite	Tons	52,379	75,955
Clay (pottery)	Tons	166,298	112,423
Coal	Tons	3,527	6,343
Copper	Lb.	48,534,611	47,793,046
Dolomite	Tons	27,911	24,660
Feldspar	Tons	11,792	4,132
Fuller's earth	Tons	220	37
Gold	Dollars	20,087,504	16,529,162
Gypsum	Tons	30,825	19,695
Infusorial and diatomaceous earths	Tons	24,301	35,963
Iron ore	Tons	2,874	3,108
Lead	Tons	10,826	6,732
Lime	Tons	500,730	436,843
Limestone	Tons	237,279	208,566
Lithia	Tons	880	4,111
Magnesite	Tons	209,648	83,974
Magnesium salts	Tons	1,064	1,008
Manganese ore	Tons	15,515	26,075
Marble (a)	Cu.ft.	24,755	17,428
Mineral paint	Tons	520	728
Mineral water	Gal.	1,942,020	1,808,791
Molybdenum ore	Tons	243	243
Natural gas	M.cu.ft.	44,343,020	46,373,052
Petroleum	Bbl.	95,396,309	99,731,127
Platinum	Oz.	610	571
Potash	Tons	129,022	49,381
Pumice and volcanic ash	Tons	525	122,114
Pyrite	Tons	111,325	128,329
Quicksilver	Flasks	24,382	22,621
Salt	Tons	227,825	212,076
Sandstone	Cu.ft.	31,090	900
Silica (sand and quartz)	Tons	19,376	23,257
Silver	Dollars	1,462,955	1,427,861
Soapstone and talc	Tons	5,267	11,760
Soda	Tons	24,505	20,447
Strontium	Tons	3,950	2,900
Tungsten concentrates	Tons	2,466	1,982
Zinc	Lb.	11,854,804	5,565,561

(a) Includes onyx and serpentine in 1918.

In addition, there was produced cadmium, fluor-spar, graphite, and molybdenum, which are not reported separately, probably to conceal individual business.

The total value of California's mineral production in 1918 was \$199,753,837, compared with \$161,202,962 in 1917.

As compared with the 1917 output, the notable features of 1918 are the enormous increase in petroleum valuation and the decrease of over \$3,000,000 in the gold yield. Of the metals, copper decreased approximately 740,000 lb. in quantity and \$1,444,000 in value; gold decreased \$3,558,342; manganese increased in tonnage and value; and quicksilver slightly in value. Silver, lead, zinc, and tungsten showed decreases.

Siberian Mines*

Present Mining Outlook in Old and New Districts—Primitive Methods of Prospecting and Exploitation—Effects of the War on Mining Development—Status of Gold Dredging—Mining Problems of the Future

THE years 1907 to 1915, inclusive, witnessed a remarkable activity in the development of a few of the gold and base-metal deposits of Siberia and the Urals, under the auspices of British capital and the technical control of American engineers.

KYSHTIM COPPER MINES

The Kyshtim Mining Corporation, Ltd., was built up from the ruins of a semi-defunct Russian company which had mined copper in a desultory way for a period of nearly a century before 1919. About £900,000 was raised in London by means of debentures, and pyritic smelting of the ore was introduced from abroad. This was found to be the salvation of the property, and under the able direction of Messrs. T. J. Jones, R. Gilman Brown, D. P. Mitchell, and H. H. Knox, the Kyshtim, from being an abandoned mine, became the largest copper producer in Russia. In 1916, the last full producing year, the output approached 15,000,000 lb. of metallic copper annually. This, although large for Russia, is only from one-quarter to one-tenth the output of the large "porphyry" copper mines of the United States. A considerable output in gold was obtained yearly as a byproduct.

DEVELOPMENT ESTABLISHED LARGE RESERVES

The published reports indicate that when the mine was closed down owing to "nationalization," about three million tons of 3 per cent ore still remained as reserve, established by development. Much of the ground is still unprospected, and, besides important iron deposits which are worked on the property, an important discovery of nickel ore has been made.

The pre-war cost of producing copper at the Kyshtim property compared favorably with the average cost at American copper mines. Following the political crash in Russia, the expenses of operation became prohibitive, and at present, only destructive work is in progress in the Urals and in Russia. Also, there is no demand for the product, even did the political conditions allow the property to be operated. It will probably take from three to five years to restore this property to its former productiveness, even after the restoration of peaceful conditions in the Urals.

NUMEROUS PROMISING PROSPECTS

Other copper-mining properties in the Urals were the Sissert Co., Ltd., the Verk-Isetz Co., the Bogoslof Co., the Revdinsk Co., and the Tanalyk Corporation, Ltd. In the Kirghese steppe region, the Atbazar Mines, Ltd., and the Spassky Co., Ltd., also operated in a small way. The last three mines mentioned were controlled largely by British capital. Both the Sissert and the Revdinsk properties, near Ekaterinburg were in the development stage, but with good promise for the future, the ore being in many respects similar to that of Kyshtim. The Tanalyk property, in the Orenburg

district, although started as a copper mine, was proving to be a more important producer of gold than of copper when operations were suspended in 1917.

A most important copper deposit of "porphyry," or disseminated ore, is stated to have been partly prospected by drilling by the engineers of the Irtysh Corporation, Ltd., This property is situated adjacent to the Ekibastus coal field, to the west of Pavlodar. In the published reports, the company has merely referred to the deposit in a general way, but it is said to be of large dimensions.

Altogether, the production of copper in Russia and the Caucasus in pre-war days was small, not filling the demand. It was infinitesimal as compared with what will be possible when the known deposits are exploited. Siberia, unquestionably the world's greatest storehouse of copper as well as of gold, produced practically no copper previous to the closing down of the industries due to the revolution. The Spassky Co., previously mentioned, produced a few million pounds annually, but with this exception probably no copper was produced in Siberia. Doubtless the first successful copper mining on any considerable scale will be in the porphyry deposits which can be mined by open cut with steam shovels, a minimum of hand labor being required.

LEAD, SILVER, AND ZINC

The two well-known base-metal districts of Siberia are the west Altai and the Nerchinsk-Argun regions. A much less known region recently developed for the production of zinc is the Te-Hu-He area, about two-hundred miles north of Vladivostok, only twenty miles inland from the seacoast.

Notwithstanding the fact that the Nerchinsk mining district was known over two hundred years ago, like the Altai region, to which reference has been made, it is still in the development stage. Both these districts are extensive, as large as whole states in the United States or Mexico, and contain deposits which are of great importance. They have both been held since discovery as the private property of the Russian Crown, only recently abolished.

An antique system of administration retarded the development of lead and zinc mining in both the Altai and Nerchinsk mining regions and stifled any attempt at industry. Silver has been produced from rich surface ores during the last century and a half, largely by forced labor.

WEST ALTAI REGION

In 1912, the Russo-Asiatic Corporation, Ltd. was formed in London, and D. P. Mitchell was sent to examine the so-called Cabinet Concessions in the West Altai. He selected as the best of the largest three mines, the Ridderski Kope, situated about fifty miles northeast of Ust-Kamenogorsk. A lease was obtained from the Cabinet of the late Emperor, and the Irtysh Corporation, Ltd., with a capital of £2,000,000, was founded to develop and operate this property. This

*Reprinted from a series of articles by C. W. Purington appearing in *Echo*, June 27, 28, and 29, 1919.

company also obtained the control of the Ekibastus coal mines, formerly part of the Popof properties, west of Pavlodar, and connected with the Irtysh River by fifty miles of standard-gage railway.

ORE-TREATMENT PROBLEMS SOLVED

In the five years preceding 1917, another railway was constructed by the company, connecting the Ridderski and Sokolni mines with the Irtysh River. Coke ovens and zinc retorts have been constructed, a concentrating plant has been erected at the mines, and a large amount of development and diamond drilling has been accomplished on the ore deposits. Some of the best mining and metallurgical talent has been employed, and the problem of effectually treating the complicated base ores is thought to have been solved. All preparations were made for a regular and profitable output of zinc, lead, silver, and gold, the four principal recoverable metals present in the ore.

LARGE ORE RESERVES ESTIMATED

It is estimated by competent engineers that the amount of ore in the Ridderski and its neighboring mine, the Sokolni, was sufficient, on a conservative basis, to net the shareholders £10,000,000 in the course of ten to twelve years after operations were well under way. This was estimating ore to only a moderate depth in two deposits; twelve other deposits of the famous hornstone were known to exist on the property, where surface indications were of similar character to the developed mines. Besides the deposit mentioned, the coal mines of the company were under competent management and a large amount was spent in preparations for an assured annual production, both for coking purposes in smelting the ores and for filling contracts with the Trans-Siberian railway.

It should be noted that the estimated future production of the Ridderski mine in gold, merely as by-product, was £1,000,000 annually or as much as the average production of the Lenskoie Gold Mining Co., which produced 25 per cent of the gold output of Siberia previous to 1915. It is one of Russia's unwritten tragedies, not yet realized, that this fine fabric of industry, the product of much thought, and well-directed energy, by high-class specialists, should be brought dangerously near to the verge of destruction just on the eve of its fruition, by the senseless acts of those who would have gained the most from it.

Other portions of the Altai zinc-lead domain have been developed by the Russian Mining Corporation, Ltd., of London, and this company in 1916 made copper discoveries on its property which may prove of importance. Altogether it is said that more than four thousand prospects exist in the Altai region showing silver-lead mineralization, only a small percentage of which have been worked or even inspected during the last three or four decades.

LACK OF SYSTEMATIC MINING

The Nerchinsk mining region, known to English readers since the time of Robinson Crusoe, who may be said, if one is to believe De Foe, to have been the first Trans-Siberian traveler, has not been the object of modern development. There are indications that it may yet become the seat of profitable base-metal mining, and it is perhaps fortunate for the future Siberian commonwealth that this great area has, as it were, been

protected from half-hearted private exploitation in the past by the old Cabinet system. Under that régime, the convicts employed merely "gophered" out the rich streaks of silver ore near the surface, and did not attempt systematic mining of the important bodies of lead and zinc.

POSSIBILITIES OF COAST REGION

The coast region, as has been stated, contains the Te-Hu-He zinc mine, which has produced in the last few years a notable quantity of high-grade ore, and is not unlikely to be of importance in the future for the production of mixed base ores on a considerable scale. This region has the great advantage of being on the seacoast, and therefore is not dependent on a domestic market for the concentrates and zinc produced. Ample deposits of coking coal are also available in the vicinity; and should the region of these ores prove extensive, it is highly probable that the southern Sikota Aline may become the seat of an important lead- and zinc-smelting industry.

MINES OF THE ALTAI

Alexander von Humbolt is authority for the statement that gold has been mined in Siberia since the time of Herodotus, and the probability is that it was mined many centuries before that historian was born. All travellers in the southern Altai agree that ancient workings are numerous, although dates are not assigned. It is practically certain that much of the gold wrought into personal ornaments by the Greeks of the Chersonese found its way there from the Altai.

The recorded production of Siberia and the Urals since the middle of the eighteenth century is slightly less than £300,000,000 and with the thieving and illicit production which is the invariable accompaniment of gold mining, one may place the output during this historical period at not less than £400,000,000. The greatest single contributions to this output have been from the North Yenisei district and the Vitim district, which may be estimated at £50,000,000 and £80,000,000, respectively.

In 1751, a twelve-stamp mill was erected by a German engineer at Bereozovsk, near Ekaterinburg. The property on which this mill operated has continued to produce both quartz and placer gold with more or less regularity up to the present. Up to 1820, when location of claims by private parties was first allowed in Siberia, the Urals produced most of the gold recorded. Quartz mining was never an important factor, and placer mining became the greatest source of the metal.

DISCOVERY OF THE LENA DISTRICT

In the late 30's, the North Yenisei came into prominence; for several years before the discovery of gold in California this district was producing at the rate of from £1,000,000 to £1,500,000 per year. About 1842-50 the ore became exhausted, according to the standard of the work carried on, and the miners migrated east. One Trapeznikof located a claim on the Homolko river, a branch of the Zhuya, in the Olekma district, in 1847, and there was a rush to the region, now famous for the world over as the Lena gold district.

It was not, however, until 1867 that Michael Sibirya-kof located the famous Blagoveshensky mine, on the Nakatami, a branch of the Bodaibo Creek, tributary to the Vitim, and is said to have found by chance the deep-lying gravel which has since made this stream

and the Bodaibo known wherever placer mining is of interest. The claim mentioned proved the richest gold-gravel area of which there is record, 1,000,000 cu.yd. of bedrock gravel having produced £3,330,000.

The fame of Bodaibo Creek, which may be estimated to have produced over £40,000,000 in forty miles of length, is too well known to need description. A reality considered, it is but a fraction of the gold-bearing territory of the Vitim and Olekma districts, and, although worked out by the present Lenskoie company, there still remain important reserves of gold to be recovered by modern contrivances.

ANTIQUATED MINING METHODS

Up to 1914 the methods pursued in mining the drifting ground by the Lenskoie Gold Mining Co., were of that archaic description introduced into the Urals by some disciple of Agricola in the time of Katherine the Great. The so-called washing machines were of great historic interest, and one regretted that, on account of their bulk, it was impossible to transport them to some museum of antiquities.

Fortunately, in 1913 Reuben E. Smith, a mining engineer and specialist on placer mining, was engaged by the company. He at once essayed to improve the methods employed, and in the course of three years, in the face of most intense opposition by the Lenskoie board and many of the local officials of the company, succeeded in greatly reducing the cost and increasing the gold output. Stealing of coarse gold from the drift faces and dumps, which had for several years averaged £300,000 annually, was reduced to less than £100,000 in 1915. This was the result of the introduction of all-the-year washing of gold, instead of exclusive summer washing, as formerly. A most ingenious system was developed by Mr. Smith which allowed the gold to be washed every day of the year, even in the record winter temperature of 1914-15, when 88 degrees below zero, Fahrenheit, was recorded.

By this and other improvements, the introduction of standard Alaskan sluices, and the saving of fine gold which had formerly been lost, the output was gradually raised until in 1915 the record production of £1,800,000 in gold was reached. This, in fact, was a large output.

Underground improvements, such as the recovery of timber put into the workings, the reduction of man and horse power, and all round general cost-cutting had been introduced and the Lenskoie property, so far as working cost and production were concerned, was fast getting in line with the world's well-administered mines. But unfortunately the board at Petrograd had engaged the doctor when the patient had nearly expired, and the inevitable fact remained that Bodaibo Creek was worked out. Therefore, irrespective of any political disturbances, the Lenskoie output began to decline in 1916, and has steadily done so since. Although it is reported that the property is still being operated, the 1919 output will probably not reach more than 20 per cent of that of 1915.

ANCIENT RIGHTS HANDICAP EXPLOITATION

New discoveries of drifting gravel are reported from eastern areas of the property, remote from Bodaibo. Though it is possible that these will lend for a time a new drifting life to the property, a thorough liquidation of the present organization will be necessary, before even the richest gravel can be worked at a profit. Ancient poodage rights, imports, and other charges must

be met by many of the best claims, serving to handicap their profitable exploitation, even were all the unnecessary overhead charges eliminated.

Aside from the Lenskoie Co., the output of any one mine in the Siberian or Ural territory is insignificant. The aggregate pre-war annual output of Russia was from £5,000,000 to £6,000,000 in gold. This was less than the daily cost of the war to Great Britain. Of this sum, the Lenskoie Co., annually contributed from 25 per cent to 30 per cent. Thus, notwithstanding the fact that Siberia promises to be the world's great gold-producing country of the future, it may be said to be at that turning point where the alluvial gold is largely worked out and the initiation of quartz mining, and the obtaining of gold as a byproduct from base-metal mines has not begun.

To select the areas where deep mining will be possible, and to develop the deposits, and determine the proper processes for extraction of the metal will require the services of foreign engineers from America, South Africa, and Australia. There is no intrinsic reason why the Siberian output will not eventually equal or even exceed the present annual output of the Transvaal, but the evolution of the industry will be slow.

Gold dredging, which has attained success in other countries, will also have a wide field, but up to the present it has hardly begun. Of about fifty dredges which have hitherto been installed in various districts in Siberia, only five are of any value as machines. Two of these are on the Pacific Coast, at the property of the Orsk Goldfields, Ltd., and three are in the Ural region, at the property of the Nikolai Pavdinsk Co. Gold dredges are only significant in increasing notably the gold production of a region when they are installed in multiple units on large areas, as the recoverable tenor of the gravel on which they operate is generally low, a few pence per cubic yard.

PLATINUM DREDGING

I am credibly informed that twenty-seven so-called platinum dredges in the Ural region, mostly on the Iss and Tagil fields, were sunk during the political disturbances, but, with one or two exceptions, one may say that the loss of these mechanical contrivances is not greatly to be deplored. For the sake of the future of the platinum industry, it is to be hoped they will remain scrapped and be replaced by modern dredges.

The entire pre-war platinum output averaged about 150,000 oz. troy annually, and so far as can be gathered sunk to 80,000 oz. in 1917. The Iss field, by far the most important, if worked intensively by dredges for ten years, with an annual output of, say 300,000 oz., would probably be exhausted. It is not unlikely that other platinum fields will be discovered, either in the Urals or elsewhere, to take the place of this field when exhausted. It is also possible that certain zones of the Iss dunitites may be found workable as a rock-source of platinum, since it is known that the platinum occurs in the dunitite in recoverable quantity. The same may be said regarding the adjacent less important fields of the Pavdinsk estate and the Tagil.

I do not attempt to touch on the subject of coal and iron deposits, or of the great group of non-metallic mineral products, as these subjects merit treatment in separate articles. The best general résumé of Siberian and Russian mineral deposits in English was published some years ago in a small book entitled "The Times Book of Russia," obtainable from the London *Times*.

ORE DRESSING AND METALLURGY

Practical Suggestions and Progress
in Invention and Use of
Mechanical Appliances

A New Flexible Coupling*

Many designs of flexible couplings have been used for connecting shaftings in order to eliminate mechanical troubles due to misalignment, and although they have served their purpose to good advantage, there is always room for improvement.

The "Karge" cushion and flexible coupling, manufactured by the Three Rivers Machine Tool and Die Corporation, Phoenix, N. Y., is designed to take the place of flexible joints, gears, pulleys, beltings and any other

helical spring in appearance, and this member is shrunk in the sleeve at each end, being secured to the shaft or machine, as the case may be. A flexible spindle extends through the center of the coil, and a flexible sleeve is also placed on the outside of the coils for the same purpose as the spindle.

Where the flexible coupling is applied to a shafting or as a connection between two units, it can be bent and placed at almost any angle. It will absorb all shock and strain, and transmit the power in a satisfactory manner.

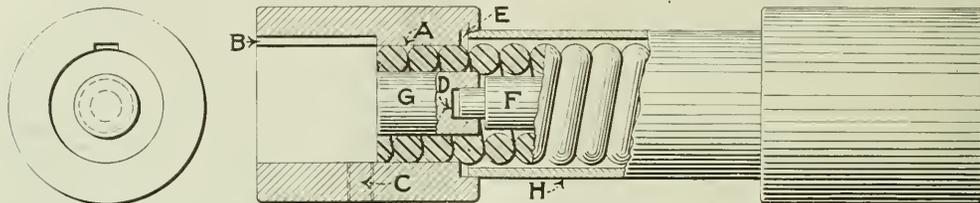


FIG. 1. DETAILS OF CONSTRUCTION OF FLEXIBLE COUPLING

mechanical devices used for the transmission of power. The cushion coupling is constructed of a special alloy steel and consists of a coil within a coil, wound in op-

Fig. 1 shows the details of construction. The end of the coupling is secured to the shaft by either a key or setscrews, as shown at B and C. The space between the plug and the floating spindle is to allow for contraction and expansion of the spring lengthwise, as shown at D. The space between the coupling and sleeve is to allow for contraction and expansion of the spring lengthwise, as shown at E. The floating spindle F limits the contraction of the spring, and has a sliding movement in the plug G. The sleeve H limits the expansion of the spring and has a sliding movement in the coupling.

Fig. 2 illustrates an application of the flexible coupling. All couplings are made of cast iron and the compression sleeves of steel. It is the practice to make the inside diameter of the coil spring the same as the outside diameter of the shafting with which it connects. When constructed in this manner, the couplings are claimed to have 30% more strength in torsion than the solid-steel shaft. The devices are made in various sizes for shafting from $\frac{1}{2}$ to 6 in. in diameter.

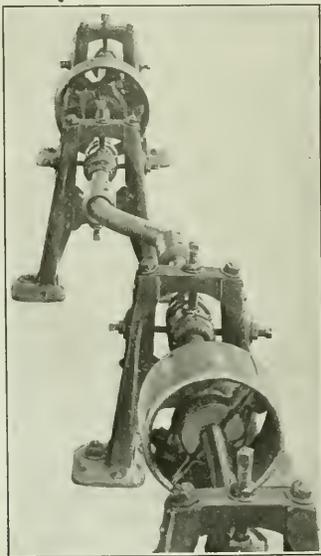


FIG. 2. COUPLING IN USE

posite directions. In other words, the coupling proper is formed in a cylindrical shape, so that it resembles a

*Abstracted and condensed from an article in *Power*, Apr. 22, 1919, p. 599.

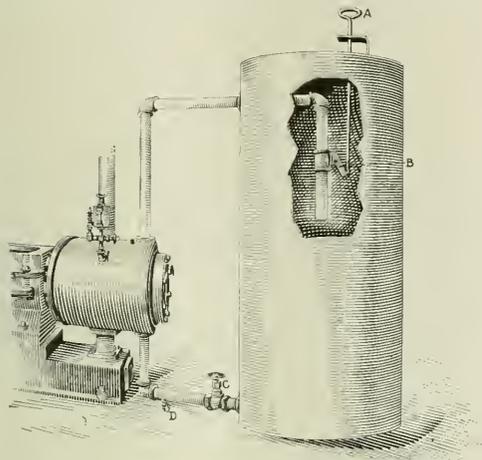
Circulating-Water System

By C. E. DUTTON

Gas engines and compressors using water for cooling give considerable trouble in winter, owing to the water in exposed pipes and in the cooling tank freezing after a temporary shutdown. It is well known that still water in an open tank or vessel always freezes on the top first. A satisfactory method of overcoming these difficulties is shown in the accompanying sketch. The pipe connections to the tank are made in the usual way, excepting that the top connection is at least 1 ft. below the top of the tank, and no valve is placed on the overhead

line outside the tank. Instead, the line is run into the center of the tank and turned down, the valve *B* being at least 1 ft. below the elbow. A lever is then connected to this valve in the manner shown. The tank should always be kept full of water, and whenever the machine is shut down in cold weather valves *B* and *C* are closed at once and the engine is drained at *D*.

A temporary shutdown in the coldest weather will not interfere with the resumption of operations; in fact



METHOD OF PREVENTING THE FREEZING OF CIRCULATING-WATER PIPE

the tank would have to freeze almost solid before the system would be affected. The lever operating the valve will be frozen in, of course, but a little hot water, or drilling, will release it. Valve *C* and the nipple in the tank are generally protected by packing, but, if necessary, they could also be extended into the tank and operated like *B*.

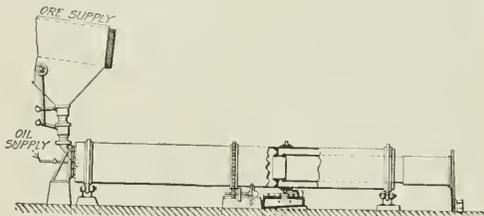
Such tanks are usually placed outside the engine room, and another good practice is to board them in, leaving about a foot of space between the tanks and walls, filling this space with manure or other handy non-conducting material to a foot or so of the tops of the tanks and then covering the shed with doors. This will not only keep out the cold winds but prevent undue vaporization in summer.

Handling Flue Dust

At the Nichols Copper Co.'s refinery on Long Island, N. Y., flue dust is mixed with cement in a concrete mixer. Just sufficient water is added to make a stiff mud. The mixed batch is poured into a charging buggy and wheeled into a yard contiguous to the blast furnace. Here it is dumped and allowed to harden for 24 hours. It is then broken up and shoveled into the charging buggies, wheeled to the elevators, and taken to the charging floor of the blast furnace, where it forms part of the charge. The method is one that requires little new equipment—practically nothing but the cement mixer. It is effective and is well worth the attention of smeltery managers who are starting up new plants. The amount of cement used is about 10 per cent of the weight of the flue dust.

Converter for Magnetizing Treatment

R. W. Irwin, has been granted a patent for an apparatus for treating ores preparatory to magnetic separation (No. 1,295,719 issued Feb. 25, 1919), comprising a converter having an inlet and an outlet and adapted to receive and permit passage of the ore and its associated gangue, means for feeding the ore and gangue, means for maintaining a magnetizing reagent in the converter which is adapted to render the ore magnetic, and means for sealing the inlet and the outlet against the entrance of air and adapted to permit free passage of the ore and gangue to and from the converter.



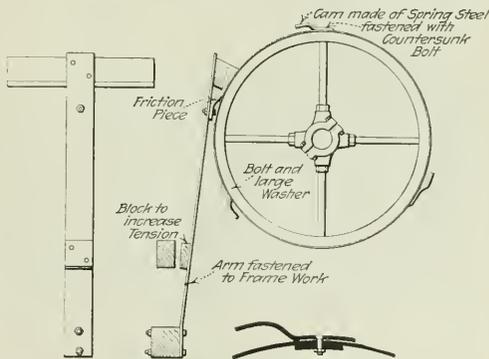
APPARATUS FOR MAGNETIZING ORES

The apparatus is shown in the accompanying cut. A pipe conveying oil at high pressure projects into the cylinder, as shown, and a gaseous hydrocarbon atmosphere is maintained. Certain ores, such as limonite and red hematite, are non-magnetic, but are rendered magnetic by a treatment in the converter described.

Trommel Screen Cleaner

BY CHARLES LABBE

In screening a roll product, the apertures of the trommel often become clogged, but may be freed by means of a spring arm attachment. This is made of a good piece of 1-in. x 4-in. lumber, about 6 ft. long, with a crosspiece of fairly hard wood 18 to 24 in. long. The arm is fastened at one end with bolts on one side of



SPRING-ARM TROMMEL CLEANER

the framework. The cams are made of discarded wagon spring, and measure not less than 2 in. wide by $\frac{3}{8}$ in. thick. The friction piece on the arm is made of the same material, and the cams are fastened on the screen itself by countersunk bolts and large washers.

COMPANY REPORTS

Annual and Quarterly Reviews
of the Activities of
Operating Mines

Utah Copper Co.

According to the forty-fifth quarterly report of the Utah Copper Co., covering the second quarter of 1919, the gross production of copper contained in concentrate for this quarter is as follows: April, 9,309,256 lb.; May, 9,058,715 lb.; June, 9,155,629 lb.; total, 27,523,600 lb. Average monthly production, 9,174,533 lb.

In addition to the above, a total of 523,378 lb. of copper was contained in precipitate from the leaching plant, making the total gross production for the quarter 28,046,978 lb., as compared with 29,261,209 lb. for the previous quarter.

During the period there was treated at the Arthur plant a total of 1,242,500 tons, being 284,000 tons less than for the preceding quarter. The average grade of the ore was 1.35 per cent copper, as compared with 1.27 per cent copper for the first quarter, and the average recovery was 81.80 per cent, as compared with 74.70 per cent for the preceding quarter, being a decided improvement.

The average cost per pound of net copper produced, including plant depreciation and all fixed and general charges, but excluding Federal taxes, and without credit for gold and silver or miscellaneous income, was 11.59c., as compared with 13.72c. for the first quarter, calculated in the same way. The value of the gold and silver in concentrates and the miscellaneous income for the quarter amounted to 5.40c. per net pound of copper produced.

The financial results of the operations for the quarter are as shown below:

Net profit from operations.....	\$1,043,757.53
Other income, rents, etc., in Utah.....	1,233,158.80
Income from Nevada Cons. Copper Co. dividends.....	375,187.50
Total net profit.....	\$2,652,103.83
Disbursement to stockholders.....	2,436,735.00
Net profit.....	\$215,368.83

The earnings for the quarter are computed on the basis of 14.74c. per lb. of copper, as against 12.89c. for the previous quarter. The low carrying price is due to the small sales of copper made during the period and the increase in the amount of copper unsold and carried at 13½c. per lb. The regular quarterly disbursement of \$1.50 per share was paid on June 30.

Operations were continued on the curtailed basis of approximately 50 per cent of normal. The operating cost per pound of copper for the quarter is lower than it has been for a long time, fulfilling the prediction made in the report covering the first quarter of this year.

During the period there was removed a total of 333,048 cu.yd. of capping, being an average of 111,016 cu.yd. per month, as compared with 379,264 cu.yd. and 126,421 cu.yd., respectively, for the first quarter of the year. This decrease was due to the second curtailment of operations, which took effect about Mar. 1.

A daily average of 6,753 tons of ore and of 1,981 tons

of commercial freight was transported over the Bingham & Garfield Ry. making a total daily average of 8,734 tons, as compared with 13,520 tons per day for the previous quarter. This decrease was caused by the curtailment in the operations of the Utah Copper Co.

Nevada Consolidated Copper Co.

The fortieth quarterly report of the Nevada Consolidated Copper Co., for the quarter ended June 30, 1919, states that the production of copper for the three months was 11,149,362 lb., as compared with 12,201,444 lb. for the quarterly period ending Mar. 31, 1919. During the quarter, 558,525 dry tons of ore of an average grade of 1.42 per cent copper from the shovel pits and the Ruth mine was treated, as compared with 529,692 dry tons, averaging 1.79 per cent copper, for the previous quarter. Of the tonnage milled during the quarter 68 per cent was supplied from the pit, and 32 per cent from the underground workings of the Ruth mine. No custom ore was offered for treatment during the quarter.

The cost of production per pound of copper for the quarter, including charge for depreciation of plant and equipment, and the usual overhead or fixed and general expenses, but without credit for gold and silver recovered and miscellaneous earnings, was 18.07c. per lb. The value of gold and silver recovered and the miscellaneous earnings for the second quarter amounted to 4.61c. per lb. of copper. The costs for the preceding quarter, calculated upon the same basis, that is, including charge for plant depreciation and the fixed and general expenses, but excluding credit for miscellaneous earnings, were 16.85c. per lb. of copper.

The total production for the first six months of the current fiscal year averaged 3,891,801 lb. of copper per month, as compared with an average of 6,500,000 lb. per month for the first six months of the preceding year, indicating that the program of production curtailment made necessary by prevailing industrial conditions has been consistently observed.

The financial results of operations for the quarter, as below, include charges to cover depreciation of plant and equipment as operating costs:

FINANCIAL STATEMENT NEVADA CONSOLIDATED COPPER CO., SECOND QUARTER, 1919

Operating loss.....	\$329,970.55
Earnings from investments and miscellaneous.....	514,748.23
Net gain.....	\$184,777.68
Distribution to stockholders.....	749,796.38
Net deficit.....	\$565,018.70

The operating income upon which the earnings for the quarter are based is computed at 15.12c. per lb. of copper, as compared with 13.6c. per lb. for the preceding quarter. This slight increase in the carrying price is due to the fact that the sales of copper during the quarter were increased to some extent, all unsold copper being carried, as usual, at 13.5c. per lb. The actual sales of metal for the quarter, however, did not equal

the production for the period, which resulted in a further increase of unsold copper on hand and in transit.

A general improvement in industrial conditions at this time would seem to indicate a slow but gradual increase in domestic consumption and a decided stimulation of foreign demands. Though this fairly well-defined improvement in the copper market gives promises of further expansion, the management has considered it advisable to continue the output of copper on the present basis of curtailment until some part of the company's accumulation of copper stocks can be marketed to advantage.

Canada Copper Corporation, Ltd.

The annual report of the Canada Copper Corporation, Ltd., for the year ended Dec. 31, 1918, was issued July 17, 1919. Operations at the Mother Lode mine and at the smeltery at Greenwood, B. C., terminated on Nov. 26, 1918, upon which date the plant closed down owing to the low grade of the remaining ores in the company's older mines. So far as can be foreseen, the company's operations in the Boundary District have been brought to a conclusion.

During the year, 154,332 tons of Mother Lode ore were mined and smelted. This compares with 203,478 tons for 1917. From this, and custom ores purchased and smelted, the production of metals was as follows:

Copper (fine), lb.	2,813,993
Silver (fine), oz.	60,495
Gold (fine), oz.	12,662.8

During the last few months, the grade ran off rapidly, until the shipments were running below 0.7 per cent copper. Under such circumstances, it was evidently impossible to operate at a profit, so measures were taken to close down. These included a careful survey of the mine and the stoping of any ore of pay grade. After this had been extracted, operations ceased. The average analysis of the ore produced during the year was as follows:

Copper, per cent.	0.856
Silver, oz. per ton.	0.185
Gold, oz. per ton.	0.039

The Lone Star Mine was operated until July 23, during which period 3,540 dry tons of ore was shipped. Greater care was used in sorting the ore, so that the grade was slightly higher than in 1917, containing copper 2.04 per cent, silver 0.14 oz. per ton, gold 0.022 oz. per ton. The expense was, however, much higher. This property is in much the same condition as the Mother Lode. It contains a considerable quantity of low-grade material, but it is practically impossible to produce ore of payable grade at a cost low enough to leave a profit.

At the Copper Mountain property, the permanent development and construction program begun in 1917 was continued up to Sept. 1, when, most of it being completed, the work ceased, to be resumed in the spring. The ore reserves remain as last year—10,000,000 tons assured and 2,000,000 tons probable, of an average grade of 1.74 per cent.

The development performed consisted of 1,710 ft. of tunneling, 146 ft. of drifting, and 3,694 ft. of raising, or a total of 5,560 ft. Also, 289 ft. of level workings were widened. No prospecting was done to develop additional ore reserves.

Up to April, 1919, construction of the mill at Allenby proceeded at a satisfactory rate, but labor trouble which then developed in the forces of the railroad construction has since caused delay.

Chino Copper Co.

The thirty-first quarterly report of the Chino Copper Co., covering the second quarter of 1919, was issued on Aug. 5, 1919. The gross production of copper contained in the concentrate from milling operations for the period under review was 10,541,471 lb., compared with 11,512,133 lb. for the previous quarter. The total amount of ore treated for the three months was 401,100 tons, equivalent to an average of 4,408 tons per day. This daily average is 1,083 tons less than that milled for the first quarter of 1919. The average assay in copper of the ore treated for the second quarter was 1.83 per cent as compared with 1.80 per cent for the first quarter of 1919. The ore milled during the second quarter was considerably more favorable to concentration than that treated during the previous quarter.

The recovery per ton of ore milled for the quarter under consideration was 26.28 lb. of copper, as compared with 23.29 lb. for the first quarter of 1919. There was produced 26,830 dry tons of concentrate, averaging 19.64 per cent copper, as against 41,539 dry tons, averaging 13.84 per cent copper, for the first quarter.

The cost per pound of net copper produced from milling operations for the second quarter, after allowing for smeltery deductions and including depreciation, was 14.16c., as against 15.03c. for the first quarter of 1919, calculated the same way. The cost figures shown do not include any charge for federal income or excess-profits taxes, nor do these costs take into consideration miscellaneous income. There were no gold and silver credits from the concentrates produced during the second quarter.

The financial results of the company's operations for the second quarter are shown in the following table:

Net income from copper production (only).....	\$44,031.05
Miscellaneous income.....	326,384.19
Total.....	\$370,415.24
Disbursement to stockholders.....	652,485.00
Deficit after disbursements to stockholders.....	\$282,069.76

The above figures are based on a carrying price for copper of 14.60c. per lb. for the second quarter of 1919, calculated in the usual manner of inventorying the unsold copper at 13½c. per lb. A disbursement of 75c. per share was made to stockholders during the second quarter of 1919.

During the period under review there was removed by steam shovels at Santa Rita a total of 1,084,668 cu. yd. of material, equivalent to an average of 361,556 cu. yd. per month, as compared with a total of 1,060,765 cu. yd. of material during the first quarter of 1919, and an average of 353,588 cu. yd. per month. Of the total material removed during the second quarter, 818,195 cu.yd. was stripping, the remainder being equivalent to 546,423 tons of ore, of an average grade of 1.62 per cent copper, according to mine sampling and assaying. The difference between the tonnage mined and the tonnage milled during the second quarter is in part oxidized ore, which was sent to the mine stockpiles.

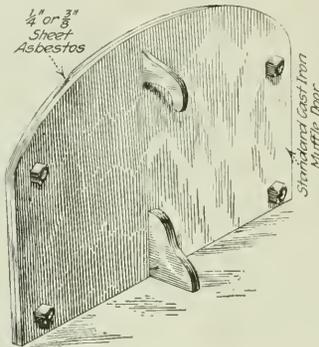
Camp Bird, Ltd.—During the quarter ended Mar. 31, 1919, the tunnel level east was extended from the end of the tunnel company's ventilating drift a distance of 206 ft.; crosscuts and drifts therefor, 465 ft.; raises, 47 ft.; total development, 718 ft. The company's ventilating raise was advanced 19 ft. The drive east is in vein of no commercial value. The supply of labor is fair. Wages in the district have been again advanced 50c. per day, making the minimum wage scale \$4.50.

ASSAYER AND CHEMIST

Laboratory Methods and Hints
for the Mine Assayer and
Works Chemist

Improved Muffle Door

The cast-iron muffle door used in connection with assay furnaces and sold by any chemical supply house is to be preferred to the tile door, because of its greater durability and especially because it can be handled more easily. It has, however, one fault, that of radiating the muffle heat too rapidly. This objection may be overcome satisfactorily in the simple manner shown in the accompanying illustration. A piece of $\frac{1}{2}$ -in. or $\frac{3}{8}$ -in. sheet asbestos is cut to conform to the size and shape



IMPROVEMENT ON STANDARD CAST-IRON DOOR FOR ASSAY MUFFLE

of the door. Four or more holes are drilled through the iron door and asbestos sheet, the latter is placed on the rear side of the door, and $\frac{1}{2}$ -in. bolts, provided with large washers, are slipped through from the rear, and drawn up tight by means of the nuts. This asbestos sheet is a good heat insulator, lasts for considerable time, and is easily changed.

A Bone-Ash Economy

By C. R. COREY

Having observed the waste of bone ash in used cupels that were not entirely saturated with litharge, it occurred to me to investigate the matter, and the following experiments were conducted:

One hundred pounds of used cupels, a fair sample of a quantity that had accumulated during the last few years at the laboratories of the University of Washington, was revolved, without previous crushing, in a cylindrical mill, containing neither balls nor pebbles, for 15 minutes. The product was then screened on a 20-mesh sieve, the oversize, containing the hard saturated part of the cupels, was put aside, and the undersize, the unstained or unsaturated part, together with some small pieces of saturated bone ash, was screen sized.

The weight of the material passing the 20-mesh sieve was 35.83 lb. The part that passed the 80-mesh sieve, 13.34 lb., was mixed and made into new cupels in the

usual way. These were dried for one month, together with others made from the regular stock of bone ash. Tests for hardness, absorption of litharge, and silver were then made.

Rate-of-absorption tests for litharge were made by cupeling 20 gm. of pure lead in each cupel, the two different lots of cupels being placed side by side in a gas-fired muffle furnace, four cupellations being made at one time and four different lots being run. Practically no difference was observed in the rate of absorption of the litharge.

The next and last test was to note the silver lost. Eight cupellations were made. The weights of the silver before and after cupeling were as follows:

ABSORPTION OF SILVER IN RE-MADE AND NEW CUPELS

Number of Cupel	Silver Taken, mg.	Silver After Cupellation, mg.	Silver Lost, mg.
1	19.85	19.80	0.05
2	19.90	19.76	0.14
3	19.95	19.87	0.08
4	19.30	19.62	0.18
5	20.00	19.77	0.23
6	19.87	19.70	0.17
7	19.84	19.60	0.24
8	19.92	19.65	0.27

Odd numbers are the re-made cupels; even numbers, those made from stock bone ash. The temperature at the start of cupellation was 850° C. At the end of two minutes all were "driving"; at the end of five minutes the temperature was 830° C. It was further lowered to 790° C. and when near the finish was raised to 880° C.

The tests show that nearly 36% of the bone ash was knocked loose in the ball mill, and half of this would pass an 80-mesh screen without further grinding; so 18% was available for re-use. The color of the recovered bone ash was only a little darker than that of the original, and the material proved to be as effective as the original and unused bone ash.

Copper Ore Treatment

U. S. Patent 1,296,523, has been issued to Joseph Irving, under date of Mar. 4, 1919, for an invention which relates to a process for the treatment of cupriferous ores, compounds, or products, for the extraction of metal therefrom in soluble form, and for the recovery of the metal. Its objects are to effect in such a process a continuous regeneration of the reagents the presence of which is desired, and simultaneously to eliminate undesirable reagents, to avoid waste, to reduce the amount of added chemicals required to a minimum, and to render the process cyclic in all its parts in so far as is possible.

The process includes subjecting the ore to the action of an iron-containing electrolyte from the copper-depositing tanks, removing the electrolyte and the copper therefrom, washing the treated ore with an iron-containing solution, passing the solution over iron, thereby reducing the iron salts contained therein and precipitating copper therefrom, and again washing the treated ores with the solution.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

The Oil Land Leasing Bill

Indications point at this writing to an early vote on the Oil Land Leasing bill. Senator La Follette, after many hours' debate in opposition to the bill, began the presentation of his amendments on Aug. 30. Some of those presented have been accepted, but the more important ones do not meet with approval. For instance, one of Mr. La Follette's amendments provides: "That the Government hereby reserves the right at all times, under rules and regulations to be prescribed by the President, to determine, fix, and control the selling price of all products derived from lands leased hereunder, whether in the crude or natural condition or in other merchantable form, which shall be a reasonable price both as to the producer and the consumer; and the reservation of such right shall be expressly stated in each lease."

The mooted question as to what extent the bill invalidates present locations upon which no discoveries have been made was brought to a head when Senator Jones, of New Mexico, presented to the Senate telegraphic protests from his state alleging that thousands of claims would be voided for lack of discovery. Senator Smoot claims that Section 36 of the bill protects such cases as these cited by Senator Jones. Section 36 reads:

That the deposits of coal, phosphate, sodium, oil, oil shale, and gas, herein referred to, in lands valuable for such minerals shall be subject to disposition only in the form and manner provided in this act, except as to valid claims existent at date of the passage of this act and thereafter maintained in compliance with the laws under which initiated, which claims may be perfected under such laws.

Commenting on the question, Senator Smoot said:

The bills that have been heretofore introduced used the language "except as to valid locations" and that has been changed to "valid claims." That was done as the result of the decision of the United States Circuit Court, in which the court upheld the Western American Oil Co. in the claims that they had which were contested by the Government of the United States. I am quite sure that under Section 36 of the pending bill if the parties referred to by the Senator have complied with the law and have made their locations under existing law and continued to comply with the law so that up to date they have valid claims, under Section 36 of this bill they will not be interfered with in any way.

Freight Rates From Pacific Ports

A supplemental tariff covering ocean rates from Pacific Coast ports to European ports has been issued by the Shipping Board. In this tariff the rate on arsenic to United Kingdom ports is \$1.90 per 100 lb.; on brass and copper scrap in packages, \$2 per 100 lb. Quick-silver in flasks and sulphur take the same rate. Tin scrap in bales takes a rate of \$1.75. An addition of 25c. per 100 lb. is charged when the destinations are French Atlantic ports, Antwerp or Rotterdam. The addition for Christiania, Copenhagen and Gothenburg is 50c., while the addition to Stockholm is 75c.

New Law Will Affect Appropriations

It is believed that appropriations for Government bureaus are certain to suffer as a result of the recently enacted statute preventing officers and employees of the Government from communicating with members of Congress in regard to such appropriations. In the past it has been customary for specialists in many of the Bureaus to explain the need of the appropriation for their work to individual members of the House and Senate. Members of Congress have so many demands on their time that they can study into all phases of such a situation only infrequently, unless they are particularly interested. It has been found that a few minutes' personal talk on the part of someone who can present briefly and concretely the need for the money is one of the best methods of getting essential information to a lawmaker. That the law will have a particular effect on the technical bureaus is certain since the nature of their work is less understood.

The law also forbids Government officials and employees from engaging in propaganda among the public in behalf of appropriations. To that provision there is no objection on the part of the officials.

Tariff Bills in the Senate

There is no tendency on the part of the Senate to rush through any of the tariff bills which have been passed by the House and are now pending before the Committee of Finance. Senator Penrose, of Pennsylvania, the chairman of the committee, is of the opinion that world conditions are too disturbed at this time to permit of intelligent legislation on the tariff, and apparently he is not greatly impressed with the assertions that higher duties must hurriedly be made effective. Nevertheless, he expects to take the matter up in the near future with the committee, and if it is decided to go ahead with the legislation at this time an opportunity will be given to those interested to be heard.

Rulings on Child Labor

A series of rulings have been issued by the Commissioner of Internal Revenue relating to the child labor provisions of the 1918 revenue act. A tax of 10 per cent is levied on the entire net profits of any mine or quarry in which children under sixteen years of age are permitted to work. A similar tax is imposed on mills, canneries, workshops and factories. The law does not apply to children who may be employed in offices or such operations which are physically separate from the mine or manufacturing establishment.

A contract for 500,000 bbl. of oil fuel has been placed with the Mexican Petroleum Corporation by the U. S. Shipping Board. The price was \$1.18 per bbl., and it is to be delivered at the American bunkering station at St. Thomas, W. I.

Manning Discusses Petroleum Industry

Co-Ordination of American Petroleum for Purposes of Research—American Participation in Development of Foreign Oil Fields Essential

AT A CONFERENCE held on Aug. 15 at the Engineers' Club of San Francisco, Cal., Van. H. Manning, Director of the Bureau of Mines, addressed the local oil men on the necessity of perfecting the organization of the American Petroleum Institute and of securing an annual fund of \$1,000,000 for the purpose of encouraging research in petroleum technology. Mr. Manning presented the following review of the petroleum situation:

I expect to see improvements in the technique of the recovery of oil and the protection of oil and gas against waste take place in the general development of this country. I am looking forward to the future; to the growth of better methods for producing and utilizing oil and gas. I am confidently expecting tremendous progress along these lines, and look forward to the day when the methods which are now used in our oil fields will be looked upon as most crude and inefficient. I expect to see more oil taken from the ground than is now thought possible. I expect to see it recovered with less loss. I expect to see it utilized with far greater efficiency, and that the producers and refiners of oil and those who consume oil and its products will derive far greater benefits from it than at present. In this progress, in this development, it is my hope that the Bureau of Mines will take a most commendable part.

There is the advantage of doing a public service and of having the public confidence, so I do not feel that our contributions will be negligible. I hope the Bureau of Mines will be an active agent in inducing progress. To use a chemical term, it should be the catalyzer of the industry.

I take advantage of this opportunity to speak of the American Petroleum Institute. On this subject, I shall speak both in my private capacity as Director of the American Petroleum Institute and in my public capacity as Director of the Bureau of Mines. The American Petroleum Institute is essentially a getting together of all the oil and gas men into a one-unit organization for the purpose of inducing progress. What I have said about the progress I expect to see in the next twenty years in the petroleum industry I confidently hope will come about largely through the American Petroleum Institute. It will be the greatest mistake in the history of the oil industry if the industry does not take this opportunity to promote the Institute and foster its growth in every possible way. It is a big conception, but it is by no means a new thing, as similar institutes have been founded in other industries and have been of inestimable benefit. The interests of the petroleum industry and of the country will be harmed unless the industry supports this movement, and I feel that the progress in oil and gas will be greatly retarded if advantage of this opportunity is not taken.

The following may be enumerated as some of the objects of the institute:

1. To present a united front in all matters relating to the industry when it is of national import.
2. To serve as spokesman for the industry itself, to Congress and to Government and state agencies.
3. To avoid political embarrassments on the part of legislation.
4. To draft uniform law and urge its adoption in all the states.
5. To safeguard the industry both at home and abroad, from the standpoint of foreign competition.
6. To study foreign and domestic commerce.
7. To conduct a statistical bureau.
8. To study various problems such as cost accounting, labor conditions, tank car traffic, and similar matters.
9. To publish a bulletin through which the various needs of the industry can be co-ordinated.

10. To conduct a welfare committee.

11. To establish a research bureau.

Through this agency, various producing, refining, and internal-combustion interests could be co-ordinated by the establishment of a research fund, which would encourage Government and private initiative, and would attract inventors and owners of patents and patent rights, whose patents could be tried out on a commercial scale, and, if successful, adopted by the entire industry on a payment of a small royalty, which would provide a revolving fund after the first investment is made, which fund would be used in the payment of a bonus or a royalty to the patentee.

I have estimated that to carry on this work in a successful manner a million dollars per annum should be provided by the petroleum industry, which amount should be distributed between the producers of oil, refiners, and producers of natural gas. The total gross production in 1918 was about \$2,500,000,000. To raise this one million dollars would take one-twenty-fifth of 1 per cent, or \$1 out of each \$2,500 gross profit.

I want to say a word concerning the international policies affecting the petroleum industry. On July 29, 1919, there was published in the *Congressional Record* a report which I submitted to the Secretary of the Interior on this subject. There is no other situation in respect to future supplies of essential raw materials for the United States, and in respect to our future trade, which is at the present time so important and so critical as the petroleum situation. In so far as America is concerned, the whole complexion of our petroleum industry has changed within the last two years. We are now consuming more crude oil than we produce, depending upon imports to make up the deficit. The geologists of the Department of the Interior say that there has been taken out of the ground and used up 40 per cent of our natural petroleum reserves, whereas we have used up but 1 per cent of our coal. On account of our past over-production, and apparent abundance of petroleum at home, Americans have not gone extensively abroad for petroleum supplies and reserves. American oil-producing companies are to be found only in Mexico, Central and South America, and Roumania. The vast potential resources of Africa and of the Near and Far East have been neglected by our nationals up to this time, partly on account of our plentiful but fast diminishing supplies at home, and partly because they have felt that large investments of this nature far abroad would not be secure.

This country holds the premier position in the petroleum industry of the world, and now produces yearly between 65 and 70 per cent of the world's total production. This position has been and is our national right because of our immense production, and more because of our even greater consumption.

The latest statistics disclose the fact that in 1918 our domestic consumption was practically equal to our domestic production, and more than 5.3 times greater than our exports, which were abnormal, on account of ten months of war, during which time more than 80 per cent of all the petroleum products consumed by Great Britain, France, Italy, and the A. E. F., as well as neutral Europe, had to come from this country, for reasons of limited ocean transport.

Production and not refining and marketing organizations is going to be the key to independence in respect to the world's petroleum trade of the future. Inspection of a map showing the petroleum reserves of the world disclose that many of these areas, particularly the most promising ones, are now closed to the entry of America, through being already possessed or controlled by the nationals of other countries—those of Great Britain and of Holland, especially. It is further disclosed that practically all of these areas, with the exception of Mexico, and parts of Central and South America, lie within British and French possessions or spheres of influence.

British and British-Dutch nationals practically control all of the world's petroleum industry that is not controlled by our own companies. Great Britain and British nationals are alive to the fact that production—production scattered all over the world—will be the dominating factor from now

on, and it is their plan to secure concessions, or other rights, covering these probable and possible oil-productive areas. Unless Americans are encouraged to go abroad and secure at once rights and privileges to produce oil from the world's fast-dwindling reserves that are not open to them, future oil production will all be in the hands of other nationals within the next few years. No greater and more lasting and far-reaching service can be rendered to this country at the present time than making possible and effecting the securing by or for American citizens their rightful participation in the development of all of the world's reserves of petroleum.

American Progress in Spanish Industry*

Great Britain Concerned Over the Position Held by American Machinery, Particularly in the Mining Fields—Spanish Iron-Ore Reserves

THE British authorities are worrying over the progress which American steel industries are making in Spain. Copies have reached the United States of an interesting document issued by the British Department of Overseas Trade concerning conditions and prospects of the iron and steel industries and engineering projects in Spain.

The report, which has been prepared by William Thomson Anderson, deals at great length with the activities of Americans in Spain seeking trade, and cites numerous instances where the British have lost trade. It also calls attention to the fact that American trade papers have gained wide acceptance in Spain and are proving of immense value in establishing American goods in the minds of Spaniards. The report refers specifically to *The Iron Age*, declaring that it is found everywhere among miners and the manufacturers of iron and steel goods, building materials and hardware. It also refers to the *Engineering and Mining Journal* as being universally taken by managers and owners of Spanish mines. As a result, the demand for American mining machinery and equipment is great. Mr. Anderson recommends a similar propaganda for British goods.

SPANISH IRON-ORE RESERVES

	Tons
Vizcaya—All mines fully exploited.....	60,000,000
Gipuzcoa and Navarra—Partly exploited.....	10,000,000
Santander—Exploitation almost complete.....	30,000,000
Oviedo—Exploitation insignificant.....	60,000,000
Lugo—Exploitation partial.....	65,000,000
Estremadura, Segovia, etc.—Not yet exploited.....	10,000,000
Leon—Wagner, Ferradillo, Monte Teleno, etc.—Not yet worked.....	300,000,000
Huelva—Exclusive of sulphur ores unimportant.....	20,000,000
Sevilla—Exploitation unimportant.....	33,000,000
Malaga—Exploitation partial.....	30,000,000
Almeria—Exploitation important.....	30,000,000
Murcia—Exploitation limited.....	15,000,000
Peru—Exploitation large.....	150,000,000
Ciudad Real—No exploitation as yet.....	10,000,000
Catalonian provinces—No exploitation as yet.....	15,000,000
Aragon—Exploitation partial.....	40,000,000
Logrono—Exploitation none.....	20,000,000
Total tonnage.....	900,000,000

In the Asturias, which is the center of the most active development and production of coal in Spain at the present time, Mr. Anderson believes that there is in prospect an immediate demand for boilers, briquetting machinery, washing and screening plants, lubricating oils, iron and steel pipe, iron and steel bars, nails, and similar requirements, hoisting engines, air compressors, cranes for loading ships, steam, compressed air, and electric haulage engines, explosives, shop tools, hardware, light railway equipment, locomotives, miners' tools, pulleys, all kinds of rolling stock, ropes, safety lamps, ventilating fans, and auto-meter weighing machines.

*Extract from *Iron Age*, August 21, 1919.

Concerning iron, Mr. Anderson gives an optimistic report based upon figures collated by Julio de Lazurtegui in 1918. The accompanying table shows in condensed form the estimated quantity of iron ore unmined and the state of development and operation.

The Germans had been taking ores that were relatively high in phosphorus. The English, on the other hand, demand ores very low in both phosphorus and sulphur. They, however, tolerate considerable amounts of silica, and are content with comparatively low per cents of iron in the ore.

Mr. Anderson maintains that Spain is destined to reach an annual output of 1,500,000 tons of pig iron. Before the war it was approximately 450,000 tons, and during the war it increased to nearly 700,000 tons. Of this amount 60 per cent was produced by the great Spanish concern called the Altos Hornos de Vizcaya at Bilbao. Other large contributors to the total were the Fabrica de San Francisco, of Bilbao; Fabrica de Nueva Montana, of Nueva Montana, Santander; and the Fabrica de Mieres, of Mieres, Asturias. The iron and steel business in Spain is fairly well organized into the steel syndicate known as the Central Siderurgica, comprising the following concerns: Altos Hornos, Duro Felguera, Fabrica de Mieres, Fab. de San Francisco, Fab. de Moreda y Gijon, Fab. de Bidasoa, Hijos e Romualdo Garcia, Santa Ana de Bolueta, Sociedad Material para Ferrocarriles, and the Union Carrajera.

Referring to mining machinery, Mr. Anderson directs especial attention to the aggressive and successful work accomplished in Spain by the Ingersoll-Rand Co., of New York, which he thinks gained a strong lead in Spain for air compressors and rock drills of all kinds. The Sullivan Machinery Co., New York and Chicago, also has done business in Spain. It appears that the Americans have practically absorbed the compressor business in this country, to the exclusion of others. Also, America takes the lead, according to Mr. Anderson, in steam shovels. The Rio Tinto mines in Huelva have seventeen Bucyrus shovels at work, these ranging from 65 to 100 tons, loading up to 2,500 tons per ten hours.

Crushing machinery for the mines, however, is mainly British and German. Copper converters are almost exclusively supplied by the Power and Mining Machinery Co., which company also furnishes other mining machinery in Spain. Ore cars are supplied to the Spanish mines mainly by the German firm of A. Koppel & Co.

Determining Water Ratio in Flotation Pulp At Anaconda

Anaconda copper concentrator flotation equipment receives its feed directly from the overflow lip of the Dorr classifiers, each operating in closed circuit with one Hardinge ball mill. The mill feed is the reject from the Wilfley table section of the concentrator. There is no stabilizing system between the Wilfley tables and the Hardinge mills. As a consequence, the ratio, water to solids, varies considerably, as the rate of feeding the ore varies. The only control possible is to divert as much as possible of the table head water to the slime-thickening tanks.

For the above reasons no regular determinations of water to pulp ratio are made, and there is no attempt to maintain a constant ratio. It has been found that 18 to 23 per cent solids in flotation feed give the best

results. With a lower percentage of solids the tailings are not improved and the grade of concentrates is lowered; above 23 per cent solids the concentrates are improved at the expense of the tailings.

At the slimes-floatation plant treating copper concentrator slimes (95 per cent—200 mesh), the slimes are thickened to about 16 per cent solids and then diluted with hot water to 10 per cent solids. The percentage of solids is determined by means of an ordinary sp. gr. hydrometer for liquids heavier than water. Each hydrometer is roughly calibrated by checking the percentage of solids as calculated from the reading against a weighed and dried sample of the pulp.

At the zinc concentrator the feed to the Hardinge mills is the undersize of $1\frac{1}{2}$ by 12 mm. trommels. The ratio of water to pulp is maintained at the minimum amount required to carry the pulp in the launders from the crushing to the grinding division. The overflow from the Dorr classifiers goes direct to the floatation division and is thinned by the cleaner tailings and return floatation middlings. The rougher concentrates are about 30 to 35 per cent solids and are thinned to about 20 per cent solids by means of the clear overflow from the thickening tanks.

Engineer Urged for I. C. C.

Engineering Council Sends Letter to the President Requesting Appointment—Technical Knowledge Required

ENGINEERING COUNCIL, of which J. Parke Channing is president, has written President Wilson urging that a member of the engineering profession be appointed to the vacancy on the Interstate Commerce Commission. The letter is as follows:

The transportation systems of our country are largely the creations of its professional engineers. This statement can be made without disparagement to the statesmen, the financiers, the manufacturers, the lawyers, the educators, the mechanics, the laborers and many others, who, with the engineers, have contributed to the development of transportation. Through all stages of preliminary exploration, final survey, construction, upkeep and operation, in financial management, and in adjustment of the relations of transportation to the public, the genius and knowledge of the engineer are essential. Not only in technical physical matters, but also in determinations of policy, his contributions have supplemented and must ever supplement those of other men. These declarations hold good for all the carriers of commerce, by rail, by highway, by water, by pipe-line, by wire, or by air. Hence, it follows that the body established by Government to regulate the commerce, the carriers and the ways of communication, embracing so many engineering features, should number among its nine members, men of engineering training and experience.

Engineering Council, being aware of a vacancy on the Interstate Commerce Commission, begs leave to request the Chief Executive that in filling this vacancy he give earnest thought to the selection of a man who, to his other qualifications, adds the training and experience of an engineer familiar with transportation problems.

Engineer members wisely chosen would bring to the investigations and deliberations of the Interstate Commerce Commission not only technical knowledge of great value, but also experience in executive duties, a judicial attitude gained through the direction of work under contracts, minds of analytical habit, familiarity with costs of construction and operation, experience in dealing with employees of many vocations, and integrity of thought cultivated by that inescapable obedience to the laws of Nature involved in the practice of this profession. The engineer's training fits him for that mode of thinking which is indispensable

to impartiality of judgment. One important function of the commission is valuation of public utilities and another is the determination of relationships and responsibilities of the management of such utilities to the public. No other body of men has given so extensive and so scientific consideration to these matters as have members of the engineering profession.

Council's purpose is not to further the interests of any individual or group, but solely to serve the nation by strengthening one of its most important regulatory bodies. Upon the wisdom, intelligence and courage of this commission depends in large measure the commercial welfare of the country. It is believed that the engineering profession can and should contribute to the country's well-being through the channel of membership in the Interstate Commerce Commission.

Very respectfully,

J. PARKE CHANNING, Chairman.

Notes on Luxemburg's Steel Industry in 1914 to 1918*

Effects of the War—Germany Benefited Greatly Through Control of Output of Iron Plants Running to Full Capacity in 1915 and 1916

By ANDRÉ SURNY DE BONNIER
Mining Engineer, Liège, Belgium

THE critical state of the iron market in 1913, particularly in Belgium, caused a curtailment in the iron industry in Luxemburg at the end of 1913. The need of iron and steel in the Balkans was great, but the financial condition of these countries was deceptive. Furthermore, the negotiations opened in Dusseldorf at the Stahlwerk Verband, the difficulties between the United States and Mexico, and the absence of business in the Orient were the principal reasons for the inactivity of the market.

Mining statistics show a decrease in production of 3,200 metric tons of ore per day in Luxemburg during the first half of 1914, compared with the corresponding period of 1913. When the war broke out, operations stopped abruptly, only the men necessary to protect the mines being kept at work. By Aug. 10, 1914, of 5,400 laborers, 4,130 had been sent away. But by December, 1914, almost 80 per cent of them had been taken back.

During 1915 all male labor was employed, and it became difficult to find trained men by the second half of the year. The same situation existed during 1916 and the first part of 1917. In consequence, there was an increased use of machinery and mechanical devices of all kinds, the average production per man likewise increasing.

The price of ore, sold in 1913 at 3 fr. per ton, increased monthly. From 3.21 fr. in 1914 it rose to 4.50 fr. by August, 1915, for calcareous ore carrying 30 per cent Fe, and 3.90 fr. for siliceous ore with 35 per cent Fe. In 1917, calcareous ore was quoted at 5 fr., and siliceous ore sold up to 6.5 fr. At the end of 1917, the total extraction of ore was 30 per cent less than in 1915, because of the greater use by German blast furnaces of ore from the district of Briey, which is richer than the minettes of Luxemburg.

The iron resources of Luxemburg were a great help to Germany. More than 25 per cent of the total production of minette in 1913 was exported to countries independent of the Zollverein, but in 1915 less than 3 per cent was exported to these countries.

*Data taken from yearly reports of the Chambre du Commerce, of Luxemburg.

In August, 1914, the metallurgical plants became as greatly disorganized as the mines. During the first week of August, forty-two out of fifty furnaces were shut down. The Germans having removed the railroads for military use exclusively, the plants could not receive the coke required to keep them in operation. However, this abnormal situation did not last long, and in December the production of pig iron was 111,523 metric tons, or nearly one-half of the normal production. During 1915 and 1916 the plants ran at full capacity, the production being slightly lessened at the end of 1917.

as follows, the year 1918 figures being given in parentheses: Mining and metallurgical companies, \$61,466,935 (\$105,848,575); Canadian, Mexican, Central and South American companies, \$10,402,370 (\$13,573,665); holding companies, \$910,005 (\$1,425,005).

Occurrence of Iron and Nickel On Celebes Island

The British Bureau of Mines has issued a mimeographed report of eleven pages on the manganese-chrome iron ores and the nickel ores occurring in the Verbeek Mountains of Central Celebes and on neighboring islands. Celebes lies on the equator, south of the Philippines and east of Borneo. The iron ores are of the same type as those found in Cuba. There are four fields in Central Celebes, containing approximately the following number of tons of massive ore: Larona, 7,500,000; Lingkona, 1,500,000; Lingkobale, 1,500,000 and Karipenan, 1,300,000. Two analyses, the highest and the lowest, from the Larona field, showed the following results:

ANALYSES OF LARONA IRON ORE

	Per Cent.	Per Cent.		Per Cent.	Per Cent.
Loss on ignition.....	12.2	15.4	Al ₂ O ₃	7.0	10.8
SiO ₂	0.5	0.8	C ₂ O.....	1.7	2.3
F ₂ O ₃	70.1	73.6	MgO.....	0.3	0.4
Mn ₂ O ₄	1.5	2.0	P ₂ O.....	0.08	0.11
NiO.....	0.3	0.6			

These and other deposits on neighboring islands may be summarily described as follows:

1. *Deposits of the Verbeek Mountains.*—Quantity of ore estimated at 1,000,000,000 tons; 200,000,000 proved. Favorably situated. About 300,000 hp. available from the Mailili River.

2. *Kilone Dale.*—Hasty reconnaissance indicates considerable ore. Situated just across from an export harbor, more favorably than the territory in which Verbeek Mountain deposits occur; also better prospects for water power.

3. *Group of Islands in Laeot Straits.*—About 25,000,000 tons on Poeloe Soewangi, at the disposition of the government, and 300,000,000 tons on Poeloe Seboekoe, in private hands. Favorably situated near coal mine on Poeloe Laeot and convenient for shipment.

4. *Obi Islands.*—No data on ore, but in large amount. Not as favorably situated for power, but more so for export shipment.

Nickel deposits have been found in association with the iron ore, their origin being closely connected. They belong for the most part to the garnierite group of hydrated magnesium nickel silicates, such as are found in New Caledonia. Two experimental pits in a nickel deposit at Soroako, on the south shore of Lake Katano, gave throughout a depth of 9 and 12 m., respectively, an average content of 2.3 and 2.5 per cent Ni. Eleven pits on Nendjangan hill average 2.5 to 3.0, and 21 pits and trenches on Boetoh hill averaged over 5 per cent Ni. The total amount of this ore was estimated at 60,000 tons, but 1,000,000 cu. m. of material would have to be removed in development. Several other essentially nickel deposits are known, and, as has already been mentioned, the iron ore is nickeliferous. The investigations are being continued.

Tungsten Ore Imports into the United States in June, 1919, amounted to 338 long tons. The countries of origin and amounts were as follows: Chile, 136 long tons; Peru, 59; Japan, 53; Argentina, 50 long tons.

Hoover Banquet Arranged

General and Executive Committees of the American Institute of Mining and Metallurgical Engineers
Appointed by President H. V. Winchell

HERBERT HOOVER expects to arrive in America some time before the middle of September—the exact date to be determined by cable from him.

The engineers of America, under the auspices of the American Institute of Mining and Metallurgical Engineers, have decided to express their admiration for Hoover's services during the last five years, in international affairs, by giving him a large dinner, to be held in New York, shortly after his arrival. Mr. Hoover expects to go to his home in California, where he will resume his practice of engineering.

An organization has been completed consisting of a general committee and also an executive committee appointed by President Winchell of the A. I. M. E.

The personnel of the executive committee is as follows:

- | | |
|-------------------------------|--------------------|
| W. L. Saunders, chairman, | M. L. Requa |
| Chas. F. Rand, vice-chairman, | E. G. Spilsbury |
| E. P. Mathewson, treasurer, | Edgar Rickard |
| Albert C. Ludlum, secretary, | Edward B. Sturgis |
| A. B. Thayer | Arthur Williams |
| A. R. Ledoux | Horace V. Winchell |
| E. E. Oicott | J. Parke Channing |

W. L. Saunders is also chairman of the general committee with Charles F. Rand and E. P. Mathewson as vice-chairmen.

August Mining Dividends

Dividends disbursed in August, 1919, by 15 United States mining and metallurgical companies making public reports amounted to \$5,702,821, compared with \$10,320,109 distributed by 21 companies in August, 1918. Canadian and Mexican companies paid \$626,514, as compared with \$1,980,163 a year ago.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead & Sm., pfd.....	U. S.	\$1.50	\$120,810
Anaconda, c. a. s.....	Mont.	1.00	2,331,250
Arizona Copper.....	Ariz.	.18	227,000
Barnes King, c. g.....	Mont.	.05	20,000
Caledonia, Is.....	Ida.	.01	26,050
Chief Cons., Is.....	Ariz.	.063	57,475
Cresson Cons., g.....	Colo.	.10	122,000
Golden Cycle, g.....	Colo.	.03	45,000
Homestake, g.....	S. D.	.30	125,580
Intermt. Nickel, pfd.....	U. S.-Can.	1.50	133,689
Miami, c.....	Ariz.	.50	373,557
Mohawk, c.....	Mich.	1.00	100,000
New Jersey Zinc.....	U. S.	4.00	1,400,000
United Easterns, g.....	Ariz.	.07	95,410
United Verde Ex., c.....	Ariz.	.50	525,000
Canadian and Mexican Companies			
Amparo, g.....	Mex.	.05	100,000
Coniagas, s.....	Ont.	.123	100,000
Hollinger, g. s.....	Ont.	.05	246,000
McIntyre Porcupine, g. s.....	Ont.	.05	180,514

The only holding company to pay in August, 1919, was the White Knob Copper and Development Co., preferred, which disbursed 5c. a share (\$10,000).

The totals of the first eight months of the year are

BY THE WAY

Alluring Gold

"It is surprising how many people are duped into buying spurious bars of gold," said the *Ironmonger* recently. "Hundreds of pounds have been paid for single bars of what afterwards proved to be brass. It is quite a weekly occurrence; the 'sharps' on the lookout for pigeons to pluck frequent liquor bars, and sometimes pose as pioneers and prospectors who have 'struck 'ile.' There is much secrecy observed, and all sorts of subtle excuses. Sometimes the bars have a film of gold and pass the acid test. On Mar. 7 a member of the Provincial Council was duped, he alleged, to the tune of £200 for a bar of alloy of 63 per cent copper and 37 per cent zinc, the lot said to be worth 1s. 6d. It was palmed on to him as South African Republic gold, which is of lighter color."

A Matter of Habit

"There gaws tha bloody whistle naow a'blawin' like some creature possessed," says Cap'n Dick. "But I tell e, m'son, 'er do 'ave a powerful h'influence on these 'ere chaps oo works daown in tha bal. W'y, dam-me, they h'eats, works, an' sleeps by un, an' days w'en there's no blaw to 'er, don't seem as 'ow tha boys be themself's. I suppose any 'abit be pretty much tha same, an' once a man's formed un, it's bloody 'ard to break 'is ways. An' 'e naws it, m'son. H'out in Butte nummer o' years h'ago—thinkin' on this 'ere whistle reminds me o' this story—tha pastor o' one o' tha churches figger'd as 'ow 'e'd raise enough money to buy a bell to 'ang in the belfry so that Sunday moornin's tha sexton could ring un, an' let tha boys naw w'en to come to church. So h'out 'e starts collectin'. Some o' tha boys gave 'im one day's pay an' some wuz more liberal. Finally 'e come to Jan Tregar, oo, min' you, was'nt one o' these 'ere stingy chaps but 'e wants to naw jus' w'ere 'is money's gawin' to. So tha preacher tells 'im. 'Oh gos along, reverend,' says Jan, 'W'ot thee wants is not a bell, thee wants a bloody 'ooter. Tha boys is more like to turn h'out w'en they 'ears 'er a'blawin'.' An', dost thee naw, m'son I do believe a whistle might be more persuadin' to some, jus' from force o' 'abit." D. E. A. C.

A Tribute to Oil

An oily tongue maketh smooth speech, and the following from a Texas broker does not require sand papering:

Mineral oil is liquid sunshine. The sun itself may be an incandescent globule of oil. Forests of ancient ages locked in the earth are solidified sunshine. Oozing from them through eons of time is crude petroleum gathered into vast subterranean lakes and rivers. Man has tapped those reservoirs, refined their products and restored the liquid sunshine again to illuminate, lubricate, glorify and bless the world.

Oil is 85 per cent carbon; so is the sun. It is 15 per cent hydrogen; so is the sun. The body of every animate being on the earth, above the earth and in the sea contains and is dependent upon this liquid sunshine or oil. All vegetation contains and is dependent upon oil as a life element. Cut off all oil and the earth would be a cemetery in ninety days.

Every bit of machinery, every wheel, shaft, spindle and cog in the industrial world depends upon oil to move. Every engine, ship and aeroplane would stop but for oil. Not a

banking house, factory, store, office, shop could open in all the marts of trade if there was no oil. Not a church, schoolhouse, theater, movie or game could bless, educate, give pleasure, delight and recreation without oil. No hospital or sickroom could offer hope of health without oil.

The oil springs of Is, on the banks of the Euphrates, that furnished oil for the building and glorifying of Ninevah and Babylon, are still running. There is an oil spring in the Ionian Islands that has flowed for over two thousand years. The oil wells of Rangoon have supplied over 400,000 bbl. of oil annually for more than ten generations. There are oil wells in Burkesville, Ky., that have flowed since 1826. Other wells in Oil Creek, Pa., which have flowed since 1858. You should worry.

Put your ear to the ground. Do you hear the march of industry? It is oilward. In the next twenty-five years the demand for oil and oil products will be more than double that of today. There is no substitute for oil. It can't be done. Oil is in a class by itself. If you wish to be in the march of progress, be abreast of your times, be one in the front ranks of success, and win wealth, power and honor, become an active investor and promoter in the oil industry. There are a few choice seats with the winners left. Cut out doubt, unbelief and distrust; go in now.

Get your oil and be in at the feast.

Rocks and Literary Indigestion

A San Francisco contemporary seems perturbed because a reporter referred to a mine as being in the ideal geological formation of "anthracite and porphyry," and takes pains to suggest that rock conditions at Tonopah indicated that perhaps "andesite" was meant. Had the reporter (or the compositor) taken the trouble to consult the *Mining & Scientific Press* of June, 1908, p. 23, he could have found a plausible pretext for the error in an article by C. W. Purington on Treasure Mountain, in the Eureka mining district of San Juan County, Col. In speaking of the outcrop of the big vein on the Cinnamon fault, the author says that it resembles a wide series of alternate bands of quartz and anthracite coal. A careful reader might notice that the coal effect is due to weathered rhodonite. Still more interesting is the allusion to the crosscut in the Gold Prince mine, where a solid wall of rhodonite 30 ft. wide resembled a wall of pink ice cream. In these days of the cost of high living becoming so burdensome, why should reporters neglect opportunities? Horse-flesh ore might do for folk who are not too squeamish, while kidney ore suggests stunts with a chafing dish. Peacock ore would serve for a Sunday or company dinner. Honey stone, ground to proper size, should prove a boon to dishonest grocers. And so on, *ad nauseam*. About twenty-five years ago Prof. J. F. Kemp was on a geological jaunt in the Franklin Furnace district of New Jersey with a group of students. Among other specimens gathered were some interesting pieces of banded willemite, calcite and rhodochrosite that looked something like slabs of chocolate-vanilla-strawberry at a Sunday-school picnic. The sight of them actually spurred the appetite (not the greenish hexagonal crystals) and an approaching baker's wagon was hailed with glee. By a phenomenal coincidence the food vendor's only stock consisted of some cake that was gotten up as a camouflage for ice cream, being in streaks of brown and white and vivid pink. Thinking that the professor also might be hungry, several of the boys proffered chunks of the treasure trove. Taking a slice in one hand, "Jimmie" compared it with a rock that he had been looking over. With a merry twinkle in his eyes the pious geologist remarked "I asked for stones, and ye gave me rhodochrosite cake."

PERSONALS

CHARLES L. PARSONS, mineral technologist of the U. S. Bureau of Mines, has returned from Europe where he has been making an investigation of a number of chemical processes. Dr. Parsons was also in attendance at the London and Brussels meeting of the Interallied Chemists.

F. F. Sharpless is in Tennessee on professional business.

A. W. Grier-son has been appointed manager for the Kirkland Combined Mines, Ltd., at Kirkland Lake, Ontario.

Edwin J. Collins has returned to Duluth from Cobalt, Ontario, where he has been on a ten days business trip.

R. L. Chase of Denver, Col., has returned from examining properties at Lake City.

L. G. Harris, general manager of the North Davidson Mining Co. of Porcupine, has gone to England with the object of raising funds for development.

C. L. Colburn was in several districts of Colorado recently, including Breckenridge, Leadville, Cripple Creek and Denver.

F. A. Thomson, dean of the school of mines of the University of Idaho, has concluded a tour of all the mining districts in southern Idaho.

R. R. Rose has resumed his duties as assistant secretary of the Canadian Mining Institute after an absence of nearly five years on military service.

W. F. Gowans is now in charge of the underground work at the Miller Independence Mines at Boston Creek, Ontario.

M. L. Regua contributed a comprehensive article to the Washington Star, Aug. 24 on the subject: "Striking at the Root of the Profiteering Evil."

Ellsworth Y. Dougherty has been appointed mining geologist in Southern Oregon for the Oregon Bureau of Mines and Geology.

J. E. Perrault has been appointed Minister of Colonization and Mines for Quebec Province, in place of Honore Mercier, who becomes Minister of Lands and Forests.

H. M. Richmond, professor of geology at Williamsville, Liberty, Mo., has been making an examination of the Wyoming Mining Company's mines south of Lander, Wyo.

F. G. Cottrell, the assistant director of the Bureau of Mines, has returned from an extended stay in Europe, where he made an investigation into the general mineral situation existing there.

Olof Zetterlund, general manager of El Arco Mines Co., Sinaloa, Mexico, was in New York recently, and has gone to Denver, Col., to purchase mining equipment necessary for the operation of his properties.

Rudolph Gahl, consulting metallurgist, of Denver, is conducting experiments on the chloride volatilization process at the Utah station of the Bureau of Mines, on a copper-silver ore from Peru.

V. K. Ting, director of the Geological Survey of China, visited Washington recently. Mr. Ting intends to visit some of the Western stations of the Bureau of Mines before sailing from San Francisco on Sept. 26.

T. S. Carnahan, who has been appointed safety engineer for the Utah Copper Co. recently, made a trip to Arizona and New Mexico for the purpose of investigating steam shovel operations.

Seth S. Langley will change his headquarters from Los Angeles, Cal., to San Antonio, Texas on Sept. 15. Mr. Langley expects to be actively engaged in Western Texas, and the Gulf Coast district as a petroleum technologist.



CHARLES L. PARSONS

Irving A. Palmer and **Samuel Z. Krum**, of the metallurgical department of the Colorado School of Mines, recently made a tour of inspection of the ore dressing plants in the San Juan district.

H. C. Parmelee, **Howard R. Ward**, **H. H. Stock**, **Charles W. Merrill**, **S. A. Taylor**, **Frederick G. Clapp**, **Ralph Arnold** and **Kenneth Seaver** constitute the advisory committee of the International Exposition of Mining Industries.

John Seward of 152 Halsted St., East Orange, N. J., having been discharged from the Army, has been appointed manager of the El Salvador Silver Mines Co., Inc., with properties in El Salvador, including the Butters Divisadero mine.

James Freeburn, general manager of the Chicago Mining Co., and **George Oswell**, general manager of the Ebner Mining Co., have returned after a northern trip in the course of which they inspected properties in which they are interested.

SOCIETIES

American Mining Congress will hold its Twenty-second Annual Convention in St. Louis, Mo., Nov. 17 to 21.

Colorado Scientific Society has issued the year book dated Jan. 1, 1919, containing the constitution, officers for the present year and a list of members.

Canadian Mining Institute, as a result of the recent balloting of the members, will be known as the Canadian Mining and Metallurgical Institute, or the Canadian Institute of Mining and Metallurgy, as the council shall determine. The total number of votes polled was 435, of which 343 were affirmative. On the proposal to create a new class of "Professional Members" there were 248 affirmative and 15 negative votes.

Colorado Metal Mining Association and the Colorado Chapter of the **American Mining Congress** jointly held a banquet in honor of Van H. Manning on Aug. 25 at the Denver Club. George M. Taylor, president of the Portland Gold Mining Co. was toastmaster. Dr. Manning spoke on "Coöperative Effort in Development of Our Mineral Resources." Other speakers were Bulkeley Wells, D. W. Brunton, and R. B. Moore.

Chemical, Metallurgical, and Mining Society of South Africa has elected the following officers and council for the ensuing year: President, James Gray; vice-presidents, J. Chilton, G. A. Watermeyer, and A. Whitby; treasurer, J. R. Thurlow; members of council are H. R. Adam, R. A. Cooper, C. J. Gray, C. H. Greathead, H. C. Hilton, J. H. Johnson, A. King, J. J. R. Smythe, F. W. Watson, F. Wartenweiler, E. M. Weston and H. A. White.

The **Institute of Metals**, London, England, will hold a meeting on Sept. 24 and 25 in Sheffield. The program will include visits to industrial plants, inspection of the University of Sheffield, and the presentation of a number of papers, followed by discussions. Among the papers are the following: "The Ternary Alloys of Tin-Antimony-Arsenic," by J. E. Stead; "Graphite and Oxide Inclusions in Nickel Silver," by F. C. Thompson; and the "Solidification of Metals From the Liquid State," by C. H. Desch.

Winnipeg Mining Association. On Aug. 21 a meeting of mining men was held in Winnipeg, Man., and an organization effected. The membership includes mine and claim owners, shareholders of existing companies, brokers, and financiers. The objects of the association are to encourage legitimate mining enterprises, to secure reliable information, to obtain government aid in the building of roads and other public improvements, and to establish rules governing the sale of mining shares and claims. The following officers were elected: J. Murray Baird, president; John Beckman, vice-president; J. Mur-

ray Baird, John Connor, and W. Tobias, directors. The association proposes to establish a bureau of information where the public can obtain accurate data regarding mining developments.

INDUSTRIAL NEWS

The Michigan Smelting & Refining Co., of Detroit, has opened a branch office at Pittsburgh, 945 Oliver Building.

N. S. Thulin has been appointed special railroad representative on the staff of S. C. Sprague, manager of Western railroad sales for the Chicago Pneumatic Tool Co.

S. F. Bowser & Co., Fort Wayne, Ind., has issued a circular which describes a storage system for lubricating oil. The system permits the addition of more units when required.

B. F. Goodrich Rubber Co. announces the appointment of F. O. Slutz as manager of the railroad sales department, effective July 1, succeeding C. M. Woodruff, who resigned to accept a position with Akron Board of Education.

Collins & Webb, mining machinery merchants, of Los Angeles, announce the removal of their general offices and salesroom to 447-449 East 3d St., Los Angeles, Cal., where they will have much larger space and facilities.

Coast Equipment Co., Merchants' Exchange, San Francisco, Cal., has been appointed representative of the Atlas Car and Manufacturing Co., for California and Nevada. All inquiries from this territory should be addressed to them.

Green Engineering Co., East Chicago, Ind., announces the appointment of E. L. Sullivan to represent the company in the Pittsburgh district including western Pennsylvania, eastern Ohio and western West Virginia. Mr. Sullivan will maintain the present offices at 2545 Oliver Building, Pittsburgh.

Wood Equipment Co., Chicago, Ill., will change its name to Car Dumper & Equipment Co., better to represent the nature of its business, but no change will occur in the active organization. The principal products of the company are rotary dumpers for mine and railroad cars.

The Overstrom Manufacturing Co. announces that its Los Angeles factory and offices have been closed, the factory having been moved to Berkeley, Cal. This company therefore requests that all communications be sent to its main office, 1,215 First National Bank Building, San Francisco.

The Griscom-Russell Co., 90 West St., New York, has placed on the market the G-R Duplex strainer, designed for installation in the suction or discharge lines of lubricating or fuel-oil systems for the removal of solid foreign material in suspension. This strainer is also suitable for straining

the water supply from such sources as rivers and lakes. This apparatus is described in Bulletin 1,150 published by the manufacturer.

"Industrial Transportation" is the title of a pamphlet issued by the Bicycle Manufacturers' Association, Hartford, Conn., which claims the bicycle is the lowest cost means of transportation and is the solution of the problem of carrying workmen to and from their places of employment. Letters from employers are included, attesting to the adaptability of the bicycle for this purpose. Joseph Goodman is secretary of the association.

TRADE CATALOGS

McCool Pulverizer The McCool Co., Cleveland, Ohio; Bulletin 49; 7 x 10; 16 pp.; illustrated. Describes a pulverizer for laboratory or assay work. A capacity of reducing one pound of material to 100 mesh in 30 seconds is claimed for the 9½ K size.

Surveyors' and Engineers' Instruments The A. Lietz Co., 61 Post St., San Francisco, Cal. Catalog; 61 x 9½; 612 pp.; illustrated. Contains a list of the instruments manufactured by the company and a large number of engineering books and publications. The company also carries a large stock of other manufacturers' goods.

Excavating Machinery. The Marion Steam Shovel Co., Marion, Ohio. Catalog 188; 5½ x 8; 64 pp.; illustrated. Describes the excavating machinery manufactured by the company, which includes steam shovels, dredges, and kindred equipment. Tables of specifications and working diagrams are included.

Automotive Electrical and General Supplies and Garage Equipment. Hendrie & Bothoff Manufacturing & Supply Co., Denver, Col. Catalog No. 50; 6½ x 10; 488 pp.; illustrated. This comprehensive volume should prove valuable for reference to mining and metallurgical men. It describes a large number of automotive, electrical, and general supplies and garage equipment, with directions for ordering. Eleven pages are devoted to a cross index.

Marine Equipment. Llewellyn Iron Works, Los Angeles, Cal.; 7¼ x 11; 56 pp.; illustrated. Describes the manufacture of parts of marine engines, boilers, propellers, marine railways, cargo winches and many other similar products in the two plants at Los Angeles and Torrance, Cal. It is stated that practically everything entering into the construction of Llewellyn products is manufactured by the company. Open hearth steel furnaces, rolling mills and a grey iron foundry are in operation. The last three pages are devoted to a list of various kinds of machinery manufactured by the company, which includes a number of other fields besides the marine.

NEW PATENTS

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

Alloy of Copper, Nickel and Zinc. Foster Milliken. (1,310,363; July 15, 1919.)

Alloys—Method of Making Alloys of Aluminum, Magnesium and Uranium. Hermann G. C. Trofehn, assignor to Light Metals Co. (1,310,309 and 1,310,310; July 15, 1919.)

Aluminum Materials, Process of Purifying. Otis Hutchins, assignor to the Carborundum Co. (1,310,342; July 15, 1919.)

Drilling—Percussive Engine. Wilhelm Mauss. (1,309,649; July 15, 1919.)

Electric Furnace. Otis Hutchins, assignor to the Carborundum Co. (1,310,341; July 15, 1919.)

Electrode Rack. John Spense Finlay, assignor to Anaconda Copper Mining Co. (1,311,958; Aug. 5, 1919.)

Flotation—Concentration of Ores. Harry Vernon Seale and Wilson Shell-shear, assignors by mesne assignments, to Minerals Separation North American Corporation. (1,311,919, and 1,311,920; Aug. 5, 1919.)

Flotation—Ore-Concentrating Process and Apparatus. Edward Hopkins Emerson, assignor to Minerals Separation North American Corporation. (1,311,882; Aug. 5, 1919.)

Flotation—Sulphidation and Flotation of Ores. Raymond F. Bacon, assignor to Metals Recovery Co. (1,312,668; Aug. 12, 1919.)

Flotation Apparatus. Joseph P. Ruth, Jr. (1,309,219; July 8, 1919.)

Flotation Ore-Separating Apparatus. Alfred L. Blomfield, assignor to the Dorr Co. (1,310,051; July 15, 1919.)

Fuel Storage—Yielding Supporting and Vertically-Guiding Apparatus. William O. Renkin, assignor to Quigley Furnace Specialties Co. (1,308,370; July 1, 1919.)

Jig. James B. Barbee and Otto J. Cross. (1,312,429; Aug. 5, 1919.)

Nitrogen—Process of Recovering Combined Nitrogen from Blast Furnaces. Edward W. Haslup. (1,310,480; July 22, 1919.)

Open-Hearth Furnace. Albert Miller. (1,309,149; July 8, 1919.)

Ore-Cleaning and Concentrating Apparatus. Lewis H. Falley. (1,312,028; Aug. 5, 1919.)

Ore Separator. Owen Hawkins. (1,312,324; Aug. 5, 1919.)

Potash—Process of Producing Potassium Hydrate from Green Sand. Benjamin A. Peacock. (1,309,744; July 15, 1919.)

Potash—Treatment of Ores for Production of Metal and of Potassium Compounds. Charles Catlett, assignor to The British Potash Co., Ltd. (1,311,043; July 22, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

SAN FRANCISCO, CAL.—Aug. 28

Recent Mine Accidents in California were as follows: One man killed on July 16 at Carson Hill, held in court scenes by skip jumping track, one killed by fall of rock on Aug. 4 at Plymouth Consolidated at Plymouth; one killed by falling on Aug. 11 at Pennsylvania Mines, Tuolumne.

Comstock Northern Mines at Virginia City, Nev., produced 2,152 tons, valued at \$67,438, for the first week ended Aug. 23. Of this Consolidated Virginia produced 1,113 tons valued at \$34,817 and Ophir 1,039 tons valued at \$32,621. Twenty-seven bars of bullion were shipped to the San Francisco mint.

A Mine Rescue Station will be established at Berkeley, Cal., in connection with the University of California, providing the board of regents will make provision therefor at its next meeting. Following a recent conference between Van H. Manning, director of the U. S. Bureau of Mines, with Dean F. H. Probert, of the department of mining of the University, it was said that the University had suitably selected as the location of the station. A Congressional appropriation of \$25,000 has been made for such a station in California. The station will be in charge of mine rescue work in the state and Government engineers will be in charge.

RENO, NEV.—Aug. 30.

The Nevada Consolidated Strike at Ely ended Aug. 30 by men returning to work. The company will improve working conditions and establish a company commissary. Speedy settlement of the strike at Tonopah and Divide, which has closed down all the mines at these places, seemed assured a week ago, both sides appearing confident. But, lately, the operators seem to be less favorably disposed, though speaking well of Joseph Lord, the Federal mediator.

At the urgent request of Governor Boyle, the Comstock miners, who had voted to strike to enforce their demands for a dollar a day wage increase, postponed going out until the governor's arrival. It is hoped in a settlement may be reached at a joint conference of the operators and miners with the governor.

NESPELEM, WASH.—Aug. 28

Silver Mining in the Nespelem District is displaying renewed activity. There are now six small producing companies in operation. Practically all are on a narrow mineralized belt running north and south two miles south of Nespelem. The district is hampered by high transportation costs, being 40 miles from railroad. This handicap has been largely met by the erection of an 80-ton flotation plant, owned by the Great Metals Mining & Milling Co. This plant first went into local dump ore averaging 10-20 oz. silver. The Great Metals company has just finished sinking its shaft to the 200 level and is ready to crosscut to get under a promising surface lead. The Double Head Mining Co., operated under bond and lease by E. S. Jenkins, of Seattle, has a crew of four men on development at Beggs and Trowsky, are shipping 25 tons daily from the Great Metals mill from the Apache property two miles away. The Panama property, operated by H. B. Dickinson, of Seattle, has about 100 tons of ore in the bins. A. J. O'Neil, Elmer, is operating a small crew is engaged. The Rebecca Mining Co., ten miles east of Nespelem, is diamond drilling its property.

BUTTE, MONT.—Aug. 28

The Suit Against Butte & Superior brought by the Clark Montana Realty Co. has been settled by compromise. By the stipulation of the agreement the Elm Orlu, which is owned by the Clark-Montana Realty Co., was awarded 186 ft. additional eastward on the Rainbow vein below 1,200 ft. and the Butte & Superior Copper Co., that portion above 1,200 ft. The Jersey Blue vein west of a new plane below 1,300 ft. is awarded to the Elm Orlu. Each side will pay its own costs. Butte & Superior closed last year with net current assets over all liabilities of \$4,200,000. There remains now only the agreement

upon damages which Butte & Superior must pay to the Mineral Separation Corporation, Ltd., for the infringement of the latter's oil flotation patents. An accounting is now in progress in an endeavor to determine the extent of Butte & Superior's liability and the amount of damages it should pay. Return of these findings is scheduled for Oct. 29.

SALT LAKE CITY, UTAH—Aug. 30

Dr. Van H. Manning, director of the U. S. Bureau of Mines, addressed the Utah Chapter of the American Mining Congress at a luncheon given in his honor on Aug. 21 at the Commercial Club in Salt Lake City. Dr. Manning urged the need of greater co-operation between the Bureau and mining men, looking to the day when the Bureau, at present receiving annual appropriation of about \$2,500,000, compared with the \$30,000,000 given the Department of Agriculture, will be as important and well fostered as the latter. He also outlined the work of the Bureau on toxin gases, airplane bombs and helium gas during the war, and pointed out the need of increased production of petroleum in the United States.

A Solution of the Smoke Problem, recurring in Salt Lake City during the winter months, is being sought by the U. S. Bureau of Mines in co-operation with city officials, and by means of funds furnished in part by the government, and in part by the city. Dr. Van H. Manning, director of the Bureau, is in the city in company with Osborn Monet, consulting fuel engineer. Consultations with the city commission have been had. Thomas and local of the local bureau also attending. S. Q. Canon, city engineer, will also take part in the investigation. It is planned first to look into the locomotive problem and high-pressure plants operating the year round to determine what percentage of the trouble is directly traceable to these sources, before the smaller plants and local furnaces start up for the winter. It is the purpose of the investigators to determine upon a sane and reasonable program of procedure without taking rash or drastic action.

DENVER, COL.—Aug. 23

The State Mines-Development Association of Colorado has opened offices in the Kirtland Building. This will be the headquarters for the central organization, which will co-operate with the subsidiary organizations in ten of the mining camps of Colorado. The president of the central organization is Lee M. Brokaw, who was its promoter. The chairman is W. F. Kendrick. The Board of Engineers attached to this central organization are Forbes Ricard, Arthur J. Hoskin and E. S. Shuttleworth. These are all well-known engineers in Denver, and in co-operation with the mining engineers of the various subsidiary organizations will pass upon the advisability of each case presented to the attention of the organization.

HOUGHTON, MICH.—Aug. 28

Production of Copper from the mines of the Michigan district continues to depend entirely upon the labor situation in the camp. The output has not as yet reached a point where it may be a strong factor in increasing the copper output. Mines of the copper country are also suffering from labor shortage, and it is doubtful whether they have no control. The law fixing the minimum age at which a boy can go to work in the mines is so drawn that mine managers are in doubt as to whether a mining company may hire boys under 18 years of age, no matter what class of work they are required to perform. Under the law the boys can go underground if less than 18 years of age and the opinion has been expressed that a mining corporation runs the risk of violating the law if it employs boys under 18 in any capacity whatever. The problem, therefore, from the viewpoint of the community, is a serious one. Practically the only industry in the copper country is mining and there are few other jobs in other lines at which these boys may work. There is no complaint about the state law. It would, however, in

some cases be easier for the companies to get men and to keep them if it were possible for their sons to secure work in the same district.

AUSTIN, TEX.—Aug. 28

All Oil Companies must at once file reports with the Texas Railroad Commission giving full particulars regarding the organization, holdings, production, etc. Failure to comply with this law involves a penalty of \$500 fine.

New Oil Refineries will be built at Galveston and Houston. Carson Petroleum Co. will build storage and terminal facilities at Galveston for supplying Missouri, Kansas and Texas R.R. Contract is for 3,000,000 bbl. yearly for five years. The railroad company will finance construction of terminals and conversion of locomotives to oil burners of the Mexican Petroleum Co. and the Pan American Petroleum Co. It is estimated the saving to the railroad by this change will be \$3,000 daily. An application has been made to the city of Galveston for Galveston for supplying Missouri, Kansas & where it is desired to build an oil refinery of 1,000 bbl. daily capacity. At Houston is the Louisiana Petroleum Refining Co. has purchased 37 acres on the north side of the ship channel, and will build an oil refinery at once of a daily capacity of 1,000 bbl. The city of Galveston has also secured land near Houston with a frontage of 600 ft. on ship channel, and will build an oil refinery, the first unit to have 1,000 bbl. daily capacity. R. A. Fouts, of Chicago, will be general manager, and C. W. Shearer, Houston, will be in charge of construction.

DULUTH, MINN.—Aug. 28

The Wash Ore Area of the western Mesabi Range continues to be the main feature of the development of this range. It is reported that negotiations have now been completed for the leasing of what is known as the Trumbull prospect by the Great Northern Ore interests to the Cleveland Cliffs company. A feature of wash ores which largely offsets their additional cost is their popularity with furnace men, and this feature probably accounts more than any other for the recent development of silicious orebodies. Finished wash ores compare very favorably chemically with the straight shipping ores from the other districts and the removal of a large percentage of fines in the process of washing transforms them into an excellent furnace charge.

BIRMINGHAM, ALA.—Aug. 26

A Strike at the Mines of the Sloss-Sheffield Steel & Iron Co. took place during the third week of August but was of short duration, being settled by the company granting the men's demand for a ten-hour day with eleven-hour pay. This is the plan now in vogue at the Tennessee Coal, Iron & Ry. Co. and ore mines are followed by the Republic Iron & Steel Co. at their mines on Red Mountain, the Woodward company being the only one in the south end of Red Mountain now operating on a straight ten-hour day. Members of a Roumanian commission were in Birmingham during the third week of August for the purpose of placing the Birmingham Steel Corporation relative to placing an order for a large tonnage of fabricated steel for bridge building. This order is said to be for a large quantity of steel in connection with the company placing a bridge over a branch of the Danube River which was destroyed during the war.

NEW YORK—Aug. 26

The Directors of the Cerro de Pasco Copper Corporation at a meeting held Aug. 13 definitely authorized the construction of a new smelting plant at Oroya, Peru, the construction point of the Peruvian Republic and Peru and the Cerro de Pasco Railway. The plant will consist of two blast furnaces and two reverberatories with necessary adjuncts. The estimated capacity will be about 2,800 tons of raw ore per day. It is hoped that the plant will be in operation early in 1922.

TORONTO, ONTARIO—Aug. 30

Much Survey and Exploration Work is being carried on this season in that part of Northern Ontario lying between the Transcontinental Railway and James Bay, which is expected to result in securing valuable information concerning the mineral and other resources of that region. Among the different parties in the field are a survey party of the Geological Survey of Ontario Ry., completing survey for extension of the line and estimating the possible water power development; a party from the Ontario Bureau of Mines mapping the geology of the area; and a party sent out by the Canadian Geological Survey to investigate coal, clay and oil indications. A general description of the area will be given by James Stewart.

At Cobalt, a committee of business men has been attempting to bring about a settlement of the miner's strike, but without result. The mine managers have issued a statement defining their position. They say that "the present labor dispute has narrowed down to a positive difference of opinion as to whether or not the local branches of the Western Federation of Miners, now known as the International Union of Mine, Mill and Smelter Workers, should be recognized. On one side the union officials and the Minister of Labor insist that it must be recognized, and on the other side the mine managers are just as positive in their determination that the union will not be recognized. The mines which have now been shut down since July 23 are gradually filling with water.

The Ontario Government has interfered to put a stop to the expensive advertising of stock in oil companies of doubtful standing and prosecutions have been instituted against four promoters dealing in shares of such companies as follows: Glen Craig Tobias, Canada Petroleum & Refining Corporation, Ltd.; Thomas F. Fleming, Texas Producing & Refining Co.; O. J. E. Yersley, Texas Globe Oil Co.; and A. G. Rogers Dollar Oil Wells. They are being prosecuted under the Ontario Companies Act, which provides that a company before offering shares to the public shall file a prospectus giving full particulars as to the original incorporators, and directors, number of shares subscribed for, amount paid for

property, commissions, preliminary expenses and other data, indicating the character and financial standing of the company. They were arraigned at the Toronto Police Court and remanded for one week, being released on bail.

VICTORIA, B. C.—Aug. 29

The Canada Copper Corporation has settled its dispute with its employees and operations will be resumed at once. The delay caused by the four-months' strike will prevent starting the concentrator before next spring.

Tests of the Fleet Electrical Smelting Furnace in handling British Columbia magnetite ores are taking place. The Provincial Government has supplied a quantity of ore from Texada Island for this purpose. One test made recently was witnessed by the Provincial mineralogist and other officials. While it was not as successful as might have been desired, others, it is understood, are to be arranged.

Vancouver Mining Development Syndicate has been organized with a capitalization of \$500,000, of which \$100,000 has been subscribed. The object is to bring mining prospects of British Columbia to the attention of the investing public. The syndicate plans to aid a prospector locating promising properties. Nicol Thompson, A. M. Whiteside, J. H. Greer, A. H. Wallbridge and A. Erskine Smith, all of Vancouver, B. C., are members of the board of the new organization.

The Cariboo District of British Columbia is attracting the attention of men with experience in dredging operations in the Yukon. James Moore, one of the largest operators in the Yukon, is placing a dredge on Antler Creek, in the Cariboo. His associates have secured a promising placer tract on the Swift and Little Swift rivers, and their preliminary investigations have arranged to install a large dipper dredge. The Dominion Government, according to William Sloan, provincial minister of mines, is making a geological and topographical survey covering 16 sq. mi. of this section, the work centering at Harper's Camp. The International Dredging Co. has a machine equipped for a dredge on the Yukon. The work of North and South forks of Horsey River a drag-line scraper is being put in

by Victoria mining interests, whose experiment is being watched with interest.

LONDON, ENGLAND—Aug. 25

Chemical & Metallurgical Corporation held its statutory meeting in London on July 31, at which the report of the directors was presented, where it was pointed out that the contract with Frank Elmore had been completed, company acquiring the world rights of Elmore's patented invention for separating the lead and zinc-lead ores by an economical and efficient chemical process. The price paid was £25,000 in cash and £1,000,000 in ordinary shares. The chairman, Herbert Guedella, stated that the company is arranging to establish a plant in Great Britain for treating middlings and concentrates; that a supply of middlings from Australia has been contracted for; and that the company is negotiating further for a contract supply of raw material.

As regards the foreign situation of the patents it was stated that the Burma Corporation has an option to call for a license in Burma and India on certain terms. This option extends to May, 1920. The option with regard to the United States and Canada has been exercised, and calls for formation of a company with a capital of £400,000, of which the corporation will receive £200,000 in fully paid shares. The option with regard to Mexico and Central America has also been exercised, and the corporation will receive £115,000 in fully paid shares in a company with a nominal capital of £200,000. Another group has exercised the option with regard to Russia, Norway and Sweden, and this case the company will receive £150,000 in fully paid shares in a company with a capital of £300,000. The company is completing an agreement for the establishment of a trial plant to demonstrate the process in Australia in connection with the chief mining companies there, and an agreement is almost completed with most important mining interests in France for the acquisition of the patents for France, North Africa, Spain, Portugal, etc. The option with regard to Southern Africa has not yet been exercised.

When the corporation was formed, Elmore also transferred to it the benefit of an option on the rights to the Francois cementation process for shaft sinking through waterlogged strata.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ALASKA

AT WILLOW CREEK about six good properties operating with 100 men.

KENNECOTT (Kennecott)—Employing all miners available. Supply insufficient.

ALASKA GASTINEAU (Thane)—Laying off miners, who are being hired by Alaska Juneau.

JUALIN ALASKA (Jualin)—All bids rejected on large tunnel contract. Companies doing work itself. Miners hard to obtain.

ARIZONA

Cochise County

ARIZONA UNITED (Johnson)—Kirby Thomas, of New York, inspecting this property.

COPPER CHIEF (Johnson)—Leased by Mines and Development Corporation of Arizona, which will build concentrator. Martin Fishback, manager.

EMPIRE (Johnson)—Being examined by D. G. Kidder, of Los Angeles, for California company.

O. K. SHAFT (Johnson)—Compelled to stop work on account of water. New pumps being installed.

Pinal County

MAGMA COPPER CO. (Superior)—Drill hole sunk 400 ft. below 1,800 level, and core indicates that last 47 ft. is in ore averaging 5 per cent copper, and 4 oz. silver per ton. Bottom of hole still in ore.

SILVER KING OF ARIZONA (Superior)—New shaft down 245 ft. On Aug. 27 sinking was speeded up by addition of third shift. Shaft has been equipped with new hoist and cable, and machinery for sinking to 1,000-ft. depth. New compressor installed.

Sinking under contract discontinued, and work being done on company account under direction of John Fowle, general manager. Mill now running three shifts. At least average about 20 oz. silver per ton. Extraction by flotation reported to be well above 95 per cent.

CALIFORNIA

Nevada County

GOLDEN CENTER (Grass Valley)—Discovered 17 two-foot vein of good ore announced by E. A. Abadie, superintendent. Ledge encountered in crosscut driven 500 ft. west of shaft and opens up large territory to development.

UNION HILL (Grass Valley)—Hoisting plant being dismantled to be moved to Idaho Maryland ground.

CENTRAL CONSOLIDATED (Nevada City)—Property on Greenhorn Creek three miles south of town being reopened. Complete plant will be needed. Paul W. Smith, formerly superintendent, again in charge.

COLORADO

Boulder County

BOULDER COUNTY TUNNEL (Cardinal)—R. D. George, state geologist, and Fred Fair, ex-county surveyor, examining tunnel and mine for G. J. Clark, of Boulder, and Fred A. Spies, of Chicago, who have recently taken property over.

Eagle County

BAILEY COPPER (McCoy)—William H. Rathbun, of Minneapolis, Minn., and associates, recently purchased equipment to develop Bailey Copper mine at Copper Spur near McCoy. Ore copper carbonate in granular sandstone. Incorporated under name of Electro Copper Co. Planned to build leaching and electrolytic plant.

Park County

POWDER RIVER GOLD (Fairplay)—Excavations begun for largest gold dredge in Colorado. Company recently purchased large acreage on Middle Fork of South Platte River. Dredge to be entirely of steel and will have 9-cu.ft. buckets and capacity of over 3,000 cu.yd. a day. W. F. Hammon, of San Francisco, president. Operation will begin half mile below Fairplay.

Pitkin County

HOPE M. & M. (Aspen)—Tunnel advanced 76 ft. last month. Heavy water encountered, which will require upper workings. Mill being remodeled and power line extended to plant. Operation expected to start about middle of September.

San Juan County

SUNNYSIDE M. & M. (Eureka)—Mill again in operation. Daily capacity 500 tons. Property forced to suspend several months ago because of \$250,000 fire which destroyed building and hoist. New mill also big warehouse, commissary department, steam and crusher plant.

SOUTHERN

EL PASO EXTENSION (Cripple Creek)—Plans to erect concentrator at Clara D shaft of old Lexington Gold Mining Co. Numerous blocks of ground leased and leases developing milling ore. Some leases reworking dumps.

PORTLAND (Victor)—Recently struck rich smelting ore when drifting on Lee No. 1 vein of Portland No. 2 shaft. Body five feet wide containing coarse iron 1 to 3 in. wide of almost solidylvanite. Discovery at 2,131-ft. depth below collar of Portland No. 2 shaft at Roosevelt tunnel level.

IDAHO

Boundary County

IDAHO CONTINENTAL (Porthill)—This property, 26 miles from Porthill, Boundary County, adjoining International boundary line, is concentrating 250 tons of ore a day, which in connection with its stock pile has afforded daily shipments of 80 tons of concentrates carrying 60 per cent lead and 22 oz. silver since July 22. Twelve motor trucks used in transferring product from mine to Porthill, a distance of 26 miles. The mine shows a very substantial ore reserve, has a large unproven territory of exceptional promise and in fact is one of the largest surface distributions of clean lead-silver mineral in Idaho outside of the Coeur d'Alene district.

LOUISIANA

ALUMINUM ORE CO. (Pittsburgh, Pa.)—Has purchased land at Baton Rouge, La., for shipping terminals.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Reclamation plant at Lake Linden recovering more copper than at any time before. Dredge working well. Additional flotation plant ready on Sept. 1. Hardinge mills being relined with Belgian flint bricks, first cargo having arrived.

FRANKLIN (Demmon)—Sinking operations continuing. Shaft now down 3,000 ft. and in footwall of Pwabic amygdaloid, mineralized portion of which may be reached by crosscut to west. Alouez conglomerate approximately 420 ft. east. Ob-

hydraulic stripping. One shovel to load ore for balance of season.

Mesabi Range

SEVILLE (Buhl)—Shipping from stockpile. Underground property owned by A. B. Coates.

THORNE (Buhl)—Installation of compressor completed. Plans under way for electrification to provide for underground and stockpile haulage. Hanna Ore Mining Co., operators.

MONROE (Chisholm)—Oliver company dismantling old No. 2 shaft house. Fire recently destroyed power plant.

MAHONING (Hibbing)—Advantage taken of lull in shipments to continue stripping. Four shovel crews now adding to total of 11,000,000 cu.yd. of overburden already removed.

Vermilion Range

CONS. VERMILION & EXTENSION (Ely)—Property transferred to Phoenix Mining Co. C. Butler, of Butler Bros., president of new concern. Surface plant and development in good shape except that mine, which has had checkered career, requires unwatering.

MONTANA

Mineral County

TARBOX (Saltse)—Managerial board of three members of the directorate created, following disagreement between Wallace and Butte stockholders. Further development of ore suspended, as ample tonnage now in sight to warrant construction of mill. Assessments will probably be continued to finance proposed concentrator.

from old dumps and tailings, has closed down and camp practically deserted.

ROCHESTER SILVER MINES (Lower Rochester)—Under direction of Charles D. Kaeding, general manager, and C. A. Bennett, superintendent, about 1,000 ft. of development work being done each month on company's three mines, the Rochester Mines, Rochester Merger and Nenzel Crown Point. Good milling ore found on 1,000 level, where there was little showing before. Ore has been picked up beyond fault on 900 and 1,000 levels, new orebodies being in virgin ground. Transportation tunnel relaid with heavy steel rails and heavy electric motors installed. Improvements being made in Rochester mill expected to result in saving of from \$2,500 to \$3,000 per month and to increase capacity to 160 tons per day.

Washoe County

STANDARD METALS (Reno)—Flotation plant running steadily. Capacity estimated 75 tons per 24 hours. Erected under supervision of "Garve" Logan.

OKLAHOMA

Joplin-Miami District

ADMIRALTY ZINC (Douthat)—Installing sand jig and additional tables. W. B. Shackelford manager.

DUDLEY MILLING (Douthat)—Erecting tailings mill to treat tailings from Admiralty No. 2.

HOPE LEAD & ZINC (Hockerville)—Moving old Scott Eagle mill from Quapaw to Hockerville.

UNDERWRITERS LAND (Picher)—Erecting new concentrator at No. 4 shaft at St. Louis, Okla.



COUNTRY NEAR RENO, NEV., SHOWING PROPERTY OF STANDARD METALS CO., WHICH OPERATES PEAVINE MINE

jective of present sinking operations to develop these two formations. There will be no 35th level. No plans made to resume production, but this may be done in short time if desired.

Geologic Range

DOCKWORKERS' STRIKE at Ashland, Wis., settled Aug. 23 and mines on range resumed shipping promptly. At most of mines steam shovels also working and ore being rushed to docks as fast as boats can take it away.

AT IRONWOOD all mines and business houses in or near city closed Aug. 28 in honor of soldiers and sailors homecoming.

OLIVER IRON (Ironwood)—Has started surveys for transmission line from Pabst power house to Puritan mine. Construction will be rushed this fall.

PURITAN (Puritan)—Head wireman for power company electrocuted at mine sub-station while trying to rescue fellow workman caught on wet pole. Latter saved by the act.

MINNESOTA

Cuyuna Range

IDA MAE (Crosby)—Will increase boiler capacity. Complete electrification contemplated.

PORTSMOUTH (Crosby)—New open pit property of Coates & Tweed has completed uncovering large manganese orebody and in position to ship when market improves.

SAGANORE (Ironton)—Winston Deare, contractors to John A. Savage Co., complete large stripping contract in which two drag line shovels were successfully used. Understood operators will continue

NEVADA

Clark County

YELLOW PINE (Goodsprings)—New mill completed, except calciner, and working steadily. Only one shift employed, but another will be added.

Humboldt County

IN SUNSHINE DISTRICT, W. S. O'Brien has stripped vein for 85 ft. on promising discovery. Values largely in silver. Johnson-Baldwin property also shows high-grade in several openings. Ratliff lease on Gem Five has made several shipments. Lease equipped with good hoist, air compressor and jackhammer drills. Joe Shell has opened up good lead-silver ore on his property.

Lyon County

NEVADA-DOUGLAS (Ludwig)—Report just issued estimates company has 190,000 tons of sulphide ore in sight running between 3.65 and 3.5 per cent copper.

Mineral County

PILOT MOUNTAINS (Mina)—Bugg and Drew have opened up cinnabar ore, carrying gold and silver also, in 200 level of their mine 12 miles east of Mina. Three flasks of quicksilver being produced daily from ore on upper levels.

Nye County

WHITE CAPS (Manhattan)—Cleanup of White Caps mill for first half of August estimated at \$15,750, which is richest cleanup yet made by property.

Pershing County

SEVEN TROUGHS COALITION (Love-lock)—Mill, which has been running on ore

RIGHT GOOD (Quapaw)—Moving old McCurdy mill from Hockerville to Quapaw. E. Dunlap superintendent.

TEXAS

Bell County

B. & W. OIL & REFINING (Belton)—First test well 20 miles south near Jarrell, showing oil in boiler, although no oil sand of commercial thickness passed through. Company locally organized, and holds leases on 18,000 acres of land in Bell and Williamson counties.

Brazoria County

WEST COLUMBIA FIELD PRODUCTION for third week in August 28,600 bbl. liquid daily, of which 18,000 bbl. was oil. Producing companies: Humble Oil & Refining Co., 13,800 bbl.; Gulf Production Co., 5,800; Crown Oil & Refining Co., 5,400; Texas Co., 4,000; Hanmcker Co., 35. Twenty-three wells producing in field, largest being Humble company's No. 5 Japhet, making 4,500 bbl. oil daily. Several wells making 3,000 bbl. liquid, which settles out only 10% oil.

Hardin County

HUMBLE OIL & REFINING (Batson)—No. 1 Garza well down 300 ft.; good progress being made.

SAN BERNARD OIL (Saratoga)—No. 5 Hooks well making fair production by pumping from 1120 ft.

Harris County

DRILLING IN SHELDON FIELD being done by Crown Oil Co., Gulf Coast Oil Corporation, Crosby Petroleum Co., and Prendergast and associates.

Wichita County

PENN OIL & GAS (Burk Burnett) — Michna well No. 1, on block 819, one mile west of producing area, has just struck top of sand at 1,530 ft. Good showing made, and casing being set. Most westerly discovery made in field.

UTAH**Juab County**

TINTIC DRAIN TUNNEL (Eureka) — Present length of tunnel 3400-3500 ft. and not 400-500 ft., as reported in issue of Aug. 23.

Salt Lake County

EMMA SILVER (Alta) — Directorate of newly formed company; C. S. Burton, of Columbia Trust Co., president; John Dern, National Copper Bank, vice president; J. E. Gallagher, J. M. Hayes, A. L. Hoppaugh, F. B. Cook, George Deem, general manager.

SOUTH HECLA (Alta) — Management reports operations but little interfered with by recent cave-in.

UTAH CONSOLIDATED (Bingham Canyon) — About twenty dwellings housing employes, majority belonging to company, destroyed by fire during night of Aug. 26.

UTAH METAL & TUNNEL (Bingham) — Particulars concerning re-financing contained in recent report from head office in Boston; 50,000 shares of stock purchased by syndicate at \$4 a share. This stock part of 100,000 shares held by company for conversion of \$750,000 7 per cent bonds. Company converted \$375,000 of its bonds into stock, exchanged \$225,000 for a like amount of 6 per cent bonds, which matured April 1, and still has about \$150,000 bonds in

LOON LAKE COPPER (Loon Lake) — First two cars of concentrates shipped from flotation plant. Mill receiving about 75 tons daily on two shifts and expects to add third shift when labor supply will permit.

WYOMING**Albany County**

NATIVE COPPER (Tie Siding) — Company operating mines at Tie Siding, 20 miles south of Laramie on Union Pacific R.R., has discovered small amounts of platinum in copper ore.

WISCONSIN**Zinc-Lead District**

ROSS (Linden) — David MacKay and Milwaukee interests have taken over and will operate Ross mine at Linden.

VINBGAR HILL ZINC (Platteville) — Continued drilling on Coulthard land east of Field-Thompson gives assurance of another mine. Good borings found in extensive drilling on Duxton-Sherry-Pedely tracts, east of old drum at lead mine. New run located by drill 1,000 ft. south of North Unity mine. Drilling and shaft sinking in progress at Copeland, near Shullsburg, and drilling has begun on William Fields land at New Diggings.

WISCONSIN ZINC (Platteville) — Drilling on David Booty land adjoining Winskell on west, at New Diggings, gives promise of shaft development. Edge tract of 800 acres, at New Diggings, and Bushnell land just east of Platteville have been leased for drillings.

ZINC HILL (Platteville) — Milling started at Little Dick No. 2 at Cuba City.

Ontario

MILLER INDEPENDENCE (Boston Creek) — Contracts made with Northern Ontario Light & Power Co. for power to operate new mining and milling plant.

FOSTER (Cobalt) — Bought by Mining Corporation of Canada.

MIPSSING (Cobalt) — Financial statement as of Aug. 23 showed cash in bank, war bonds, ore in hand and in process and bullion ready for shipment to amount of \$3,863,386. Company has secured leases of important oil lands in Texas on which drilling has reached depth of 1,200 ft.

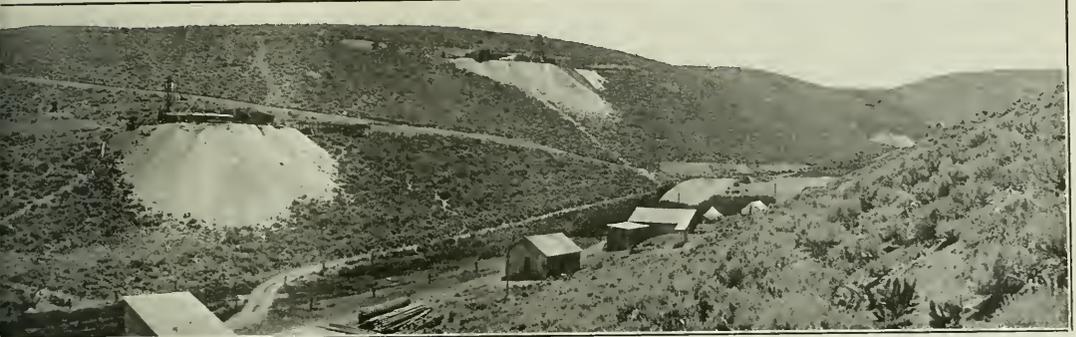
WELSH-McARTHUR-MILLER (Goudreau) — Six claims of this group in Algoma district purchased by Consolidated Mining & Smelting Co. of Canada, conditions including construction of plant to cost \$500,000. Contract for diamond drilling let to Smith & Travers, of Sudbury, and power will be secured from Michipicoten Power Co.

GRANBY-KIRKLAND (Kirkland Lake) — Has two claims about one mile northeast of Tough-Oakes, on which three promising veins varying from 3 to 5 ft. in width have been opened by trenching.

KIRKLAND - PORPHYRY (Kirkland Lake) — Has gone into voluntary liquidation and assigned to F. C. Clarkson, Toronto.

ANZAC (Porcupine) — Name of company changed to Wakenda.

DOME (Porcupine) — Unofficially stated that mill has latterly been treating ore of average grade of \$9 per ton at the rate of about 600 tons per day. Operating costs are understood to be high. Mill heads will



COMPANY RECENTLY INSTALLED 75-TON FLOTATION PLANT, WHICH IS NOW RUNNING STEADILY

treasury. Outstanding 750,000 shares. Floating debt of approximately \$30,000 will be paid off and company will have \$120,000 in treasury to renew mining operations.

Summit County

PARK CITY SHIPMENTS week ended Aug. 24; 2,825,600 lb. ore and concentrates. Shippers: Silver King Coalition, 1,180,620 lb.; Ontario, 640,000 lb.; Judge Mining & Smelting, 378,650 (zinc 100,000 lb.); Daly West, 221,500; Silver King Consolidated, 220,000; Iowa, 83,000.

NEW QUINCY (Park City) — Operations resumed at this property adjoining Daly West.

THREE KINGS (Park City) — P. J. Mackintosh, manager, to succeed W. R. Elliott, elected president of company.

WASHINGTON**Ferry County**

IRON CREEK (Keller) — Mill of 25-ton capacity being erected. L. R. Richards, formerly with Canada Copper Corporation, has been elected manager.

Spokane County

ROSELLE MINING (Spokane) — Allen Property Custodian ordered sale of 337,766 shares of common capital stock of Roselle Mining Co. and 99,996 shares of common capital stock of American Tungsten Consolidated Corporation. Sale to take place at office of Roselle Mining Co., 605 Columbia Bldg., Spokane, on Sept. 27. Prior to war these companies owned and operated about 659 acres of tungsten claims in Stevens County, Washington, originally developed by Germania Mining Co. Stock of Roselle company held by Charles S. Cullen, of Ocala, Fla., for Schillman & Bene, of Hamburg, Germany.

PAQUETTE (Shullsburg) — Platteville company assembling small milling equipment at this property, already opened up by shaft.

CANADA**British Columbia**

BIG MISSOURI GROUP in Salmon River district owned by Sir Donald Mann to be diamond drilled, necessary plant having arrived at property. Drilling contract awarded to Eosly Brothers, of Anyox, B. C.

BULLION (Barkerville) — Ward-Hopp litigation for possession of this placer property decided by Privy Council in favor of Ward. Property reputed to be largest hydraulic mining operation in this region, lease before courts for last five years with property idle in meantime.

SPOKANE GROUP (Bayonne District) — Owners building an arrastra to be run by water power. Two carloads of gold and silver-lead ore have been packed out in last two years.

LUCKY JIM ZINC (Bear Lake) — Foreclosure proceedings to be taken immediately against owners of Lucky Jim mine in Slocan district. Action based on second mortgage of \$35,000. Reorganization expected to follow.

CANADA COPPER (Grand Forks) — Nearly 150 men working at Copper Mountain building ore bins and preparing mine for producing as soon as railroad and mill are ready.

EVENING STAR (Slocan) — Cars, rails and other mine supplies forwarded through Nelson for operating Evening Star property on Dayton Creek near Slocan and Silver Nugget property near Silvertown. William Moore supervising work.

be reduced gradually as the milling capacity is increased.

DOME EXTENSION (Porcupine) — Three crosscuts at 600 level show good ore and fourth started.

PORCUPINE CROWN (Porcupine) — Entirely dewatered and working force largely increased. Operations will be conducted on large scale.

MARGOLD (Swastika) — New orebody encountered on 200 level.

AUSTRALIA**New South Wales**

DETAILS OF FIRE at Broken Hill which destroyed buildings of Broken Hill South mine on July 30 are as follows: No. 1 shaft, including top brace, crude ore bins, Gates breaker structure, crushed ore bins completely destroyed. Mill engine house gutted. Table section and grinder section saved. New power house and winding engine safe. General manager estimates not less than 12 months required to replace destroyed building and machinery. Underground quite free of fire. Main shaft not much damaged by fire and water. Plant destroyed covered by insurance, \$33,000.

NORTH BROKEN HILL (Broken Hill) — Mine still shut down.

Western Australia

GREAT FINGALL CONSOLIDATED'S report for 1918 states that mine closed in February, 1918, it having been found impossible to continue work without heavy loss. Since then every effort made to, realize to best advantage assets of company in Western Australia. Considerable sales effected, but at end of year large portion of plant remained unused. Efforts being made to realize on assets.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver		Sept.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
28	424	111	58 3/4	1	418 1/2	113 3/8	59
29	420	108 1/2	58	2	418 1/2	113 3/8	61
30	420	108 1/2	58	3	418	113 1/2	61

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

Daily Prices of Metals in New York

Aug.-Sept.	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	N. Y.	St. L.	N. Y.	St. L.	St. L.
28	21 3/4 @ 22	54 1/2 @ 54 3/4	5.80 @ 6.00	5.60 @ 5.65	7.45		
29	21 3/4 @ 22 1/2	54 1/2 @ 54 3/4	5.80 @ 6.00	5.60 @ 5.65	7.45		
30	21 3/4 @ 22 1/2	54 1/2 @ 54 3/4	5.80 @ 6.00	5.60 @ 5.65	7.45		
1	22 @ 22 1/2	54 1/2 @ 54 3/4	5.80 @ 6.00	5.60	7.45		
2	22 @ 22 1/2	54 1/2 @ 54 3/4	5.80 @ 6.00	5.60	7 3/4		
3	22 @ 22 1/2	54 1/2 @ 54 3/4	5.80 @ 6.00	5.60	7 3/4		

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Aug. Sept.	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
28	97 3/4	98 3/4	...	271	266 1/2	24 3/4	25 3/8	37 3/4	38 3/4
29	99	100	...	272 1/2	267 1/2	24 3/4	25 3/8	38 1/4	39 1/4
30	...	...	...	...	...	...	...	...	...
1	100 3/4	101 3/4	...	275 3/4	268 3/4	24 3/4	25 3/8	39 3/4	40 3/4
2	101 1/2	102 1/2	...	279	271 1/2	24 3/4	25 3/8	40 1/2	41 1/2
3	101 1/2	102 1/2	...	278 1/2	272 1/2	24 3/4	25 3/8	41	42

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

Metal Markets

New York—Sept. 3, 1919

All of the markets were distressingly dull this week. There were scarcely any changes in prices and no new features of special interest.

Copper

The Export Association did a little business with neutral countries. This was mainly transacted by its foreign agents on c.i.f. terms. There was some inquiry from France in this market, which did not result in business. Germany bid for a few hundred tons, but did not offer to pay anything like our prices.

Domestic business was confined to second-hands, the principal producers holding firmly to their previous prices and making no sales. From second-hands copper was freely offered at about the same terms as in the previous

week, but toward the close of this week it looked as if these offerings had been pretty well cleaned up by consumers and by more powerful interests that were willing to buy for an advance.

Nothing more was heard this week of offerings by Japanese and British houses, but in the early part of the week American interests bought copper in London. These were probably in the nature of arbitrage transactions.

Copper Sheets—The base price of copper sheets is 33c. per lb. Demand strong. Copper wire is quoted at 26 @ 26 1/2c. in carload lots, f.o.b. mill. Market is dull.

Tin

The market for this metal stiffened a little during the latter part of the week, and on the whole a fair amount of business was done. At the close, tin of 99 per cent grade was quoted at

54 1/2 @ 54 3/4c., and Straits tin at 56c. Straits tin for September shipment from Singapore was 52c. at the beginning of the week and 53c. at the end. Singapore quoted c.i.f. London, £272 on Aug. 28 and 29, £270 1/2 on Sept. 1, £271 1/2 on Sept. 2, and £273 on Sept. 3.

Arrivals of tin in this country in August were 5,215 tons, of which 3,000 was Straits and 2,215, other kinds. Deliveries were 2,270 at Atlantic ports and 2,075 at Pacific ports. Stocks, landing and in warehouse, were 920 tons at the end of the month.

George Armsby, chief in charge of tin of the War Industries Board, on Aug. 28 issued a statement to the tin trade giving the statistics on the tin situation while under control of the board. It is shown that there were received and distributed from Pacific Coast points 812,250 lb. at a total cost of \$554,469, or 68c. per lb., while from points east of Chicago 21,982,866 lb. was received and distributed at a total cost of \$15,281,016, or about 69 1/2c. per lb., a total of 22,795,116 lb. with the cost \$15,835,484, or a slight fraction under 69 1/2c. A refund of nearly 3c. per lb. has been made to each buyer of the tin.

Lead

About the same conditions prevailed as in the previous week, lead being still offered at low prices by second-hands, but the amount of such offerings diminished. Producers did scarcely any business.

Zinc

The market was very dull throughout the week. Prime Western zinc was offered from numerous quarters at 7 1/2c., and could be bought at 7.45c. On Sept. 2 a fair amount of business was done at that price, partly with galvanizers and partly with dealers. On Sept. 3 there was a distinctly weaker tone. Large dealers offered at 7.40c., and a large producer offered to sell at 7 3/8c.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market was very quiet at substantially unchanged price. We quote spot at 8 3/8 @ 8 3/4c. Chinese houses maintain their optimistic attitude, and antimony for shipment is quoted at higher prices than for spot. Probably 9 @ 9 1/2c. would have to be paid.

Bismuth—We quote at \$2.97.

Cadmium—Unchanged at \$1.40.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—A large arrival from Italy influenced the market. The price quoted during the week was \$95, at which figure it was rather weak.

Silver and Platinum

Silver—The silver market has experienced wide fluctuations in the last week. Closing at 61½d. in London on Aug. 27, the price broke to 58d. on Aug. 29 and has risen to 61d. again on Sept. 2. These violent changes in London are due to a scarcity of spot silver, so that any urgent demand for the trade on the Continent is likely to cause a spurt in the price, and any large offerings a fall in the price.

On the sharp advance in the London price, China stopped buying, so that silver was thrown on the London market. On the break in London price, China buyers reappeared and absorbed all offerings. The London market is very limited and sensitive, but there seems to be a broad demand for the Far East.

Mexican dollars at New York: Aug. 28, 86½; Aug. 29, 84½; Aug. 30, 84½; Sept. 1, holiday; Sept. 2, 86½; Sept. 3, 86½.

Platinum—This metal continued in strong demand, with the result of further advance in price. We quote refined ingot at \$110@115.

Palladium—Unchanged at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 30—Zinc blende, per ton, high, \$49.75; basis 60 per cent zinc, premium, \$48.50; Prime Western, \$47.50; fines and slimes, \$45@42.50; calamine, 40 per cent zinc, \$30. Average settling prices: Blende, \$46.47; calamine, \$30.40; all zinc ores, \$46.24.

Lead, high, \$65.05; basis 80 per cent lead, \$62@64; average settling price, all grades of lead, \$62.85 per ton.

Shipments the week: Blende, 7,527; calamine, 112; lead, 1,035 tons. Value, all ores the week, \$421,260.

Shipment eight months: Blende, 337,004; calamine, 9,142; lead, 49,629 tons. Value, all ores eight months, \$17,202,320.

The blende tonnage is 19,916 greater than the same period of last year; the calamine tonnage is 4,781 less, a net gain for all zinc ores of 15,135 tons.

Railroads have furnished a few more cars, and there is an improvement in moving out loaded cars, yet there are over 300 loaded cars on sidetracks in the district.

Platteville, Wis., Aug. 30—Blende, basis 60 per cent zinc, \$46 base for both premium grade and high lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$65 per ton. Shipments reported for the week are 1,777 tons blende, 275 tons galena and 637 tons sulphur ore. For the year to date the totals are 66,568 tons blende, 4,087 tons galena and 10,752 tons sulphur ore. During the week 3,481 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Recent sales have been on the basis of \$20 per ton, f.o.b. California points.

Manganese Ore—Metallurgical ore is quoted at 50@60c. per unit.

Molybdenum Ore—A little more inquiry was reported, but no business seems to have resulted.

Tungsten Ore—Chinese ore was offered at \$7.50 per unit and Bolivian ore at \$10, duty to be paid by the buyer if tariff be imposed. Buyers seem to be unwilling, however, to pay those prices, and those who were recently offering to pay \$7@7.25 seem to have disappeared.

Other Minerals

Graphite—Decided dullness is reported in both Ceylon and Alabama grades, the effect of any increased steel production not being felt, owing to stocks remaining in the hands of crucible manufacturers which were purchased last autumn and winter. The prices for Ceylon grades have remained firm, because of the fact that the rupee has maintained its price level in foreign exchange and on account of the comparatively high cost of labor, preventing profitable operation at lower prices. The market for Alabama grades continues very dull, producers having adopted a waiting attitude and making no attempt to sell. Quotations for Ceylon grades are as follows: Lump, 13½@14c.; chip, 10½@11c.; dust, 7½@8c. All prices are c.i.f. New York, ex ship.

Nitrate—Conditions continue to be reported dull, no change occurring from the previous week. Spot supplies are quoted at \$2.90@\$2.95 per cwt., carload lots.

Pyrites—Spanish pyrites is quoted at 17c. per unit for furnace size ore, free from fines, c.i.f. New York or other Atlantic port. Market slow and unsettled; hand-to-mouth buying. Very little ore coming in. Price will decrease with ocean freights.

Sulphur—No change has occurred from the previous week. Prices are quoted at \$18 per ton, carload lots, domestic delivery, and \$20 for export. Both quotations are at mines, Freeport, Tex., and Sulphur Mine, La.

Iron Trade Review

New York, Sept. 3

With labor difficulties temporarily out of the way, the iron and steel trade is now beginning to devote itself closely to the likely commercial developments of the next few months, according to *The Iron Age*. Multiplied bits of evidence have fully proved that the sentiment among the wage earners is heavily against a test of union strength, and so far as wage advances are concerned there is a widening circle of thinking workers who realize the impossibility of reducing living costs with continual wage advances and at the

same time little consideration to increasing unit production. The more cheerful outlook comes largely from the President's proposal for a conference of employers of labor and labor officials, whatever may be the disposition of the "putting the whole question of wages upon another footing."

Pittsburgh—Sept. 2

The great change that has occurred in the labor situation and prospects in the last week is the dominant factor in the iron and steel market. A feeling of relief pervades the entire trade, as it is now practically a certainty that there will be no interruption to production from labor disturbances. At no time was it the balance of probability that there would be a strike or a voluntary closing of plants, but there were distinct possibilities of such occurrences. Immediately after the publication of the President's statement referred to a week ago, a committee constituted by the unions that had been attempting to organize the iron and steel industry endeavored to secure a conference with the manufacturers, approaching Judge Gary to this end, and threatened to call a strike if a conference were not arranged. As the Steel Corporation has always conducted an "open shop," and does not deal with organized labor in any manner, Judge Gary refused a personal interview. Meanwhile, Samuel Gompers, president of the American Federation of Labor, returned from a trip abroad. It is believed he disapproved strongly of the strike threat. Last Friday the committee endeavored to enlist the President's influence in the matter of bringing about a conference, and the President evidently refused. Yesterday a statement of the President was published to the effect that he intends to call a general conference on labor matters, which will probably be held early in October, whereby all questions may be settled peacefully. It is remarked that the strike committee has made such utterly untrue statements as to the condition of steel workers that the steel manufacturers would be glad to have the actual facts brought to public attention. It is not beyond the possibility that the abolition of twelve-hour work in the iron and steel industry, which has been in progress for years, will soon be made practically complete, with an increase in the rate paid per hour, but with a decrease in the daily rate.

Iron and steel prices are absolutely stabilized by present conditions. There is no general disposition to advance prices, even if that could be done without bringing about fresh demands on the part of labor, while in quarters where there has been such a disposition the feeling has been disappearing. If it is even probable that should there be a slight increase in manufacturing costs in the next couple of months through wage adjustments, leading producing interests would be disposed to absorb the increase rather than pass it on to the buying public.

THE MINING INDEX

Listing Special Articles of Interest
and Value to the Miner
and Metallurgist

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Number 11

The Advantages of Contact

THIS edition of the *Journal* is devoted in large measure to the 117th meeting of the American Institute of Mining and Metallurgical Engineers, to be held at Chicago, Sept. 22-26. The New York meeting of the Institute in February of this year was of special significance; as, following closely the date of the signing of the armistice which terminated the war, it offered the opportunity for an accounting and a recognition of the various activities of individual members and of the Institute as a body. It now seems fitting that the coming convention should be held in a section so closely identified with industries that played an extensive part in the winning of the war.

Chicago has long held a foremost place in the steel industry, its supremacy as a center for machine manufacture is unquestioned, and its growing importance in the metallurgical field and its situation with reference to several important mining districts are such that it will always have an intimate connection with the mineral industry. Certainly that portion of the program of the meeting outlining the many trips for which arrangement has been made is indicative of the extent of territory that will be covered and the various industries that will be inspected. Such opportunities come seldom, and it seems almost unnecessary to point out the many advantages that are to be gained by those attending the convention.

We have many times emphasized the importance of contact, interchange of ideas, and the advantages of securing varied opinions on mining and metallurgical problems. The high standing of the mining profession and the industry today is due to co-operation and interchange of opinion, and extension of the opportunity for further conference promises a continual improvement in the methods employed in the industry.

Textbooks and the technical press are important means for the propagation of information, and practical experience in operation is essential, and all may be regarded as indispensable to a well-rounded knowledge of actual conditions in the mining or metallurgical field. Supplementing these should come the necessary adjunct of observation. The mere viewing of a plant in operation may not secure a complete knowledge of existing conditions, nor is it expected that the observer will grasp, first hand, all the details thereof, but he is conscious of an addition to his store of knowledge, greater or less, depending upon his interest in the subject under observation.

The papers that have been prepared for the forthcoming meeting offer a mass of information to those interested in the various subjects treated, and these are arranged and grouped so that separate sessions include the reading of papers on related topics. In this connection it may be mentioned that the mere reading of papers at a meeting, either by the author or his substitute, often does not do full justice to the

subject and that great good will result from subsequent discussion. Engineers particularly appreciate the value of this in connection with their problems.

To all mining men the meeting should be an inspiration, and the opportunity of attending it should not be neglected. The interchange of ideas, the consideration of problems that are slightly different and yet closely allied with one's own line of endeavor, and the forming of new friendships constitute important needs in the mining industry today.

In considering a list of the advantages to be gained by the attendance at an Institute meeting one cannot overlook the benefits to the engineer that may be found by association with others of his profession. The elder members, schooled in experience, should be able to look to the younger members for inspiration; whereas the young engineer should be appreciative of the opportunity given him to "rub shoulders" with his older associate. A feeling of comradeship and of confidence creates a healthy atmosphere for the profession and for the perpetuation of such a worthy and useful institution as the A. I. M. E.

The Artful Dodger

A NOVEL expedient has been adopted by the Carranza government in its latest attempt to avoid responsibility for the safety of United States citizens in Mexico. Holders of passports from the State Department, authorizing them to visit the Tampico region, are asked to sign a formal release of the Carranza government's responsibility for what may happen to them. If the traveler declines to waive his right to protection from bodily harm, Mexican officials may refuse to visé the passports, on the ground that under international law a government may refuse foreigners permission to travel in a region where it cannot guarantee their safety.

Is this new artifice of Carranza calculated to inspire confidence in his ability to improve conditions in his country? In the light of the peculiar circumstances surrounding the recent robberies of oil companies in the Tampico district, and the firing upon and wounding of a United States aviation officer while he was on patrol duty on the American side of the border, is this latest device of the Mexican President to be regarded as an answer to General Salvador Alvarado's accusation that the present Mexican government is a "despotic, corrupting, and ultra-personal regime, without responsibility or legal restraint?"

We were informed that the news of the firing upon American aviation officers and the wounding of Captain Davis B. McNabb was received in Washington with "mixed indignation and surprise," and that the vexed officials who received the reports "would take steps to get at the facts without delay." This "getting at the facts" is becoming less satisfying with every new outrage.

The message of the Mexican President in answer to our recent expedition over the border in an effort to capture bandits who had seized United States Army officers and held them, under threat of death, for ransom, contains no word of apology. In fact, it is, as the *New York Tribune* aptly remarks, "practically an announcement that the season for hunting Americans in Mexico is now open." We cannot forbear again asking the question, "When is it time to intervene?"

The Hoover Dinner

AN IMPORTANT EVENT, and one which must be of unusual interest to the engineering profession, will occur on Sept. 16, in New York, when a banquet will be held in honor of Herbert C. Hoover, soon after his arrival in this country. The affair will mark Mr. Hoover's at least temporary retirement from public service. The banquet will be given under the auspices of the American Institute of Mining and Metallurgical Engineers; and it will be the only public celebration of Mr. Hoover's return, after five years spent in many patriotic activities in fields of endeavor far removed from the mining industry.

Mr. Hoover has reflected great honor on the profession of mining engineers by his achievements in various administrative capacities. His work is a demonstration of the especial abilities which are developed by the practice of engineering, and the record of his service pointedly suggests the conclusion that further advantage should be taken of the engineers' ability and training by more generally placing engineers in public office. The constructive genius required in the handling of great and difficult tasks is developed to no greater degree in any other field.

The Hoover dinner will be a function of importance to the engineering profession. It will serve strikingly to emphasize the value of the engineer in public affairs.

The Strike Fever

AS ONE views the recent recurrences of the strike fever, now at Tonopah and Divide, yesterday at Ely, and the day before at Oatman and in the Coeur d'Alenes, to say nothing of the disturbances in Eastern coal fields, alarm may be, perhaps, momentarily tingled with amusement. The very time that the President and his followers have put a noticeable dent in the cost of living is seized upon by the unions as the proper time to strike. It almost seems as if the unions were afraid that the high cost of living would really come down appreciably, and thus take away the legitimate reason they have had for jamming their demands down their employers' throats.

In that happy day when the cost of living shall become less of a bugbear than it has been during the last few years, with what pretexes will the strikers strike? Almost anything will serve, it seems. The determined man needs no pretexes. Lenine and Trotzky used them for a while, but soon cast them aside.

The experience of the Railroad Administration furnishes proof of this. The car inspector—that individual who walks alongside the train when it stops at Caliente or Barstow and looks for possible hot boxes, tapping each cover shut after glancing within—the car inspector, after having his salary increased from less than \$900 to a figure two and a half times as great, again seeks further increase. The cost of living no

longer serves, so the demand is based upon the ground that his remuneration does not compare favorably with that of some of his fellow employees. This would indicate that jealousy, rather than the desire for a square deal, was at the bottom of the demand.

What Is Your Policy Going To Be?

SUPPOSE a German—and by that term we mean a Sreal German from Germany—should ask you for a job as a chemist, let us say. Suppose he were well qualified for the position, and that you needed another laboratory assistant. Would you employ him?

Five million Germans have applied for permission to leave Germany. This was to be expected, for the burdens of the war in defeated countries will be onerous in the extreme. Also, our American boys from the occupied regions report unlooked-for friendliness on the part of the population, particularly from the girls, who appear to be trying to arrange for future homes on this side of the ocean. The German horde will probably not be released, and if it is, Representative Johnson has introduced a drastic bill into Congress to keep it away for two years, and President Wilson has recommended that the passport law be continued for another year to keep out undesirable aliens. But supposing the German does come—will you give him a job, and why?

Here is another thing to consider: Will you buy German beakers, chemicals, dyes, manufactured steel products, potash, and toys? The German wants your copper, and you want to sell it to him, so that your mines and mills will run to capacity. To pay for these things, he must work for us and send back to this country the things he can make cheaper than we can make them. We would not want his gold if he had any available. We want his manufactured goods, to increase our supply and reduce our prices.

But it is not necessary to kill off all our infant war industries by allowing a flood of more cheaply produced foreign materials to enter the country. Possibly the solution will lie in a protective tariff, or license, so adjusted that American manufacturers may continue to supply a certain percentage of our requirements for such goods. This will be the spark of fire which will keep these industries alive until such time as we may again be cut off from our main supply. A blind determination never to buy another German-made article sounds like the Hymn of Hate, which was never enthusiastically received outside of the "Fatherland."

Making Prohibition Easier To Bear

WE DEVOTE one of our pages this week to a short article on the importance of providing good drinking water in mining camps. This is a subject too often neglected, chiefly on account of carelessness or ignorance. Although in some cases the provision of pure drinking water may cost considerable money, it is a very simple matter to determine the quality of that normally supplied. Many works chemists are prepared to make the necessary determinations, or samples of the water, taken in properly sterilized bottles, can be sent to the various state boards of health for a report. A few cents spent monthly in testing the water

supply may save thousands of dollars later. Possibly trouble has never been encountered, but epidemics often occur when least expected.

The healthy worker is in general a happy and an efficient worker. Disease is too expensive to tolerate. The Federal Government learned this lesson in 1898, and in the Great War took extraordinary precautions to keep the doughboys in good health. If such care was necessary on the surface in France, it is vastly more important where workers are underground.

The "Health Almanac for 1919," Public Health Bulletin No. 98, which is, by the way, well worth writing to the Superintendent of Documents for, says "it is the patriotic duty of every loyal American to keep well." Until the millennium arrives, when we will all know how to keep well, it is necessary for most of us to be kept well, or as well as possible, and the laborer must rely to a large extent on the intelligence of those in charge of conditions where he works.

Now that the Long Drought is upon us, the large foreign element, not to mention the American element, in our population will be deprived to a large extent of its favorite beer. At least its palatability will be lessened to such a degree that many will no doubt seriously consider the use of the well-known combination of hydrogen and oxygen as a beverage. It devolves upon us, therefore, even more than formerly, to see that the drinking water is as inviting as possible and free from the *bacillus coli* or his friends.

The provision of a supply of pure water also often includes proper disposal of sewage, and this subject, too, deserves more attention from the standpoint of health and cleanliness than it usually gets in mining communities. Complete sewage systems are not often practicable, but there is no excuse for depositing the refuse of a house in the back yard or gutter. Provision may at least be made for a cesspool, properly drained, which means away from a well. Garbage should be collected at least once a week during warm weather and either burned or otherwise denatured.

The large companies are paying a great deal of attention to these things, and if it pays them it will pay the small plant, also. It is not a question alone of social welfare; it is downright good business.

Oil Lands Suit

Settled by U. S. Judge

THE long-drawn-out litigation between the Government and the Southern Pacific over title to about 162,000 acres of oil-bearing land in the lower west San Joaquin Valley of California has reached a turning point. Judge Benjamin F. Bledsoe, of the U. S. District Court, Southern District of California, recently decided that the Government had failed to sustain its charge that the lands in question had been patented fraudulently, and dismissed the six consolidated suits of the Government against the Southern Pacific company and 221 other companies and individuals. The decision is, of course, not final, for the Government may appeal the case to the Circuit Court of Appeals and from that to the U. S. Supreme Court. We hope that this will not be done, and that the decision rendered by Judge Bledsoe will mark the termination of the litigation in so far as these particular cases are concerned. The oil industry of California has had more than its share of litigation, and it will materially advance the interests of the industry if such disputes reach a speedy decision.

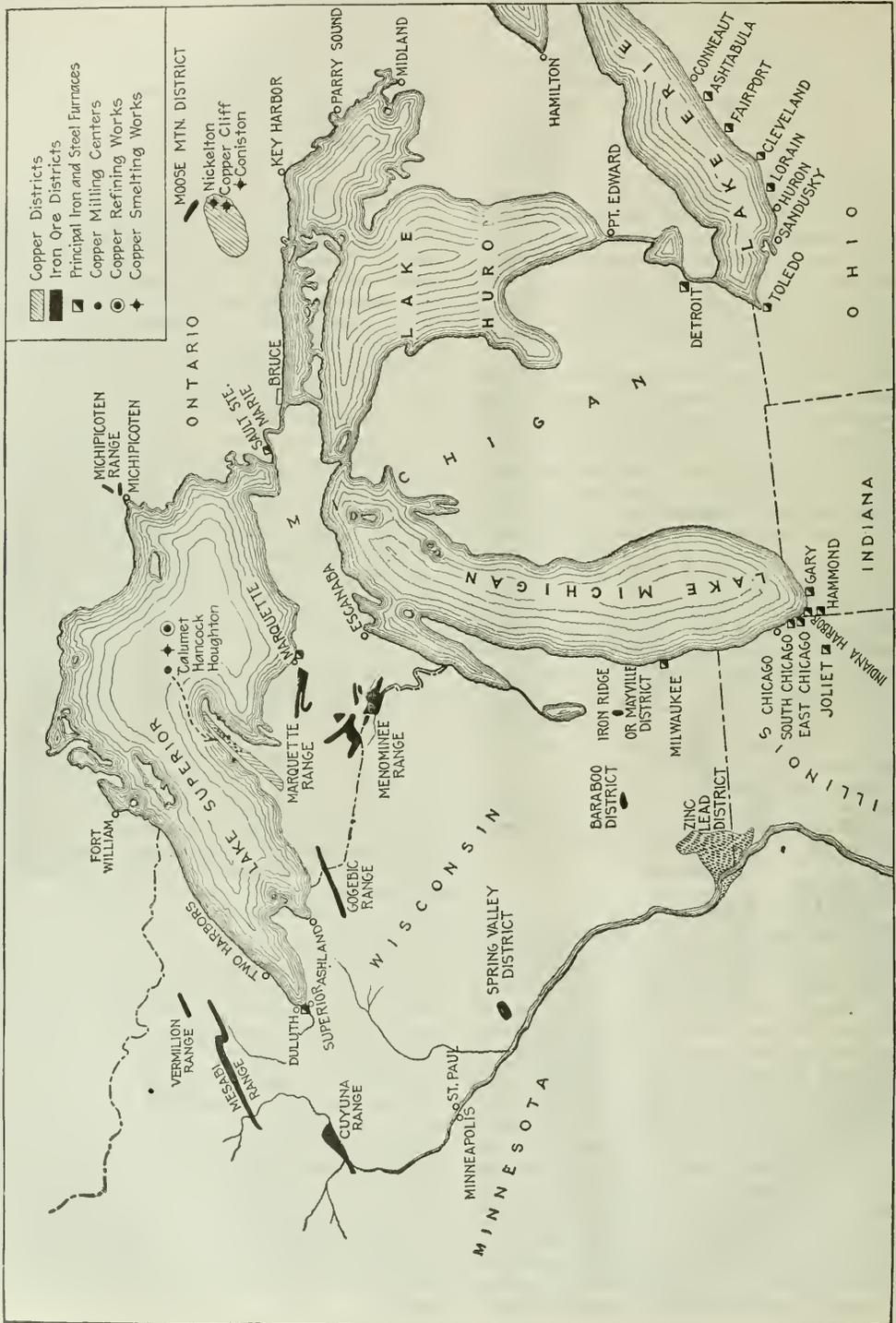
Rejuvenation of the Iron Districts

TWO important facts are emphasized in the development of orebodies that has taken place during the last year and a half on the Gogebic iron range. The first of these, which is perhaps more of local concern to the district, is the strengthening of the belief that the so-called "north vein" ore is likely to be found in many of the mines, and this conviction is well founded since the discovery of extensive orebodies well north of the foot wall in the Montreal, Townsite, Norrie group, McKinney Steel Co., Newport, Anvil, and other mines. The earliest discoveries were in "north vein" territory, and were recognized as such on the early commercial maps. Owing to the 60-degree dip of the formation, the early shafts soon struck the foot-wall quartzite on the south side of the formation. As ore occurred here, and the top of the quartzite was easily followed, mining soon limited itself to the foot-wall ore horizon, and little work was done for many years to explore the northern part of the formation.

The second feature, which was brought out by recent development on the Gogebic, is the tendency on the part of the various iron districts comprising the Lake Superior region, to "come back." The original development of each of the ranges has been slow for the most part, due to a lack of interest in the iron market, a hesitancy on the part of capital to invest money in a new and heretofore unexplored district, or a doubt as to whether proper shipping facilities would be obtainable. With the overcoming of each of these retarding influences, the various ranges have developed in turn, and each has had its boom. Continued exploration and further study of the iron formations have brought about discoveries that have had a distinct bearing on the location of new orebodies, and without exception each of the iron ranges has gone through a period of rejuvenation, which has obtained for it, during that particular period, the center of interest in the iron-mining field. It is not to be assumed that this supremacy is based on a tonnage production, for the Mesabi Range, has, of course, maintained the position of the greatest producer for a quarter of a century. However, judged by the standard of interesting geological features, and the development of knowledge that has led to the discovery of new orebodies, each iron range has commanded particular attention at some time since its original opening.

Continued exploration and study show that iron-ore reserves in the Lake Superior district are sufficient for many years; the recent strides that have been made in iron-ore beneficiation will make available a great tonnage of ore heretofore regarded as being too low grade to be merchantable, and an optimistic belief in regard to iron-ore supplies in that region prevails, despite occasional discouragements in the iron markets.

Mr. Hotchkiss' article, "The Geology of the Gogebic Range and Its Relation to Recent Mining Development," the first installment of which begins on page 443 in this issue, will be found interesting not only to those that are engaged in mining in the Lake Superior region but to all others who are concerned with the study of geology applied to mining, and the encouragement offered as to possibilities that may be expected with further exploration is sufficient to convince mining men of the importance of this feature of their industry.



MAP OF THE PRINCIPAL MINING, MILLING AND SMELTING DISTRICTS OF THE NORTH CENTRAL STATES

Some Facts and Figures About the A. I. M. E.

THE membership of the American Institute of Mining and Metallurgical Engineers is composed of men engaged in the different branches of mining, metallurgy, geology, and chemistry. Although metallurgy was always considered to be within its field, it was believed that many metallurgists had been reluctant to join what they erroneously considered, because of the former designation, American Institute of Mining Engineers, solely a society of mining engineers, despite the fact that over 35 per cent of the papers published in the *Transactions* during the last five years have dealt with metallurgical subjects. It was therefore thought advisable to change the name to the American Institute of Mining and Metallurgical Engineers, and it was so voted by the members on Feb.

IRON AND STEEL—Joseph W. Richards, Chairman.
 REDUCTION AND REFINING OF LEAD—Heinrich O. Hofman, Chairman.
 REDUCTION AND REFINING OF ZINC—George C. Stone, Chairman.
 REDUCTION AND REFINING OF MISCELLANEOUS METALS—Charles H. Fulton, Chairman.
 PETROLEUM AND GAS—Ralph Arnold, Chairman.
 COAL AND COKE—H. H. Stoek, Chairman.
 NONMETALLIC MINERALS—George F. Kunz, Chairman.
 MINING GEOLOGY—James F. Kemp, Chairman.
 MINING METHODS—Louis S. Cates, Chairman.
 MILLING METHODS—Robert H. Richards, Chairman.
 ACCOUNTING METHODS—Judd Stewart, Chairman.
 LEGISLATION AND PUBLIC POLICY—Mark L. Requa, Chairman.
 INDUSTRIAL ORGANIZATION—T. T. Read, Secretary.



MARTIN CORYELL
 Secretary A. I. M. E., 1871-1872



THOMAS M. DROWN
 Secretary A. I. M. E., 1873-1884

18, 1919. It is expected that this change, definitely including metallurgy in the title, will result in increased interest in that branch of the Institute's field. The initials "A. I. M. E." are retained.

It would be interesting were a compilation to be made showing the manner in which the various geological, mining, and metallurgical subjects have been covered in the *Transactions* and in papers presented at meetings of the Institute; how much attention has been paid to gold, how much to copper, iron, and other metals. However, it is certain that the field of the Institute has been and is a broad one, and every effort is made to meet the varied needs of its members. This is evident from the following list of technical committees, whose purpose is to obtain papers of high merit on subjects covered by the titles of the committees:

REDUCTION AND REFINING OF COPPER—E. P. Mathewson, Chairman.

EXTRACTION AND REFINING OF PRECIOUS METALS—F. Lynwood Garrison, Chairman.

The following, taken from the Year Book of the Institute, defines its aims and purposes:

The Institute aims to promote the arts and sciences connected with the economic production of the useful minerals and metals, and the welfare of those employed in these industries, by means of meetings for social intercourse, and the reading and discussion of professional papers, and to circulate among its members by means of publications the information thus obtained.

THE EARLY DAYS OF THE INSTITUTE

In this brief space it will be impossible to give more than a few notes regarding the early history of the Institute. Some features, not generally known, are of especial interest. The first mention of the American Institute of Mining Engineers in the *Engineering and Mining Journal* appeared in the issue of Feb. 7, 1871, when reference was made to a circular prepared and signed by Eckley B. Coxe, Richard P. Rothwell, who later became editor of the *Journal*, and Martin Coryell, whom the editor described as "three mining en-



OFFICE OF BRADLEY STOUGHTON, SECRETARY, A. I. M. E.



OFFICE OF PERCY E. BARBOUR, ASSISTANT SECRETARY, A. I. M. E.

gineers whose reputations are a guaranty that the proposition they have issued is intended in good faith to promote the interests of their profession, and not, like some others of the kind, to favor the schemes of adventurers or foist insignificance into notoriety."

The response was favorable, and on May 16, 1871, the first meeting of the Institute was held at Wilkes-Barre, Pa., twenty-two engineers being present. Of the three men who issued the circular, E. B. Coxe became vice-president, Martin Coryell, secretary, and Mr. Rothwell served as one of the managers. David Thomas was the first president, and J. Pryor Williamson, the first treasurer. Of the members who were present or represented at the organization meeting, and therefore were the founder members, the following are still living: Willard P. Ward, Henry S. Drinker, and Edmund C. Pechin. Dr. Drinker and Mr. Pechin have served as officers of the Institute a number of times, and the former is now one of the vice-presidents.

Among those who attended the first meeting was Dr. Rossiter W. Raymond, who was one of its most active supporters, becoming a vice-president in 1871 and again in 1876 and 1877, and president from 1872 to 1875. In 1884 he became secretary, which position he held until 1912.

To Dr. Raymond and Mr. Rothwell are due the success of the Institute in its early days. Mr. Rothwell served as manager in 1871, 1898, and 1899 and 1900; as a vice-president in 1872, 1873, and 1877; and in 1882 he was unanimously elected president. In writing some reminiscences Dr. Raymond called attention to the interesting fact that it was Mr. Rothwell who urged him to attend the organization meeting of the Institute, and although Mr. Rothwell was one of the founders of the Institute, he devoted himself in later years to the *Engineering and Mining Journal*, while Dr. Raymond, who was with the *Journal* in its early days, gave his later energies to the Institute.

The story of Dr. Raymond's work with the Institute has already been told, and it is necessary only to record here that in 1912, when more than seventy years old, Dr. Raymond retired with the title of secretary emeritus, and Dr. Joseph Struthers became secretary.

At the first meeting of the Institute five papers were read, and at subsequent sessions from ten to fifteen, so that during the first year forty-four papers were presented at four meetings. These were by twenty-six authors, and covered a wide range of subjects.

In the beginning, by arrangement with the publishers of the *Engineering and Mining Journal*, all of the papers appeared first in that periodical, but this arrangement was discontinued Dec. 31, 1877.

The annual dues at the time of the organization were \$10, and remained at that figure until they were increased by action of the membership of the Institute within the last few years.

The suggestion to change the name of the Institute was made as early as 1876, but apparently no steps were taken at that time and any other attempts were unsuccessful until the action of 1919.

The first list of members, published in Vol. I. of the *Transactions*, February, 1873, contained 243 names. In December, 1881, about ten years after its founding, the Institute had 6 honorary members, 849 members, 125 associate, and 51 foreign members, and had become well established.

The Institute has gone steadily forward, broadening its influence and increasing its services to the mining

industry. The present roster includes 15 honorary members, 6,514 members, 485 associates, and 590 junior members, a total of 7,604. There are 6,431 members residing in the United States, 229 in Canada, 150 in Mexico and 794 in other foreign countries. For a large number there is no permanent address.

The Institute has added to its local sections, the advantages of which are obvious, until now there are seventeen, covering all the important mining centers. There is active co-operation with other organizations, including Government bureaus. On July 1, 1918, the American Institute of Metals affiliated with the American Institute of Mining Engineers, as the Institute of Metals division. This brought the alloying, founding, and metallography of the nonferrous metals within the scope of the Institute.

To date 119 meetings have been held, covering every important mining and metallurgical district in the



BRADLEY STOUGHTON
Secretary since 1913

United States, and including seven meetings in Canada, one meeting in Mexico, one in England, and one in the Canal Zone.

SPECIAL PUBLICATIONS OF THE INSTITUTE

The Institute has published two special treatises, one on the "Genesis of Ore Deposits," by Franz Posepny, and "Ore Deposits," by S. F. Emmons. The supply of the former has been exhausted. There have been a number of innovations in the *Bulletin* in recent times, one of these being the starting of a mining and metallurgical index, in September, 1918. The *Year Book* was enlarged in 1919, and now gives, in addition to the list of members, a mass of interesting information regarding the Institute and its activities.

WAR WORK OF THE INSTITUTE

The Honor Roll of the Institute is an impressive one. When the last list of members known to be in active military service was compiled, on Mar. 5, 1919, it comprised 845 names. This list, however, is no doubt incomplete, for many members failed to inform the Institute of their military connections. Twenty-six mem-



MEMBERS' WRITING ROOM, A. I. M. E.



STENOGRAPHIC DEPARTMENT, A. I. M. E.

bers died in active service. As a fitting memorial, to pay tribute to these men who had made the supreme sacrifice, meetings were held by the members of the Institute in connection with its 119th meeting in New York, in February, 1919, and in Colorado the preceding year. Brief biographical notices were read, as the portraits of those who had died in service were shown on a screen, and two buglers sounded "taps."

In addition to those in military service, a large number of the members rendered great service to the Government during the war in many capacities, and at a personal sacrifice. The foregoing relates to individual effort. The Institute as a body also made its contribution. Among its activities were assistance in the recruiting of the 11th Engineers, active participation in the work of the Naval Consulting Board and the War Committee of Technical Societies, and financial and other support of the National Research Council and of the War-Minerals Committee. It was active in stimulating the production of manganese and chrome, and aided in supplying a great many engineers for Government work.

THE INSTITUTE HEADQUARTERS

When first organized, the A. I. M. E. had no regular headquarters, it being thought inadvisable to do anything which might create the impression that the Institute was in any sense a local organization. Correspondence and other business was carried on from the office of the secretary wherever he happened to be, and the necessary papers were carried to each meeting. Later, previous to the completion of the Engineering Societies Building, the Institute had its office at 99 John St., New York City, the accommodations being, of course, in striking contrast to its present rooms on the ninth floor of the building at 29 West 39th St., which are, no doubt, familiar to most mining engineers who have visited New York. For those who have not had this opportunity, some views of the headquarters are given herewith, showing how adequately the needs of the members are taken care of, and the efficiency of its business organization.

The number of persons employed by the Institute at present is sixteen, exclusive of the secretary and assistant secretary and the advertising manager. The equipment is up to date, and such modern office appliances as the automatic typewriter, the dictaphone, mimeograph, and addressograph are employed in getting out the large amount of correspondence, circular announcements, and wrappers for the bulletins.

The members' rooms have been recently enlarged and are suitably furnished for the purpose they serve, the color scheme of the hangings and floor covering, a deep blue, being especially agreeable. Facilities are provided for receiving or sending mail or telegrams; and a member may dictate letters and meet acquaintances; in short, may make his headquarters there, and be as much at home as in his own office.

The offices of Bradley Stoughton, secretary, and Percy E. Barbour, assistant secretary, adjoin, and, as the pictures show, are commodious and well arranged.

The Institute has an excellent collection of photographs which are interesting to all visitors. These are hung in the different rooms, the directors' room having a complete set of portraits of honorary members; the large room for the accommodation of members, pictures of ex-presidents of the Institute; and the small room for the members, and the secretaries'

offices, a collection of photographs of distinguished members. In Mr. Stoughton's office many of the pictures are framed groups of photographs of prominent mining men and metallurgists which have appeared from time to time in the *Engineering and Mining Journal*.

WOMAN'S AUXILIARY OF THE A. I. M. E.

In any article describing the activities of the Institute, mention should be made of its Woman's Auxiliary, and in response to our request, Mrs. Sidney J. Jennings, secretary, has furnished information regarding its organization and work.

The idea of forming a woman's auxiliary to the A. I. M. E. had its inception in 1916, when the distressing condition of Belgium and Mr. Hoover's appeal for aid engaged the interest of the Institute members, and resulted in prompt and efficient response. This was a work in which women would naturally be interested, and Mr. Hoover's appeal crystallized an idea that had been considered by some of the wives of the A. I. M. E. members since the autumn meeting of the society in 1916, held in Arizona. The boundless hospitality of the West, the admiration aroused by the splendid spirit of friendliness and co-operation, suggested the thought, "Why cannot the women who so largely helped to bring about the results obtained join in an organization which will be ready to stand beside the Institute to help whenever needed, and to render service to their country in any way that directly or indirectly pertains to the interests of the engineering profession?" The women of the New York Section, where naturally the relief work centered, felt that, with the aid of the women of other sections, help for the Belgians could be gathered from quarters that the men could not reach.

The answer to the appeal was an affirmative and encouraging one, and at the meeting of the Institute in February, 1917, the ladies present organized, and agreed on a tentative constitution, the object of the organization being "to render service to the country and to the community, or to humanity at large, through all that pertains to the interest of the profession of mining engineering."

The president for the first year was Mrs. Sidney J. Jennings, with Mrs. Arthur S. Dwight, Mrs. H. W. Hardinge, and Mrs. Karl Eilers as vice-presidents, and Mrs. Bradley Stoughton and Mrs. Axel O. Ihlseng as secretaries.

During the first year the following work was accomplished: The sum of \$12,000 was collected for Belgian relief; the Emergency Committee collected money and clothing for the sufferers in the Halifax explosion, and filled 500 Christmas comfort bags for our soldiers; work was done in food conservation, and in Seattle a shop was opened where canned fruit and vegetables were sold for charitable purposes, the Woman's Auxiliary for that section being put in charge of the food-conservation tent at the Interstate Fair.

In 1918 the following were officers: Mrs. R. C. Gemmell, president; Mrs. L. D. Huntoon, Mrs. Karl Eilers, and Mrs. L. P. Holbrook, vice-presidents; Mrs. Sidney J. Jennings, secretary; Mrs. H. K. Masters, treasurer. Activities increased during this year, and among the important work accomplished was the establishment of a dispensary bearing the name of the New York Section of the A. I. M. E. at Briey, France. This was done through the Foreign Relief Committee under the chairmanship of Mrs. H. H. Knox and Mrs. Jesse Scooby, successively. In addition, \$3,000 was sent to



ACCOUNTING DEPARTMENT, A. I. M. E.



SHIPPING DEPARTMENT, A. I. M. E.

France, \$1,720.51 was contributed for emergency dispensary work among refugees, and \$966 was contributed for the purchase of sheep for stocking reclaimed districts in France.

The Emergency Committee, with Mrs. H. N. Spicer as chairman, did good work in helping to supply comforts for the 27th Engineers, the special mining regiment. The Western section helped in this, and a large number of knitted articles were provided. In New York, Utah, and Montana, French and Belgian children were adopted and provided for, and in Utah and Montana gifts for Belgian relief are still coming in.

In 1919, Mrs. James F. Kemp was elected president, with Mrs. L. D. Huntoon, Mrs. H. P. Henderson, and Miss Madeline Stone as vice-presidents, Mrs. Sidney J. Jennings, as secretary, and Mrs. Masters as treasurer. Mrs. Masters resigned and was succeeded by Mrs. Karl Eilers.

The war is over, but there is still work for the Auxiliary to do, and plans have already been made for the continuance of its efforts. Americanization has been chosen as a work in which the efforts of the Woman's Auxiliary can and should be engaged. It is the purpose of the Auxiliary to have such work include not only friendly, helpful assistance to foreign-born women and children, but the study of economic problems, legislation, and kindred subjects, the understanding of which will make better American citizens of the members of the Auxiliary themselves. Another splendid thing the organization is doing is the collecting of funds for the endowment in perpetuity of a bed or beds in the American Memorial Hospital, to be built at Rheims, the beds to be endowed in memory of those members of the A. I. M. E. who died in the Great War.

Continuity of Veins

In a suit involving title to a quartz vein, the U. S. District Court, Northern District of California, decided that a segment of a vein, beginning fifteen feet or more below where a vein apexing in complainant's claim terminated in a fault, was properly regarded as a continuation of the same vein, which complainant was entitled to follow in its dip through the side lines into defendant's adjoining claim. (Original Sixteen to One Mine, Inc., vs. Twenty-One Mining Co., 245 *Federal Reporter*, 630.) The court said:

On the trial a vast amount of expert testimony was offered by the plaintiff, tending to show the identity of the vein from the outcroppings or apex on the surface of the Sixteen to One claim down through the various workings, and perhaps an equal amount of testimony was offered by the defendant tending to show the contrary. The experts on each side consisted of geologists, mining engineers, and practical mining men. It is almost needless to say that the opinions of these experts were positive and unequivocal in favor of the party who called them, and little would be accomplished by adding one or more additional experts to the long list already in the record. It was conceded throughout the trial that there is a vein on the Sixteen to One claim; that this vein dips in an easterly direction at an angle of 45 to 50 degrees; that the vein terminates at a fault at about the 200-ft. level; and that by dropping down a distance of fifteen to twenty feet at the shaft, and a distance of thirty-five or forty feet at the northerly boundary of the claim, another vein is picked up, likewise terminating at a fault. The witnesses for the plaintiff testified that these two segments were one and the same vein, while the witnesses for the defendant testified to the contrary. Their theory is that, while there are two segments of veins there, the upper segment of the lower vein was thrown up several

hundred feet above the present surface of the mountain and has eroded away, while the lower segment of the upper vein can probably be found several hundred feet lower down. The jury found it much easier to join the two existing segments together, thus making a single vein, than to speculate as to what has become of the two lost segments, and with that conclusion I am in full accord.

Uncomplimentary

In conversation with M. O. Leighton, chairman of the committee working for a Department of National Public Works, an acknowledged statesman and keen observer of people and events made the following remarks, which are somewhat uncomplimentary:

Your task is appalling. You have been elected to lead engineers into a political reform. They are the most unresponsive citizens that we have. Your organization has a praiseworthy purpose, but if it were sponsored by almost any other group of reputable men than engineers there would be more promise of success. If your organization succeeds I believe that you will find that it will not be the engineers who have carried it through. Their aloofness and indifference in all matters outside of their own professional sphere are among the unexplainable things in our political life.

Submarine Diamonds

Dredging for diamonds in the sea along the coast of the Southwest Protectorate, formerly German South West Africa, was recently undertaken by a company specially formed for this purpose, under a concession granted to it by the Union Government, according to a consular report. This concession covers a very extensive area of the sea channel between the islands off the coast and the mainland. Reports seem to show that the Pomona diamonds found in the South West Protectorate are of sea origin, and that a deposit exists under the sea within the area that lies between Possession Island and Pomona. The stones on the mainland, according to this theory, have been washed up and carried by the wind into the drifting sand dunes. Under the terms of the concession the Union Government receives a royalty of 40 per cent on all the diamonds extracted and all the stones must be turned over to the Government for disposal. A ship fitted out with the necessary dredging and diving apparatus left Cape Town for the scene of operations in the first week of March, but unfortunately was wrecked on Possession Island. Work has, therefore, been postponed until a new vessel and new equipment can be obtained.

Optimism of Youth

When a fellow has been a high flier, it is hard to keep him down. A recently discharged flight lieutenant sells securities, but he will admit that anyone else in his line of business is simply peddling stock. Having conceded in an unguarded moment that his father had once been stung on some Cripple Creek mining stock, he hastily hedged by alleging that the camp in question was simply impregnated with gold and silver for miles around. Taxed with the undeniable fact that the hills in that vicinity were gophered with innumerable holes that were never anything more than the pretext for the unloading of fake stocks, he retorted, "Oh, well, the land itself is bound to be good for something or other some day. Why, the shale there is just loaded full of oil and things, and it is only a question of time before they begin to take it out."

Mine Machinery Manufacture in the Middle West

Much of the Mining and Metallurgical Equipment Installed Throughout the World in the Last Fifty Years Originated There—Reminiscences of Early Installations
In the West and in South Africa

THE machinery manufacturers of the Middle West have to a large degree developed the mining and metallurgical industry of the world. Hardly a plant of even moderate size can be found in any of the better-known mining districts which does not contain machines designed by Illinois, Indiana or Wisconsin engineers. Equipment of almost every kind suitable for the mining industry has been produced, and a detailed list of the various machines manufactured is obviously beyond the scope of this article. However, there are some types that represent milestones in the industry, and they should have at least passing notice.

The stamp mill, or, more specifically, the stamp battery, is one of the most generally used means of ore reduction, especially in the treatment of gold and silver ores. For more than fifty years, this type of machine has stood the test of time, and that alone speaks volumes for its success. Probably no fewer than 25,000 stamps, with their auxiliary equipment, have been manufactured in the Middle West. In the last three or four years not many stamp mills have been built, as other methods of ore crushing in connection with the improvement in processes of treatment have become more popular. There are many thousands of stamps, however, that are adding to the wealth of the world, and it may be said, without entering into detailed discussion, that they have proved their economic worth.

A LARGE STAMP MILL

It would hardly be proper to pass from this subject without a reference to one of the largest historic stamp milling plants. In the '70s, gold was discovered in the Black Hills of South Dakota, and in the latter part of that decade about 640 stamps were being operated by the Homestake Mining Co. These have since been augmented, until the total at present is 1,000. The greater part of this equipment has been supplied from the Middle West district.

In 1897 the Alaska Treadwell Gold Mining Co. placed an order with Fraser & Chalmers for 520 stamps and other equipment aggregating 6,000,000 lb., which was considered at that time, and probably still is, the largest individual order for machinery of that class ever purchased in one contract.

The large steam stamps which are so successfully used in the Lake Superior copper mines should also receive mention. These machines were tried out on an extensive scale in the late '80s at a large gold mine in South Dakota, in large concentration works in Montana, and also in Australia. They were not entirely successful, because of the nature of the ores, and the metallurgical treatment following crushing, and have long ago been superseded by other apparatus. However, these steam stamps continue to be useful in the Lake Superior district. The greater number, by far, have been built in this territory.

A great step forward in the process of ore treatment was made in the introduction of the Frue vanner, about 1873. This machine was built almost exclusively in

the Middle West, several thousand of the vanners having been shipped to all points of the world. They are still built, but their application in recent years has been rather limited, on account of changes in the treatment of ores.

The gyratory crusher was brought out in the '70s, and has had a wide application in the mining industry. It is today, notwithstanding its early introduction, in extensive use; it is being built in greater numbers than ever before, and it bids fair to continue its successful career for an indefinite period.

In the '80s and '90s the pioneer mines of the Rand were being extensively equipped. Conditions then were much different from those of today. Most of the equipment furnished consisted of stamp mills for gold ores, accompanied with Frue vanners for concentration of the sulphides, and this represented the best method of treatment then known. Special means for the transportation of this equipment were required. There being no large timber available, it was necessary to supply it from here. This resulted in the sending of men to the Southern states along the Gulf, where timbers were sawed ready to assemble at the destination. The tonnage for shipment was so large that on many occasions entire vessels for carrying the timber and machinery were chartered for direct sailing to South Africa.

Conditions naturally changed in this field as well as elsewhere, and now greater development has resulted in the specialization of industries, so that lumber, as well as other materials and supplies, is available from local dealers. In the early days, supplies, including hardware, window glass and similar equipment, had to be furnished by the machinery manufacturer.

The development of the famous De Beers diamond mines also required a vast amount of machinery, and, in the early stages, most of this was shipped from Chicago. The gold mines on the west coast of Africa also required a large amount of equipment, and in later years the enormous copper deposits in the Belgian Congo have drawn largely from the Middle West market for their equipment.

AMERICAN ENGINEERS ON THE RAND

It is pertinent to record the fact that the early development of the Rand was largely under the direction of engineers from the United States. However, the story has been told frequently, and there are still among us many who had an active part in those early installations. Many famous mining and metallurgical engineers were engaged for Africa, and scores of mechanics, operators and millwrights were sent from here. South Africa still continues to draw a large amount of her machinery requirements from the Middle West district.

The barrel chlorination process for the treatment of gold ores reached its zenith in the late '90s. Many of the largest installations were built in the Middle West, including those in Colorado for the treatment of Cripple

Creek ores. These plants were the largest of the kind ever built.

The application of the cyanide process began in the '90s. The process has since been greatly developed and improved, especially its mechanical applications, so that it is almost universally employed in the treatment of gold and silver ores. From its inception it has been exploited by the building of many large plants, which have been shipped to all parts of the world.

In the latter part of the last century the development of the mining industry had been so rapid, and the processes of ore treatment had so changed, that the written technology of the subject could not keep pace. The catalogs of the manufacturers in those days were more than mere illustrations of equipment, and they went at great length into the metallurgy and methods of ore treatment. They also contained much useful information in the way of operating hints, engineering data, and general technical information, and were recognized as the best sources of data available. Many of the schools where mining courses were given made use of these catalogs in their classes. Time has changed this practice, and there is now available in the published books on various branches of metallurgy complete and detailed information for the operator and the student. There are also many handbooks on engineering. Above all, there is the great diffusion of knowledge through the technical press. This latter is the current source of up-to-date information on what is taking place, and keeps posted those interested in what is happening in all corners of the globe, long before the information is available in book form.

MANUFACTURERS FORMERLY HANDLED ALL NEEDED SUPPLIES

The machinery manufacturer in the early days had, if possible, a more varied demand upon him than at the present time. Not only was the necessary machinery for the plant furnished, but all supplies required for its operation. These included drills and powder for mining, chemicals and supplies for milling, and often groceries, provisions, and even drugs for the maintenance of the camp. Shipment of coal in sacks for blacksmithing was common. Another extensive demand was for candles and oils, both lubricating and illuminating.

When the application of electric lighting was a demonstrated commercial success, the mining industry was quick to adopt it. It was an easy task to show that the cost of the lighting plant would readily pay for itself in the saving of candles and kerosene, to say nothing of the cost of attention to lamps, which were usually ill kept. Truly in those times the sales engineer had to have a versatile knowledge and experience.

The use of cement was not formerly as general as it is now. The production in this country was limited and confined to the Eastern states. Transportation was not available, and the cost was prohibitive. For this reason many of the old foundations and retaining walls were built of masonry and have proved very durable. Construction was often finished off with cut and dressed capstones, which occasionally were supplied by the machinery builder.

It will be recalled that railroad and transportation facilities were, until comparatively recently, rather limited in the West, and numbers of shipments were made to Missouri River points to be hauled by ox teams several hundred miles to destination. For these rea-

sons, and on account of the inaccessible situations of mines in the mountains, there was formerly an enormous demand for machinery built for transportation on the backs of men and animals. As progress was made in other lines, better means of transportation became available. There is not one sectional plant built now where formerly ten such plants were needed. It is wonderful, however, to recall the enormous plants which were built in sections for muleback transportation and which were shipped all over the world from the Middle West. These included engines, boilers, pumps, compressors, and smelting and milling machinery of capacity and size that taxed the ingenuity of the engineer.

Another requirement of the earlier days was for pumping equipment, which recalls the enormous Cornish pumps with which some of the mines were equipped. Many of the largest of these installations were manufactured in Chicago. Pumping is still a necessary expense in many mines, but modern pumping equipment is not so massive or cumbersome.

Hoisting engines are in use wherever ore is mined. Each installation is a special problem, as the equipment must be made to suit the mine. To refer to any individual type of installation or to many that have been shipped from the Middle West would be without the scope of this article. Suffice to say, the number of machines built is in the thousands and the destination everywhere there is mining. Only a few weeks ago, inquiry was received for repair parts for an engine built over fifty years ago and still operating.

Tramways, both of the surface gravity and the aerial types, were within the scope of the mining machinery manufacturer years ago, and numerous installations were shipped from the Middle West. In recent years, however, this branch has become more specialized with certain rope and cable manufacturers.

Reference should be made to the activity in silver mining during the latter half of the nineteenth century. The large amount of machinery required in the silver milling plants, and the great number of them built, would be in itself a history of interest. The dry crushing and roasting plants, wet crushing silver mills, continuous and combination milling plants, leaching and hyposulphite plants, required a large amount of heavy machinery and many skilled engineers. These plants were shipped to the great producers of silver in Nevada, Montana, Utah, Arizona, Mexico, South America, and, in fact, all over the world, but they have nearly all passed out of existence.

DEVELOPMENT OF SMELTING MACHINERY

Smelting machinery has undergone a great many changes. Forty years ago there probably were twenty smelteries to every one now in operation, as these plants were in smaller units than is now customary. The number of smelting plants shipped from here for both lead and copper can be reckoned by hundreds.

The reasons for the changed conditions now are due to better transportation facilities, enabling shipment of ores to large custom plants, and cheaper operation on the larger scale, making it more economical to ship instead of smelting locally.

Coupled with smelting, the art of copper converting was introduced into the Western states, and some of the first converters were built in Chicago. The development of the industry due to this advance in metallurgy has resulted in the equipment of many large

smelters from this territory, in turn permitting lower operating costs, making it possible to handle grades of ore that could not be treated commercially in the smaller plants.

The roasting of ores has been changed materially from the heap and stall type roasters and hand-rabbed furnaces, to the mechanical types such as the Howell-White, Bruckner, Brown, Holthoff-Wethey, Jackling, McDougal, and kiln.

Probably the greatest of all world's fairs was the World's Columbian Exposition at Chicago in 1893. Here were exhibited not only the products of mines from all over the world, but actual mining and milling processes were in daily operation. Naturally, the exhibition was operated from power developed by machinery furnished by local manufacturers.

POWER DEVELOPMENT

The development of power for mining plants has been an extensive and interesting engineering problem, and likewise has been a vast source of business for the Middle West district. The isolated or individual power plant has been developed to a high degree of efficiency, largely because of remote conditions of location. There has been in later years a growing use in mining districts of electric power wherever possible, especially where developed by hydro-electric plants. Many mines have also made use of gas power installations, and at present there is extensive application of the Diesel engine for power in places where oil is available.

EQUIPMENT SUPPLIED TO IRON INDUSTRY

About 80 per cent of the iron ore produced in this country is mined in the Lake Superior district. Here mining operations are carried out on a larger scale than in any other place in the world. The district being

contiguous to this manufacturing center, it is only natural that a large amount of the machinery required has been locally supplied. Included in the list are hoisting engines, pumps, steam, hydraulic and electric power plants, ore-crushing plants, and ore-washing plants.

MACHINERY IN MOST OF THE NOTED CAMPS

The discoveries and development of the Black Hills, the Rand, Cripple Creek, Mount Morgan, Kalgoolie, Tonopah, Goldfield, Thunder Mountain, the Porphyry Coppers, and many other noted camps have been, in a large degree, responsible for expanding the manufacturing facilities for mining and metallurgical machinery in the Middle West. That it has been possible to make this the largest source in the world for such equipment speaks well for the engineering skill and the manufacturing facilities found in this part of America.

Barnes-King Development Co.

Report of the Barnes-King Development Co. for the quarter ended June 30, 1919, shows that the company earned in that period \$52,998.71, and expended \$25,627.45, leaving a net profit of \$27,371.26.

The North Moccasin property produced \$52,598.76 from 6,298 tons, or \$8.35 per ton. Development work, 756 ft. The Piegan-Gloster property produced \$25,172.50 from 3,801 tons, or \$6.62 per ton. Development work, 597 ft. The Shannon property produced \$105,864.50 from 9,017 tons, or \$11.74 per ton. Development work, 962 ft. In the Mount Pleasant property exploration work to the extent of more than 1,000 ft. was accomplished, but nothing was found to justify further operations. The Silver Bullion shaft has been sunk to a total depth of 200 ft.



ORE DOCKS AT THE PLANT OF THE ILLINOIS STEEL CO. GARY, IND.

Geology of the Gogebic Range and Its Relation To Recent Mining Developments—Part I.

Alterations of the Iron Formation Have Changed the Iron Carbonate to Oxide, Removed Chert From Parts of the Iron-Bearing Series and Caused the Formation of Ore-bodies—Factors Governing Activity of Alteration Processes

By W. O. HOTCHKISS

State Geologist and Consulting Engineer, Madison, Wis.

THE purpose of this series of articles is to describe the details of the geology of the Gogebic Range; to discuss their bearing on the origin of the ore-bodies, particularly on some of the orebodies which lie well north of the foot wall; and to discuss also their bearing on the discovery of new "hanging" deposits.

The general outline of the series of articles is as follows:

Introduction and acknowledgments.

Brief résumé of topography and general geology as given in publications by Van Hise and others.

The geology of this range was first comprehensively described by Irving and Van Hise, whose work appeared as Monograph XIX of the U. S. Geological Survey and was published in 1890. Later it was described in Monograph LII by Van Hise, Leith, and others. There is little to be added to the general descriptions there given, but recent studies have shown new facts of importance relating to the details of the iron formation. It is with these details, which, however, have an important bearing on successful exploration and development, that this series is chiefly concerned.

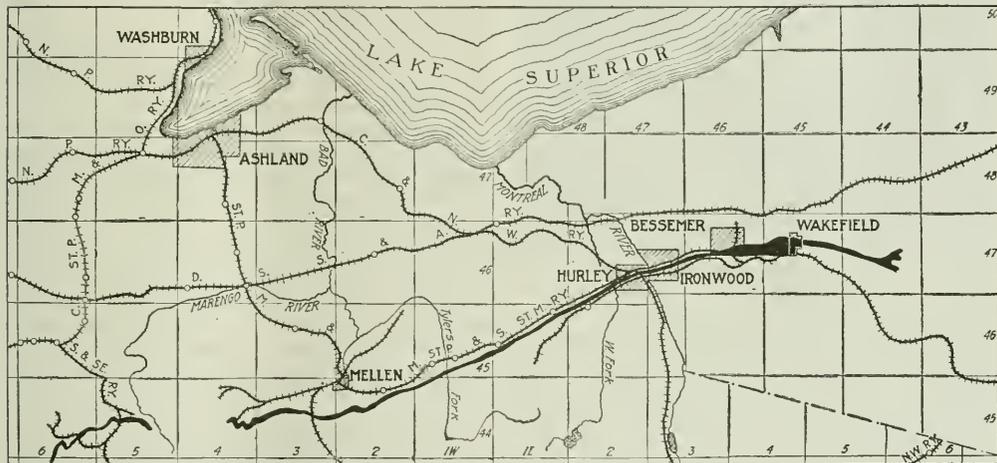


FIG. 1. MAP SHOWING SITUATION AND EXTENT OF THE GOGEBIC IRON RANGE

Detailed description of the Ironwood formation.

General composition.

Origin.

Distinctive characteristics of the various beds.

Discussion of constituents of the formation.

Various forms of chert, iron minerals, conglomerates.

Alteration of the Ironwood formation.

Discussion of the controlling factors, foot wall, dikes, faults, porosity, and folds.

Detailed description of the members making up the Ironwood formation and the lower part of the Tyler.

1. The Plymouth granular chert member.
2. The Yale ferruginous slate and chert member.
3. The Norrie granular chert member.
4. The Pence ferruginous slate member.
5. The Anvil granular chert and jasper member.
6. The Pabst fragmental beds and ferruginous slate beds.

Structure and intrusives of the Ironwood formation.

Occurrence and origin of ore deposits.

Exploration and future possibilities.

The work on which these articles are based was done first for the Wisconsin Geological and Natural History Survey, which will publish a report on the Wisconsin end of the range. Observations were later extended in the course of professional work for private clients; and finally, in order to get comparative data for the whole range, some time was spent visiting mines on the Michigan end of the range and making measurements of the thickness of the various beds which make up the iron formation.

All the mining companies on the range have contributed information and co-operated in securing the desired data. A list of those to whom acknowledgments are due would include nearly every man in an executive or engineering capacity in the district, and my thanks are extended and obligations acknowledged to all of them. It has been a pleasure to meet them and receive their hearty co-operation. I hope they may find in this compilation of their data and my own

observations some partial recompense for the courtesy extended me.

Fig. 1 shows a general map of the range prepared from the general map of the Lake Superior district in Monograph LII and from unpublished field work of the Wisconsin Geological Survey. Three generalized cross-sections showing the configuration of the surface and the geological formations present are given in Fig. 2. In this figure Section A is taken across the Geneva mine, Section B gives the contour of the

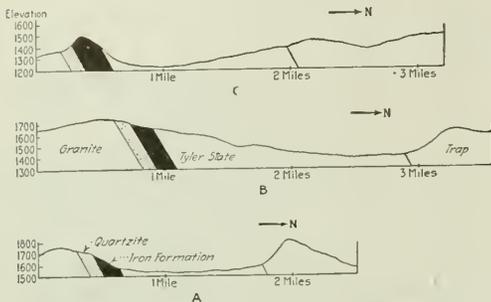


FIG. 2. CROSS-SECTIONS SHOWING THE TWO RANGES, THE "IRON RANGE" AND THE "TRAP RANGE," AND THEIR RELATION TO THE GEOLOGIC FORMATIONS

range at the Montreal mine, and Section C shows a cross-section at a point just west of Penokee Gap. It will be noted that at the Geneva mine the granite makes the crest. Farther west at the Montreal mine the quartzite makes the crest. At Penokee Gap and in general in the western part of the range the iron formation makes the crest of the southern ridge. In the extreme east part of the range, east of Sunday Lake, the quartzite again makes the crest of the ridge and the granite and green schist lie in a depression to the south. Referring to Fig. 2 it will be noted that there are two distinct ranges of hills—the southern one being made by the iron formation or the formations immediately south of it and the northern one by the Keweenaw trap rocks—the copper-bearing series. The valley between is underlaid by the Tyler graywacke slates. The present streams, however, cut almost directly across the ranges and the longitudinal valley between them and pursue a precipitous course of a few miles to Lake Superior, which is about 1,000 ft. lower than the iron range.

In the central part of the district, which has been the most productive, the iron range has been reduced for the most part to isolated elongated hills separated by broad gaps. The same is true of the Keweenaw trap range to the north of the Tyler slate valley. East of Sunday Lake and west of the Montreal River the trap range is much less broken.

GEOLOGICAL FORMATIONS OF THE GOGEBIC

Fig. 2 shows the major geological divisions, which have a general northward dip of about 60° . The oldest is farthest south in the section and is made up of granite and green schist, both being igneous in origin.

Lying upon this base there is the Bad River cherty dolomite. This formation is found in isolated remnants, most of it having been eroded away before the succeeding formation was deposited, and consequently it is not shown in Fig. 2. At the eastern end of the

district the dolomite has a quartzite at its base, known as the Sunday Lake quartzite. The maximum thickness of dolomite is on the Marengo River and is not less than 300 ft. The dolomite lies unconformably on the granites and schists below it, and there is frequently a well-developed conglomerate at the contact.

Upon the dolomite, or on the lower formations when the dolomite is absent, lies the Palms formation. This contact represents an unconformity, but it is marked only by occasional thin lenses of conglomerate. Fig. 3 shows the contact with the granite as seen in the shaft crosscut in the Yale mine. The granite blocks are angular and the granite surface is broken and irregular, showing little rounding by erosion. The lower part of the Palms formation is a quartz slate. It is composed almost wholly of very small quartz sand grains, with a small amount of slaty material. It is made up of very thin, even, to slightly irregular ripple-marked beds. The Palms formation usually varies from 400 to 500 ft. in thickness, but east of Sunday Lake it is as much as 800 ft. thick in places. The upper part of the Palms is a hard glassy quartzite varying from 30 to 100 ft. in thickness. This makes the foot wall of most of the orebodies developed heretofore, and is usually the formation in the minds of the mining men when "foot wall" is mentioned.

Upon the Palms quartzite lies the Ironwood formation, in which practically all the orebodies are found. Descriptions of this and its relation to the quartzite will be given later in detailed form.

Lying unconformably upon the Ironwood formation is the Tyler graywacke slate. It has heretofore been believed that the Ironwood and Tyler were deposited without any erosion period intervening, but conclusive evidence of unconformity has been disclosed by recent work. The Tyler varies from nothing to two miles in thickness. At the eastern and western ends of the district it has been entirely eroded away, so that the Keweenaw deposits rest directly on the iron formation or on lower formations. The extreme lower part of the Tyler is quite heavily ferruginous in many places, sufficiently so to form orebodies. This part is described in detail with the Ironwood formation. There is much

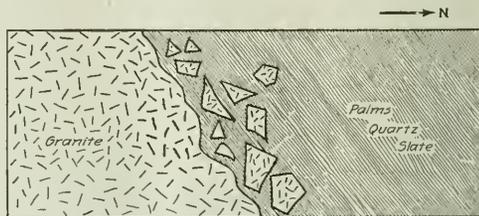


FIG. 3. CROSS-SECTION OF MAIN CROSSCUT IN YALE MINE, SHOWING CONTACT OF THE PALMS QUARTZ SLATE AND THE GRANITE

iron carbonate in the Tyler, and it is not at all impossible that ore may some day be found well north of the Ironwood formation. The exposures are so few, however, that little information is available with regard to this.

The Keweenaw formations lie unconformably upon the Tyler slates. The first of these is a formation that in some places is a sandstone and in other places is a quartzite with a very well-developed conglomerate at the base. Then follow the successive volcanic flows,

for the most part dark green diabases and amygdaloids with porphyries and syenites.

The Ironwood formation is what is commonly called the "iron formation" in the district. It is dominantly composed of some form of cherty silica and some form of iron. Away from the orebodies the iron minerals usually range from 25 to 50 per cent of the formation by weight and the silica from 50 to 75 per cent. Owing to the silica being lighter, the 50 to 75 per cent of the iron formation which it makes by weight would make from 67 to 86 per cent of the volume. In addition to these two predominant constituents, certain phases of iron formation contain moderate percentages of carbon, and of clayey or argillaceous matter, the presence of which is indicated by the alumina in the analyses.

The Ironwood formation was deposited in water, in the same general way as limestone, and so is sedimentary in origin. The deposition of a sedimentary formation is a very slow process. To accumulate 600 to 1,000 ft. of this iron formation doubtless required many thousands of years. During this long period there were slow, gentle oscillations in elevation of the land and of the sea bottom, possibly no more rapid than the rate at which the Lake Superior region is known to be rising at the present time—a few inches in a century. The changing of elevation during the long period of time in which the Ironwood formation was being deposited caused corresponding changes in the character of the deposits. In the shallow-water periods deposits of ferruginous cherts were formed. When the water became deeper, deposits characteristic of deeper water conditions were laid down, namely, the ferruginous slates. When the bottom was elevated, some of the near-shore deposits were raised above the surface and subjected to erosion, and conglomerate beds resulted. Along with these broad general changes less general or local variations were taking place, which resulted in similar differences of deposition on a smaller scale. These lesser variations are sometimes limited to a few miles, and sometimes to a few thousand feet in extent along the range.

As the deposition of a formation of this character, extent, and thickness would require a body of water of considerable area, it is evident that as *general* changes occurred they would be reflected in changing character of the deposit over *wide* areas, and because of this we find certain well-defined members of the formation which can be traced throughout its full extent. Changes which were not so widespread in their nature resulted in more or less local deposits, which are found as minor lenses extending over only a few miles, or over a few thousand feet. Some of these minor changes affected such small areas that variations are found on the different levels of a single mine.

The foregoing description will serve to give a general picture of this iron formation. It is made up of five well-defined divisions, each of fairly considerable thickness, which are identifiable throughout the range. Within each of these five larger divisions there are minor subdivisions, which may extend several miles as definite beds, and still smaller members, which may be identifiable only for a few thousand feet.

It is important to remember that in a sedimentary formation of this kind, deposited on a flat sea bottom, changes in character of any particular bed cannot be abrupt, because of the nature of the conditions under which it was deposited. A proper appreciation of this fact will greatly assist the mining engineers of the dis-

trict in studying the geology of the mines. A thick ferruginous slate bed on one level does not become a hard granular chert bed on the level below. If the slate bed is not found, it is seldom proper to assume that it has changed in original character. Such a thick bed will usually extend considerable distances before pinching out, and any change in the original character of a thick bed requires thousands of feet to be completed. If a thick bed is identified on one level and not on the next, its absence is almost certain to be due to faulting, or failure to correlate oxidized and unoxidized phases of the same bed. The most common difficulty is failure to recognize a soft, red, ferruginous slate on one level as the much-altered equivalent of a hard greenish gray, thin-banded iron carbonate on the next level.

The differences in character between the various members which make up the formation are due, first, to the differing character and amounts of the various constituents which form them, and, second, to the difference in bedding. Some beds contain one variety of

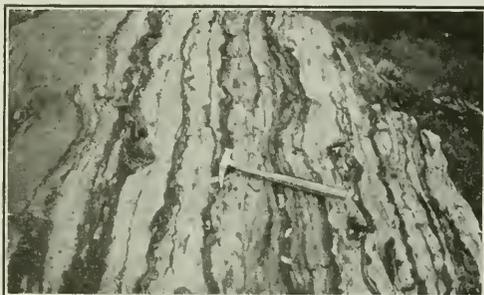


FIG. 4. CHARACTERISTIC "WAVY-BEDDED" GRANULAR
CHERT AND HEMATITE
(Taken at outcrops on Tyler's Fork, by W. O. Hotchkiss)

chert, and adjacent beds may contain different varieties. In some of the beds a large amount of iron was deposited and in other beds a relatively small amount. This particular feature, the variation in original iron content of various beds, is one of extreme importance in searching for orebodies, as it is in these originally more heavily ferruginous beds that orebodies are most likely to be found.

In some beds the iron is chiefly in the form of iron carbonate; in others it is chiefly in the form of magnetite and hematite; and this feature serves as a distinctive characteristic in recognizing various beds. In other beds more or less noticeable amounts of clayey material were deposited, and these form the so-called slaty portions of the formation.

The second feature causing difference between the various members making up the formation is the character of the bedding. In the dominantly cherty portions of the formation certain members of the formation are peculiarly irregularly bedded. As a convenient short term to characterize this bedding the term "wavy bedded" is used. The appearance of this bedding is given in Fig. 4. It will be noted that the bedding planes are never parallel for any appreciable distance. The wavy-bedded portions of the formation are usually composed of thicker individual layers than the other portions of the formation.

In strong contrast to the wavy-bedded structure is

what is called the "even-bedded" structure. This even bedding is shown in Fig. 5. In these beds the bedding planes are parallel for long distances and usually the beds are very thin. The similarity to the bedding in slate has resulted in the proper and rather general practice of mapping practically all soft even-bedded portions of the formation as "slate." The hard unaltered portions of these same beds, however, when found in other parts of a mine, have not been recognized always as equivalent.

The bedding characteristics just described are remarkably consistent in the various major members



FIG. 5. CHARACTERISTIC "EVEN-BEDDED" FERRUGINOUS SLATE OF THE IRON FORMATION. THE SCALE LIES UPON A BED OF GRANULAR CHERT

(Taken by W. O. Hotchkiss on east side of Penokee Gap)

of the formation and serve as a basis for distinguishing them.

While it cannot be stated positively as a fact, it is believed that the wavy-bedded members of the iron formation are relatively shallow water deposits in which the bottom was within reach of the action of waves that disturbed the bottom and produced the wavy-bedded structure, and the water contained abundant oxygen to oxidize the iron as it was deposited. The even-bedded portions of the formation are believed to have been deposited in deeper water where the bottom was

below the reach of wave action and contained so little oxygen that the iron could persist as carbonate.

One of the most common changes in character, found as a particular bed is traced along the range, is in the ferruginous slates. In places these are almost entirely free from the thin flinty chert layers. As the bed is followed from mine to mine the number of platy flint layers increases gradually until they make up a major part of the bed. Such beds on the one end of the range can be properly correlated with those on the other end only by tracing them carefully through the intervening area.

Another common variation along the range is found in the granular cherts. From the Davis mine west these cherts contain very few jasper grains. Eastward the jasper grains increase gradually in amount until some of the beds become "granular jaspers" and are made up almost wholly of iron oxide and round jasper grains.

Similar changes occur down the dip, but owing to the relatively short distance that observations can extend, these changes are not so marked.

DETAILED DESCRIPTION OF CONSTITUENTS OF THE IRON FORMATION

As there is no standard terminology in use in all of the mines to describe the various kinds of iron formation, it is necessary to give some discussion to this subject here, so that there will be no doubt as to what is intended by the terms used in this series of articles.

The constituents of the iron formation may be tabulated as follows:

Chert.

1. Granular chert. When the individual grains are jasper this is called "granular jasper."
2. Fine-grained chert.
3. Flinty chert.
 - (a) Clear, colorless.
 - (b) Yellow.
 - (c) Green.
 - (d) Vermilion, or "jasper."

Iron minerals.

1. Hematite.
 - (a) Non-hydrous or "hard blue" and earthy, red hematite.
 - (b) Hydrous—red, yellow, or brown limonite.
2. Siderite (iron carbonate).
3. Magnetite.

Slaty material.

The present form of the small amounts of clay originally deposited in the ferruginous slates.

Conglomerates.

These are almost invariably made up of pebbles of iron formation material.

Minor constituents.

Very small amounts of quartz sand, lime, magnesia, pyrite (rare), manganese, phosphorus, and carbon are found in the iron formation.

Chert—Both by weight and by volume the largest portion of the iron formation is made up of silica. This silica occurs in a variety of forms, all of which are included under the general name of chert. According to Van Hise, chert includes all forms of amorphous and finely crystalline, non-fragmental silica. It is distinguished on the one hand from sandstone or quartzite in that it is deposited from solution instead of being carried as fragments of sand in suspension and deposited by the water. On the other hand, it is distinguished from vein quartz, which also is deposited from solution, by its finely crystalline or amorphous character.

The descriptions given here apply to the unaltered

forms, the altered chert being described later under the general title "Alterations of the Iron Formation."

There are three principal varieties of the chert in the iron formation. What is spoken of in this article as "granular chert" is composed largely of grains of chert approximately $\frac{1}{8}$ in. in diameter. These grains are egg shaped to round in form, and the spaces between are usually filled with clear flinty chert and iron oxide, which gives more or less contrast of color between the matrix and the granules. This chert has been called "taconite" from the likeness in appearance to the granular Mesabi taconite, but it differs in that the grains are in general not iron silicate, as they are on the Mesabi. It is also called "oolitic" chert, but as the grains show only rarely the characteristic concentric markings, it is not a true oolite, so it is given the more descriptive name of "granular chert." Associated with this granular chert and making an important part of it are abundant thin beds and grains of iron minerals.

The second variety of the chert is what is referred to in this article as "fine-grained chert." This differs from the granular chert in that it has no noticeable coarse granular texture. However, it has a distinct grain and breaks with an uneven fracture much like very fine-grained maple sugar, or like chocolate. In this fine-grained character it differs from the third variety. The iron minerals occur in the fine-grained chert in exactly the same way as in the granular chert.

The third variety of chert is what is called in this article "flinty chert." When in its fresh state this flinty chert is semi-transparent in thin splinters, breaks with a smooth curved surface like the fracture of glass, and has no visible granular texture. The term "jasper" as used is limited to the particular variety of flinty chert which is stained a brilliant vermilion by finely disseminated hematite. The term jasper has oftentimes been used as synonymous with "iron formation," making it an even broader term than chert, but it seems desirable here to limit its application to the very definite and easily notable brilliant red flinty chert.

The flinty chert occurs most commonly in the thin and evenly bedded parts of the formation as thin pure flint or jasper bands between ferruginous bands. The grains of which the granular chert is made up are themselves usually the flinty form of chert, but the term as used here is not applied to these granular forms.

In distinguishing these different cherts it must be borne in mind that it is rarely possible to make absolutely sharp distinctions between similar varieties of rocks. Gradation phases are common. It is easy to find hand specimens of chert which are difficult to assign to one of the three chief varieties described, but when large masses are studied, it is easy to tell which variety they are.

Iron Minerals—In the iron formation there are three principal types of iron minerals—hematite, magnetite, and siderite (iron carbonate). Hematite is the most abundant iron mineral present both in the unaltered and the altered phases of the iron formation. In the extreme west end of the range there are some particular parts of the formation in which the percentage of magnetite probably exceeds that of the hematite, but usually magnetite is a very minor constituent compared to the other iron minerals.

In the unaltered iron formation the hematite is entirely of the hard, blue, non-hydrous variety, and

occurs in rounded granules of the same size and shape as the granular chert grains, as thin solid beds, or as finely disseminated particles. In the altered phases of the iron formation some of the hard, blue, non-hydrous hematite is found, but it is exceeded in amount by the red, yellow, and brown, more or less hydrous forms of hematite.

Magnetite occurs in small quantities throughout the formation, both in the altered and unaltered phases. In the productive part of the range it is more abundant in the ferruginous slates than it is in the cherty portions of the formation.

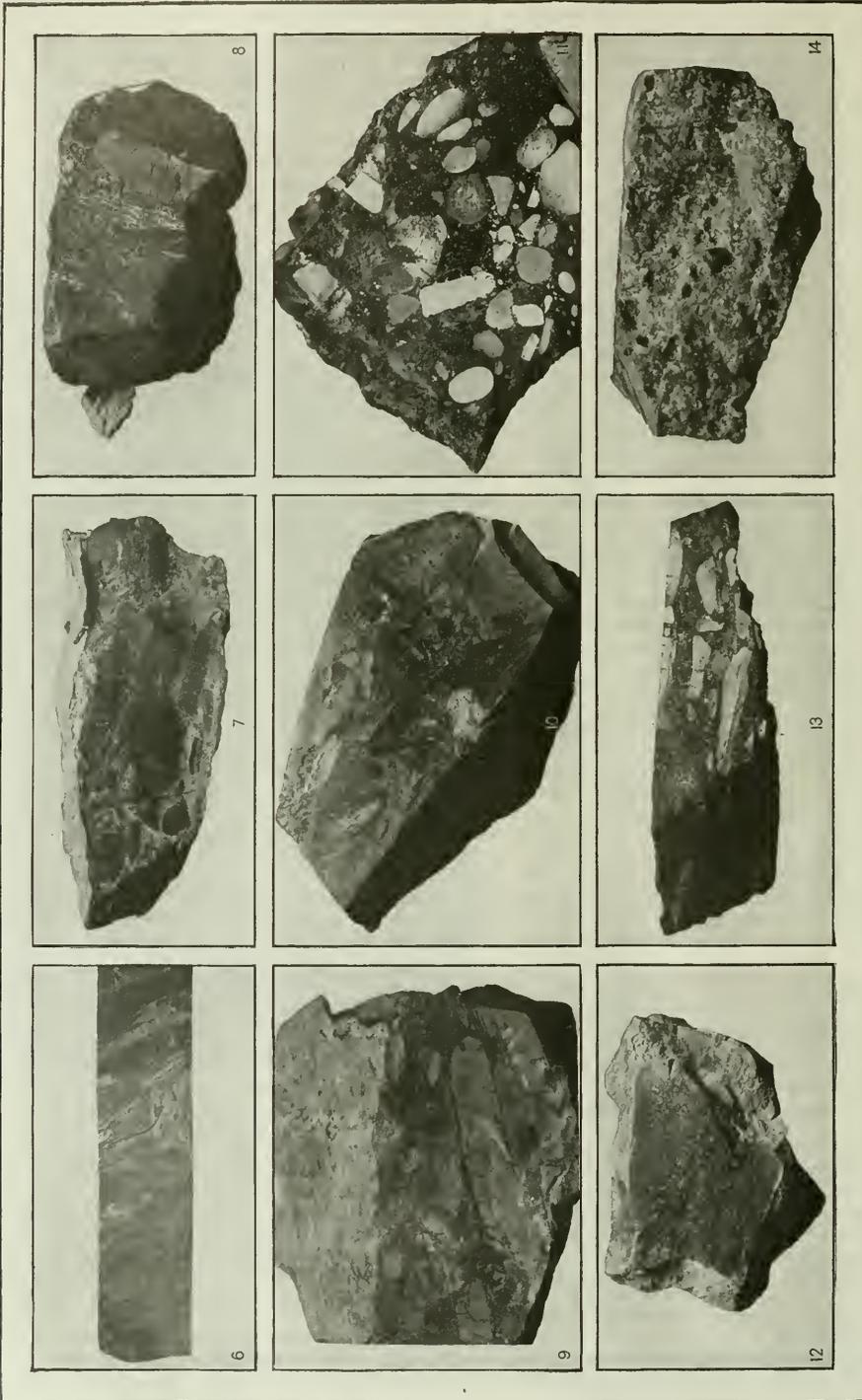
Siderite occurs both as coarsely crystalline beds, and in beds of a massive fine-grained form, which is best described as having the appearance of a consolidated iron-carbonate mud. This latter phase is the most common and almost invariably exhibits very fine parallel bedding.

In the dominantly cherty portions of the formation—the "granular" and "fine-grained" cherts—hematite, magnetite, and carbonate occur both as separate granules and thin beds. When these formations are oxidized, the carbonate and much of the blue hematite and magnetite are altered to more or less hydrous hematite of earthy consistency and various shades of red, yellow, and brown in color.

Color—The color of the unaltered formation, as seen in drill cores and in some new mine workings, is dominantly gray with a prevailing tinge of green. The more heavily ferruginous phases of the original formation are darker than the more cherty phases. The color of the altered formation is dominantly a brownish red from the great abundance of earthy iron oxide. Various thin beds of the formation alter to very characteristic colors, which are oftentimes persistent over considerable distances. These characteristic colors help to identify beds of only a few feet in thickness over distances of several miles. The fine-banded jasper is a case in point. As a consequence, the color of a particular bed is oftentimes of very great use in correlating the various strata in different portions of a mine.

"Slate"—Certain phases of the iron formation are frequently referred to as "slate." While in some particular cases the bands so described may contain as much as 30 to 40 per cent of argillaceous or slaty material, in many cases what is termed "slate" in the iron formation is so called largely because of its thin, even bedding, which is like that of a true slate. When these so-called slate beds are found in their unaltered condition they are dominantly iron carbonate rock, with varying percentages of blue hematite and magnetite and flinty chert. In most cases the true slaty matter is a relatively insignificant part. Nevertheless, the term is well fixed in usage in the district, and there is no suitable short term to use in its place. Most of the so-called slate beds, as seen in the mine workings, should be properly described as "somewhat slaty, oxidized iron carbonate rock, with flinty chert bands." Consequently the term "ferruginous slate," which is used for these beds in this article, should convey to the reader's mind the idea that they are not dominantly slate, but that iron oxide, or iron carbonate, and flinty chert make up nearly the whole of the rock so designated.

The argillaceous material present in this type of rock was brought in by the streams entering the body of water in which the iron formation was being deposited.



ROCK SPECIMENS FROM GOGEBIC IRON RANGE

Fig. 6—Polished section of a diamond-drill core, showing concretionary chert conglomerate at base of Ironwood formation. Fig. 7—Polished specimen of fresh unleached conglomerate from test pit at the Plummer mine. Cut across beds. Fig. 8—Polished specimen of the conglomerate marking the contact between the Norrie and Ponce members. From the Montreal mine. Shows effect of leaching. Cut across beds. Fig. 9—Polished specimen of yellow flinty chert conglomerate about 140 ft. north of the foot wall in the Plummer mine. Shows effect of leaching. Cut across beds. Fig. 10—Polished specimen of fragmental jasper or fine jasper conglomerate from base of Ironwood formation. Fig. 11—Cut parallel to beds. Fig. 12—Polished specimen of fragmental jasper or fine jasper conglomerate from base of Ironwood formation. Fig. 13—Same specimen as Fig. 11. Cut across beds. Fig. 14—'Worm-eaten chert' from the Plummer mine. Shows an early stage of leaching of the chert in which the water has attacked irregular, more easily leached parts.

It was carried in suspension and deposited with the iron carbonate and chert.

Conglomerates—Possibly it should be explained in beginning the description of these conglomerates that some of the mining engineers of the district are rather inclined to believe that some, at least, of what are called conglomerates in this article are "growths in place" representing enlargements of the grains of the granular type of chert with which these conglomerates are usually associated. While it may be admitted that this is a possible explanation for the occurrence of these pebbles, it is not believed to be the correct one. The fact that most of them exhibit no concentric arrangements of material, such as would be characteristic of a concretionary growth in place, and the further fact that the pebbles are composed of several different varieties and colors of chert and of hard blue hematite, with bedding planes in various inclined attitudes, are satisfactory evidences that they are eroded fragments of older beds. Some of the well-developed phases of these conglomerate beds are shown in the illustrations, Fig. 6 to 13. From these it is evident that there can be little doubt of their true conglomeratic nature.

The pebbles are almost invariably of the much elongated form characteristic of pebbles derived from thin bedded or platy formations. (See Figs. 11 and 13.) A pebble half an inch in thickness may be six inches in its longer dimension. Some of the pebbles of the conglomeratic jasper marking the lower part of the Plymouth member are definitely of concretionary origin (Figs. 6 and 10), showing beautiful examples of the banding characteristic of concretionary growth. But as these concretionary growths were formed, they were oftentimes battered about by the waves, broken and rounded, so that the outlines of the pebbles frequently do not conform to the rounded outlines of concretionary growth. In some cases pebbles derived from the more massive beds of chert are more nearly round in form and correspond in shape to the ordinary round pebbles which we find in the glacial drift.

The form of a pebble is always characteristic of the type of material from which it is derived. Crystalline rocks make round or egg-shaped pebbles. Thin bedded rocks and those that break into thin plates make thin flat pebbles. In the usual textbook illustration, and the specimens exhibited in collections ordinarily shown to students, conglomerates are composed of well-rounded pebbles derived from massive formation, such as granite or quartzite or other crystalline rocks. The textbooks seldom give adequate consideration to the conglomerate derived from material which has a tendency to break into thin plates, and, as a consequence, the average student gets only a partial idea of the truth as to the forms assumed by conglomerate pebbles. A formation which breaks into thin plates makes flat rounded-edged pebbles, as most of the wear on such pebbles is confined to the thin edges.

A common characteristic seen in conglomerates derived from thin-bedded formations is that these thin flat pebbles oftentimes stand upon edge across the bedding, instead of lying flat upon their sides; hence the name "edgewise conglomerates." Wherever the conglomerates found in the Ironwood formation are composed of thin flat pebbles, almost invariably the flat sides of the pebbles are parallel to the bedding or nearly so. Just exactly what this signifies is not known with certainty, but it is believed to indicate either

gentle current action or moderate wave action, rather than vigorous action of any kind. I have observed pebble beds forming on the shores of modern lakes where the material was derived from a thin, platy limestone subjected to vigorous wave action, and the pebbles all stood upon edge. It is believed that if the flat pebbles in this iron formation conglomerates had been subjected to similar wave action, they also would stand on edge. Instead of calling these formations "edgewise" conglomerates, they could more properly be called "flatwise" conglomerates.

Further evidence of their true conglomeratic character is the occurrence of three of them at horizons which are believed to represent unconformities. These include the one at the base of the Plymouth member, the one at the base of the Pence member, and one in the Pabst member. The fourth one, at the top of the Plymouth member (or the base of the Yale member), may or may not indicate an erosion interval, but suggests that in further work the evidence on this should be carefully sought.

In addition to the conglomerate beds mentioned, scattered pebbles are quite commonly found in the granular cherts, especially toward the eastern end of the district. These are believed to indicate that the granular cherts were deposited in relatively shallow water where the larger waves due to occasional storms could transport larger fragments fairly considerable distances.

Minor Constituents—Quartz sand grains are found in certain parts of the Ironwood formation. They occur as scattered grains of sand in the chert, but never, so far as is known, in sufficient abundance to make beds dominantly of sand. Their occurrence suggests the probability that they were wind-borne, rather than washed in by currents and waves, as are ordinary sands. The impure quartzite which is found associated with the heavily ferruginous beds of the lower part of the Tyler formation is of different character, however, and was an ordinary wave- and current-carried bed of sand.

The lime, magnesia, manganese, phosphorus and some of the other constituents that occur in minute amounts are disseminated through the formation quite generally. They are not in sufficiently large quantities to be visible as a rule, excepting the manganese. The amounts present in various beds differ decidedly; ore derived from one member of the iron formation may be low in phosphorus, while ore making part of the same orebody but derived from beds to the south or north may be much higher in phosphorus. Whether there is any uniformity throughout the mines in the high or low phosphorus or manganese content of ore derived from a particular bed is a question that would be a very interesting and important one to solve on account of its bearing on the problem of ore grading. The information from which to do this for the range as a whole has not been available, but in some mines there is no question of the definite relationship between the phosphorus content and certain beds from which the ore was derived. It is quite possible that there is a similar relation between the manganese content and the various beds of the formation.

The pyrite and carbon are found almost exclusively in the ferruginous slates. The pyrite is quite rare; in fact, Gogebic ores contain as little sulphur as any of the Lake Superior ranges.

The carbon, when present, is always in particles too small to distinguish without a microscope. In one of

the ferruginous slates it is present in sufficient abundance to give a black color. This carbon is almost unquestionably derived from minute organisms that lived in the sea in which the iron formation was deposited.

ALTERATION OF THE IRON FORMATION

The particular alterations which are of interest to mining men are: (1) Those by which the iron carbonate has been changed to iron oxide; (2) those by which chert has been removed from certain portions of the iron formation, thereby forming the ore deposits; and (3) those by which iron has been carried and deposited in certain favorable locations, thus assisting in forming orebodies.

The iron carbonate requires the removal of carbon dioxide and the addition of oxygen to alter to iron oxide. In this process the iron oxide united with water, so that the first product was limonite. This hydrated iron oxide gradually lost water and the oxide changed in color from the yellow characteristic of limonite to the red of the earthy hematite.

The chert was altered by being partly dissolved by the water, and became a soft, white, chalky form of silica, which is a very fine powder in its final form, and is easily carried away by the circulating water, either in solution or suspension.

This alteration to chalky chert goes on quite uniformly in the flinty varieties, but in the granular and fine-grained cherts it is much more irregular in its action. In these it frequently affects spots which are usually $\frac{1}{4}$ to $\frac{1}{2}$ in. across. The chalky chert is removed very quickly from these spots, and they are either left as holes with iron-stained walls or are filled with iron oxide. This results in a peculiar appearance usually referred to as "worm-eaten" chert. This appearance is shown in Fig. 14 and is quite characteristic of certain individual beds of the formation.

The iron minerals were in part dissolved and carried to places favorable for deposition and in part carried in suspension and deposited in the openings caused by the removal of the chert.

All these alterations were caused by the circulation of water coming from the surface and carrying air with which to cause the oxidation. In considering the different factors which resulted in the greater or lesser activity of these altering processes in particular situations, it can be stated in general that any factors which aided in the circulation of water or any conditions which permitted or controlled its concentration in particular beds or in any particular situations have been effective in promoting the greatest degree of alteration of the iron formation. It is probable that the time of the most active alteration was in the period immediately following the Keweenaw folding, when topographic relief was greater than at present, and, presumably, more arid conditions prevailed.

FACTORS CONTROLLING THE CIRCULATION OF WATER

The factors which have had an obvious control of the circulation of water may be stated as follows: Foot wall, dikes, faults, physical condition of beds, porosity, folds.

Foot Wall—The influence of the foot wall on the circulation of water through the iron formation is due to its general dip of about sixty degrees to the north and its relatively impervious character. It is obvious that this foot wall must have served to concentrate the

circulation of water into that portion of the formation immediately upon the quartzite. Similarly, any impervious bed in the iron formation has served in the same fashion to concentrate the water in more porous parts of the formation above it. If other conditions were right and this impervious bed was sufficiently extensive it might form the foot wall of an orebody. Thus, orebodies may occur immediately north of such an impervious bed, wherever it may be. The ferruginous slate beds make these secondary foot walls in many cases. In other cases dense massive beds of the chert serve as foot walls.

Dikes—There are numerous dikes present in the iron formation. When fresh they are quite impervious, and under the influence of water altered to an equally impervious clayey substance. As these dikes are nearly perpendicular to the beds of the iron formation, they made an impervious trough with any impervious foot wall that they intercepted. These impervious troughs usually have an eastward pitch, but there are many cases of westward pitch. They served to concentrate the circulating water effectively, bringing it southward toward the foot wall. The most common type of orebody is one which owes its origin largely to, and is found at the intersection of, a pitching dike and an impervious foot-wall formation.

Orebodies of large size frequently occur in places where a westward-pitching trough, made by a dike and a foot wall, has carried the water downward to the west to the intersection of an eastward-pitching dike which has carried the water downward to the east.

It must be borne in mind that the trough formed by a dike and a foot wall represents only two of the factors which controlled the circulation of water. If, for any reason, the iron formation in such a trough was too impervious, the water did not get through. If the formation was porous, but too lean in its original iron content, the leaching was not likely to proceed far enough to clean the silica out, and this trough will not contain any ore. As a matter of fact, probably not more than half of these dike and foot-wall troughs will be found to contain workable orebodies. In such situations one or both of the factors of porosity or of original high iron content are lacking, with the result that the alteration in this portion of a trough has not proceeded far enough to develop ore.

Faults—Faults were of importance in the alteration of the iron formation because in many cases they made ready channels for the circulation of water. The great fault parallel to the beds, which is known practically throughout the whole productive portion of the range, has played an important part in the formation of many ore deposits. Where the brecciation, due to the faulting, was in ferruginous clay parts, the formation was usually left in a porous condition and was quite likely to be altered to ore along dikes controlling the water circulation, because of the greater freedom with which the water circulated. On the other hand, where this bedding fault occurred in the relatively impervious ferruginous slates, it has in most cases resulted only in mashing them and leaving them still impervious. As a consequence, the alteration has rarely gone to the stage of producing ore in such situations.

In addition to the bedding fault, there are faults in many directions in the iron formation, and these various directions of faulting played an important part in the formation of ore. The faults which go directly across the formation and are approximately vertical

in their dip have in many cases permitted the circulation of water to go down across the formation and spread out into the richer and more porous portions of the formation, developing portions of these beds into blanket-like orebodies. Usually, however, as these blanket types of orebodies come to a dike below, they thicken in cross-section, as indicated in Fig. 15. In this illustration the fault lies parallel to the plane of the paper.

There are other faults known in the formation which have the attitude of a normal eastward-pitching dike in which the portion of the formation lying below the fault is set out north relative to the portion above the fault. In some cases this has resulted in bringing relatively impervious parts of the iron formation or of the quartzite below the fault underneath the relatively pervious and rich portions of the formation above the fault. This condition has served to control the water circulation much as though a dike were present. It is believed that some of the orebodies in the Mikado and Asteroid mines are due to situations of this kind.

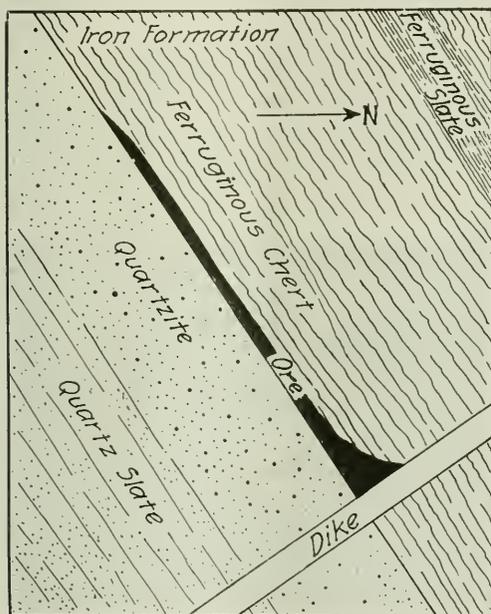


FIG. 15. THIN "BLANKET" TYPE OF OREBODY ON THE FOOT WALL SHOWN IN CROSS-SECTION

Physical Condition of Beds—Some beds in the iron formation are relatively much more porous than others in their original condition. These porous beds favored the circulation of water, while the more impervious beds relatively impeded it, and so were subjected to a less less active circulation. Of two beds, equally rich in iron originally, a porous one is much more likely to have developed into an orebody than one which was impervious. This controlling factor even goes farther than this statement would indicate. For instance, many of the ferruginous slates in their original condition contained a larger percentage of iron than some of the ferruginous chert beds; and yet these ferruginous slates have been altered to ore much less frequently than the

chert beds, the relatively impervious nature of the thin-bedded ferruginous slates acting to retard the alteration process.

The cherty members of the iron formation seem in general to be more porous than the ferruginous slates. In these more cherty portions the massive parts where the chert beds are much thicker are in general less porous than the beds in which the bedding planes are closer together. In some places orebodies rest upon a foot wall of massive, dense, lean, ferruginous chert, which has proven to be sufficiently impervious to the



FIG. 16. SKETCH OF WEST SIDE OF A CROSS CUT ON THE 14 LEVEL OF THE PURITAN MINE

Shows the irregular top of an orebody and the way the form is influenced by thickness of beds. Where beds are thinnest the formation is altered to ore higher than where they are thicker.

circulating water to serve effectively as a foot wall, and thus act to concentrate the circulation in the thinner bedded ferruginous chert above it.

In an orebody, especially near its north or south edges where large chunks of rock are found in the ore, it is found on tracing these along the beds that they are remnants of the unusually thick single beds of chert. Thus it almost invariably happens that, while the bottom sides of an orebody are relatively smooth planes, because they rest upon a dike and a foot wall which control the form, the top of the orebody or the "cap rock" is of an irregular shape. The alteration to ore has proceeded higher in some beds than in others, and in between these places, where the ore goes high, the "cap rock" projects down into the ore. The principal factors controlling the alteration of the iron formation in dike troughs, and hence the shape of the top of the orebodies in cross section, are the richness of the original beds in iron and their porosity. Where the beds are richer and more porous than usual the ore goes highest. In other words, the alteration of the original formation has proceeded farthest. Rock masses which project down into the orebody represent the leaner or less-porous portions of the formation, and the chert masses which project farthest are usually both relatively impervious and relatively lean in their unaltered condition. These facts are illustrated by Fig. 16, in which the beds under bracket (1) are thicker, more impervious and contain less iron than the others. Those under brackets numbered (2) show somewhat thinner bedded chert. Those under brackets numbered (3) are thin bedded and contain the greatest percentage of iron and are most porous. The alteration to ore has proceeded higher up on these beds than in the thicker bedded, less porous, leaner beds. This is a sketch from a crosscut through the top of an orebody in the Puritan mine.

Folds—Folds seem to be much less important in relation to orebodies on the Gogebic than in other Lake Superior ranges. They are unimportant in the main productive portion, because the formation has simply been tilted to an angle of about sixty degrees, with almost no crumpling of the beds. In the western portion of the district, however, the structure is somewhat different in that there are several large folds

which form westward-pitching troughs. One of these of very large size occurs in Sections 9 and 10 of T.44, R.2W. Two other large folds of this character are known in Sections 16 and 18, T.44, R.3W., west of Penokee Gap.

In the much-faulted area lying between the Anvil mine and the big Sunday Lake cross fault east of the Mikado and Wakefield mines, the faulting has been accompanied with folding, which has developed at least one pitching trough in the formation.

No orebodies are known in any of these pitching troughs, but exploration up to the present time has been so meager in these structures that it cannot be said whether or not they have influenced the water circulation to such an extent that orebodies resulted. It is believed, however, that conditions of this sort present favorable places for future exploration.

(To be continued.)

Power Rates for the Engels Copper Mining Co.

California State Railroad Commission Determines Readjustment on Basis of Consumption and Adverse Natural Conditions of Supply

READJUSTMENT of rates and service by the Railroad Commission for the Engels Copper Mining Co., of Plumas County, Cal., which is served by the Great Western Power Co., was contained in a decision handed down on Aug. 13 in the complaint of the mining company against the power company which is expected to reduce the copper company's bill for power approximately \$40,000 a year. The Engels company is one of the largest consumers of power on the Great Western system, its demand exceeding 1,000,000 kw.-hr. per month, at a cost of more than \$175,000 a year. To supply the mine the Great Western constructed a 22,000-volt delivery line from Veramont to the Engels mine, ten miles distant. This line connects with the sixty-mile line at Las Plumas, on the Feather River. The mining company consumes 88 per cent of all the power sold in Plumas County.

In its complaint the mining company alleged that the Great Western Co. has been charging its highest rate for this class of service, and the Engels company demanded not only that the rate be reduced to the cheapest rate for the same class, but, in addition, that the power company be required to enlarge its delivery facilities in order that the mining company could make many improvements, all of which would require further use of power. The power company put great stress on the risk of the business of the mining company and the great expense necessary to supply it at all. The special line is constructed at high altitude over heavily timbered regions and in a district where there is no probability of further industrial development. The company contended that it was entitled to the highest rate because of the equity of covering this great cost, approximately \$400,000, in its rates. The mining company presented facts to show that it has enough ore blocked out and a profitable market to keep it operating at least ten years.

The decision requires the power company to construct within ninety days such additional facilities between Veramont and the mine as shall provide adequate line capacity. The mining company contended that the ca-

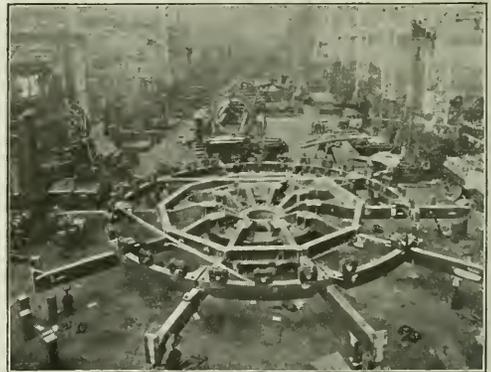
capacity was not equal to its demand and that it had been subject to many costly and avoidable interruptions by reason of the lack of diligence on the part of the power company. The commission explains that the power company cannot be held responsible for acts of nature and climate where the line is in such an exposed condition. In its decision the commission bases the new rate upon the demand of the mine and not upon the connected load at the Veramont station. The commission holds that the extension of the lowest rate to Plumas County would not adequately compensate the power company.

The rates fixed for the Engels company are effective Aug. 22, and are: Demand charge, \$1.50 for the first 200 kw.; \$1.25 for the next 800 kw.; \$1.00 for all over 1,000 kw. per month, plus an energy charge of 1.0c. for the first 100,000 kw.-hr.; 0.9c. for the next 400,000 kw.-hr.; 0.7c. for all over 500,000 kw.-hr. per month.

The minimum charge of \$50 per month is established, and the measured maximum demand is fixed at the highest average demand in kilowatts recorded during any fifteen-minute period of the month.

A Copper-Casting Machine

The photograph reproduced herewith illustrates the general supporting frame of a copper-casting machine while the machine was being assembled at the plant of the Worthington Pump & Machinery Corporation, Cudahy, Ill. The entire part shown revolves, and carries with it the molds, which are placed at the outer



WALKER CASTING MACHINE IN PROCESS OF CONSTRUCTION

periphery. This particular machine will carry thirty-six molds when turning out wire bars, three molds fitting into each segment or opening between the radial arms. When the machine is being used for slabs, two molds are placed in a segment. This casting machine is of the well-known Walker type, in general use for a number of years in copper refineries.

Amalgamated Zinc (De Bavay's), Ltd., have had considerable success in using the Cascade system of flotation on Broken Hill blende ores; in fact the results are said to equal those obtained with that company's original practice. At the Central Mine, the results were not as good as had been obtained with the sub-aeration cells, particularly as regards the percentage of gangue in the blende concentrates.

Drinking Water and Morale

The Consideration of the Mine Supply Should Be Regarded as an Essential Part of Welfare Work—
The Dangers of Natural Contamination

BY RAY W. ARMS

THE subject of drinking water supplies for mining camps is one of those important but seldom discussed topics which should receive more consideration than it gets. Everyone recognizes the need of providing good drinking water, and a source of supply of this necessity is among the first essentials to be established in a new camp. Too frequently, however, managers are easily satisfied, and congratulate themselves on an easy solution of the water problem, when they could, with profit, spend more time and trouble in that particular. After several years of wandering from one camp to another, I am convinced that bad water is the cause for much of the unrest among workmen, and that good water will, directly or indirectly, remove much of the difficulty arising from this discontent.

A certain well-intentioned superintendent in California regarded the case of his mine water supply indifferently, and the final solution caused trouble. The mine was twenty miles from a railroad, and surface operations were conducted on manganese deposits. Water was hauled over the road from railroad tank-cars and stored in an iron tank on the hillside in the full glare of the desert sun. The nearest available water containers for the transportation over the road were whiskey barrels, of which there was a plentiful supply in a near-by town. These were pressed into service, and used to carry water from the railroad to the supply tank. But the containers gave to the water not only an odor, but a taste of bad whiskey as well. The superintendent, fearing the water was contaminated at its source and by frequent handling, adopted the only expedient of which he knew, namely, added chloride of lime as a germicide, and added plenty of it. The result was vile, and one hot day there was a walk-out of the men. In passing, I might say that in the office of this same superintendent there was an olla filled with good water which came in bottles from the city.

Often, when the water is only slightly impure the effect will be more subtle and hard to define. A slight indigestion will be followed by a feeling of lassitude and indisposition to work. Discontent will have its inception within each individual, and not in adverse mining conditions. Men will quit without knowing exactly why. Grumbling and complaining will be directed at everything about the premises, strange to say, but the real cause.

MUNICIPAL WATER SUPPLIES RECEIVE CAREFUL SCRUTINY

The water supplies of cities are watched with jealous care by organized and medical boards whose duty it is to see that the proper examinations and analyses of the water are made, and also that sewage-disposal plants and other possible contaminative sources are not in dangerous proximity. The mining camps receive their water as nature gives it to them, and if it happens to be a little bad, either from salts in solution or from contamination, the circumstance is considered unfortunate, but often that is as far as it goes.

Water exerts a varying influence on the system. That from natural sources of supply contains bacteria which may or may not be harmful. Typhoid is directly traceable to water supply, and other diseases just as serious may have the same source. In a certain mining camp in New Mexico distress was in evidence every spring. This was said to have been caused by the spring rains, which washed bacteria from the plants and the surface into the water supply. At other seasons, when the people would of necessity go to the extra trouble of getting their water from the natural springs, this universal indisposition was not in evidence.

VARYING EFFECTS PRODUCED BY CHANGES IN CONDITION OF WATER

Again, certain soluble salts, added to spring water as it meanders its way through cracks and crevices in the rocks, have a variable effect on the men, depending on their physical condition, and, to a large extent, on the kind of water to which they have previously been accustomed. Magnesia, lime, soda, and potash in the form of sulphates, chlorides, carbonates, and a host of other elements and combinations occur in water and exert their influence on the health and feelings of each individual. These naturally affect different persons in different ways. An occasional case of illness in a newcomer should not be viewed with much alarm, as a change in water has long been known to cause a shake-up in one's interior organization, resulting in temporary turmoil until the system fortifies itself against the attack from new quarters and abandons those reserves in the now quiet sectors.

A change in the bacteria condition of the water no doubt causes the greatest redistribution of the body's digestive forces, but the chemical salts also demand varying methods of elimination, depending on their nature and quantity. A widespread and persisting occurrence of ill feeling among mining-camp inhabitants should be viewed with the same concern that it inspires in the cities, and investigation will often trace the cause of the discomfort to an improper or insufficient consideration of the water supply.

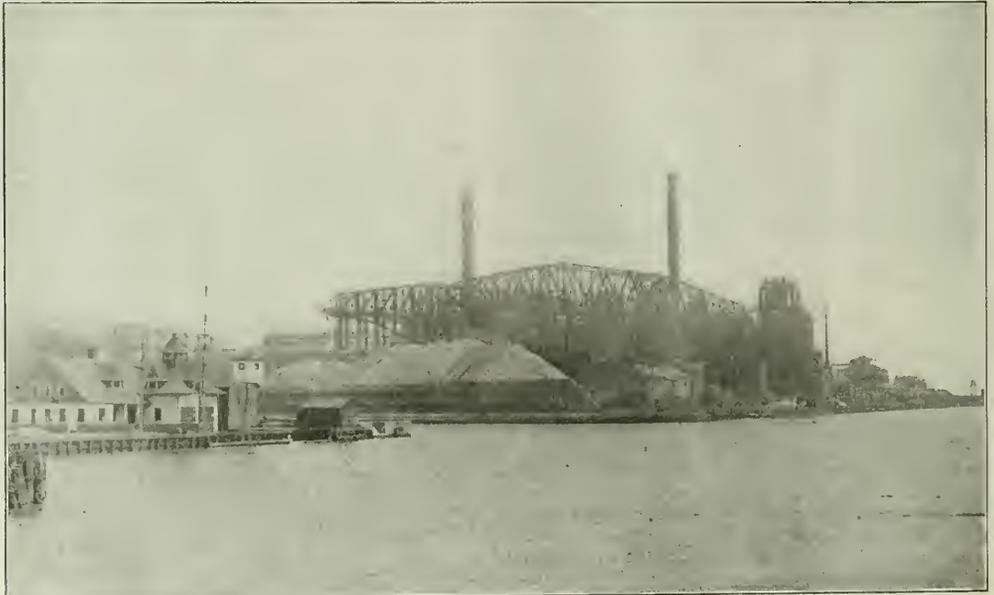
It is not within the scope of this article to give a panacea for the evils of water supply nor to hint at the best solution for any one's difficulties in this respect. Primarily, every case presents its own phases. Whether the well or spring should be deepened, cased or abandoned; whether the intake pipe should be nearer the middle of the stream or farther up or down the stream; whether or not there is a substance which can be added to the water with benefit; whether a sand filter or actinic rays will do the work best—all are subjects that should be discussed. In most cases where the water is bad the best method of improvement will be perfectly apparent, although perhaps expensive. Oftentimes a little effort on the part of the mining companies to furnish more nearly pure drinking water will bear fruit in an improved morale of the men, if not an absolute removal of a definite source of discontent.

A New Invention, Called Conducting Aluminum M. 277, which is said to be attracting considerable attention in Switzerland, has been made by Dr. Georges Giuliani, the famous expert in the aluminum trade. The new metal is produced by putting ordinary aluminum through a special patented process, by which it is reported to acquire the same mechanical qualities and capacities as bronze, copper, and brass without changing its specific weight.

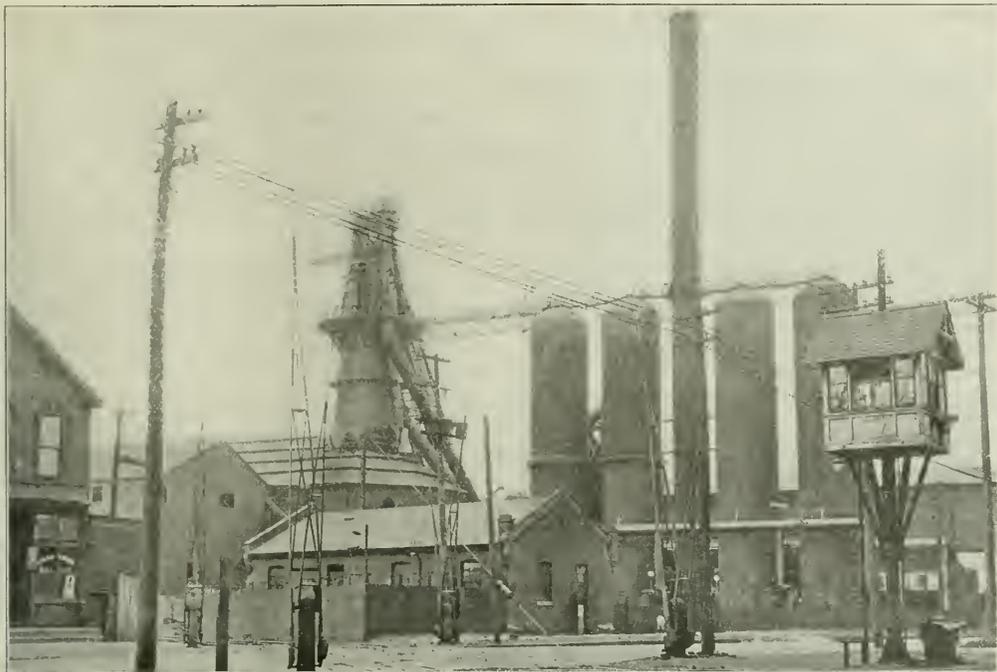
Chicago as a Steel Center



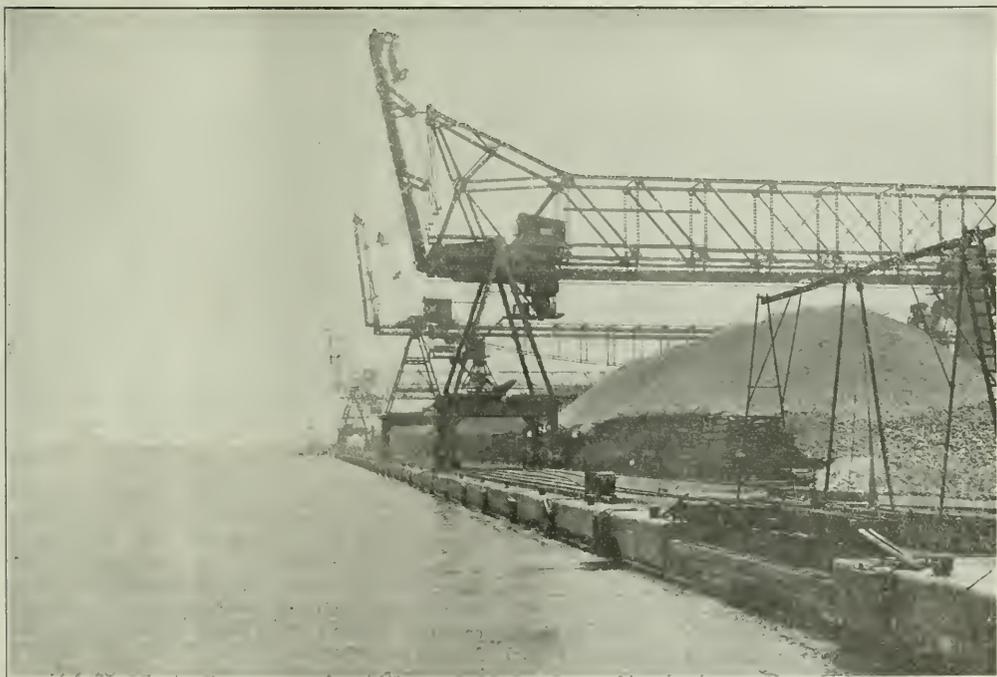
STEEL-BUILT IRON-ORE CARRIER AT INDIANA HARBOR



BLAST FURNACES OF THE ILLINOIS STEEL CO., SOUTH CHICAGO, ILL.



BLAST FURNACES OF THE IROQUOIS IRON CO.



ORE BRIDGES AND ORE YARD OF THE IROQUOIS IRON CO., SOUTH CHICAGO

Pulverized Coal To Be Used in Cerro de Pasco Blast Furnaces

Tests at the Peruvian Smeltery Have Proved Entirely Satisfactory—Experiments by the International Nickel Company Still Unsuccessful

PULVERIZED coal is to be used in the copper blast furnaces of the Cerro de Pasco Copper Corporation at La Fundición, Peru, as a result of recent experiments by that company, which have been very encouraging.

There are five 15-ft. blast furnaces at this smeltery, and bituminous coal mines are only a short distance away. Provision for powdered-coal firing is also being made in the plans for a new smeltery to be constructed by the company, the design of which is under the supervision of A. G. McGregor, of Warren, Ariz.

The Cerro de Pasco is the third company to secure a license from the Garred-Cavers Corporation for the use of powdered coal blown in blast-furnace tuyères. Work done by the Tennessee Copper Co., and by the International Nickel Co., of Canada, Ltd., was described in the *Journal* of Aug. 16. The exhaustive experiments which have been carried out by the latter company at Copper Cliff, in an effort to smelt copper-nickel ores without coke, have so far been unsuccessful, and it is probable that the work will soon be terminated. The ores of the Sudbury district are exceedingly refractory, and, despite their comparatively high sulphur content, all attempts at pyritic smelting, of which a large number have been made, have proved fruitless. From 12 to 13 per cent of coke on the charge is ordinarily required, and it has not been found possible to burn sufficient coal in the furnace to provide an equivalent amount of heat, or even sufficient heat for smelting under the improved conditions supposed to result from the application of the fuel under the charge.

In this connection it is interesting to recall that a few years ago an attempt was made at Copper Cliff to substitute the comparatively cheap lump coal for some of the coke used on the blast-furnace charge. The experiment was not an economic success, the value of the coal which it was necessary to use for the same rate of smelting being greater than that of the displaced coke.

Mining in Eastern Australia

Labor Unrest in the Cloncurry District—Improvement in Conditions Probable—Government Operation of Mines, Smelteries and Railways

UNDER the heading of "Mining in Eastern Australia" in the *Journal* of Mar. 15 last, a Queensland correspondent referred to the "closing down of several copper concerns in the Mount Elliott district, owing principally to the dislocation of normal operations caused by the influence of the extremist element in the labor party, the officially non-existent I. W. W." We are informed by a reliable authority who has been in close touch with the Queensland mining industry for the last twenty years, that this should have read the "Cloncurry district," of which vast area Mount Elliott, where there is one smeltery only, is but a small part. Our informant goes on to say:

"Though there has been a good deal of trouble in

the Cloncurry district, caused by the extremist element in the labor party, the immediate cause of the closing down of all the principal copper mines of that district was the big slump in the price of copper, following on the release of large stocks in Great Britain after the signing of the armistice. All the big copper mines in Australia except two closed down for the same reason. One of these two—Mount Morgan—managed to keep going because the company was able to get its blister copper treated at the Mount Kembla Refinery Works, in New South Wales, and thus to realize on the extracted gold contents.

"Owing to a coastal maritime strike, the transit of the blister copper was lately stopped, and the big mine had to cease operations for a short time, but has now resumed. Mount Morgan has, however, a large quantity of copper on its hands, and still accumulating, on which at present (July 7) it cannot realize, both because of the low price prevailing and the difficulty of procuring overseas shipping accommodation.

"Though in Queensland mining as well as many another industry has been retarded by the extreme labor element, there are, in the opinion of many qualified to judge, indications that the extremist has nearly reached the end of his tether, and that the more moderate and reasonable influence will prevail, to the benefit of both employer and employed.

"The taking over by the government of the Chillagoe railways, mines, and smelteries, referred to by your correspondent, has now been accomplished, and preparations for active operations are in progress. The mines include the Einasleigh copper mine, which is a large cupriferous deposit that has been worked occasionally for a number of years, but which has been idle since the closing down of the Chillagoe smelteries some years ago. The resumption of operations at the smelteries is sure to cause a revival in mining in the district, or at any rate as soon as metal prices are such as to encourage it.

"It is true that the gold production of Queensland, as indeed of the whole of Australia, has steadily declined for years, but this is mainly because known auriferous areas have become exhausted, and there have been no new discoveries. The increased cost of production has, of course, accentuated the trouble. But it is wrong to state, as your correspondent does, that gold mines, even when favorably situated, must produce an average of 2-oz. ore to be profitable. In pre-war times an average of 1 oz. was considered a good return, and at the present time, speaking generally, it may be said that anything over an average of 1 oz. is profit. It may interest you to know that at the present time, in the case of one mine at Charters Towers, about eighty miles from the coast, it costs £5 to mine and raise a ton of ore from a depth of over 1,700 ft., and that the last monthly return was £1,624 from 194 tons, or a yield of over £8 7s. per ton.

"Writers and others who refer to Queensland's declining gold yield are prone to treat this as a decline in our mining industry generally, and to ignore the compensating increase that has taken place in other minerals. There was a time when gold production was the mining industry of Queensland, but this has long ceased to be the fact. Though the yearly gold yield fell from £2,839,813 in 1903 to £761,639 in 1917, there was a great increase in the production of other minerals during nearly all this period."

The McClure Hydro-Electric Plant

Water Flows Through 13,600 ft. of 7-ft. Pipe Under 420-ft. Head—Hydraulicking Used in Preparation of Grade for Pipe—Power Utilized in Electrification of Company's Iron Mines on Marquette Range

THE work of construction of the Dead River power project, situated about seven miles west of Marquette, Mich., and now known as the McClure plant of the Cleveland-Cliffs Iron Co., was begun in August, 1917, and was recently completed.

The many and unusually interesting features attending the situation, construction, and final completion of the plant, which is the largest hydro-electric project in northern Michigan, have occasioned considerable in-

terest among engineers, and the enterprise represents an accomplishment which does great credit to the Cleveland-Cliffs company and particularly to O. D. McClure, chief mechanical engineer, who had entire charge of the undertaking and for whom the plant was named. A description of the work preparatory to the building of the dam has already appeared in the *Journal*.¹

The completion of the McClure plant, which supplies 5,000 hp., secured for the Cleveland-Cliffs company a total of 8,800 continuous horsepower for use at the company's mines in Marquette County. Previously constructed plants with corresponding horsepowers are as follows: Carp plant, 2,500 hp.; Au Train, 500, and the Hoist plant, 800 hp. In addition there is a 400-hp. plant at the company's Republic mine, at Republic, Mich.

The completed dam, which is shown in an accompanying illustration as in the course of construction, is of the gravity type and is 500 ft. in length. The spillway



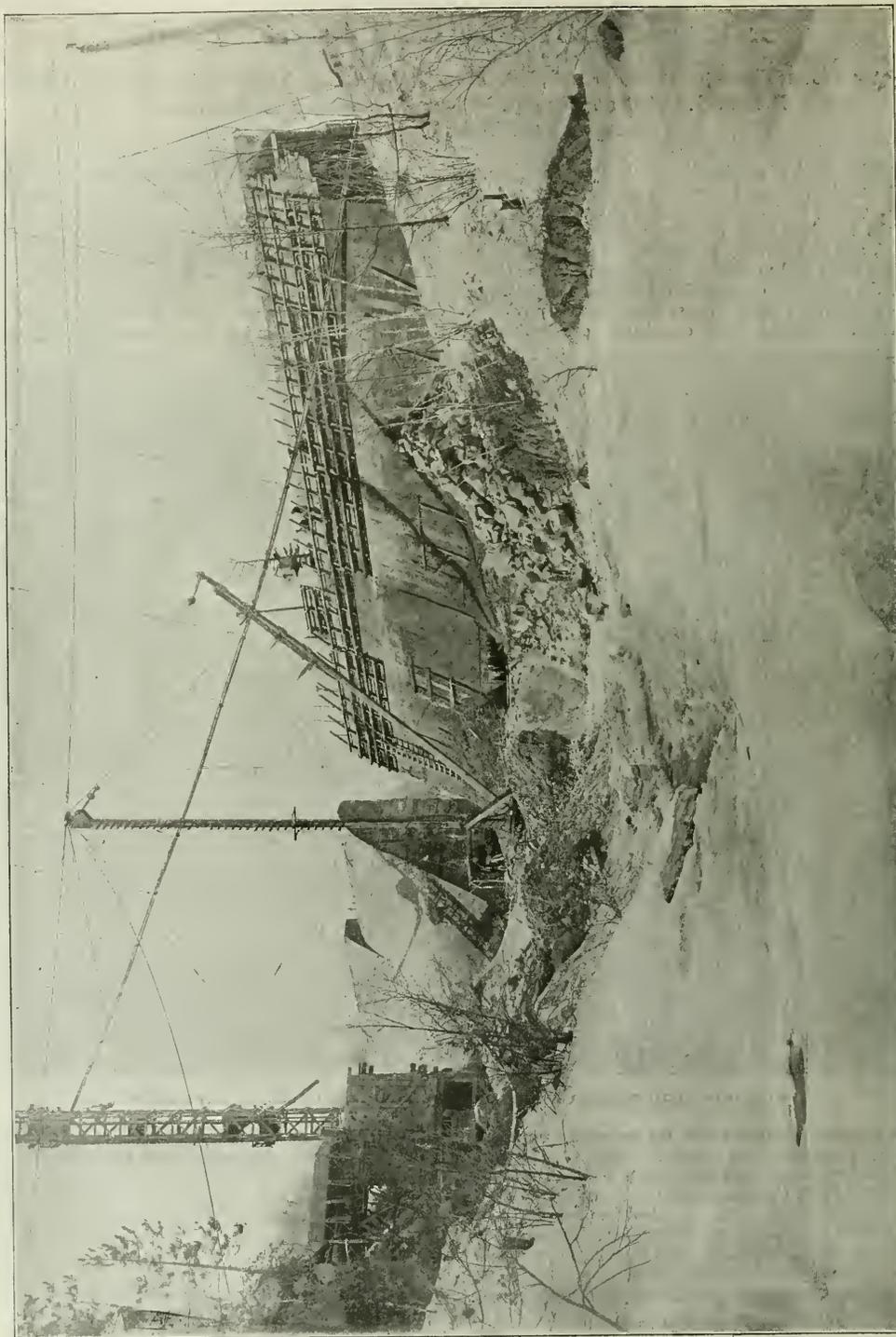
HYDRAULICKING THROUGH A HILL FOR THE PIPE LINE OF THE McCLURE PLANT

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is 200 ft. long, and a 200-ft. section placed 4 ft. above the spillway proper serves as an overflow space if excessive water should raise the level to this height. This section terminates in a rock bluff at the south end of the dam, and on the north end a core wall 6 ft. higher than the highest part of the spillway and 100 ft. in length extends into the bank. The core wall has the same cross-section as the main dam, and is provided with a 7-ft. diameter opening through its entire length. This opening is provided with screen and stoplog spaces at the point where the core wall joins the main dam,

¹"New Hydro-Electric Development on Dead River, Michigan," *Eng. and Min. Journ.*, Aug. 17, 1918.



THE 500-FT. GRAVITY-TYPE DAM UNDER CONSTRUCTION AT McCLURE PLANT OF THE CLEVELAND-CLIFFS IRON CO., NEAR DEAD RIVER, IN NORTHERN MICHIGAN

and at the other end there is a 7-ft. pivot valve connected to the pipe line.

In the construction of the dam, which was built by the Foundation Co. of New York, under a "cost-plus" contract, 17,000 cu.yd. of concrete was used. Its height is 50 ft. from the foundation, the width in solid concrete at the base is 50 ft., and this tapers to 4 ft. at the top of the spillway. In spite of the extremely unfavorable winter during 1917-1918, remarkable progress was made, and there was little or no interruption in the construction work.

SEVEN-FOOT DIAMETER PIPE LINE TO POWER HOUSE

Separated by an interval of 80 ft. from its juncture with the dam is a 13,600-ft. pipe line that extends to the power house, which is built at a point where Rainy

1-in. iron, spaced 2 in. A 7-in. diameter steel pipe which completes the remaining 3,600 ft. to the power house varies in thickness from one-half to three-quarters of an inch and was made by the Walsh Steam Boiler Works, of Holyoke, Mass.

Midway on the wooden pipe line is a surge tower. This is built of reinforced concrete, is 30 ft. in diameter and has a height of 40 ft., with walls 2 ft. thick. It is banked to the water line with earth, to prevent freezing in severe weather, and is roofed with steel.

The preparation of the grade for the pipe line involved considerable cutting and filling and the use of hydraulic washing, the latter being done when it was impossible to reach the desired point by means of the crane used and also to bring material for the fills. The country through which the grade was made is rugged,



MAKING THE FILL FOR THE PIPE LINE ON THE DEAD RIVER POWER PROJECT

Creek enters Dead River. The intervening space between the dam and this pipe line is connected by a steel pipe. In this length is a 7-ft. diameter riser, which extends to a height a few feet above the dam and serves as an air vent when the control valve is closed. The riser is made of sufficient size so that it may be entered and the passageway cleared in the event of accumulation of ice. Joined to the steel line and extending 10,000 ft. in the direction of the power house is a 7-ft. diameter fir pipe line. This line was built by the Continental Pipe Co. and is banded on its upper reaches with 1-in. iron, spaced about 6 in. and on its lower reaches with

as shown typically in an accompanying illustration, and it was necessary to make a maximum fill and cut of 35 ft. and 24 ft., respectively. Throughout its entire length the wood-stave pipe is without reverse grade and joins the steel pipe at a point where the head of water is 200 ft. The steel pipe is provided with two inverted siphons, which have the usual air valves.

The country which the 3,600-ft. steel pipe traverses is badly broken, and the handling of the pipe was a difficult undertaking. It was placed by means of two hoists that were set up on high points on the grade and which operated standard track trucks over a rail track

laid in the trench graded to receive the pipe. The pipe was shipped in 36-ft. sections weighing from twelve to sixteen tons each. The pipe farthest from the station was delivered first, and gradually the lengths were placed where, according to profile, they should be wanted.

The power house, which is 45 x 90 ft. in plan and 25 ft. high, is of solid brick and is provided with a fire-proof roof. The interior is of buff glazed brick, the only ornamental feature being a large fireplace.

POWER-HOUSE EQUIPMENT

The power-house installation consists of duplicate General Electric 5,000-kva. generators coupled to 7,000-hp. turbines manufactured by the S. Morgan Smith Co., of York, Pa. One of these sets is sufficient to develop the minimum continuous horsepower. To carry peak loads, however, or in the event of a breakdown in some other part of the company's electric system, both units may be operated by drawing more generously on the reserve water supply. Water is delivered at the station inlet from the pipe line from an orifice 3 ft. in diameter.



SURGE TANK IN COURSE OF CONSTRUCTION AND 84-IN. WOOD PIPE LINE, McCLURE PLANT

The outlet is beneath the floor of the station, whence a channel to carry the flow to the nearby river is provided.

The station transformers are, according to the latest practice, set up outside the station, immediately south. They receive the current at 2,200 v. and step it up to 30,000 v. for distribution.

The fall from water level above the dam to water level in the race beneath the floor of the station is 420 ft., and represents the maximum attainable fall on the Dead River project.

Development Off the Vein Upheld

SAN FRANCISCO CORRESPONDENCE

In the suit of the Twenty-One Mining Co. against the Sixteen to One Mining Co., in which the former company alleged a trespass by the latter company, the point at issue was the extent to which a mining company can depart from the vein in following its extra-lateral rights. The Sixteen to One company in following down upon its vein continued sinking its shaft in the foot wall, and from this position raised to the vein and placed an ore and waste pocket in position. A change of dip caused the departure of the incline shaft from the vein, the latter becoming of less inclination.

The plaintiffs contended that the shaft and all connecting workings should have been made in the vein and that all work outside of the vein constituted a trespass. Defendants answered by showing that the departure from the vein was necessitated by the exigencies of mining and that they were within the scope of the law which allows a reasonable latitude in following the extra-lateral right. The trial resulted in a decree for the defendant, and the injunction asked for by the Twenty-One Mining Co. was denied. The case was heard in San Francisco on Aug. 22, before Judge W. C. Van Fleet, in the U. S. District Court of California. John B. Clayberg and Frank R. Wehe were counsel for the Twenty-One Mining Co. and William E. Colby, John S. Parttridge, and Harold Searles appeared for the Sixteen to One Mining Co.

Tuolumne Copper Mining Co.

The annual report of the Tuolumne Copper Mining Co. for the year ended Dec. 31, 1918, states that the Tuolumne mine remained closed during the entire year, because of high operating costs. In the Colusa-Leonard mine, 215 ft. of two-compartment shaft was sunk during the year.

During 1918 there was mined from the Main Range mine 25,405 wet tons of ore, or a total of 23,534 dry tons. The average assay value of this ore was 2.253 per cent copper, 8.082 oz. silver, and 0.0075 oz. gold. The total net smeltery returns from this ore amounted to \$248,220, or a net value per ton of \$10.54. Development work performed during the year consisted of 511 ft. of shaft sinking, 990 ft. of crosscutting, 1,059 ft. of drifting, 125 ft. of winzes, 118 ft. of raises, and 3,730 ft. of station cutting. The total operating expense for 1918 amounted to \$221,377. Returns from ore shipments during this period amounted to \$26,843 in excess of the expenditures.

Production from Main Range mine for the month of January, 1919, amounted to 3,588 tons, of which 493.5 tons averaged 8.143 per cent copper and 19.764 oz. silver, and 3,094.5 tons averaged 2.246 per cent copper and 8.716 oz. silver. The average grade of the total production for the month was 3.057 per cent copper, 10.235 oz. silver, and 0.01 oz. gold. The net cost per pound of copper produced during the month was 8.316c.

During February 2,840 tons of ore, averaging 2.18 per cent copper, 7.03 oz. silver, and 0.0075 oz. gold, was produced, of which 153 tons, averaging 6.37 per cent copper and 12.49 oz. silver, was shipped as first class, and 2,687 tons, averaging 2.61 per cent copper and 6.72 oz. silver, was shipped as second class. The estimated cost per pound of copper that was produced in February, 1919, is 10c.

Chief Consolidated Mining Co.

The report of the Chief Consolidated Mining Co., in Utah, for the quarter ended June 30, 1919, was issued July 24, 1919. Development work performed during the quarter totaled 5,880 ft. Total shipments were 12,069 dry tons, yielding, after smelting, transportation, and sampling charges, \$458,415. The net profit after payment of all charges was \$167,337. Average gross value of the ore mined and shipped to the smelters was \$55.57 per ton.

Development of the Collinsville Zinc Corporation

Early Operations of the Plant Included Original Installations of Equipment Used in the Zinc-Smelting Industry—Enterprise, Started in 1873, Used Refuse Slack From Coal Mines—Additions to Original Plant

THE plant of the Collinsville Zinc Corporation is situated at Collinsville, Ill., on the Pennsylvania R.R., eleven miles east of St. Louis, Mo. The nucleus of the present plant, which has been remodeled for the manufacture of lithopone, was the zinc smeltery built at Collinsville in 1873 by Dr. Octavius Lumaghi, for the purpose of utilizing as fuel the refuse slack from his coal mines in the immediate vicinity. He first constructed one block of furnaces containing 68 retorts on each of two sides, making a total of 136 retorts, and one small single furnace containing 60 retorts. In connection with this he also constructed a blende-roasting furnace, which was operated by hand, and a lime kiln for burning his carbonate of zinc.

style of furnaces and increased the capacity of the plant, building hand roasters and, later on, mechanical roasters. In 1886, this firm was succeeded by the Collinsville Zinc Co., which immediately began the construction of a new plant, the old furnaces being kept in operation. The new unit included a Belgian block furnace of 266 retorts, massed in one block, whereas the former furnace had only 136 retorts, so that the capacity was doubled and the consumption of coal reduced. Hand roasting furnaces were still in use.

In 1890 the first mechanical roasting furnace ever used in the zinc industry was built at Collinsville, and was known as the Brown roaster furnace, having been invented by Herman Brown, metallurgist. The Brown



PLANT OF THE COLLINSVILLE ZINC CORPORATION, COLLINSVILLE, ILL.

In 1878 Otto F. Meister and Henry Wyman leased the Lumaghi plant. Five additional acres of land were purchased, together with a furnace containing 80 retorts owned by Louis Heintz, the capacity of the original unit was materially increased and modernized as of that day, and the plant was operated by Otto F. Meister & Co. The total production of zinc in the United States in 1878 was not over 33,000 tons. The present production in the United States is about 750,000 tons.

It is singular that the original zinc smeltery at Collinsville was constructed to use waste coal from the mines of Dr. Lumaghi, and that at that time Illinois was a virgin field for coal mining, most of the coal in this vicinity being mined at Cheltenham, Mo., which is now included within the city limits of St. Louis.

Subsequently, Otto F. Meister & Co. changed the

roaster then used was a circular furnace, having a hearth ten feet wide. The ore was raked mechanically without the use of manual labor. The records of the Collinsville Zinc Co. show that the advantages of this mechanical furnace were so ably demonstrated by the inventor, Mr. Brown, and presented in such a convincing manner, that the company authorized the construction of one unit. This furnace, from the time of its first operation, and viewed from a labor-saving standpoint, effected good results in fuel economy, low depreciation, lower costs for repairs and greater production, so that four additional furnaces of a similar type were constructed. The history of this furnace is included in Ingalls' "Metallurgy of Zinc."

In 1887 the company began making its own firebrick and retorts and was one of the first to make retorts by screw presses. The present plant, with five Brown

mechanical roasting furnaces, having a capacity of 100 tons per day, has also nine Belgian block furnaces, each consisting of 256 retorts, making a total of 2,304 retorts.

Otto F. Meister, president of the Collinsville Zinc Corporation, and long identified with the zinc industry, both under the firm of Otto F. Meister & Co. and Collinsville Zinc Co., was graduated from Washington University as mining engineer in 1876. Other officers of the corporation are: Treasurer, Robert W. Barrell; secretary, W. R. Wild; directors, Henry W. Schultz, Joseph Carr, and C. D. Lukens; general manager, A. F. Versen; general superintendent, H. E. Gillaspay, and director of operations, A. J. Meier.

The Lost Hill mines, situated at Moselle, Mo., are owned by the Collinsville Zinc Corporation and have been developed to the extent of showing sufficient ore to supply the manufacturing plant for a number of years. The ore "in sight" has been estimated at from 190,000 to 300,000 tons. H. A. Kruger, a graduate of the Colorado School of Mines, recently resigned as underground superintendent of the St. Joseph Lead Co., to take charge of the mining operations at the Lost Hill mines.

Lithopone is an accepted paint pigment of extraordinary quality and characteristics, and it is used in the manufacture of paints, enamel, rubber tires, oilcloth and linoleum, shade cloth, wall paper, printing inks, and in other industrial applications. The demand is far in excess of the production of all of the lithopone manufacturers combined, for with the advancement and progress made in its perfection in recent years, this product can now be used for exterior as well as interior work.

The St. Louis industrial district embracing Collinsville, Ill., is conceded to be the logical center of lithopone manufacture, because Missouri ranks first in the production of barytes, and the deposits are less than 100 miles distant.

Commercial Recovery of Pyrite From Coal

Greater Demand for Sulphuric Acid and Shortage of Pyrite Imports Have Increased Need for Domestic Product

BY S. H. DAVIS

THE supply of pyrites used in making sulphuric acid in the United States has been largely imported from Spain and Canada, the Spanish imports amounting to nearly 1,000,000 tons per annum in the pre-war period. The greatly increased use of sulphuric acid and the cutting off of these Spanish imports, incident to war conditions, brought about a threatened shortage of sulphur supplies during the war period.

The bituminous-coal mines of certain districts have long furnished a small tonnage of pyrite in the form of coal brasses. A mechanical concentrator at Danville, Ill., for a number of years has been treating hand-picked lump pyrite and coal from the picking belt and from the mines, and a small plant near Gillespie, Ill., for a few months has been recovering pyrite from washery refuse.

Many mines throughout Illinois, Indiana, Western Kentucky, Ohio, and Pennsylvania have shipped an oc-

casional car of the hand-cleaned lump pyrite. Only a small percentage of the available pyrite has been recovered in this way, however, as usually the miners throw such lumps into the gob with slate and other impurities. It has been estimated that the western Indiana coal field could furnish annually more than 100,000 tons of pyrite. The present production is small, and although the possibility of furnishing the domestic trade with pyrites recovered as a byproduct from coal-mining operations appears attractive, there are certain features that are difficult to overcome.

Pyrite, to be used in acid making, must meet with certain requirements as to size and purity. Lump ore for grate burners should be under 3 in. and over 1 in. in diameter. Fines for use in mechanical roasters should be under quarter mesh. The material should be high in sulphur, free from arsenic and phosphorus, and as low in carbon as possible. The pyrite obtained from coal can be made to meet all the above requirements, but it is difficult to remove all the carbon. The pyrite in coal occurs as bands and nodules of varying thickness and size and of comparative purity, but mixed with this is more or less web sulphur. The web sulphur carries with it admixed coal, which may make the concentrate run up to several per cent carbon. This makes the concentrate subject to fringing, causes heavy consumption of niter, and lowers the acid plant capacity, which is due to dilution of gases. The hand-cleaning methods and the present plants have failed to overcome this entirely, so that it may be necessary at the acid plant to mix this material with other ore.

Each year a large tonnage of pyrite is thrown in the waste at the coal mines, but there are certain difficulties in making this material available. Hoisting the crude pyrite from the coal mines involves, in most instances, a serious handicap to the coal-mining operations. Injury to the chutes and screens is inevitable, which necessitates separate loading facilities; and the miner must co-operate. These difficulties have not been overcome at most of the larger mines. In treating washery refuse, this difficulty is not present, but there are few washeries at which the refuse contains sufficient pyrite or where the refuse is in sufficient quantity to make it attractive.

The recovery of pyrite from coal will not be extensively practiced, it is felt, so long as the Louisiana brimstone can be obtained at present or pre-war prices. The acid plant that uses pyrite must have a greater investment in burning and dust-settling equipment than if brimstone is used. It is true, however, that at certain points farthest removed from the source of supply of brimstone, and near the coal fields, coal pyrite can be used advantageously.

Iron Ore Reserves in the Orient are reported by F. T. Edgingfield, in charge of reports on the iron and steel situation for the Bureau of Mines, according to *Iron Age*, as follows: Taoshung mine, containing 20,000,000 to 30,000,000 tons of ore, supplies the Oriental Ironworks Co. Taiyeh mine, containing about 50,000,000 tons, supplies the Government Ironworks at Yawata, Japan; also furnaces near the mine supply the Yawata Ironworks with pig iron. At Anshanchan Ironworks of the South Manchuria Railway Co., furnaces are being set up and further enlargements are proposed. Large deposits of iron ore are reported in this neighborhood. Penchiifu Coal & Iron Co. has blast furnaces and electric furnaces. They are reported to have a large supply of coking coal. Chienerhpu Iron Works, Chosen (Korea), operate two blast furnaces.

*Paper presented at the Chicago meeting of the A. I. M. E., Sept. 22-26, 1913.

Bulkheading Open Stopes*

Conditions Subsequent to the Caving of Ground Mined by the Sub-Stope and Back-Stope Methods Require the Placing of Bulkheads To Prevent Flooding—Removal Of Surface Water From Mine Caves Advisable.

By M. E. RICHARDS

General Manager, Judson Mining Co., Alpha Mich.

THE sub-stope and back-stope methods of mining, which are in more general use on the Menominee Range than at any of the Lake Superior iron districts, are particularly adapted to deposits in which the ore occurs in lenses of comparatively small width, with rock capping, in steeply pitching folds in the foot wall. The backs are thus narrow, if properly arched, and strong enough to hold up the surface when the lens is being mined. The ore must be such that it will not cave too readily. The hanging wall must be hard or tough enough so that it will not fritter away, or cave into the stope and mix with the ore, thereby spoiling the grade.

A lens-shaped orebody, not too large, is ideal for sub-stoping. The orebody coming to a peak at the top makes a natural arch, which supports the back. When the orebody is too large, extending over approximately 150 ft. in width, it becomes necessary to leave pillars of ore, at regular intervals, in order to hold up the back.

REMOVAL OF ORE PILLARS

The orebodies are usually stoped down several levels before the stopes on the upper levels begin to work, and finally fill. If conditions allow, the ore pillars are robbed out before the stopes fill. However, if it is unsafe to remove the pillars before the stopes fill, they are left in until rock and surface fill the open stopes, and then the pillars are removed by top-slicing, or a combination of stoping and top-slicing.

Large open stopes above the ore where miners are working are always a source of more or less danger, and several serious accidents have occurred when these stopes filled. When the back comes in, there is usually a strong air blast, which resembles a cyclone, blowing cars, timber, and men in front of it like paper. Sometimes the miners receive a few bruises, but usually the results of these air blasts are not serious.

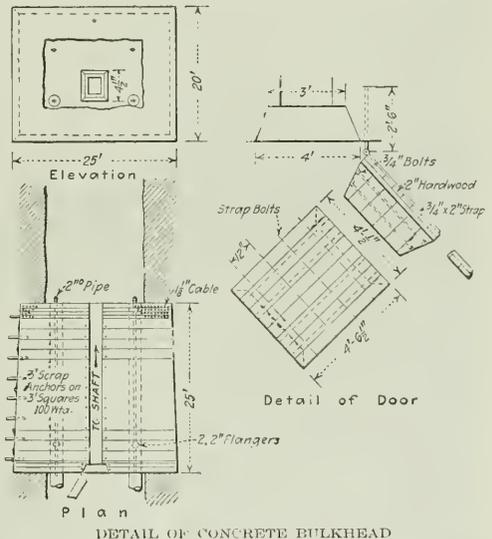
If there is water in the surface above the orebody, great care must be taken to prevent a rush of sand and water into the mine. Usually, after the mine has been working for a couple of years, the water drains out of the surface, although there are conditions, such as the occurrence of an impervious layer of clay or rock, which prevent this drainage.

BULKHEADING TO PREVENT FLOODING OF THE MINE

Before a stope fills, bulkheads should be built in the main drift, or in all openings to the working parts of the mine or to the shafts, in order to prevent a rush of sand and water which may be caused by the surface that caves into the stope. Such caving plugs up most of the holes into the stope, but some part of the stope or old workings often remains open, the water dams back, and if there is a point weak enough and the head is sufficient, it will break loose and rush

into the mine. The dammed-back water sometimes acquires a tremendous force, so that the greatest care must be exercised in the building of such bulkheads. It is customary to use reinforced concrete, where a considerable quantity of water is expected, but if the surface is practically dry, timber bulkheads will answer the purpose.

Bulkheads that are to be built in the drifts should be made from 6 ft. to 12 ft. in thickness, depending on the size of the drift and estimated pressure. Niches should be cut in the bottom, top, and sides of the drift, three to five feet deep, in order to prevent the water getting around the bulkhead. Great care should be used



in cutting these niches not to blast too heavily, for doing so may crack the rock too much around the bulkhead. When clearing out the niches it is best to use a pick as much as possible, so that all the broken rock may be worked out. If a seam of part rock or other weak material should be encountered, this should be dug back very deep and filled, exercising care before pouring the concrete into the niche that all dirt is washed from the sides and bottom. After the niche has been thoroughly cleaned the sides are painted with a thin mixture of water and cement. The niche in the bottom of the drift should be dry, and should there be any water running down the drift it is necessary to build a launder, or run pipes across the niche to carry it away.

The difficulty of thoroughly filling the top of the bulkhead with concrete is overcome in the following

*Paper read at the Lake Superior Metal Mine Safety Conference, Duluth, Minn., June 19-20, 1919.

manner: A 10-ft. raise is driven about 10 ft. back from the bulkhead, and from this a small gopher hole is driven over the bulkhead. A raise is then put up to connect the latter to the gopher drift, and through this opening the top of the bulkhead can then be poured, and a thorough filling is assured.

Four to six pipes should be set in the form through the bulkhead, before the concrete is poured. The two bottom pipes on the floor of the drift will serve to take off any flow of water that might occur. Extra heavy pipe should be used, and extra heavy valves should be placed on all of the pipes, in order to close down the flow of water in case it should become excessive. In addition to handling the water, the pipes through the bulkhead will relieve any strong pressure of air that may accumulate behind the bulkhead after a cave.

It is sometimes necessary to leave a small door through the bulkhead so that inspection of the stopes may be made, and also in some cases to aid ventilation. These doors should be built on the inside, and so arranged that they will not swing outward quite ninety degrees. This precaution will cause any sudden heavy pressure to close the door automatically. The doors

be placed in the bottom of the pit and the water kept down close to the bottom so that it will not gain sufficient head to break through into the mine with a rush.

After the stope commences to fill there are likely to be several settlements of the surface, so that the pump should be placed on skids, made from long stringers, along the slope of the pit. These stringers should be held in place by steel cables that are fastened to a dead man about 100 ft. from the edge of the pit. In the event of a slide of earth, the stringers will hold the pump and the dirt will slide under, thereby saving the pump.

A small drop shaft in the bottom of the pit close to the pump, about 15 to 25 ft. deep, will aid materially in keeping the sand away from the suction of the pump and will drain the water down below the bottom of the pit and thereby assist greatly in draining out the ground.

In some cases, a small rock drainage drift is driven out around the sides of the pit, just below the top of the ledge, and this aids materially in draining off the surface if water is running on top of the ledge.



THE JUDSON MINE OF THE JUDSON MINING CO., AT ALPHA, MICH.

should be made of several layers of 3-in. hardwood plank, with steel plate on the inside or I-beams to help strengthen them. Iron guides should be set in the concrete all around the door to prevent the door from being pushed sideways by any lateral pressure. An accompanying sketch shows the details of these bulkheads.

PRECAUTIONARY SURFACE DRAINAGE

When a large stope fills, after breaking through to the surface, a good-sized open pit usually results. If the surface contains some clayey material and surface water collects in the pit, conditions are quite favorable for the accumulation of a large body of water. Under these circumstances a pump should immediately

Arizona Binghamton Copper Co.

Report of the Arizona Binghamton Copper Co., for the year ended May 31, 1919, states that the mill crushed 36,605 tons of ore, from which 1,873,358 lb. copper was recovered. The mining cost was \$4.61 per ton of ore, or 9.01c. per lb. of copper; the milling cost was \$2.65 per ton of ore, or 5.18c. per lb. of copper; and the smelting cost was 5.65c. per lb. of copper, making the total cost of 19.84c. per lb. of copper, as against an average selling price of 20.45c.

The new shaft is being sunk to the 900 level. On the 750 level an orebody has been cut which is 15 ft. wide and averages 5 per cent copper. This is the same ore shoot encountered on the 400 and 600 levels.

Crushing Practice, New Cornelia Copper Co.*

Ore Is Reduced by Stages in Two Crushing Plants, and
The Product Obtained Is of Sufficient Fineness To
Permit Satisfactory Treatment by Leaching

BY W. L. DUMOULIN

A DETAILED description of the entire plant and leaching process in use at the New Cornelia Copper Co. was given in a paper recently presented¹, so this paper will cover briefly only the company's crushing practice for the year 1918.

The ore, which is mined by steam shovels and loaded in side-dump cars, passes through two crushing plants. The primary plant reduces to less than 3 in. and the secondary plant to 1 in., which is sufficiently fine for satisfactory percolation of solution through the ore in the leaching tanks and to give good extraction. The ore is then conveyed to the leaching tanks by a system of 28-in. belt conveyors. On the way to the leaching tanks it passes through an automatic sampling plant, where a 1 per cent sample is taken.

From the primary crushing plant, the ore is conveyed by means of two 36-in. belt conveyors to a 10,000-ton steel storage bin, with a reinforced-concrete flat bottom. The ore discharges from the bottom of this bin on to four 20-in. belt conveyors, which deliver it to the four units of crushers in the secondary crushing plant. There is no storage bin between the mine and the primary crushing plant. The ore breaks very coarse, is hard, and contains a great many boulders. Jams that are formed in the bowl of the coarse crusher in the primary crushing plant, as a consequence, are freed by means of an immense steel hook operated from a 40-ton electric traveling crane. The crushing plants were constructed to crush the ore required by a leaching plant of 5,000 tons' daily capacity, during a crushing period of 16 hours.

THE PRIMARY CRUSHING PLANT

The primary plant consists of one No. 24 Gates, Style K, gyratory crusher, followed by four Gates No. 8, Style K, gyratory crushers. All the ore from the mine is dumped directly from the mine-ore cars, loaded with about 35 to 37 tons of ore each, into the bowl of the No. 24 gyratory. This crusher will take boulders as large as 4½ by 4½ by 10 ft. and reduce them to approximately 9 in. at a rate of 500 tons of ore per hour. The ore crushed by the No. 24 crusher discharges into the bowls of the four No. 8 gyratories, after passing over grizzlies with 3-in. spaces. The No. 8 gyratories take the 9-in. discharge from the No. 24 and reduce it to approximately 4 in. There are two No. 8s on each side of the No. 24, which discharge on to one of the 36-in. belt conveyors carrying the ore to the 10,000-ton storage bin. All crushers in this plant are belt-driven by alternating-current induction motors.

When crushing to the size indicated, the discharge from the No. 24 would "flood" the No. 8s; therefore, as the head is not adjustable, the bottom row of concaves in the No. 24 was replaced by a row of thicker concaves, and a new lower section of the mantle of larger diameter was placed on the head, so that this crusher now reduces

the ore to approximately 6 in. This throws more work on to the No. 24 crusher and slows its rate of discharge sufficiently to give a fairly uniform feed to the No. 8s, resulting in an increase in the capacity and a reduction in wear and cost of repairs in connection with these smaller crushers. The increase in the capacity of these smaller crushers was so great that it was possible to set out the bottom row of concaves, and so obtain a product of less than 3 in. This balances the work between the primary and secondary crushing plants in a more economical manner. Previously, the rate of crushing in this plant was limited by the No. 8s, but now it is determined by the No. 24 gyratory, which has an average capacity of 400 to 450 tons per hour, crushing to less than 6 in., the rate depending on the percentage of large boulders that are to be found in the ore that is being treated in the crushing plant.

THE SECONDARY CRUSHING PLANT

The secondary plant consists of four units of 48-in. Symons vertical shaft (pillar) disk crushers, each unit consisting of three crushers, one coarse Symons and two fine Symons. The coarse and fine Symons are identical, with the exception of the upper disk, which, in the coarse crusher, has a grinding surface 4-in. wide, and in the fine crushers, 6-in. wide. Each crusher in this plant is driven by a special, direct-connected, 75-hp. alternating-current induction motor having a speed of 400 r.p.m. As the ore is harder than was anticipated, it was soon demonstrated that to crush the 5,000 tons in the desired time would crowd the crushers too much for economical maintenance, so a fifth unit of three 48-in. Symons vertical-shaft disk crushers has just been added to the equipment already installed.

The ore from the primary crushing plant is conveyed to the storage bin of 10,000 tons' capacity, from which it is fed to the coarse Symons at a uniform rate, and crushed to approximately ¾ in. The discharge from these coarse crushers is divided, one-half passing to each of the two fine Symons crushers in each unit, where it is crushed to approximately ¼ in. Screens ahead of the fine Symons crushers bypass a large percentage of under-size. The capacity of a unit depends somewhat on the character of the ore, and varies from 90 to 100 tons per hour.

FINE CRUSHER HAS HEAVY REPAIR COSTS

The coarse Symons have a capacity of 100 tons per hour, crushing to ¾ in. with small cost of repairs; but the fine Symons have each a capacity of only 50 tons per hour, crushing to ¼ in. with rather heavy repair costs. As this type of crusher may be considered to be in an experimental state for crushing as fine as ¼ in., it developed that certain parts of the machine required strengthening, when it was found advantageous to substitute cast steel for cast iron, as well as otherwise to strengthen this design. But even under these circumstances, this type of crusher has proved satisfactory for the service required of it and gives the most uniform product that has the minimum amount of oversize and fines.

A great deal of trouble has been experienced with tramp iron in the crushers, but this has been eliminated largely by the suspension of large and powerful magnets over the conveyors leading from the primary crushing plant. These magnets were installed in addition to the magnetic pulleys already in service.

*Abstracted from a paper to be presented at the Chicago meeting of the A. I. M. E., Sept. 22 to 26, 1919.

¹H. A. Tobelmann and J. A. Potter: "First Year of Leaching by the New Cornelia Copper Co.," *Bull.* 146, A. I. M. E.

Deep-Mine Pumping in the Lake Superior Iron Districts

Single-Lift Pumps, Electrically Driven, Handle 500 Gal. per Minute Against a 2,400 ft. Head—Pumping Costs Reduced by Use of Electricity

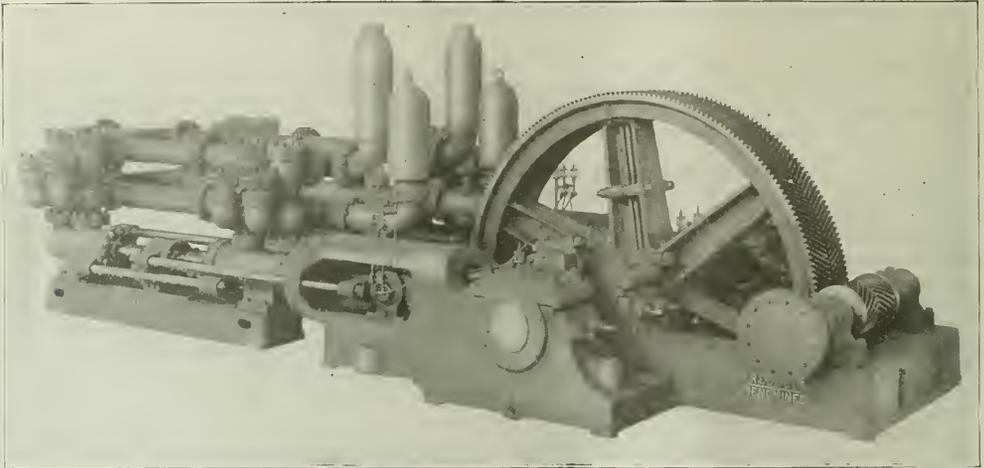
EARLY in 1918 the Cleveland-Cliffs Iron Co. installed an important pumping plant at its Athens mine, Negaunee, Mich., and there is now being placed a duplicate of the first pump, both equipments having been built by the Prescott Co. of Menominee, Mich. Each of these pumps has a capacity of 500 gal. per minute against a vertical head of 2,400 ft., and the pressure due to that head, static and friction, is approximately 1,150

quality of materials which have come about within recent years it is anticipated that there will be no difficulty in successfully pumping water against any

SOME DEEP-MINE PUMPS IN THE LAKE SUPERIOR IRON DISTRICTS

Company	Gal. per Min.	Ft. of Head
McKinney Steel Co.	1,250	1,000
Cleveland-Cliffs Iron Co.	1,000	1,100
Montreal Mining Co.	500	1,350
Oliver Iron Mining Co. (thru) ..	400	1,700
Newport Mining Co.	400	1,950
McKinney Steel Co.	350	2,050
Cleveland-Cliffs Iron Co. (two) ..	500	2,400

increased head that the mines may develop, and that at a lower cost than was possible under older prevailing conditions.



ONE OF THE TWO 500-GAL. PUMPS AT THE ATHENS MINE, NEGAUNEE, MICH.

lb. per sq.in. At other mines water has been pumped from greater depths, but it has always been shambled or relayed from one pump to another at different levels. In this instance the water is delivered from the bottom of the mine to the surface in one lift.

The pumps are electrically driven, and each is operated by means of a 400-hp. motor, the power being transmitted through single-reduction sets of double helical gears commonly known as the herring-bone type. The use of these gears is of distinct advantage in that a greatly increased mechanical efficiency is obtained and high ratios of reduction are permissible between gear and pinion. The pumps themselves are of the duplex, double-acting plunger type, and the entire water ends are of steel.

Several deep-mine pumps have recently been built for service in the iron districts and show that the tendency is toward deeper mining. A few years ago shafts in the iron country having depths of 1,000 to 1,200 ft. were considered quite deep, but now 1,400- to 2,000-ft. shafts are common, the deepest of all being the Athens, referred to above. In this connection, a list of some of the pumps built by the Prescott company is given in the adjoining column.

There is evidence that pumping from even greater depths than these will be reached in iron mines, and with the application of electricity and the improved

Annual Report of Fairview Round Mountain Mines Co.

The annual report for the year ended Dec. 31, 1918, of the Fairview Round Mountain Mines Co., shows that 12,561 tons of ore was trammed to the surface, from which 3,753 tons of waste was sorted out and placed on the dumps. The remaining ore yielded bullion valued at \$178,801, representing an extraction of 93.1%, the tailings loss being \$1,4931 per ton. The total operating cost per ton, exclusive of depreciation, was \$7.1645, of which \$2.1048 was the milling cost. Development work amounted to 1,546 ft. at a cost of \$9.04 per foot.

During the first half of the year operations were confined to the south segment of the Fairview vein and the fault fissure between the north and south segments. During the last half of the year 85% of the ore milled was taken from the north segment.

The Roasting of Zinc Ores has developed along the line of long-period roasting at relatively high temperature, Matthiessen-Hegeler, Zellweger, and other types of straight-line furnaces being until recently used almost exclusively. Wedge furnaces have been successfully introduced, however, at some electrolytic zinc plants, including Trail, B. C., where it is necessary to keep the roasting temperatures reasonably low to secure good results on low-grade concentrates.

New Screen-Sizing Scale Proposed

Importance of Proper Screen Tests in Ore-Dressing Plants—Troubles Caused by Lack of Standardization of Sieves Now Used—Advantages of the New Bureau of Standards Scale

BY EDWARD H. ROBIE

PROPER screen sizing is extremely important in modern milling. Although possibly not of the same relative importance as correct sampling and assaying, nevertheless, it is essential to the most economical operation of the mill. Since flotation has been so widely applied, screen tests are more important than ever, as with any given ore there is usually a limiting size beyond which the flotation machine used will not give satisfactory results. Most mills of even moderate size have a satisfactory series of screens, giving results which can be intelligently interpreted by the metallurgists in charge. These are not always intelligible to others, however. It is, of course, the opening between the wires, and not the number of meshes to the inch, which determines the size of the particles passing through. Unfortunately, a screen of a certain mesh sold by one manufacturer will not always have the same opening as one of the same mesh sold by another maker. Thus, a published screen test which does not give the opening as well as the mesh is of little value for comparative purposes. Also, if the series of openings used is not a standard one, the results, though perfectly intelligible in the mill in which the tests are made, are incomparable with those obtained at other mills using a different standard.

THE TYLER STANDARD SCALE

In most American ore-dressing plants the Tyler standard screen scale has been adopted, and the Tyler Co. deserves a great deal of credit for what it has accomplished in this field. The basic screen in this system is that of 200 mesh with an opening of 0.0029 in., arbitrarily adopted. The next larger sieve is of 150 mesh with an opening of $0.0029 \times \sqrt{2} = 0.0041$ in. The opening in each screen is that of the next finer screen multiplied by $\sqrt{2}$. Where results are given in mesh and the Tyler scale is specifically mentioned, the tests at different plants are comparable.

In 1916, the Bureau of Standards, after conferring with representatives of many of the national societies representing trades and professions in which screen testing was important, promulgated a new screen scale to take the place of the Tyler scale. The basis of this new scale was a screen having an opening of 1 mm. between the wires—certainly a more logical foundation than 0.0029 in. The next finer screen had an opening of 0.5 mm., and so on, each screen having an opening one-half of that in the next coarser screen. Intermediate screens were also provided for the finer sizes. This screen scale, although it had been devised by experts, was not adopted in practice to any extent. The chief explanation for the disinclination to accept the proposed scale was the same as that given for the failure of the metric system to secure adoption in this country. It is more logical, but its adoption involves scrapping too much valuable material. Millmen refused to throw away their stock of screens, and reports of screen tests under the new system would not

be comparable with the former. Furthermore, those who were willing to try the new screens found considerable difficulty in getting them, as the manufacturers stuck to the old standards.

THE NEW BUREAU OF STANDARDS SCALE

With these objections in mind, and also taking into consideration the troubles caused by the mesh designation, and the adoption of the unscientific basic screen in the Tyler system, the Bureau of Standards has now devised a screen scale which deserves adoption in every mill. No Tyler standard screens need be discarded, for they fit into the new series. Metallurgists must, however, forget the term "mesh," which means nothing of any importance when applied to screens made by different manufacturers. It is proposed to designate the screens by number, and a No. 30 screen, for example, will have the same opening, no matter by whom made or where found. A number will be much easier to remember than the fractional opening to which it corresponds. The basic screen in the series will have an opening of 1 mm., and, as it will ordinarily have about 18 meshes to the inch, will be called No. 18, leaving 17 screens coarser than 1 mm. and 13 sieves finer than 1 mm., there being 31 in all. The successive screen openings will vary by the square root of 2, as in the Tyler system, but intermediate screens corresponding to the fourth root of 2 will also be provided for those manufacturers who require closer sizing.

The essentials of the new screen scale are shown in the following table, together with a list of the Tyler screens for comparison.

DATA RELATING TO THE NEW STANDARD SCREEN SCALE AND THE TYLER SCALE

Standard Sieves		Tyler Sieves	
No.	Opening, mm.	Mesh	Opening, mm.
24	0 80	3	6 68
30	6 72	4	4 70
36	5 66	5	3 33
42	4 76	6	2 36
5	4 00	7	2 83
6	3 36	8	2 38
7	2 83	10	2 00
8	2 38	12	1 68
10	2 00	14	1 41
12	1 68	16	1 19
14	1 41	18	1 03
16	1 19	20	0 84
18	1 03	25	0 71
20	0 84	30	0 59
25	0 71	35	0 50
30	0 59	40	0 42
35	0 50	45	0 35
40	0 42	50	0 30
45	0 35	60	0 25
50	0 30	70	0 21
60	0 25	80	0 177
70	0 21	100	0 149
80	0 177	120	0 125
100	0 149	140	0 105
120	0 125	170	0 088
140	0 105	200	0 074
170	0 088	230	0 062
200	0 074	270	0 053
230	0 062	325	0 044

It will be seen that there is practically no difference in the opening of a screen made according to the Tyler standard and a screen made according to the Bureau

of Standards plan. Until all of the present screen cloth is used up, slight discrepancies will be tolerated, and in fact will not be noticed. In many cases the screen number is the same as the mesh commonly used. The proper diameters for the wires to be used, the mesh, and other pertinent factors are also given by the Bureau, but these are of interest only to the screen manufacturers and merely tend to complicate the system for the millman.

It will be observed that provision is made for anyone who has laid in a supply of screens made according to the 1916 requirements of the Bureau of Standards. Screens Nos. 2½, 5, 10, 18, 35, 60, 120, and 230 correspond to this scale. Also those who have clung to the English system, with openings of ¼ in., ½ in., ⅜ in. and proportional sizes, are provided for in screens Nos. 3, 6, 12, and the other dimensions of the scale, which have openings of approximately the same size.

Complete data on the subject can be obtained in mimeograph form from the Bureau of Standards, Washington, D. C., and those interested are urged to write for a copy. The tentative scale has the enthusiastic approval of C. D. Demond, of the Anaconda Copper Mining Co., and other leading testing engineers of the country. Those who have not already done so are asked to make known to the Bureau their wishes on the subject, as soon as possible, so that action on the definite adoption of the scale can be taken.

The Portland Cement Industry Of the La Salle District

Processes of Cement Manufacture Are Fundamentally
Similar in Three Plants Which Have a Com-
bined Daily Output of 14,000 Bbl.

PORTLAND CEMENT is manufactured extensively in La Salle County, Ill., where the La Salle limestone and the shale immediately underlying it are the sources of raw material. The three mills manufacturing portland cement in the district use essentially the

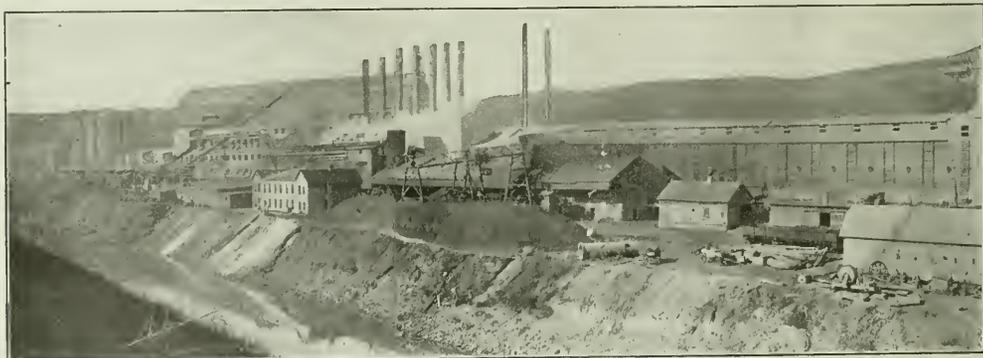
same process of manufacture. The limestone and shale are quarried (in one case mined), mixed in correct chemical proportions, and ground until 78 to 80 per cent of the product will pass a 200-mesh sieve. The powder is then burned to incipient clinker in rotary kilns, pulverized coal being used as fuel. The clinker is ground to cement, 78 per cent or more passing a 200-mesh sieve, and then stored in suitable warehouses preparatory to packing and loading. Packing is done mechanically throughout the district.

The plant of the La Salle Cement Co. is situated at La Salle, and has a daily capacity of 3,500 bbl. The quarry is supplied with modern equipment, and a system of stripping, together with back filling, is used. Steam shovels load both the limestone and shale. A 36x60-in. Fairmount roll crusher performs the preliminary reduction, and No. 5 gyratory crushers are used in secondary reduction. Williams mills and tube mills complete the crushing of the raw material, which is then treated in three 10x164-ft. rotary kilns. Sturtevant mills, comminuters, and tube mills are used in the final grinding of the cement.

The mill of the Lehigh Portland Cement Co. is situated at Oglesby, and has a daily capacity of 4,500 bbl. Steam-shovel loading of the limestone and shale is performed in an open quarry. A 42-in. McCully gyratory crusher is used in the primary reduction and Jeffrey hammer mills in the secondary reduction. An aerial tramway extends from the crushing plant to the mill, where Hercules mills and tube mills are used for fine grinding of the raw material, which is then roasted in seven 8x140-ft. rotary kilns. Kent mills and tube mills complete the clinker grinding.

MARQUETTE COMPANY USES UNDERGROUND MINING

The mill of the Marquette Cement Manufacturing Co., shown in an accompanying cut, is situated at Oglesby, and has a daily capacity of 6,000 bbl. Limestone and shale are secured from mining operations conducted on a room-and-rib system. Compressed-air operated shovels are used for loading, with gasoline and electric motor haulage. In crushing, a 36x60-in. jaw crusher is used for primary and a No. 8 K Gates crusher for secondary reduction. Ball mills and Fuller mills are used for fine grinding the raw material, which is afterward sent to seven 9x100-ft. rotary kilns. Kent mills and tube mills complete the clinker grinding.



MILL OF MARQUETTE PORTLAND CEMENT CO., OGLESBY, ILL.

same process of manufacture. The limestone and shale are quarried (in one case mined), mixed in correct chemical proportions, and ground until 78 to 80 per cent of the product will pass a 200-mesh sieve. The powder is then burned to incipient clinker in rotary

Returned Soldiers, particularly those who saw service overseas, are going back into civil pursuits better fitted for work. One of the largest employers in the United States found that, of 600 returned soldiers who have been employed by his corporation, 43 per cent have proved more efficient than they were before military service.

The Board of Directors, A. I. M. E.



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1—Horace V. Winchell,
President, 1919-'20.
2—Sidney J. Jennings,
Past President, 1919-'21.
3—Philip N. Moore,
Past President, 1919-'20.
4—A. R. Ledoux,
First Vice-Pres., 1919-'20.
5—George D. Barron,
Treasurer, 1919-'20.
6—Charles W. Goodale,
Vice-Pres., 1919-'20.
7—Mark L. Requa,
Vice-Pres., 1919-'20.
8—Henry S. Drinker,
Vice-Pres., 1919-'21.



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Board of Directors, A. I. M. E.



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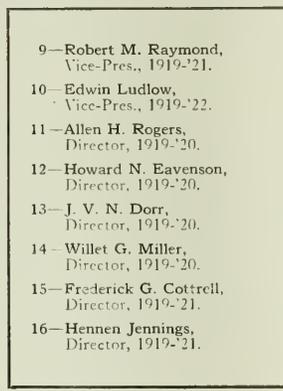
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Board of Directors, A. I. M. E.



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17— George C. Stone,
Director, 1919-'21.

18— Samuel A. Taylor,
Director, 1919-'21.

19— Arthur Thacher,
Director, 1919-'21.

20— J. V. W. Reynders,
Director, 1919-'22.

21— Charles F. Rand,
Director, 1919-'22.

22— Louis S. Cates,
Director, 1919-'22.

23— Stanly A. Easton,
Director, 1919-'22.

W. R. Walker,
Director, 1919-'20.
(Photograph not available)



21



22



23



HERBERT CLARK HOOVER

Underwood and Underwood.

Herbert C. Hoover Returns

HERBERT CLARK HOOVER has completed his war work, the offices of the American Relief Administration in Paris have been closed, and the Food Administration remains in only technical existence. This announcement, made within the last few weeks, brings to a close one great chapter of Hoover's public services, which began with the invasion of Belgium in 1914, when he came to the rescue of thousands of stranded Americans, and grew until they assumed the highest international importance after the signing of the armistice, when he was named Director General of Inter-Allied Relief. Mr. Hoover, although severing his connections with the Food Administration, will always be remembered as the man who fed the starving people of Europe during the Great War.

Through the days of the war, the food supply of the Allies was a problem of the utmost importance, and the outcome a matter of doubt which hung in the balance during the greater part of the war period. Not only was the question of transportation, attended by the submarine peril, a cause for anxiety, but of still greater danger was the possible insufficiency of production in the United States, a source to which all the Allies looked as their only salvation.

The problem was a grave one, and all turned to Hoover to bring order out of disorder, to co-ordinate the efforts of individual agencies, and to accomplish the production and distribution of the necessary supplies to carry on the war. How well this was done and how efficiently the organization created by Hoover functioned have been told repeatedly in the columns of the press.

The romance of the administration of millions—even billions—of dollars' worth of food supplies has stirred popular imagination, and the name of Hoover has, in fact, come to suggest the miraculous in production and in administrative achievements.

Prior to the war, Herbert Clark Hoover was practically unknown outside of the circles of finance and the profession of engineering. But since 1914, so intimately did his work, his judgment and decisions, affect the lives of millions of men, women, and children, that he has become within five years an international figure familiar to the peoples of many countries.

The results achieved by various war organizations of Hoover's creation, and operating under his direction, are of wide public appreciation. The activities of the Commission for Relief in Belgium, Hoover's services in various capacities—as Food Director of America, Director General of Inter-Allied Relief, named by the commission sitting in Paris, and as Director General of the American Relief Administration, with full authority to supervise the expenditure of \$100,000,000, voted by Congress for European famine relief—present a record of executive ability rarely equaled, even in the days of a war which created imperative demands for qualities of the highest order.

On the morning of Aug. 4, 1914, the American Consul in London called Hoover on the telephone and

asked his help for American citizens in London, who had swamped the consular office with requests to change letters of credit, bank drafts, and express orders, for British gold. Hoover enlisted the aid of his friends and raised \$200,000, the Government lending the same amount. And during the war period 45,000 Americans were sent home. When Hoover came to the aid of his fellow Americans on this occasion, he probably had no idea that this was only the beginning of labors which would burden him for the next five years.

Meanwhile, the situation in Belgium had become desperate, and Hoover was requested to handle the work of relief in Belgium and northern France. Associating with him several able engineers, within three weeks an office had been established in New York, another in Rotterdam, and another in Belgium, and Hoover had perfected a system of shipping, checking and distribution which was a model of its kind. The rapid accomplishment of huge undertakings has long been recognized as a dominant characteristic of Americans. Men of other races could have built such a system, but only an American, with the assistance of Americans, could have done it in so short a time.

The Commission for Relief in Belgium handled, until near the close of 1916, supplies worth \$227,000,000, keeping alive a population of 9,000,000 and operated with an overhead expense of only three-quarters of 1 per cent of gross cost. Such is engineering efficiency in business, organized in an emergency and administered under constant stress and unprecedented difficulty. What might such ability accomplish under normal conditions of business and with ample time for planning and execution?

As Director General of the Inter-Allied Relief and head of the American Relief Administration, Hoover directed the distribution of 3,219,896 tons of food-stuffs, valued at \$777,795,000 and comprising over 600 complete steamer loads.

The American Institute of Mining and Metallurgical Engineers will hold a dinner and reception in honor of Hoover on Sept. 16 at the Waldorf-Astoria Hotel, New York, soon after his arrival, and this function will mark his retirement after five years of public service, given without salary and in which time he paid his own expenses. Mr. Hoover's war work has been completed, and there remains only the writing of the story of the gigantic task that he carried through with such conspicuous success.

It is reported that Mr. Hoover will leave New York without delay for a long-deferred rest at his home in Palo Alto, in California. Surely, he well deserves a long vacation, and the best wishes of a host of friends and the prayers of the multitudes whose suffering he relieved will accompany him. Although Mr. Hoover may have expressed his intention to retire from public service, he may not be permitted to do so. An insistent public wish that he continue in its service may make retirement most difficult. The desire to obtain rest and relaxation may pass away, a common occurrence among men of his type. Moreover, the sentiment persists that such men as Hoover do not possess a social right wholly to direct their own activities or destinies.



Harris & Ewing, Washington, D. C.

JOSIAH EDWARD SPURR

The "Journal's" New Editor

AS ANNOUNCED in the issue of Aug. 16, Josiah Edward Spurr will assume the post of Editor-in-Chief of the *Engineering and Mining Journal* on Oct. 1.

Mr. Spurr was born in Gloucester, Mass., on Oct. 1, 1870, son of Alfred Sears Spurr and Oratia Snow Spurr. He came from early Puritan and Pilgrim stock, being descended on his father's side from John Spurr, Boston, 1638, and on his mother's side from Nicholas Snow, Plymouth, 1623, who married Constance Hopkins, Mayflower, 1620.

Mr. Spurr attended public schools in Gloucester, and thereafter studied at Harvard University. On graduation, in 1893, he entered the employment of the Minnesota Geological Survey, and made the first geologic map of the Mesabi Range, then newly discovered. In the spring of 1894 he had prepared a bulletin on the subject, which the State Geologist accepted and published. In this bulletin Mr. Spurr announced his discovery of the origin of the Mesabi iron ores in a green iron silicate, a derivation which had not before been detected for any of the Lake Superior iron ores. This discovery was afterward confirmed by the work of Messrs. Leith and Van Hise, of the U. S. Geological Survey.

The bulletin on iron ores attracted the attention of S. F. Emmons, of the U. S. Geological Survey, who engaged Mr. Spurr as assistant in the study of the ore deposits of Leadville, Col., during the summer of 1894. Following a short period of investigation in the Leadville district, Mr. Spurr was assigned independent work in the study of the Mercur district, Utah, upon which he published a report issued by the U. S. Geological Survey. In this report he assigned the origin of the ore deposits to the after-effects of igneous intrusion, and he was probably the first American geologist to offer this explanation. In 1895, Mr. Spurr, with G. W. Tower, Jr., as assistant, made a geological survey of the Aspen mining district, in Colorado, with its complicated faulting, and as a result of this survey published Monograph XXXI of the Geological Survey.

Mr. Spurr was selected in 1896 to conduct the first Geological Survey expedition into the interior of Alaska. He was accompanied by H. B. Goodrich and F. C. Schrader as assistants. They made the trip over Chilkoot Pass on foot in June, 1896, and inspected practically all of the gold diggings then known in the region. While the party was at Circle City gold was discovered on the Klondike. Before the closing of winter Mr. Spurr and his associates returned to Washington, and a report was at once published on the "Geology of the Yukon District." Mr. Spurr also outlined further plans for Alaskan explorations, which were adopted.

In 1897, Mr. Spurr went to Berlin as a graduate special student in the university, but became dissatisfied with Prussian methods and proceeded to Paris to study under Lacroix. From this most pleasant association he was recalled to the United States for further Alaskan exploration. In 1898, he took charge of a Geological Survey party, which entered from Cook Inlet and ascended the Susitna River to the Alaskan Range. After crossing the range the party traveled 800 miles down the main east fork of the Kuskokwim River to its mouth, thence southward and through a series of hith-

erto unmapped rivers and lakes to Nushagak, on Bristol Bay. From Nushagak the trip was made across Bristol Bay in Eskimo skin-canoes, and on foot across the Alaskan peninsula to Katmai. Much of the route had not before been traversed by white men, and aside from the geological studies, rough maps were made of the general geography. The results of this expedition were published in a report of the Geological Survey, entitled "Geology of Southwestern Alaska."

Through his study of the Yukon gold fields Mr. Spurr reached the conclusion that the auriferous quartz veins were the end product of siliceous magmatic differentiation, and he was the first geologist to discover this vital association. In connection with these studies Mr. Spurr pointed out in subsequent papers, before the American Institute of Mining Engineers and elsewhere, the worldwide relation of siliceous igneous rocks to gold deposits. He also defined an important class of rocks more siliceous than granites, which he called alaskites. These definitions and conceptions have long been commonly accepted.

In 1899, Mr. Spurr was commissioned to make a reconnaissance of Nevada and adjacent California, to fill a gap in the geologic map of the United States. In addition to completing the geologic map, the result of this work was a bulletin entitled "A Reconnaissance of Nevada and Adjacent California South of the Fortieth Parallel."

In 1900, the Turkish Government applied to the State Department in Washington for a geologist and mining engineer, and Mr. Spurr was recommended. He went to Constantinople in the capacity of mining engineer to the Sultan, and made several examinations in Asia Minor and Macedonia. Mr. Spurr was appointed by the Sultan as a member of a commission to revise the mining laws, the other members being the Minister of Mines and the Grand Vizier.

Upon his return to the Geological Survey in Washington, Mr. Spurr undertook to examine the newly discovered camp of Tonopah, Nev., which he visited repeatedly, and on which he wrote several reports and papers. Subsequently, assisted by Sydney H. Ball and George H. Garrey, he made a survey of the geology and ore deposits of the Georgetown quadrangle in Colorado.

In 1906, Mr. Spurr left the Government employment to become chief geologist for the American Smelting and Refining Co., the American Smelters Securities Co., and allied organizations. He retained his connection with these companies until he left New York in 1912, having the title of consulting engineer.

About 1907, Mr. Spurr announced a theory of ore-deposition which involved the origin by siliceous magmatic differentiation, not only for auriferous quartz veins but of most metalliferous veins, and, further, that veins containing different minerals, such as copper, lead, zinc, gold, and silver, were deposited from the same solutions under varying conditions of temperature and pressure. These principles have met widespread acceptance.

In 1908, the consulting firm of Spurr & Cox, Inc., was organized, with offices in New York, Denver, El Paso, and Mexico City, specializing in mine examinations, geological surveys, mine operation, mill construction, and other forms of mining engineering.

In 1912, Mr. Spurr removed to Philadelphia and became vice-president in charge of mining operations of the Tonopah Mining Co., of Nevada, and continued in this capacity until Sept. 1, 1917. During this period he examined gold deposits in the Hudson Bay country of northern Manitoba, and became manager of the Mandy copper mine, which was the first producing mine in Manitoba.

Mr. Spurr was engaged later in mining in Nicaragua, where he developed the Eden mine, one of the most important mining enterprises in the country. He also developed the nearby Rosita mine and blocked out a large reserve of 5 per cent copper ore.

At the outbreak of the war Mr. Spurr went to Washington, and soon after was connected with the Shipping Board on a dollar-a-year rating. Here he became associated with Professor C. K. Leith, of the University of Wisconsin, on a Committee on Mineral Imports, representing both the Shipping and War Trade boards, and charged with formulating a program for reducing mineral imports, this being the time of the most acute ship shortage. Later Pope Yeatman, of the War Industries Board, became the third member of this committee.

On the termination of the work of the Committee on Mineral Imports, Mr. Spurr accepted the position of executive of War-Minerals Investigation for the Bureau of Mines, under a special fund of \$150,000 appropriated by Congress.

While on the Shipping Board and the Bureau of Mines, Mr. Spurr perceived the patriotic necessity of studies as to the control, both political and commercial, of the world's mineral resources, and outlined a comprehensive plan of treatment of the problem whereby he secured the voluntary co-operation of many geologists, mining engineers, and chemists. On the termination of the war Mr. Spurr resigned from this activity, and on the passage of the War-Minerals Relief Act, undertook to organize the force of field investigators, including engineers and auditors, with the title of Chief Engineer. Having organized this work, he accepted the invitation of the *Engineering and Mining Journal* to become its Editor-in-Chief.

In addition to the many publications of the U. S. Geological Survey which have been written by Mr. Spurr, he is the author of numerous papers published in the Transactions of different societies. In 1902, Mr. Spurr published "Geology Applied to Mining," which has had a wide popular circulation and acceptance as a textbook. In 1905 he was the leading spirit in founding *Economic Geology*, which became the principal journal in its field and worldwide in its circulation.

Chronology of Mining, August, 1919

Aug. 1—Workmen struck for higher wages on C. & N. W. ore docks at Ashland, Wis.—Arizona Hercules tailings dam at Kelvin, Ariz., destroyed by cloudburst.

Aug. 2—House passed bill imposing tariff on laboratory glassware, optical glass, scientific instruments, and similar apparatus.

Aug. 4—Proceedings begun in Elm Orlu Mining Co.'s supplemental suit against Butte & Superior at Butte, Mont.—Shopmen struck on ore-carrying railroads following dockworkers' strike at Ashland, Wis.—State Corporation Department of California issued list of oil companies that have violated the California "blue-sky"

law.—Duluth Engineers' Club held annual meeting at Duluth, Minn.

Aug. 7—Senate passed bill providing for suspension of assessment work. Bill signed later in month.

Aug. 10—I. W. W. strike at Oatman, Ariz., work being resumed two weeks later.

Aug. 13—Cerro de Pasco Copper Corporation's directors decided to build new smelter at Oroya, Peru.

Aug. 15—International Union of Mine, Mill & Smelter Workers struck in Coeur d'Alene district, Idaho.—Van. H. Manning addressed local oil men at Engineers' Club, San Francisco.

Aug. 17—Miners struck for higher wages at Divide and Tonopah camps, Nevada.

Aug. 21—Tungsten tariff bill passed House.—Winnipeg Mining Association organized.

Aug. 23—Dockworkers' strike settled at Ashland, Wis., and iron mines resume shipping.

Aug. 25—Elm Orlu supplemental suit settled by compromise.

Aug. 28—Strike of Nevada Consolidated Copper Co.'s employees ended.

Motion Pictures at National Exposition Of Chemical Industries

Operations in Coal Mining and in the Treatment of Metals in Furnaces—Formation of Coal, To Be Shown Graphically, a Novel Feature

THE motion picture is to play an important part in the coming Fifth National Exposition of the Chemical Industries, to be held at the Coliseum and First Regiment Armory, Chicago, during the week of Sept. 22-27. Vivid representation of chemical processes are to be shown, which will include all the steps, from the removal of the crude product from the ground to its ultimate presentation to the consumer.

Coal processes and coal mining will be shown by a series of pictures. On the evening of Sept. 23, M. F. Leopold, of the U. S. Bureau of Mines, will show three such pictures, illustrating the "History and Utilization of Coal." These will be "The Story of Coal," in four reels; "The Manufacture of Beehive Coke," in one reel; and "Byproduct Coking With Koppers Ovens," in three reels. These will be used to illustrate the discussion of these topics by Mr. Leopold.

Furnace treatment of metals will also be illustrated in pictures on the evening of Sept. 24, at the Coliseum auditorium. The films are supplied by several manufacturing concerns, as follows: The Electric Furnace Co., Detroit Electric Furnace Co., Shawinigan Water & Power Co., and Community Motion Picture Bureau.

Jam Handy, vice-president of the Bray Studios, will show some pictures on Sept. 25, these being the "Formation of Coal Made Visible" and the "Chemistry of Gas Engines Made Visible." These pictures will graphically illustrate the manner in which coal is formed and power extracted from the oil by gas engines.

On the evening of Sept. 26, Mr. Handy will show several other pictures, illustrating the "Invisible in Chemistry" as shown by art and as applied to munitions manufacture, the chemical processes of photography, the chemical processes of the electric battery, and also of crystallization. On the following evening, Sept. 27, the last night of the exposition, Mr. Leopold will show a number of elaborate pictures, all illustrating the safety work being done by the U. S. Bureau of Mines.

A. I. M. E. Program At Chicago

Exceptional Facilities Provided for Technical Investigations—Diverse Social Features—Many Prominent Men Will Attend Annual Banquet

SEPTEMBER 22 to 26 the American Institute of Mining and Metallurgical Engineers holds its autumn meeting in Chicago. The Congress Hotel is designated as the convention headquarters and most of the meetings and technical sessions will be held there. For the gratification of the technical appetites, a feast of over a hundred and fifty papers has been prepared for discussion at this meeting.

The first of the social activities during the session will be the smoker at the Congress Hotel, on Monday evening, and for this a lively program has been prepared. The committee in charge guarantees that at this smoker—in spite of the restrictions against 2.75 per cent—any existing trace of coolness or strangeness between members will be absolutely annihilated. An inviting series of excursions has been arranged for the members and their wives. These include a boat trip to the Gary steel mills, one day in the La Salle district, with its zinc smelteries, coal mines, and cement plants; the East Chicago lead refineries, the oil refineries at Whiting, the tungsten and molybdenum plant of the Fansteel Products Co., the Milwaukee mining machinery manufacturing and the coal mines in Franklin and Macoupin counties. Also, arrangements have been made for the members to visit the various industrial plants of interest in and about Chicago.

The general program of the meeting will be:

Monday, Sept. 22, 1919:

- 10 a.m.—Registration, Congress Hotel.
- 11 a.m.—Technical sessions, Congress Hotel.
 - a—Nonferrous Metallurgy.
 - b—Mine Taxation.
 - c—Coal and Gas.
- 2 p.m.—Technical sessions, Congress Hotel.
 - a—Coal and Gas.
 - b—Geology.
 - c—Milling.
 - d—Industrial Organization.
- 8 p.m.—Smoker, Congress Hotel.

Tuesday, Sept. 23:

- All-day excursion by steamer to the Gary steel mills, with technical session on Iron and Steel on the boat.
- 8 p.m.—Technical session on Oil, Congress Hotel.

Wednesday, Sept. 24:

- 10 a.m.—Technical sessions, Congress Hotel.
 - a—Iron and Steel.
 - b—Sulphur in Coal.
 - c—Mining and Local Resources.
- 2 p.m.—Technical sessions:
 - a—Nonferrous Metallurgy, Coliseum, in conjunction with Chemical Industries Exposition.
 - b—Sulphur in Coal, Congress Hotel.
 - c—Pyrometry in Iron and Steel Metallurgy, Congress Hotel.
- 6 p.m.—President's Reception, Congress Hotel.
- 7 p.m.—Banquet, Congress Hotel.

Thursday, Sept. 25:

- a—All-day excursion to the La Salle district.
 - Trips of inspection of zinc smelteries, coal mines, cement plant, permanganate plant, and scenic trips by automobile.
- b—Technical sessions, morning and afternoon, on Pyrometry, Congress Hotel.

Friday, Sept. 26: Optional excursions.

- a—Lead refineries, East Chicago, and oil plants at Whiting.
- b—Milwaukee mining-machinery plants and tungsten-molybdenum reduction works at North Chicago.
- c—Coal fields, Franklin and Macoupin counties.
- d—Local industries, Chicago.

The National Exposition of Chemical Industries will be held at the Coliseum and First Regiment Armory, Chicago, in the same week. A cordial invitation has been extended to members of the Institute to visit the exposition. The Wednesday afternoon session on non-ferrous metallurgy will be in conjunction with the exposition at the Coliseum.

It is thought that by having the banquet in the middle of the week, a maximum attendance can be obtained. Members who come to Chicago for only a portion of the session will then be able to be present at the banquet, whether they come for the first or the latter half of the week. The speakers at the banquet will include Charles M. Schwab, General Leonard Wood and Horace V. Winchell, President of the Institute; Captain Robert W. Hunt will be toastmaster.

The wives and daughters of all members are most cordially invited to attend the Chicago meeting. The banquet and the various excursions are being planned with a special view to their enjoyment by the ladies in the party. Also, a special ladies' committee has been appointed, of wives of members of the Chicago Section, which is arranging an attractive program for the entertainment of the women guests.

A special naval maneuver at the Great Lakes Naval Training Station will be arranged purposely for the ladies' entertainment.

27th Engineers Service Medals

During July, most of the service medals presented by the Association of the 27th Engineers to the men enrolled with the regiment were sent out. In those cases in which the addressees were known to be imperfect, the medals were not mailed. The number of medals issued was 1,397, of which sixty-four have been returned by the Post Office with the note "that the person addressed could not be found." A blank receipt was enclosed with each medal, with the request that the recipient fill it out and return to the undersigned. Up to Sept. 5, 944 receipts had been returned.

Members of the regiment who have received the medal but have not yet mailed the receipt are asked to do so without delay. Those who have not yet received it will please communicate with the undersigned. Those in the regiment who may read this notice are asked to inform other members whom they may meet.

W. R. INGALLS,

115 Broadway, New York.

Vanadium Company Under New Control

Control of the American Vanadium Co., with its mines in Peru and mills in Pittsburgh, Pa., was recently acquired by J. Leonard Replogle and Charles M. Schwab, through Allan A. Ryan & Co., bankers. The assets of the old company, which was controlled by the Flannery interests, in Pittsburgh, and was sold to a new company, which is expected to be known as the Vanadium Co. of America, will be liquidated. The new company, it is said, will issue 280,000 shares of stock.

Judge Gary Prominent in Development Of the Middle West

Influence of the United States Steel Corporation in Promoting Industrial Expansion of the Northern Iron-Ore Regions

AMONG the men prominently identified with the development of the mining and other industries in the Middle West none has had a greater part than Judge Elbert H. Gary.

Judge Gary was born in Illinois in 1846, and was admitted to the bar in 1865. His natural abilities soon attracted a number of important clients, and it was through his connection with one of these that he eventually devoted his energies exclusively to the steel trade, in which he has since risen to be the most commanding figure. In 1898, as general counsel for and a director of the Illinois Steel Co., he was called upon to take charge of the organization of the Federal Steel



JUDGE ELEERT H. GARY

Co., and for the first time was brought into close touch with the late J. P. Morgan. From then on the achievements of Judge Gary have been coincident with the growth and prosperity of the United States Steel Corporation, of which he is the chief executive officer, chairman of the Board of Directors, and chairman of the Finance Committee.

The most important iron-ore deposits in the United States lie in the Lake Superior district. The first of the Lake ore deposits to be opened was on the Marquette Range, but of all the ranges the largest, richest, and most easily worked was the Mesabi. The ore properties in the Lake Superior region, along with the Alabama properties, are the sources from which the Steel Corporation obtains its iron supply.

The activities of the Steel Corporation in the northern iron-ore region began with the purchase by the Corporation in 1901 of the Bessemer Steamship Co., a Rockefeller company, the purchase being made about one month after the organization of the Steel Corporation. This company had a fleet of fifty-six vessels engaged in

traffic on the Great Lakes. The Steel Corporation paid \$8,500,000 for the stock of the company, or about \$150,000 for each vessel of the fleet.

In 1901 the Corporation also purchased by exchange of stock one-sixth interest in the Oliver Iron Mining Co. and the Pittsburgh Steamship Co. The Carnegie Steel Co. already owned the other five-sixths of the securities of both of these firms, and this purchase gave the Corporation complete ownership.

In December, 1902, an important deal for the absorption of the Union Steel Co. was consummated. By this transaction the Corporation acquired, along with furnaces, mills, and tube works situated in various parts of the country, the ownership of two mines, and leases on two others in the Mesabi Range, with an estimated ore deposit of forty million tons.

From this period on, the history of the United States Steel Corporation, besides the achievement of greatly increased economic efficiency, is a continuing narrative of expansion, the construction of plants, and the acquisition of other companies. At the close of 1918 the Corporation had developed seventy-two mines on the Mesabi Range four on the Vermilion Range, seven on the Menominee Range, twelve on the Marquette Range, and thirteen on the Gogebic Range.

At Colerane a concentrator, the largest in the world, has been erected, and ore as low as 37 per cent in iron is treated, producing a product which averages 56 per cent iron.

Two well-equipped railroads, both owned by the Steel Corporation, carry the ore from the mines north of Lake Superior to tidewater on that lake. The Duluth, Missabe, & Northern transports the Mesabi ores to the port of Duluth, and the Duluth & Iron Range runs between points in the Vermilion Range on the eastern part of the Mesabi Range to Two Harbors. The mines of the other Lake ranges are served by independent roads, the ports being Marquette and Ashland, on Lake Superior, and Escanaba, on Lake Michigan. From these ports the ore is taken on the vessels of the Pittsburgh Steamship Co. to Gary, South Chicago, Cleveland, Ashtabula, Conneaut, Fairport, and other Lake Erie points, for distribution to the furnaces. The boats are loaded from the Corporation's docks. At Two Harbors, where there are four docks, 8,723,944 gross tons was handled in 1918, and at Duluth, 20,569,958 gross tons.

Judge Gary has with the passing of the years assumed in great degree the responsibility for determining the courses of action of the Steel Corporation, and to his influence is largely due the progress it has made, and the popular goodwill and esteem in which it is so generally held.

August Pig-Iron Production

August pig-iron production amounted to 2,743,388 gross tons, or 88,496 tons daily, as compared with 2,428,541 tons, or 78,340 tons daily, in July, or an increase of nearly 13 per cent, according to *Iron Age*. On Sept. 1 there were 266 active furnaces, with an estimated capacity of 93,360 gross tons daily, as compared with 239 furnaces, able to produce 85,635 tons a day, on Aug. 1. The number of active stacks showed a net gain of 27 during the month, 37 being blown in and 10 blown out. The production of ferroalloys amounted to 17,419 gross tons, as compared with 14,805 tons in July, or an increase of over 17 per cent.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

The War-Minerals Relief Commission

After conducting hearings in twelve cities, and listening to testimony in 500 cases, the War-Minerals Relief Commission has returned to Washington, and expects to make rapid progress in the disposal of pending claims. Senator Shafroth, the chairman of the commission, has come back impressed anew with the frankness and truthfulness of miners. Though many of the claims which were filed asked for larger amounts than were justified, it was found that as a rule this was due to misunderstanding on the part of the claimant. On the stand, where the limitations of the War-Minerals Relief Act could be explained, the claimants made no effort to misrepresent or to hedge around the "request or demand" feature of the law, Senator Shafroth said. In many cases claims were withdrawn outright when the exact provisions of the law were made plain.

Had the commission been in the position to make cash settlements on its trip, a large number of claims could have been paid off in full with a small percentage of the total amount asked. In one case a claimant while on the stand offered to take \$5,000 for his \$55,000 claim. In other cases claimants were willing to settle on a fifty-fifty basis. Others were anxious to settle on a basis of the actual cash which they paid out, though others were sticklers for the entire amount claimed. It is admitted, however, that little evidence was found by the commission indicating that the claimants regarded the Government as a partner when they began their operations. A stenographic record was made at each hearing, and the transcript of the testimony is being forwarded to Washington as rapidly as it is finished, where it will be available as a public record.

The second award made under the act is that in favor of the National Pyrites & Copper Co., a Georgia concern. In this case the original claim was for \$189,723.43. The commission recommended a payment of \$25,000 in full settlement of the claim. The award, however, was for \$37,000, the Secretary of the Interior having added \$7,000 to cover a technical error and \$5,000 to cover a salary account which the commission had not allowed.

The claim of J. N. Lotspeich, of Morristown, Tenn., was not allowed. In that case the claimant had requested reimbursement for his efforts made to interest capital in a certain manganese property.

From one of the awards it may be deduced that the commission will not interest itself in protecting the award for the claimant. In one case the claimant had purchased his mining property at a high price during the war, and on it only a part of the payment was made. He now stands to lose the entire award to the owners of the property. Some are of the opinion that the commission should do something to safeguard the claimant in a case of this kind, where the patriotic

effort was entirely that of the claimant. It was argued that the return of the property to the owners and a forfeiture of the payments already made on the property should satisfy the owners. It was pointed out that the discussion in Congress indicated that it was not intended to provide money for the payment for properties. If an award would simply become an additional asset against which the owners could proceed, it was claimed that it would in effect be awarding money to pay for the property. It is apparent, however, that the commission regarded this reasoning as illogical.

After having been in such close touch with those interested in mining, it is apparent that the commissioners now are in a position to suggest amendments to the War-Minerals Relief Act which will do away with some of the evidence of inequities, and it is probable that efforts to liberalize the act will await suggestions of amendments by the commissioners.

Senate Passes Leasing Bill

Leasing of oil, coal, gas, phosphate, and sodium land was assured when the Senate on Sept. 3, at a night session, passed the general leasing bill. Senator La Follette, of Wisconsin, who has been able to delay and prevent the passage of the bill on previous occasions, fought the measure stubbornly to the last. He had the support of nine other Senators in his efforts to pass certain of his amendments.

The amendment giving authority to the President to control the prices of coal, oil, and other products derived from the lands leased was rejected by the Senate, 48 to 10. The Senators voting with Mr. La Follette were Cummings, Iowa; Gronna, North Dakota; Harris, Georgia; Kenyon, Iowa; Norris, Nebraska; Nugent, Oregon; Sheppard, Texas; Trammell, Florida; and Walsh, Massachusetts. The main objection to the La Follette amendment was that price-fixing legislation should be undertaken as a separate measure, if at all. It was pointed out, however, that the amendment would give the Government power to fix the price on one-tenth of the oil of the country and allow the other nine-tenths to be unregulated. The same condition would apply to coal and the other commodities.

On his amendment to strike out Section 18 of the bill, only seven Senators voted with Mr. La Follette. Senator Lenroot called attention to the fact that there is nothing in the bill to prevent the President from creating as many naval reserves as he sees fit out of the 3,000,000 acres of land that will be subject to disposition under the bill. The only condition is that existing wells within any naval reserve he may create may, under certain conditions, be leased.

The bill, which will be administered by the Secretary of the Interior, allows a royalty of not less than 5c. nor more than 20c. on coal lands. The oil-land

royalties are not to be less than 12½ per cent or more than 25 per cent of oil produced. In the case of phosphates, the royalty is to be 2 per cent of the gross value of production, and with sodium the royalty is to be one-eighth of the production.

The bill now goes to the House, where it has been referred to the Committee on Public Lands. It is not expected that it will be reported out of this committee and passed by the House without further amendments, as some of the amendments adopted in the Senate are likely to be opposed in the House.

Investigation of the Oil-Shale Industry

Development of the oil-shale industry faces many technical difficulties and also involves an extensive manufacturing operation. For these reasons the Secretary of the Interior is especially desirous that Congress give favorable consideration to Senator Henderson's bill (S. 2671) which provides an appropriation of \$140,000 to carry on experimentation in the handling of oil shale. It is estimated that a supplemental appropriation of \$70,000 will be required each year thereafter.

At the request of the Senate Committee on Mines and Mining, the Secretary of the Interior has submitted to the committee an exhaustive report. Extracts from the report are as follows:

Experimental and investigative work should start in order to determine the most economical methods for the recovery of oil from shale. By proper guidance the shale-oil industry can ultimately be developed so that it is of commercial importance to this country.

The destructive distillation of shale to produce oil has been practiced on a commercial scale in Scotland, France, and New South Wales. The amount of oil produced is, however, small in comparison with the oil output of this country. The U. S. Geological Survey has estimated that we have stored in the mountains of the Rocky Mountain district billions of barrels of oil in the form of oil shale; more than can be mined in the next hundred years. A comparison can be drawn with the coal situation. There are more unmined tons of lignite in North Dakota than all of the rest of the United States, just as the oil held in the shales is vastly greater than that in the oil fields, but the actual recovery in both the lignite and oil shale is dependent upon such factors as location, labor, the number of mines, and the state of their development.

With all of these vast reserves, very little work has been done actually to determine the most economical methods for recovery. There are no oil-shale plants operating in the United States on a commercial basis. Perhaps one hundred companies have been organized for the purpose of developing or selling stock in oil-shale enterprises. Some of them have spent considerable time and money on experimental work with the aim of developing retorting processes other than Scotch, which will be satisfactory for American shale. About thirty processes, in various stages of development, have come to the attention of the Bureau of Mines.

Various engineers estimate that the cost of a complete retorting plant handling one thousand tons of shale per day will be from \$1,000,000 to \$5,000,000, and if this plant treated a shale averaging one barrel of oil to the ton of shale, it would take an initial investment of from \$1,000,000 to \$5,000,000 to produce one thousand barrels of oil per day. You can readily see, therefore, with such a heavy expenditure, the investor should have some reliable data for his investment.

Experimental work must necessarily precede such a large undertaking as the development of the oil-shale industry, and I recommend that such work start now, so that at the time when the supply of petroleum from our wells does not meet the essential demands the oil from shale will be ready to partly alleviate this shortage.

Potash From Searles Lake

Certain of the potash marketed from Searles Lake contained a sufficient amount of borax to injure crops. An official statement to this effect has been issued from the Department of Agriculture, which is of particular significance at this time because of its bearing on the matter of tariff protection for the domestic potash industry. The complete statement is as follows:

During the last few weeks the U. S. Department of Agriculture has received many complaints regarding injury to crops apparently resulting from the use of potash from Searles Lake, California. The natural brine of this lake from which the potash salts are prepared contains a considerable amount of borax. Apparently one, at least, of the companies operating in the locality did not exercise sufficient care in the operation of the potash, and let out a considerable amount of potash salts in 1918 with a high percentage of borax, averaging probably 10 per cent, and in some samples going as high as 23 per cent.

The department has been conducting careful investigations of the matter in the field, and these investigations indicate the substantial correctness of many of the complaints. In some of the special fertilizer tests of the department in the use of Searles Lake potash, injury, which apparently was the direct result of the high percentage of borax, was clearly shown, whereas potash from some other sources showed beneficial effects upon the crops tested.

Zinc Tariff Bill Passed by the House

Without a record vote, the House of Representatives on Sept. 2 passed the bill providing a new tariff schedule for zinc. The duties provided in the bill as amended are as follows:

Zinc-bearing ore of all kinds, including calamine, containing less than 10 per cent of zinc, shall be admitted free of duty; containing 10 per cent or more of zinc and less than 20 per cent, the duty is to be ¼c. per lb. on the zinc contained therein; containing 20 per cent or more of zinc and less than 25 per cent, ½c. per lb. on the zinc contained therein; containing 25 per cent or more of zinc, 1c. per lb. on the zinc contained therein. Zinc in blocks or pigs, and zinc dust, 1½c. per lb.; in sheets, 1½c. per lb.; in sheets coated or plated with nickel or other metal or solutions, 1¾c. per lb.; old and worn-out zinc, fit only to be remanufactured, 1c. per lb.

Investigation of about fifty complaints of the sale of wild-cat oil stocks in the Texas oil fields is under way by the Federal Trade Commission. The commission has sent two of its investigators into the region with instructions to make a searching inquiry into the cases. The complaints were lodged with the commission by competing concerns selling stocks or others interested in the legitimate development of the fields.

The incorporation of the United States Platinum Corporation by the Federal Government is proposed in a bill introduced by Representative O'Connell, of New York. The bill authorizes L. R. Beckley and associates to locate claims and enjoy leases which they may take up on platinum sands controlled by the United States in Alaska.

Trade between Hungary and the United States has been authorized, effective Sept. 2. Exports from the United States will be controlled by individual export licenses, but such licenses will be issued freely, except for commodities restricted for military reasons.

BY THE WAY

All Right If You Have the Car

Prohibition being a somewhat new experiment for some of the states, it is likely that complete and practicable plans for eluding the law have not yet been thoroughly contrived. In Ontario, where surreptitious practices have been necessary for some time, numerous clever schemes for spiriting the spirits away have been developed. The latest dodge is reported from Sudbury, where, according to our informant, the main wires of the city's lighting system were cut one night, after which two large drays, coming up out of the blackness of the night, were quickly loaded from a carefully spotted freight car, and silently stole away. Whether this supply will last the nickel district until another workable scheme is devised remains to be demonstrated.

A Question of Rights

"Ere pardner," said Cap'n Dick, "seems to me they do be 'avin' a 'eap o' trouble daown there in Mexico. Firs' they 'ave one o' these 'ere revolutions an' can't seem to h'agree among theysel's, an' finally, w'en they do seem to settle daown, some o' these 'ere fire-cracker ones don't care to stay daown. These 'ere bandit chaps we're readin' bout—w'y, m'son, one would think we wuz livin' back in tha h'olden h'ages, with h'all this 'ere talk about 'oldin' for ransom an' such. May be h'all right if these chaps want to carry h'on in that there fashion themself's but, dam-me, don't seem as 'ow they 'as much bloody right to h'interfere with them's as is mindin' their h'own business. 'Ere they be, a-blawin' h'up mines, destroyin' property an' h'eaven to tha killin' o' some o' they chaps 'oo be tryin' to do tha country a good turn. An' w'ot does tha Mexican government do? 'Ere I wuz readin' h'only tha h'other day about 'ow they say Mexican rights mus' be up'eld. Considerin' h'all that's 'appened, m'son, w'ot's think on un? Reminds me o' tha story about 'Arry Penglase. 'Arry come on shif' one mornin', lookin' daown in tha mouth, an' sez shif'boss to 'e, 'Wot's tha matter, 'Arry?' 'Oh, dam-me,' sez 'Arry, 'Las' night I lef' tha door to tha 'en-'ouse h'open, an' this moornin' tha chickens is h'all gone.' 'Well, m'son,' sez shif'boss, 'Don't see thee needs to worry bout that. Leave tha door h'open an' they'll come 'ome.' 'That's tha 'ell of it,' sez 'Arry, 'tha've gone 'ome.' But, dam-me, m'son, 'Arry h'admitted 'e'd no rights." D. E. A. C.

A Wicked Calling

Anyone who believes that Government reports are dull and uninteresting as the desert wastes may find here and there an oasis as fascinating as the report of the exploration of the valley of the Amazon, by Lieutenant William Lewis Herndon, in Senate Executive Document No. 36 of the Second Session of the Thirty-Second Congress. In speaking of the town of Cerro de Pasco, Herndon says: "The population varies from six to fifteen thousand souls, according to the greater or less yield of the mines. Most of the adult part of this population is, of course, engaged in mining. This seems to be a calling that greatly distorts the moral perception,

and engenders very confused ideas of right and wrong. The lust for money-making seems to have swallowed up all the finer feelings of the heart, and cut off all the amenities of society. There are no ladies—at least I saw none in society; and the men meet to discuss the mines, the probable price of quicksilver, and to slander and abuse each other. . . . I do not say that men here are individually bad; but only speak of the philosophical fact that mining, as an occupation, has a tendency to debase men's characters, and destroy those sensibilities and affections that smooth and soften the rugged path of life."

Engineerless Railroad Construction

A glib promoter, in the early days of iron-ore mining on the Vermilion Range of Minnesota, succeeded in interesting the residents of Tower in a proposition to build a narrow-gage steam railroad line between that village and the Soudan mine. He finally induced them to offer a \$10,000 subsidy, organized his company and began construction of the line. Such a simple matter as building a railroad, according to his ideas, hardly required the services of an engineer, and in due time tracks were laid and the line was ready for a tryout. A general holiday was declared, the little engine was steamed up, all the nabobs of the town were out in their finery to enjoy the free ride which had been offered, and everything went lovely until they came to a hill. The grade, lacking the kindly ministrations of an engineer, was more than the poor little engine could negotiate, but this did not daunt the holiday party. They all got out, pushed, and succeeded in getting the locomotive over the bad spots. Everything was lovely until they came to a curve, which had been laid out mostly by guess and was a little sharper than anything on wheels could go around. This proved to be the final straw. The party walked back home silently, and the next day the whole outfit was put on the market for scrap. Thus ended Tower's dream of empire.

Try This on Your Stomach

The members of the American Zinc Institute, at their recent annual meeting in St. Louis, devoted most of their time to a discussion of how best to boom the zinc trade. Almost every conceivable application was brought out, but the use of zinc as a foodstuff was unfortunately overlooked. According to the *Journal of Biological Chemistry* for June, 1919, an examination of the ash has disclosed the presence of appreciable quantities of zinc in many food products. Bakers' yeast, wheat, oats, corn, barley, rye, and rice contained from 15 to 415 mg. of zinc per 1,000 g. of fresh substances. In ordinary cows' milk, about 4.2 mg. of zinc was found per 1,000 g., and in human milk from 6 to 14 mg. Appreciable amounts were also found in hens' eggs. From its constant occurrence in the yolks of eggs as well as in cows' and human milk, it is inferred that the element zinc exerts an important nutritive function, the nature of which is not at present understood. Here is a wide field for zinc propaganda. Perhaps a splattered, or, we should say, zincated, Mellin's food can be compounded. Zinc flakes of a proper degree of thinness and crispness would be a change—we were going to say, a pleasant change—in our breakfast menu. And the profitable patent medicine field is as yet untouched. Imagine the opportunity for Nuxated Zinc.

PERSONALS



WILLIAM L. SAUNDERS

William L. Saunders is the chairman of both the general and executive committees, appointed by President Winchell of the American Institute of Mining and Metallurgical Engineers, to complete the arrangements for the banquet to be given to Herbert C. Hoover on Sept. 16, at the Waldorf Astoria Hotel, New York, in honor of Mr. Hoover's services in international affairs. Charles F. Rand and E. P. Mathewson are vice-chairmen of the general committee. Mr. Hoover sailed for the United States on Sept. 6 on board the "Aquitania."

Charles H. Repath is at the Calumet & Hecla works at Lake Linden, Michigan, in a consulting capacity.

Amil A. Anderson has been discharged from the Army and is now at Rapid City, S. D.

R. C. Allen, Michigan State Geologist, has resigned his office to take a position as secretary of the Lake Superior Iron Ore Association, with offices at Cleveland.

Harold Rabling has returned to the St. Joseph Lead Co. at Bonne Terre, Mo. Mr. Rabling left this company during the war to serve with the Field Engineers, Australian Imperial Forces.

T. L. Walker, director of the Royal Ontario Museum of Mineralogy, and mineralogist of Toronto University, is visiting British Columbia for the purpose of obtaining specimens for the Ontario mineral collection.

Major H. Whittingham, lately of the Royal Artillery, British Forces in France, has received his discharge and has returned to Sardinia as superintendent of the Gennamaru mines. His address is Ingurtosu, Arbus, Sardinia, Italy.

H. A. Megraw recently visited the Lake Superior iron district on professional business.

Jules Cousin, recently at 42 Broadway, New York, has returned to Belgium, his address being 78 Rue de l'Ermitage, Brussels.

Edwin B. Nagle, recently superintendent of El Cobre Mines, at Santiago, Cuba, is now at Saranac Lake, N. Y. Mr. Nagle expects to remain in this country for several months.

Walter K. Mallette has been selected to head the engineering department of the Copper Queen branch of the Phelps Dodge Corporation. Mr. Mallette left San Francisco recently for Douglas, Ariz.

J. Parke Channing, as president of the Engineering Council, recently addressed a communication to President Wilson urging the appointment of a member of the engineering profession to the vacancy existing on the Interstate Commerce Commission. Mr. Chan-



J. PARKE CHANNING

ning emphasized the fact that the transportation systems of the country are largely the creations of its professional engineers, and that from the early stage of preliminary exploration to the final one of upkeep and operation, and in adjusting the relations of transportation to the public, the genius and knowledge of the engineer are essential.

A. G. Burrows and P. E. Hopkins, of the Ontario Bureau of Mines, have been recalled from work elsewhere and sent to investigate the districts of Matachewan and West Shining Tree, respectively.

Carl Zapffe, geologist for the Northern Pacific Railway Co., has returned to Brainerd, Minn., after spending August in Pierce County, Wash., investigating the coal deposits and mining operations for purposes of taxation. Mr. Zapffe directs the company's iron-mining operations in the Mesabi and Cuyuna districts in Minnesota.

J. T. Shimmin has been appointed mill manager of the Arizona Hercules company's plant at Hercules, Ariz.

E. S. Boalich, mining engineer for the California State Mining Bureau, returned to San Francisco after spending a month at the Los Angeles office of the bureau.

Johannes Cornelissen, formerly with the Anaconda Copper Mining Co., at Butte, has gone to South America, where he has accepted a position with the Columbia Copper Mining & Exploration Co. at Santa Marta, Colombia.

George F. Kunz, chairman of the committee on non-metallic minerals of the American Institute of Mining and Metallurgical Engineers, has recently increased the personnel of his committee by the appointment of Raymond B. Ladoo, of the U. S. Bureau of Mines, and Eugene P. McCrorken, of *Engineering and Mining Journal*. The committee will endeavor to make a special feature of the 1920 meeting of the Institute by the presentation of a series of papers regarding the common uses and possibilities of non-metallic minerals and their value, so that material frequently not mined or disposed of as waste may be recovered.

Colonel William Boyce Thompson is president of the Roosevelt Memorial Association, No. 1 Madison Ave., New York, organized for the purpose of raising ten million dollars, the object of such fund being "To provide memorials in accordance with the plans of the national committee, which will include the erection of a suitable and adequate monumental memorial in Washington, acquisition, development and maintenance of a park in the town of Oyster Bay, which may ultimately, perhaps, include Sagamore Hill, to be preserved



WILLIAM BOYCE THOMPSON

like Mount Vernon and Lincoln's home at Springfield." Colonel Thompson has also proposed that the anniversary of the birth of Colonel Roosevelt be celebrated with memorial meetings.

John Cartmel, who has been overseas, has resumed his office as gold commissioner at Nelson, B. C.

J. L. Parker has resumed his consulting engineering practice in Vancouver, B. C.

C. A. Week, of the Bunker Hill & Sullivan company, has been inspecting properties in the Slocan district of British Columbia.

E. W. Widdowson, of Nelson, B. C., has been appointed Provincial Analyst for British Columbia.

A. G. Larson, receiver for the Lucky Jim mine, has been on a visit in southern British Columbia recently, and intends leaving on a trip to Alaska.

F. J. Crossland, formerly secretary of the Vancouver Chamber of Mines, who enlisted in the British Army in March, 1915, has returned to Vancouver, B. C.

General T. Coleman du Pont and Henry Payne Whitney have been elected to positions on the board of directors of the Vanadium Co. of America.

Charles Camsell, of the Canadian Geological Survey, has returned to Vancouver from a trip to Prince Rupert, Alice Arm, and Anyox, where he was planning the work for members of his staff.

William Meyers, recently released from service, has been named as assistant to Max H. Barber, general superintendent for the Cleveland Cliffs Iron Co., on the Mesabi Range. Prior to entering the Engineering Corps he was in charge of the Spies mine, in the Iron River district of Michigan, for the same company. This property is now idle.

George H. Ashley, of the U. S. Geological Survey, has been appointed



Harris & Ewing
G. H. ASHLEY

state geologist of Pennsylvania. Mr. Ashley will have at his disposal an appropriation of \$100,000 for the current fiscal year and it is hoped that the appropriation next year will be \$250,000.

Hon. William Sloan, Minister of Mines of British Columbia, was recently in the Portland Canal, Omineca, and Cariboo districts.

H. G. Haldane was in New York this week on professional business. Mr. Haldane has been identified with the potash interests in Nebraska.

Adolf Knopf, of the U. S. Geological Survey, has returned to San Francisco after an extended trip to Nevada, during which he visited Tonopah, Divide, Goldfield, Round Mountain, Manhattan, and Rochester.

J. H. Winchell, Jr., of the U. S. Geological Survey, has been transferred from the Washington office to Denver, where he is assistant to C. W. Henderson, chief of the Mineral Resources Division at the Denver office.

L. C. Graton, formerly professor of mining geology in Harvard University, and at present in charge of the copper division of the industrial unit of the U. S. Bureau of Internal Revenue, will



L. C. GRATON

make an address on "Mine Taxation" on Sept. 22 at the Chicago meeting of the American Institute of Mining and Metallurgical Engineers.

Robert Elder has returned to America from the Chiksan Mines, Unsan-kinko, Korea.

Jesse F. Boyd is now manager of the Cashin Mines Co., in the Paradox Valley, Montrose County, Col.

Max W. Ball is manager of the Rocky Mountain division, Roxanna Petroleum Co., of Oklahoma, with offices in Cheyenne, Wyo.

Alfred R. Flinn has been transferred from the Denver office of the Empire Zinc Co. to the Hanover mine, at Hanover, N. M.

J. B. Brown has accepted a position with the Cia Exploradora de Hidalgo, a subsidiary of the United States Smelting, Refining & Mining Co., necessitating his departure for Pachuca Hidalgo, Mexico.

George S. Rice will make an address at the smoker of the American Institute of Mining and Metallurgical Engineers to be held on Sept. 22 in Chicago. Mr. Rice will talk on coal and



GEORGE S. RICE

other features in the north of France, in the Cologne district, southern France, Westphalia, Belgium and Great Britain, and will also include the subject of liquid oxygen as he observed it in Germany.

OBITUARY

Elisha Hampton, prominent for many years in the mining industry, was killed on Aug. 20, 1919, in an automobile accident. Mr. Hampton was born at Mount Hawk, Cornwall, England, on Feb. 24, 1851. He worked in the Cornish mines from the age of eleven until twenty, when he came to California, where he engaged in placer mining in both Alpine and Nevada counties until he left for Alaska, where he had charge of one of the mines of the Alaska-Treadwell group. From Alaska he returned to California to take charge of the Oneida property, one of the larger Mother Lode mines. He remained here for four years and then assumed charge of the Central Eureka, after which he went to Goldfield, Nev. From there he went to the Bunker Hill mine, in Amador County, Cal.

SOCIETIES

American Society of Civil Engineers held a meeting on Sept. 3 at which a paper entitled, "Contracts—a Comparison of 'Cost Plus' with Other Forms," by Ernest Wilder Clarke, was presented.

Association of Iron and Steel Electrical Engineers will meet in convention in St. Louis, Sept. 22 to 26.

American Malleable Castings Association, 1900 Euclid Building, Cleveland, Ohio, has issued a circular describing the work of the organization in grading the products manufactured by members after tests, and analysis of the daily output of each, has been made at the association laboratories at Albany. When a member's product has daily met the requirements of the prescribed standard for three months, a "certificate of quality" will be issued. A pamphlet has been issued on "Malleable Iron," which can be obtained without cost by writing to the association.

Iron and Steel Institute will hold a meeting in London on Sept. 18 and 19, at which the following papers, among others, will be presented: "Nickel-Chrome Forgings," by J. H. Andrew, J. N. Greenwood and G. W. Green; "Report on Fuel Economy in Steel Works," by W. A. Bone, R. A. Hadfield and A. Hutchinson, with a supplementary report by H. J. Yates on "Fuel Economy in Foundry Practice"; "Decarburization of Steel," by E. D. Campbell; "Fuel Economy in German Iron and Steel Works," by Cosmo Johns and L. Ennis; "Experiments with Nickel Steels," by N. Hudson.

INDUSTRIAL NEWS

The Calkins Co. of Los Angeles, Cal., assayers supplies and laboratory equipment, formerly situated at 348 North Main St. has moved into larger quarters at 34 South Main St.

The Chicago Pneumatic Tool Co. announces the removal of its Cincinnati office from the Mercantile Building to the Walsh Building, Pearl and Vine Sts., where a service station with a complete stock will be maintained.

The Lakewood Engineering Co. announces the appointment of Harry W. Benkart as its representative in Buffalo, N. Y. with offices in the Ellicott Square Building. Mr. Benkart will devote his efforts to the general construction field.

William H. Baker has resigned from the Atlas Portland Cement Co. to accept a position with the Hardinge Conical Mill Co. as vice-president. Mr. Baker intends to introduce the Hardinge mill into the cement industry for grinding cement clinker.

Edison Storage Battery Co. announces the appointment of John Kelly as general sales manager, with headquarters at Orange, N. J. Mr. Kelly was promoted on July 1 of this year to the position of assistant general sales manager.

United Iron Works, Kansas City, Mo., has recently issued the August-September bulletin, containing a list

of rebuilt machinery which has been completely overhauled in the company's shops. The list includes steam and oil engines, pumps, electric motors, power plant equipment, drills, crushers, and compressors.

The Rateau Battu Smoot Co. has recently sold to the Famatina Mining Corporation, of Argentina, whose representative in this country is Bancroft Gore, a steam-driven turbo-blower for copper converter work. This blower will deliver 7000 cu.ft. of air at a pressure of 14 lb. The speed of this unit is 22,000 r.p.m. The turbine operates from boiler pressure of 150 lb. to a vacuum of 28 in.

New Jersey Zinc Co.'s exhibit at the National Chemical Exposition in Chicago will show the zinc in the form of ore as it comes from the mine, and the various products of zinc which are of every day use. Zinc oxide as used in paints, slab zinc, which this company produces in various grades, including the "Horse Head" brand and rolled zinc, which is being introduced for new uses, will be among the important exhibits. Among the other products and their applications to be displayed are lithopone, zinc chloride, sulphuric acid, muriatic acid, salt cake, spiegeleisen, and zinc dust. F. C. Ryan, sales engineer, will be in charge of the display, which will occupy booths 65 and 66, on the main floor of the Coliseum.

General Electric Co. will exhibit an interesting model of a precipitation outfit illustrating the Cottrell process, at the Chemical Exposition, Chicago, Sept. 22 to 26. The model is the property of N. H. Gellert, of the Gellert Engineering Co., which holds the precipitation patents as applies to blast furnaces. It was made by the General Electric Co., being an exact miniature of the apparatus and is completely operative. Other apparatus exhibited by the company includes a 100,000-volt Kenetrom, with a filament-heating transformer, which will be shown in operation. Of special interest will be an exhibit board, showing welded terminals for flexible cables used on blast furnaces. The booth occupied by the above exhibits will be numbers 84 and 117.

NEW PATENTS

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

Crusher—Roll Crusher. Paul C. Van Zandt, assignor to Allis-Chalmers Manufacturing Co. (1,309,827; July 15, 1919.)

Drilling—Fullering Block for Rock-Drill Bits. Orrin B. Camp. (1,312,233; Aug. 5, 1919.)

Drilling Apparatus. George H. Gilman, assignor to Sullivan Machinery Co. (1,313,859; Aug. 19, 1919.)

Electrolytic Process and Anode. Frank L. Antisell. (1,313,246; Aug. 19, 1919.)

Flotation—Apparatus for Separating Ore by Flotation. Lewis G. Rowand, assignor to New Jersey Zinc Co. (1,312,754; Aug. 12, 1919.)

Flue Dust—Briquetting Flue Dust. Felix A. Vogel, assignor to General Briquetting Co. (1,312,218; Aug. 5, 1919.)

Haulage—Means for Operating Switches for Tram Roads in Mines, Quarries, or the Like. Thomas Dixon. (1,313,586; Aug. 19, 1919.)

Ingots—Method of Casting Ingots. R. A. Hadfield. (1,310,072; July 15, 1919.)

Magnesite Refractories, Method of Manufacturing. Robert D. Pike. (1,312,871; Aug. 12, 1919.)

Mine-Door-Operating Means. Joseph J. Body, Lee Long, Mason L. Johnson, Charles F. Kilgore and Alonzo Blevins. (1,311,488; July 29, 1919.)

Mine Water—Method of Treating Mine Water. Elgie C. Auld and James R. Campbell. (1,310,382; 1,310,383; and 1,310,384; July 15, 1919.)

Mining Bit. Isaac Hubbell. (1,312,732; Aug. 12, 1919.)

Mining Car. John C. H. Lubken. (1,311,659; July 29, 1919.)

Oil Shale—Apparatus for Distilling Shale and the Like. Harold H. Godfrey. (1,309,890; July 15, 1919.)

Oil Shale—Art for Separating the Petroleum Contents from Petroleum-Bearing Sands or Shale. Frank Navin. (1,312,266; Aug. 5, 1919.)

Ore Classifier. Charles Alfred Randall. (1,313,734; Aug. 19, 1919.)

Petroleum Residues, Etc., Process of Treating. Charles S. Palmer. (1,313,009; Aug. 12, 1919.)

Potash—Process of Decomposing Natural Silicates. Benjamin A. Peacock, assignor, by mesne assignments, to Robert Gilchrist. (1,310,770; July 22, 1919.)

Potash—Process of Decomposing Potassium Silicates. Samuel R. Scholes, assignor to H. C. Fry Glass Co. (1,312,053; Aug. 5, 1919.)

Potash and Cement, Manufacture of. Arthur C. Spencer. (1,312,592; Aug. 12, 1919.)

Potassium and Aluminum, Process of Treating Silicates Containing. Louis A. Eberhardt. (1,310,413; July 22, 1919.)

Pump. Herbert Alfred Humphrey and William Joseph Rusdell, assignors to Humphrey Gas Pump Co. (1,311,166; July 29, 1919.)

Reduction—Means for Reducing Ores. Diogo Dias de Barros. (1,313,274; Aug. 19, 1919.)

Zirconium—Manufacture of a New Compound of Zirconium and Its Application in the Production of Pure Zirconia. Walter Rosenbain and Ernest Harry Rodd. (1,307,881; June 24, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

SAN FRANCISCO, CAL.—Sept. 4

Homer Wilson, of San Francisco, who opened up the Keene Wonder mine, in the Death Valley Region of California, has taken over the mining property at Lodi, Nev., forty miles northeast of Luning, and will resume operations under the name of the United Lodi Mines Co. The mining camp is an old one, the principal mine being opened to a depth of 1,000 ft. on a vein occurring in limestone close to a contact of the limestone with granite. Considerable tonnage of good grade ore was developed, but attempts made in 1908 to smelt this ore locally in a lead blast furnace were unsuccessful. The property remained in a dormant state until the price of silver reached such a figure as to make the ore values attractive.

Wilson experimented with a concentrating plant, and soon demonstrated that a simple scheme of treatment would produce a high-grade concentrate and that the tailings which contained silver could be readily cyanided. The experimental mill consisted of rock breaker, ball mill, 20- and 40-mesh screens, and two Overstrom and a Senn concentrating table. From the results of the experimental mill, a 100-ton mill along similar lines is to be erected. The crushing arrangement will comprise rock breakers, rolls, and ball mill, closing into four sizes, with the treatment of the coarser sizes on Overstrom tables and the finer sizes on Senn tables. The ore contains 5 per cent of concentrate material. A 40-hp. oil engine will be used for driving ball mill and rolls, and a 25-hp. oil engine for the tables.

The mining plant consists of a steam-driven hoist and a steam-driven compressor. At the 500 level of the mine there is a 400-gal. horizontal steam-driven station pump. A sinking pump drains the lower levels. Oil-fires are used for power, an oil-storage space equivalent to two cars of fuel oil being available at the mine and a one-car storage tank at Luning. A drill sharpener and oil-fired forge, together with power drills and jackhammers, complete this part of the equipment. Transportation is effected by 24-ton auto trucks from Luning, forty miles distant. Water is pumped through a three-inch, five-mile pipe line.

RENO, NEV.—Sept. 4

At Tonopah and Divide there has been no settlement as yet of the strike, though Joseph Lord, the Federal mediator, is said to be confident that there soon will be. The latter is handling the matter with skill and has made a very favorable impression.

The Miners at Copper Basin in Lander County, Nev., are on strike following a refusal of the management to increase wages 50c a day, with a 10c raise in the present. The management agreed to the increase in wages, but raised bond 25c per day. The strike followed.

A Strike of the Comstock Miners, which lasted but a day, was declared off at a meeting of the union held on Sept. 1. The terms of settlement had not been given out, but the men asked the management to start a store or take some steps to secure a reduction in the cost of living. It will be several days before work will be operating again, according to Whitman Synnnes, the manager, but he says that now the company will go ahead with plans to enlarge the Mexican mill and to push development work.

The Strike at Fly, Nev., was settled amicably on Aug. 28 by miners returning to work at the 75c increase offered per day by the Nevada Consolidated Copper Co. with the understanding that the company would establish a commissary and sell goods to the employees at a price in an effort to reduce the high cost of living. This increase of 75c is what the company offered the men on July 27. Mill and mines started up on Aug. 29 and the smeltery on Sept. 3. The company is short of men in all departments, on account of so many leaving during the shutdown.

OUTMAN, ARIZ.—Sept. 3

The Recent Strike at Outman, Ariz., was called on Aug. 10 by I. W. W., the demands being \$6 a day for six-hour day, two men on machine drills, and abolition of contract and bonus systems. The company ignored these demands. The Western Federation of Miners had previously asked for a wage increase of 50c per day, which request was under consideration when the strike was called. The Western Federation men voted to continue work despite the I. W. W. strike but only a few came to work. A complete shutdown was therefore announced on Aug. 15. The local of the Western Federation of Miners then opened negotiations, desiring resumption of work. The terms announced at that work would be resumed with 50c advance in wages, providing enough satisfactory men presented themselves to warrant reopening the mines. Work was resumed on Aug. 24. The present wages of machine men are \$6, and of muckers \$5.50. There has been no strike by the Western Federation of Miners, and these men are all at work. No I. W. W. strike has been reported. Employment can now be given to over 100 additional miners. The mild winter climate and high wages will doubtless attract miners from the north.

WALLACE, IDAHO—Sept. 4

The Strike of Miners in the Coeur d'Alene district is now in its third week with no indication whatever that a settlement is near. Immediately following its declaration, most of the single men left the district, and this outward movement has continued until it is estimated that less than 50 per cent of the strikers remain, most of whom are married men. Most of these, it is believed, would be glad to return to work and would probably do so if it were not for the radicals in control of the union, enough of whom remain to intimidate the conservative element. A report having gained currency recently that the men were going back to work under former conditions, the executive committee of the union circulated handbills throughout the district which stated that the strike would not be called off until the operators conceded "the eight-hour day from portal to portal, a minimum wage scale of \$5.25 per day (no bonus), grievance committee privileges, an agreement covering these points with the operators." Despite this official announcement, there is no doubt that if the mining companies would concede the "portal-to-portal" proposition, the strike would be speedily ended. It is believed that the companies would waive this construction of the law and at least split the time going and coming if there was any assurance that the men would actually work to the best advantage while underground.

The Bunker Hill & Sullivan mine and smeltery continue in operation, though all other mines of the district are shut down. The smeltery is completely unionized, but in the mine the percentage of union men is less than in other mines of the district. The men go in on company time and come out on their own time, also eat lunch on their own time. This system was adopted over a year ago on account of the long distance to be traveled underground to the places of work. Against this, however, muckers in the Bunker Hill mine receive 25c per day less than in other local mines. Thus the split in time going in and out at the Bunker Hill is offset by 25c more per day paid to muckers at other mines. In all other respects working conditions are practically the same. The employees of the Bunker Hill voted down, by an overwhelming majority, the proposition to strike.

BUTTE, MONT.—Sept 8

The Labor Situation in the Butte district shows that change in the metal crafts is still remaining out, with apparently little appreciable effect on the operations of the mining companies. Leaders of the strikers declare they will be able to tie up the mines in consequence of shut bosses and others doing the work formerly done by the metal crafts. None of the other unions have supported the strikers, however, the miners

refusing to join them. Conservatively inclined labor leaders express the opinion that the strike is slowly disintegrating and that unless the metal crafts are able to bring about complications, the force of the walk-out has spent itself. More miners are seeking employment than the mines can take care of at present, and the Anaconda company is considering reopening the Mountain Consolidated, one of its larger properties. Several days ago the East Gray Rock property resumed.

North Butte, Butte & Superior, Davis Daly and other companies report labor conditions to be satisfactory. It is stated that leaders of the metal crafts had made overtures unofficially for reopening the conferences but no attention has been paid to them, their strike, it is charged, having been called in bad faith after the companies had agreed to the demands made.

DENVER, COL.—Sept. 4

In the Hardscrabble District of Custer County much activity is apparent as the result of the high price of silver. Recently the Herman property was sold to the Pabst brewing interests, and the Empire Zinc Co. has also acquired a large acreage. The old Bessick is again being operated. Other operating properties are the Buffalo Hunter and the Bull Domingo.

A Marked Exodus of European Laborers from the mining camps of Colorado is underway. These men are returning to their homes abroad. The reason that they give, for the most part, is that they no longer like the United States, where they cannot get their liquor. This may not be the only reason for their leaving, because many of them are undoubtedly returning to their homes to settle up estates, but it is nevertheless an important reason from the point of view of the foreigner.

The American Petroleum Institute adjourned Aug. 8 at Colorado Springs after a three-day session. The next meeting will be held in New York City three months hence. During this session two most important actions endorsed were the plan of Dr. Van H. Manning for the establishment of a million-dollar research bureau to make investigations relative to all phases of the oil and oil-shale industries, and also to fight any opposition which may be made against any of the state oil inspection bureaus. At the conclusion of the session, Spencer Penrose took the entire party for an automobile trip up to the summit of Pike's Peak. The following day a few of the members left, as the guests of Henry L. Blackmer, president of the Midwest Oil Co., on a tour of inspection of the Wyoming oil fields.

AUSTIN, TEX.—Sept. 4

Elliott Jones Co. has secured from District Judge Calhoun a temporary injunction restraining the Texas Railway Commission from instituting penalty suits against it, and the State Engineering Commission the authority to regulate pipe line companies. Suit attacks the constitutionality of the statute, and denies authority of the Commission over its tank cars and pipe lines from producing wells to settling tanks.

Action of Mineral Rights on submerged state lands in Harris and Matagorda counties will take place Oct. 16-19, 1919, according to Land Commissioner G. W. Addison. The first tract is adjacent to the Goose Creek oil field, and on San Jacinto Bay. It consists of 579.8 acres, divided into lots from 4.7 to 128 acres each. In Matagorda County, 440 acres on Matagorda Bay, adjacent to Big Hill, have been divided into twenty-acre lots. Both of these tracts are submerged, but the water is only a few feet deep, so that derricks can be readily built and drilling for oil prosecuted. The mineral rights only will be sold in the form of twenty-five-year leases to the highest bidders. Each subdivision must be bid on separately, but any one subdivision or corporation may bid on any number. Certain regulations as to work on these lots will also be put in force, because the State expects to gain considerable royalty from these

leases, especially those at Goose Creek. Keen competition for the Goose Creek land is expected, for it is immediately adjacent to a large producing field.

COTTER, ARK.—Sept. 4

Dixie Power Co. is making the final survey for a hydro-electric plant to be installed on the White River about a mile and a half above Cotter, Ark. The proposed site for the dam is at a point in the river where a solid rock ledge reaches across the river, with high bluffs on both sides, and where it is possible to build a dam 125 ft. high. The engineer in charge states that the dam will be 75-125 ft. high and 1,500 ft. long, and that it will be possible to generate 60,000-100,000 hp. The present survey will cover about 50 miles of the White River above Cotter. The power will be sold in the state.

HOUGHTON, MICH.—Sept. 6

The Winona Mine has one shaft open, and a second is about to start. Work is being done on the shaft. Working forces numbers 105 men. Men are coming in every day, and within ten days it is hoped that the total force will be doubled. With a force of 200 men it will be possible to operate the property with fair economy.

Mayflower-Old Colony Company has cut the Mayflower lode. The shaft is down 1,459 ft. and has been in copper, ore and iron for the last 60 ft. A few days ago the blasts opened up some copper rock which has every physical characteristic of the Mayflower lode, including copper in quantities which warrant production. At this level there is five feet of this copper opened. However, the management of the property is not prepared to state officially that the Mayflower lode has been cut. At 1,402 ft. the shaft went out of trap into amygdaloid. The dip of the vein is so flat that continuation of exploration by shaft sinking is uncertain. There is much interest in the exploration work at this shaft, partly because of the copper shown in the drill cores and partly because the formation upon which work is being done is entirely out of the horizon of the known mineralized formations of commercial merit. If this Mayflower-Old Colony work should result successfully, it offers opportunity for extensive exploration in many other properties along lines hitherto considered without merit.

The Isle Royale Company started mining work at No. 1 shaft this week, making four shafts again in operation, Nos. 4, 5 and 6, having been opened during the depression. Production for September will show probably substantial increase over output for July and August. The mill is now being handled entirely by output from mine, and regular tonnages are going across Portage Lake to Point Mills subsidiary stamp mill. Isle Royale lode has best physical characteristics at Shafts 4 and 5. Number 4 is sinking to 20th level, 2,600 ft. from surface. Number 5 shaft is sinking below 18th level, and No. 6 shaft is sinking below 16th level. The lode in No. 6 differs in actual mining qualities from any other lode in the Lake Superior copper-producing district. The average width of the lode is from 8 to 12 ft. Sometimes it widens to 16 ft., but that is rare. Copper contents cling to the foot wall, a distinction of this formation. In opening new ground the foot wall is always cut first, and drilling is done from the foot wall across the formation. Barren trap is left standing for pillars. There never was a time in the history of mining on Isle Royale when the underground openings showed faces carrying any better copper averages than they now are showing. This is particularly true in the lower levels of No. 4 and No. 5. The increase in No. 6 is by no means discouraging, although only 60 per cent of the ground in this shaft is tried for stopping. The average in No. 7, the shaft which shows 50 per cent for stopping. No work is being done in No. 7 now, nor in No. 2.

ISHPEMING, MICH.—Sept. 6

The Workers on the Iron Ore Docks who left their places have returned to work, the Railroad Administration announcing that claims for higher wages and shorter hours will not be considered while the men were out on strike. Ore is again being transported down the Lakes from Lake Superior and Lake Michigan ports, but the strike caused a large increase in the August shipment. There was a falling off of about 4,000,000 tons as compared with the movement for the same month of 1918. The coal-dock workers have refused to accede to the wishes of the operators and the Government, and the men who unload the coal at Portage Lake docks left their places this week, following the lead of the

Duluth workers. A coal shortage developed at the mines on the Mesabi Range, and it was necessary for some of the mining companies to send steam shovels and crews from the mines of Duluth and Superior to load coal to keep the mines in operation. It is believed, however, that this strike will be as short-lived as the one instigated by the ore-dock workers, and that no further delays will result. The sales of ore continue light, and operators do not care to lose the opportunity of shipping what little they have sold. Many of the Lake carriers will soon be assigned to the grain trade and there will be fewer vessels available for transporting ore, although at present there is no scarcity of ships. It was hoped that the furnaces would start to contract for their winter needs before this time, but many of them have not done so, and the sales of ore are far below expectations. It is certain that some of the mines will have to close this winter, either because of lack of sales, insufficient stocking to know, or of care to predict, what the winter holds in store for the mining business in the district.

Western Federation of Miners is not recognized by the companies. On Sept. 4 the companies issued a statement of their position following conferences with the local workers' committee. The statement offered a raise of 50c. per shift in the base wage, with a bonus based on 80-c. silver instead of 60-c. silver, as at present. There is thus no raise in wages, but the workers are protected more against a drop in the silver market. The managers said they do not consider eight hours more than a day's work underground, and that they themselves suffered much from inefficiency underground since the war. There is no good reason, they declared, to change the nine-hour day for surface men. Sunday labor is necessary in some instances, but men to engineers will be given a day off during the week on application, and the work will be eliminated where possible. If Sunday work was paid at an increased rate, the workers, the managers said the tendency would be to do repair work during the week, with consequent loss of employment. Collective bargaining with local committees and a central council will be put into operation.

MELBOURNE, AUSTRALIA—July 21

An Interstate Copper Conference of representatives of the state governments (except Tasmania) was held in Melbourne about the middle of last month to discuss the present position of the copper-producing companies. It is understood that the proposal submitted by Mr. Groom in behalf of the commonwealth government was in the nature of co-operation between the commonwealth and state governments in making advances against the copper produced. The higher prices now ruling, coupled with the recent sale of six or seven thousand tons of Australian copper to Japan, will probably result in the opening of at least the larger mines, apart from any question of government assistance.

The Gold Producers' Association, Ltd., early in the present year, was formed by Australian copper companies. The commonwealth government was approached with a view to the removal of the embargo on the export of gold. This concession was secured, and the association has now made known the result of its activities for the five months ended June 30. During that time it exported and sold 158,311 oz. of standard gold on behalf of its members at an average price of £4 15s. 4d. per standard oz. These sales represent little more than one-third of the total production of the associated companies, so that the net premium obtained was equal to 58.7 per cent of members' total production. Prices are expected to be lower in the immediate future, owing to the removal of the export embargo on American gold. However, the Gold Producers' Association hopes to minimize the effect of reduced rates by exporting a larger proportion of its gold.

The Most Destructive Fire ever experienced at Broken Hill, N. S. W., occurred on July 30 at 1:30 in the morning. It broke out in the crushing section of the mill and did damage amounting to £100,000 before it was under control. (Details of losses incurred have been given in an earlier issue.) This was the fourth outbreak of fire on the South Mine within three weeks, and there can be no doubt that it was fully caused by the advocates of "direct action." Special steps were being taken to guard against fire, but despite this, the flames had secured a firm hold before they were detected. About 1,000 men will be kept out of work (they have been out on strike for 10 weeks) as a result of this outbreak, and it will be many months before the copper company can resume its normal operations. In view of this fact, a sinister picture is suggested by the general manager's statement that when he appealed to some men standing in the street (one of the men of the mine) for assistance to fight the fire, "no one answered my appeal except two Maltese."

The Broken Hill mines have now (Aug. 1) been idle for ten weeks, and the Associated Smelters, at Port Pirie, South Australia, where large quantities of Broken Hill concentrates are smelted, which has been feeling the effect for some time, have now closed down altogether. As there are 2,500 men employed at the works in normal times, this stop will cause a deal of suffering, and it is rendered more regrettable that it would otherwise have been by the fact that the employees at Port Pirie established such a splendid war record, by insisting repeatedly on their rights in industrial disputes which would have interfered with the supply of lead to the allies. The capacity of the works is 160,000 tons of iron ore, 8,000,000 lbs. and 6,000 tons of zinc products per annum.



MOVING DIAMOND DRILL OVER GLACIER IN BRITISH COLUMBIA From Bulletin B. C. Department of Mines.

VICTORIA, B. C.—Sept. 4

British Columbia Iron Co., Ltd. has been formed to develop forty claims situated about three miles west of Kitchener, B. C., and extending in a belt north and south which crosses the Canadian Pacific line at Thompson Creek. It is stated that this is one of the largest deposits of hematite in the province. Considerable work was done last fall in opening it up. W. C. Wragge, of Nelson, B. C., is interested. Diamond drilling will be required to determine whether this is a commercial proposition.

The Railway to the Dolly Varden Mine from tidewater at Alice Arm being practically complete, the operators of other mines in the district are giving evidence of some concern as to the policy of the Taylor Engineering Co. toward handling on this road the ore from properties other than the Dolly Varden. The Alice Arm Commercial Club has taken the matter up with the Minister of Mines and the Minister of Railways. It is stated that the company has not committed itself on this point, and that as a result work on a number of properties at the head of Kitsault River is being delayed. The management of the Taylor Engineering Co., however, has given assurance that everything will be done in its power to assist in the development of the mineral resources of the district.

SUBURRY, ONTARIO—Sept. 6

Active Mining Operations have been resumed at the Creighton mine of the International Nickel Co., in order to supply sufficient ore to the smelter for the present monthly production of 2,500 tons of bessemer matte. Most of the Creighton ore will be roasted in open heaps at O'Donnell's as heretofore.

TORONTO, ONTARIO—Sept. 6

The Strike at Cobalt has been settled, the miners returning to work Sept. 8. The

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ALASKA

ALASKA GOLD (Juneau)—In August milled 202,268 tons of ore, averaging 87.8c. per ton. Percent extraction 80.64; tailings loss 17c. per ton. Tonnage milled in July, 153,000.

ARIZONA

Cochise County

ARIZONA SMELTING & POWER (Benson)—Reported company will blow in new 200-ton smelter in thirty days. Expects to handle ores from Johnson camp and surroundings. Has contract to furnish light and power to Benson. Martin Fishback, general manager.

SHANNON COPPER (Gleason)—Expect to start mining operations soon. Shipping high-grade ores to Arizona Copper smelter at Clifton, Ariz. John E. Penberthy, superintendent.

Gila County

ARIZONA COMMERCIAL (Globe)—No. 2 shaft sinking progressing, with three shifts working. Shaft down to 5th level.

IRON CAP (Globe)—New hoist, skips, and crushing plant running smoothly, giving 75 per cent increase in capacity. New equipment electrically operated with current from Inspiration company. Shipments to Inspiration mill expected to begin soon.

OLD DOMINION (Globe)—One blast furnace and one converter stand put in operation. Plant running at about one-third capacity and handling 400 tons per day. Mill handling 800 tons. Copper production for August, 1,937,000 lb.; July, 1,629,000; August, 1918, 2,064,500.

PORPHYRY CONSOLIDATED (Globe)—Repair work at station completed, and crosscutting resumed from bottom of winze on 800 level.

MIAMI COPPER (Miami)—Work on foundations of new equipment to be installed at No. 5 shaft progressing satisfactorily. Construction of new transmission line from power house to mine will soon be completed.

VAN DYKE COPPER (Miami)—Cross-cut and dump completed on 300 level. Sinking resumed, and shaft now 112 ft. deep. Air-vented pump installed at 300 level to handle water above this point.

Santa Cruz County

AMERICAN BOY (Patagonia)—Work recently interrupted by rain. Installing new machinery. Property under bond and lease to A. F. Gross, of Duluth, Minn.

EL PASO (Patagonia)—Cutting station on 300 level. Will increase force. Property at Mowry. W. J. Mitchell, superintendent.

FLUX (Patagonia)—Will resume operations. Owned by R. R. Richardson and leased to Flux company, of which F. B. Kolberg is president.

HARDSELL (Patagonia)—Shaft down 300 ft., with 500 as objective. Three shifts on sinking, which is being done on contract.

MORNING GLOBY (Patagonia)—Since opening on June 1, 275 ft. of development work done.

ARKANSAS

Marion County

EDITH (Rush)—Mining started last week with a small force.

MCCARGAR (Rush)—D. J. McCargar in charge of development work on two leases owned by himself, W. F. Hartsion, and Sam Kelsall, of Fall River, Mass., is installing air drills and compressor. Expects to have enough ground opened for mill by end of year.

CALIFORNIA

Amador County

BUNKER HILL (Amador City)—During last half year all operations confined to territory north of shaft. Twenty stamps ran 103 days, clean-up being approximately \$2,000 in bullion; \$12,000 in concentrates shipped.

CENTRAL EUREKA (Jackson)—Station at 3700 level and ore pockets practically complete. North drift from station cross-cut advanced 32 ft., showing good ore in face. South drift also shows 4 ft. of good

ore in face. South drift on 3,500 level in good ground, face being 193 ft. from cross-cut.

Eldorado County

LADY EMMA COPPER (Placerville)—Day Brothers getting out, under contract, carload of copper ore for test run. Mine twelve miles northwest of Placerville, on southeast side of Mount Ararat. Ore will be shipped to reduction plant on San Francisco Bay. Claim patented, and owned by W. E. Deiert, of San Francisco.

ROCKY BAR RIVER GRAVEL (Placerville)—Operations to start immediately. Will install machinery. Property on middle fork of Cosumnes River, fourteen miles from Placerville. Five 60-ft. Keystone drill holes drilled last winter, with results said to be promising.

Nevada County

AT SPENCEVILLE discovery of asbestos reported on ranch of Ray Hutchinson.



PLANT OF KELVIN SULTANA COPPER CO., KELVIN, ARIZ., RECENTLY TAKEN OVER BY NEWLY ORGANIZED RAY BOSTON COPPER CO. A. L. FLAGG, OF KELVIN, ARIZ., WAS RECEIVER FOR OLD COMPANY

GOLDEN CENTER (Grass Valley)—Shut down Sept. 1 to install more powerful pumping plant to handle increased flow.

KENOSHIA (Grass Valley)—Work of unwatering mine nearly completed. Grouped with other claims under new name of Alcade mines.

CALIFORNIA (Nevada City)—A. W. Hoge, superintendent, building 15-stamp mill expecting to find channel in about 200 ft. Company has run long tunnel in hard ground and has large holdings of virgin ground.

GASTON (Washington)—Closed until spring owing to uncertain labor conditions. During summer thirty to forty employed rehabilitating property.

Plumas County

PHILADELPHIA EXPLORATION (Crescent Mills)—Secured option on Crescent and Green Mountain gold mines, and development work will be started soon.

Tuolumne County

SOULSBY (Soulsbyville)—Operations to be resumed. South shaft to be deepened to ascertain value.

DELHI (Columbia)—Property with adjacent claims advertised for sale by sheriff to satisfy \$40,000 judgment obtained by Louis Nonnenmann, of San Francisco. Sale set for Sept. 12. Property now under bond to company headed by A. A. Codd.

COLORADO

Clear Creek

GEORGETOWN TUNNEL CO. recently held annual stockholders and directors' meeting. Following officers and directors elected: C. G. Breitenback, president and treasurer; F. H. Pratt, vice-president; C. A. Basse, secretary, and L. F. Shane, J. H. Robeson, C. G. Earnest and M. B. Dittenhoefer, directors. Newly elected directors have planned extensive improvements, in addition to vigorous development campaign that has been going on for some time. Foundations almost completed for new compressor and for flotation plant and 20-ton stamp-mill. Main tunnel now in over 2,000 ft.

Eagle County

EMPIRE ZINC (Gilman)—Working about seventy-five men on development. Electro-magnetic concentrator idle. Two

million tons of zinc-lead-iron ore developed averaging 15 per cent zinc. Large body of manganese-iron ore also developed. Wilkesbarre shaft almost completed, and will connect all upper workings of mine at Gilman with lowest tunnel level and Newhouse tunnel. With completion of this connection all surface activity will be around collar of Wilkesbarre shaft, and all ore will be lowered to lowest tunnel level and trammed out to the mill, or shipping station at Belden, on Denver & Rio Grande. Will materially reduce mining costs.

Ouray County

GUADALOUPE (Fronton)—Has cut old vein at greater depth and found that ore changed from chalcoprite to bornite. Vein contains high silver values. First car shipped recently netted almost \$6,000. Work proceeding on 3,300-ft. tramway from mine to wagon road 1,500 ft. below.

SUMMIT COPPER (Ouray)—Plans completed for construction of 100-ton flotation plant and concentrator. Charles McMillan, builder of Camp Bird and Sunnyside mills, engaged to handle this work. Mill will be on railroad. Planned to handle custom ores.

Park County

LOUISIANA-COLORADO (Alma)—Employing about forty men. Mill handling 150 tons of ore daily, producing concen-

trates running about 200 oz. in silver and about 40 per cent lead.

RUSSIA MINE (Alma)—Substantial payment of purchase price recently made by K. C. Houston, who represents Eastern syndicate which recently took over properties. Rich silver ore opened up by new owners and also large tonnage of low-grade silver ores. Both mine workings and stamps samples show large tonnage of low-grade ore available for milling. Syndicate considering installation of mill.

Summit County

EVANS-WINN SYNDICATE (Breckenridge)—Syndicate formed by Mark G. Evans, of Denver, to develop low-zinc sulphide veins encountered in dredging operations, is actively engaged in sinking prospecting shaft on Emille placer claim.

IDAHO

Boise County

GOLDEN AGE, JR. (Pioneerville)—Reconcentrating 1,400 tons concentrates for shipment. Considering reworking tailings dump carrying \$8 per ton. Company seeking funds to develop and erect 300-ton mill employing concentration and cyaniding. Property now equipped with 15-stamp mill.

Bonner County

LAWRENCE (Clarksfork)—Working five men and extending long crosscut tunnel to No. 2 vein, which shows surface outcrop, 15 to 20 ft. wide, of spathic iron gangue and galena and constitutes main vein of series of five parallel fissures in pre-Cambrian formation. Smallest of these already penetrating 300 ft. deep and stopped to considerable extent, having yielded several hundred tons of clean galena concentrates averaging over 70 per cent lead and 17 to 20 per cent silver. Ore of this grade accumulated for shipment by intermittent operation of small concentrator working on ore from No. 1 vein. No. 2 vein believed to be within 100 ft. of main tunnel face. Small cross dike which was recently encountered in crosscut tunnel, matching similar dike croppings intersecting vein at surface, is guiding operators in further development.

ARMSTEAD (Talaché)—Robert N. Bell, state mine inspector, reports rich milling ore to 1,400-ft. depth on dip practically demonstrated. Vein varies in width up to 7 ft. in length. In addition to rich main vein, deep crosscut tunnel, 3,800 ft. long, has passed through series of promising fissures.

Idaho County

HOMESTAKE (Orogrande)—Several officers inspecting property to determine equipment needed. Company owns Homestake, four miles south of Orogrande, and American Eagle and Fish Hawk, seven miles southeast of Elk City.

UNA (Orogrande)—Vein cut in tunnel at 1,050 ft. point and crosscut started. Good mineral values found in vein above.

Shoshone County

NABOB (Beeler)—New 150-ton mill completed and in operation. Has much lead-silver-zinc ore available. Company controlled by Stewart Mining Co. and machinery from old Stewart mill used in building new mill.

HERCULES (Burke)—Fire started Sept. 2 at end of long No. 5 tunnel in abandoned stopes. No harm expected unless fire spreads.

NATIONAL (Mullan)—Directors' statement issued covering company's operations, which shows all ore below main tunnel exhausted and that part of mine abandoned. Efforts to locate vein unsuccessful, and mine closed indefinitely. Company has upward \$50,000 in treasury and no debts; also well equipped mill of 500-ton capacity. Ore copper, 10 to 15 per cent, and about 3 oz. silver. Believed further exploration will be undertaken.

BIG CREEK (Wallace)—Plans for 75-ton mill in hands of company, and preliminary construction started. Expect to have mill completed within ninety days. Ore chiefly lead with high silver content; also gray copper.

MICHIGAN

Marquette Range

BREITUNG (Negaunee)—All ore in stock at Breitung Hematite and Mary Charlotte mines to be shipped this year. Shipments total 1,500 tons daily.

SOUTH JACKSON (Negaunee)—Ore now being loaded by shovel. Several large blasts recently put off. One of few open pits on Marquette Range.

REPUBLIC (Republic)—New change house to be erected. Will be modern structure with all latest conveniences.

Menominee Range

CASPIAN (Iron River)—New six-ton electric locomotive received. Similar to two purchased by Pickands-Mather & Co. for one of company's Mesabi Range mines.

MONTANA

Beaverhead County

BOSTON & MONTANA (Wise River)—Raise from 1,000 level Idanha "holed" through into upper Idanha tunnel, 640 ft. above, showing continuous ore of good grade. Crosscutting from tunnel level near-joint Central and Elkhorn veins, with ground becoming well mineralized.

Mineral County

TARBOX (Saltece)—Another assessment of 1C per share called. Surveys under way for mill construction.

Missoula County

POTOMAC COPPER (Potomac)—Driving main development tunnel. Ground soft with large areas of altered and mineralized ground in evidence. Breast in more than 500 ft. Will open Copper Cliff property at 800-ft. depth and Leonard mines at 1,500 ft. Ore showing extensive.

Silver Bow County

ANACONDA (Butte)—Development of silver orebodies in Walkerville section of Butte district being pushed. Labor troubles appear to be clearing, with more miners seeking work and copper production being increased slightly.



AT NORMAN SILVER MINES CO. PROPERTY, MINA, NEV.

BUTTE & RAMSDELL (Butte)—Ore shipments ranging over 10 per cent in copper. Four-car lot returning \$8,850 net from smelters, carrying 11.96 per cent copper on average. This coming from Lizzie vein, under lease from Davis-Daly.

BUTTE & SUPERIOR (Butte)—Ore development on lower levels of Black Rock and easterly in Four Johns claim, adjoining the former, reported encouraging with considerable tonnage indicated. Produced 10,750,000 lb. of zinc in concentrates and 200,000 oz. of silver. July production was 7,800,000 lb. zinc in concentrates and 150,000 oz. silver.

CRYSTAL COPPER (Butte)—"B" vein opened on 600 level shows high-grade orebody two to three feet wide. "A" and "C" veins on upper levels showing encouraging ground, and these fissures will be crosscut early on 600 level.

DAVIS-DALY (Butte)—Sinking of Colorado shaft nearly completed. Sump now being sunk for 2,700 level and crosscutting on this level for half dozen high-grade fissures in evidence on 2,500 level will start with 200 ft. of zinc earnings for July reported more than \$92,000 and for August approximately \$140,000. Ore shipments approaching 400 tons daily and further increase expected with installation of skips, steel for which is looked for this week.

EAST BUTTE (Butte)—Increasing production. Copper output for August, 2,054,760 lb. and silver 70,841 oz., largest of all months this year. Ore reserves being enlarged.

TUOLUMNE COPPER (Butte)—Cutting of Spread Delight fissure on 1,000 level looked for daily. Three-foot oreshoot of silver-copper ore opened on this level about 145 ft. from Spread Delight vein. Fissure also cut in Sinbad shaft at 1,140 ft., showing good mineralization. Shaft being sunk to 1,200 level, which will be reached in

about three weeks, and Spread Delight will be crosscut also on this level.

NEVADA

Esmeralda County

GOLDFIELD DEVELOPMENT (Goldfield)—Mill of 1,200-ton capacity expected to start operations early this month. Mine and mill have about 25 men employed.

MAYFLOWER CONSOLIDATED (Pioneer)—First unit of five stamps on Mayflower started Sept. 5.

Humboldt County

MINERVA TUNGSTEN (Winnemucca)—Has resumed operations, employing twenty men. Under present contract fair profit made.

Lander County

CHILDRESS & FARETTI (Battle Mountain)—Sufficient tonnage of ore having been developed, retorts will soon be turning out quicksilver.

Lincoln County

PICOCHE SHIPMENTS for the week ended Aug. 28 totalled 1,900 tons as follows: Prince Cons., 1,350; Virginia Louise, 350; Black Metals, 200.

Pershing County

MAJUBA (Imlay)—Majuba Silver Tin Copper Mines Co. has taken over Majuba Hill group of 79 claims being developed under direction of Jack Welch, field man for Mason Valley Mines Co. Two thousand tons shipped from development, and William Koerner, engineer, figures 50,000 tons sulphide ore in sight. George S. Brown, of Reno, president.

ROCHESTER NEVADA SILVER (Lower Rochester)—Drift on 900 level 200 ft. long, and in ore picked up beyond fault, and drift on 1,000 level advanced 60 ft., with raise being put up to connect. All workings in good ore. Mines of Rochester shut down as result of electric current being shut off, owing to water shortage at Government dam at Lahontan. Hoped to resume when irrigation ceases in about two weeks.

Storey County

COMSTOCK (Virginia City)—For week ended Aug. 30 report shows Consolidated Virginia shipped 382 tons, averaging \$21.74 per ton, valued at \$8,312.39; and Ophir 165 tons of \$19.01 ore, valued at \$3,139.11.

White Pine County

CHAMPION (Cherry Creek)—Brown and Harrison have let contract for driving tunnel 300 ft.

NEW JERSEY

UNITED STATES SMELTING (Chrome)—Employees struck for higher wages.

NEW MEXICO

Grant County

REPUBLIC M. & M. (Hanover)—Plans being drawn for 100-ton mill. Tests show crude extraction can be made by flotation. Crude zinc sulphide being shipped at rate of 300 tons per month. O. Wiser president and general manager.

BONNEY CONSOLIDATED COPPER (Lordsburg)—Has taken over Bonney mine in consolidation with El Dorado group. Property of Torrey & Sons, of Santa Fe, Manila group and other claims, about 700 acres in all, making third largest group of copper holdings in Grant County. Will install new power machinery and 100-ton mill; 40,000 tons ore ready for mill. D. L. Hill, Lordsburg, president.

CO-OPERATIVE (Lordsburg)—Received card of machinery for new concentration and flotation mill. Working twenty-five men. B. Tabor superintendent.

85 MINE (Lordsburg)—Most machinery for steam equipment on hand. Construction progressing. Operation expected in sixty days.

START CHANCE (Lordsburg)—Pipe line completed to Aberdeen shaft, insuring water supply for mill. B. Prescott, superintendent.

MEXARKO (Pinos Altos)—Two shifts being worked in Laneston mine. Ore being stored for treatment in mill of Calumet New Mexico Mining Co.

GRANT COUNTY COPPER (Santa Rita)—Body of zinc ore developed. Mill for treating same being built. Will be ready to start about Oct. 1. H. E. Link, manager.

BLACK HAWK M. & M. (Silver City)—Taking over Lucky Bill group, east of Bayard station. Development of 200 and 300 levels of Lucky Bill shaft will be pushed. Property good producer of lead carbonate

ores for several years. E. D. Lidstone president and general manager.

TEXAS

Brazoria County.

GULF PRODUCTION (West Columbia) —Ayers No. 1 well, brought in at 3,700 ft., making large production of clear oil. No. 1 McMeans well abandoned. Rigging up to start drilling No. 2 McMeans well.

TEXAS CO. (West Columbia) —No. 9 Arnold well completed and making good production of oil by flowing. No. 1 Brown well abandoned.

Galveston County

SULPHUR CARGO of 7,735 tons loaded out of Galveston on Swedish steamer "Skagern," one of largest sulphur cargoes ever shipped from this port.

SAN LEON OIL (Galveston) —No. 1 San Leon well abandoned. Tested salt water at 2,000 ft.

Gonzales County

BELL OIL & REFINING, of Houston, has purchased all holdings of Quality Realty Co. in Slayden oil field. Drilling will begin at once on W. H. Baldrige farm between Gonzales and Walden. Work in charge of H. Gibson.

Hardin County

WELDON OIL (Saratoza) —No. 2 Hooks well completed at 2,000 ft. Pump will be installed.

MINOR OIL (Sour Lake) —No. 66 well completed, and pumping from 2,550 ft.

TEXAS CO. (Sour Lake) —No. 298 Fee bailing at 825 ft.

Harris County

COMPLETIONS AT GOOSE CREEK: Crown Oil & Refining testing No. 6 Gilt; Atlantic Oil Producing bailing No. 1 Goose Lake; Humble Oil & Refining bailing No. 4 Dannenbaum at 2,620 ft.; Gulf Production arranging to pump No. 17 State-land and testing No. 3 Rosenthal.

DEEP WATER OIL (Houston) —Application made for permit to erect storage tanks. Building of oil refinery to begin at once. Lubricating oils will be manufactured.

Orange County

HUMBLE OIL (Orange) —Closed option on lease on 300 acres of land in Dyon survey of oil field in Orange County. Drilling will start soon.

Wichita County

CORDELL PETROLEUM CO. vs. **KIMMELL & DILLARD** (Wichita Falls) —Judge Betts, of Federal Circuit Court, has ordered oil from well recently drilled by Kimmell & Dillard, on Lucinda Moore survey, to be impounded and profits from production placed in bank at Wichita Falls. Five-acre tract upon which well is drilled is claimed by Cordell Petroleum Co. Making large production. Application for receivership by latter company transferred by Judge Betts to northern district of Texas, and will be heard in Wichita Falls.

UTAH

Beaver County

CAPITOL (Milford) —Shaft being sunk; crosscutting of vein started at 260 ft. Conditions promising.

GOLD CROWN (Milford) —Ore being mined from vein followed 400 ft. by inclined shaft.

Juab County

A **NEW WAGON ROAD** into the East Tintic district is the object of efforts now being made.

CHIEF CONSOLIDATED (Eureka) —Ground owned by company in eastern end of Tintic district being prospected by diamond drills. Equipment at main property recently electrified and working satisfactorily.

EUREKA BULLION (Eureka) —Ore being followed both in winze and raise, water supplied from Chief Consolidated. Improvement in value of ore on 800 level.

LEHI TINTIC (Eureka) —Ore being sacked for shipment. Machinery and material to be used in shaft sinking being hauled to property.

NORTH STANDARD (Eureka) —Shaft down 350 ft. and to be continued another 100 ft., where drifting will be started.

PINION QUEEN (Eureka) —Shaft being sunk.

TINTIC STANDARD (Eureka) —Railroad (Goshen Valley) to this property will not be completed before middle of October. Mine producing about 100 tons of ore daily. South shaft retimbered and enlarged

to depth of 1,000 ft. Blowers to be installed, one at surface and one on 1,000 level.

Idaho County

DEER TRAIL (Marysvale) —Operating with small force. Gold-silver-lead ore, owned by Salisbury Brothers, of Salt Lake City.

WEDGE (Marysvale) —Limited tonnage of high-grade gold-silver ore being mined. Recently 200 lb. of ore mined carrying coarse gold valued at \$6,000 per ton.

Salt Lake County

ALTA DIVIDE (Alta) —Operations to be resumed at this property, situated on divide between Big and Little Cottonwood canyons. Tunnel to be driven several hundred feet below old workings, showing promising mineralization. W. H. Evans interested.

EMMA SILVER (Alta) —Unwatering in progress, and expected to be completed by middle of September.

WOODLAWN (Salt Lake City) —Ore opened along No. 2 fissure from Gardner tunnel increasing in extent both laterally and with depth as development continues. Property adjoins Prince of Wales, now part of Michigan-Utah.

Summit County

PARK CITY SHIPMENTS during August amounted to 6,445 tons, compared to 4,391 tons in July, showing output to be returning to normal, after slow-down caused by strike earlier in summer. Shippers were Iowa copper, 44 tons; Judge M. & S. ore, 17 tons; zinc, 32 tons; Barb West, ore 471; Silver King Coalition, 2,309; Silver King Consolidated, 110; Ontario, 1,018; and Naidriver, 440 tons.

Toole County

OPHIR METALS (Ophir) —Operations to be started soon at this property, taken over by Boston men. Includes 13 patented claims, comprising 146 acres, and 27 miles of lode claims and fractions. Tunnel to be driven at 500-ft. depth below old workings, productive of silver ore in past, and new work undertaken to prospect Euckhorn and Cliff limestones. Stated \$50,000 spent on work planned. W. B. Farmer, of Boston, interested.

WASHINGTON

Ferry County

FIRST THOUGHT (Orient) —Spokane men and others have formed First Thought Gold Mining Co. and taken over this property from P. Burns, of Calgary. Dr. M. B. Grieve, of Spokane, president of new company.

LONE PINE-SURPRISE (Republic) —Shipping gold-bearing ore at rate of fifty tons daily.

Okanogan County

TIP TOP (Spokane) —Has acquired Tip a fractional Lynx, could Curry and Top, two 100-acre areas, on bond from Kankakee Mining Co., at Nespelem, Wash. W. A. Startzman, and Andy O'Neil Mining Co. Properties adjoin and embrace two veins upon one of which 2,000 ft. of development work has been done and \$26,000 expended.

Pend Oreille County

BEAD LAKE (Newport) —Company expects to settle question of title to mill site in few days and begin construction of plant to be finished before end of year.

Stevens County

GLADSTONE MOUNTAIN (Boundary) Work resumed. Recent find of new ore chimney in Electric Point mine only about 250 ft. from Gladstone line. D. D. Dodd, in charge.

NORTHPORT SMELTING (Northport) —One hundred fifty men laid off in smeltery, and plant almost at standstill due to closing of Hercules and Tamarack & Custer mines in Coeur d'Alenes by strike of miners.

CANADA

Alberta

CHARLES E. TAYLOR, chief geologist for Imperial Oil Co., announced drilling for oil will start at once south of Lethbridge.

British Columbia

ASPEN GROVE, Aberdeen, and Donohoe properties, in Merritt district, recently inspected for various interests. Many unworked properties in Stump Lake district, under development by R. R. Hedley.

BRITANNIA M. & S. (Howe Sound) —Mill working at capacity, treating 2,500

tons per day and producing about 2,000,000 lb. monthly. Development in last year 24,595 ft. and diamond drilling 26,682 ft. Drilling raises from 4,100 or mill level to 2,700 level to deliver ore by gravity to mill level.

CALIFORNIA (Kaslo) —Road completed to mine. Athabasca mill expected to run on ore from this mine within two months.

NORTH STAR (Kimberley) —Mines and surface equipment, destroyed by fire, being reconstructed. O. C. Thompson and J. L. McKinney owners.

BEATRICE (Lardeau) —Men sent from Vancouver to work this property which closed down four years ago. Ore galena and tetrahedrite.

BULLOCK (Lardeau) —Bullock Mining Co., organized by Graves Bros. to work Bullock property on which silver strike was recently reported.

SILVER CREEK (Revelstoke) —W. H. Aldridge has taken bond on this and made substantial payment.

IVANHOE (Slocan) —Car and half of ore shipped daily to mill at Rosebery, owned by Rosebery-Surprise Mining Co.

WHITEWATER (Slocan) —R. II. Stewart, mining engineer, has made thorough inspection of this and Corkin Province properties.

CONSOLIDATED M. & S. (Trail) —Offers scholarship to employee's son making highest marks in 1919 entrance examination at any Canadian university. Award consists of allowance of \$50 a year toward application course. Company received 5,492 tons ore from Aug. 14-21; total for year 222,987.

SECHART MERCURY (Victoria) —Property on Vancouver Island, idle for some time, purchased by E. H. Mansfield, who plans to build furnace. Property on island Barclay Sound. Ore runs 2.5 per cent mercury.

Manitoba

MANDY (Schist Lake) —Transportation of copper ore interfered with by low water, preventing shipment by barge to railway. About 10,000 tons remain at end of hauling road awaiting shipment of water, and it is not likely that more than half of this amount can be brought out this year.

Ontario

ORE SHIPMENTS over T. & N. O. Ry. in July totaled 1,321 tons of 2,000 lb. from following shippers: Beaver, 32; Buffalo, 387; Cobalt Provincial, 30; Coniagas, 77; Dominion Reduction, 30; Hudson Bay, 32; La Rose, 81; McKinley Darragh, 166; Mining Corporation, 328; Northern Customs, 43; O'Brien, 32; Penn Canadian, 31; Casey Cobalt, 28. This was shipped as follows: Deloro S. & R., 599 tons; Coniagas Reduction, 196; A. S. & R., Pueblo, 459; Pennsylvania Smelting, 31; Balbach S. & R., Newark, N. J., 2.

MCINTYRE (Porcupine) —Body of ore at 1,100 level over 800 ft. long by about 30 ft. wide being developed on No. 5 vein. Stated to carry higher gold contents than ore now being milled, which runs about \$11 to ton. Stations being cut at 1,250 and 1,375 levels. Main shaft down 1,400 ft.

HERRICK (West Shining Tree) —Outcropping vein sampled for over 1,000 ft. and reported to be of commercial grade for width of 5 ft., with sections carrying very high grade. Shaft down 50 ft., with encouraging results.

MEXICO

Hidalgo

REAL DEL MONTE Y PACHUCA (Pachuca) —Recently added 300 acres including Santa Ana property, of 200 acres, to holdings of 4,000 acres. Now has 43 miles on outcrop of Viscaine vein.

Sinaloa

EL ARCO MINES CO. erecting 60-ton mill, which will be enlarged later to 100 tons. Olaf Zetterlund, manager.

Sonora

EL PROGRESO (Batuc) —Has completed 35-mile wagon road from mine to join Motezuma-Lampasas road, by which company can reach railroad at Nacoziari, 110 miles away. Tables in operation in new mill. Expect to complete cyanide department this autumn. Jackson Elliott, mill superintendent.

PERU

CERRO DE PASCO (La Fundicion) —August production of copper, 5,726,000 lb.; July, 3,984,000.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver		Sept.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
4	417	113 3/8	61	8	414 1/2	112 1/2	61
5	415	112 3/8	61	9	414 1/2	112 1/2	61
6	413 1/2	111 1/2	60 3/4	10	.....	.....	.....

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

Daily Prices of Metals in New York

Sept.	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	N. Y.	St. L.	N. Y.	St. L.	St. L.
4	22@22 1/2	54 1/2	5 1/2@6.00	5.60@5.65	7.35@7.40	7.35@7.40	7.35@7.40
5	22@22 1/2	54 1/2@54 1/2	5 1/2@6.00	5.65@5.70	7.35@7.40	7.35@7.40	7.35@7.40
6	22@22 1/2	54 1/2@54 1/2	5 1/2@6.00	5.65@5.70	7.35@7.40	7.35@7.40	7.35@7.40
8	22@22 1/2	54 1/2@54 1/2	5.90@6.00	5.70@5.75	7.30@7.35	7.30@7.35	7.30@7.35
9	22@22 1/2	54 1/2@55	5.95@6.00	5.75@5.85	7.30@7.35	7.30@7.35	7.30@7.35
10	.....	.....	.....	.....	.....	.....	.....

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M.	Spot	3M.	Spot	3M.
	Spot	3M.							
4	101 1/2	102 1/2	110	279 1/2	274	25	25 3/8	40	41
5	101 1/2	102 1/2	110	279 1/2	274	25 1/8	25 3/8	41	41 1/2
6	.....	.....	.....	.....	.....	.....	.....	.....	.....
8	100 1/2	101 1/2	110	282 1/2	275 1/2	25 1/8	25.85	40 1/2	41 1/2
9	100 1/2	101 1/2	109	282 1/2	276	25 1/8	25.85	40	41
10	.....	.....	.....	.....	.....	.....	.....	.....	.....

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

Metal Markets

New York—Sept. 9, 1919

The dullness in the metal markets continued this week, lead being the only one of the principal metals to show any signs of encouragement. This is not surprising in view of the well-known fact that the statistical position of this metal is strongest.

According to European advices, the industrial situation in Great Britain is distinctly better, more common sense being exhibited in all quarters than a little while ago. However, the whole European situation continues very grave.

Few people appear to recognize how serious are the necessities of Germany. She wants copper, without any doubt, but she wants other things more urgently. Consequently, Germany has even been a seller of copper in Great Britain.

Transatlantic freight rates are quoted as follows: To British ports, \$15 to \$18; to Rotterdam, \$12 to \$15; to Havre, \$20; to Hamburg, \$18. Transpacific rates to Hongkong and Kobe remain at \$14.

Wednesday, Sept. 10, was made a municipal holiday in New York, and although the banks were open, scarcely any business in the metals was transacted, and we record it as a holiday.

The cables for electrolytic copper in London have been coming over with different figures, represented as "spot" and "future." Thus, this week up to Sept. 9, spot was given at £110 and futures £120. In computing our averages, we have used the spot figure. We have been informed that these different figures, instead of representing different prices for spot and futures, actually represent the different prices for ingot bars and wire bars, the lower

figures being for the former and higher for the latter.

The average price for electrolytic copper in London in August is computed from the figures that we received and published. It is uncertain whether the blanks were holidays or whether the dispatches failed to come through. If the latter proves to be the case, the computation of the average will have to be revised. This matter is under investigation.

Copper

Another week passed without producers making any sales. The business continued to be done by second-hands, and instead of such supplies of copper having been cleaned up, considerable quantities of it continued to be offered. Much concern is expressed as to whence all of this copper originates. The aggregate of sales by second-hands during August undoubtedly amounted to a large figure, as did the sales during this week also. This information is confirmed by large consumers who have bought. The market may be generalized at 22 to 22c. right through the week for prompt and nearby copper, with somewhat higher prices for futures. A noteworthy feature is the development of what is in effect a differential between ingot bars and wire bars. Wire-drawers who bought the latter this week paid 22c. for round lots, but ingot bars were offered at 22c. and transactions occurred at that price. Another interesting feature of the week was the renewal of offerings of British ingot bars, which were to be had at 22c. c.i.f. New York, and possibly for less.

American wire-drawers report great activity in filling previous orders, and they expect a continuance of good business, but for the present their copper requirements are covered well ahead. The brass business does not show so good promise. British copper manufacturers are reported to be heavily booked with orders and well covered with metal, but the industrial situation delays the execution of orders and therefore retards consumption. Germany has sold copper to England, apparently for the purpose of getting credit for things needed more urgently.

Copper Sheets—The base price of copper sheets is 33c. per lb. Demand steady. Copper wire is quoted at 26@26 1/2c. in carload lots, f.o.b. mill. Market is dull.

Tin

There was a little shortage in tin of 99 per cent grade for prompt delivery in this market, and with the acceptance of a fair demand price stiffened a little, closing at 55c. Straits tin for

August-September shipment was quoted at 53½c. at the close. In general there was a firm tone to the tin market.

Singapore quoted £273 c.i.f. London on Sept. 4; £273½ on Sept. 5; £277½ on Sept. 8, and £279 on Sept. 9.

Lead

Some substantial business was done during the week at the full price asked by producers. At the same time there continued to be offerings at low figures by second-hands, and some lots were picked up from them. On Monday and Tuesday, however, such offerings diminished, and lead was no longer to be had from anybody at such low prices as in the early part of the week. On Tuesday, the market became quite strong, as high as 7.85c. being bid for lead in St. Louis. Such cheap lots of lead as were offered from speculative hands in the New York market were rapidly being absorbed.

Zinc

Some small business was done in high-grade and special zinc, but the market for Prime Western was extremely dull. In the early part of the week some transactions occurred at 7.35 to 7.40c. St. Louis, but on Monday and Tuesday zinc was easily to be had at 7.30 to 7.35c., and on Tuesday afternoon a round lot was offered at 7.30c.

The London market apparently conforms to German selling, declining upon German offers and rallying upon their withdrawal. According to late advices, Germany is still a seller of zinc.

The Belgian zinc smelters are slowly getting to work. During August, most of the Rhenish smelters were idle, and a good many of the works in Upper Silesia were closed.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market was very quiet, although a little more business was reported than in the previous week. We quote spot at 8½c. and futures at 9@9½c.

Bismuth—We quote at \$2.96.

Cadmium—Unchanged at \$1.40.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—The market was very quiet and unchanged at \$95. San Francisco telegraphs \$95, firm.

Silver and Platinum

Silver—Silver market really steady the last week at 61d. in London, with limited demand for the Continent. New York market has been fluctuating in accordance with the rates for sterling exchange, and closes steady at 112½c. China demand has been only moderate, as the need of silver shipments has been greatly diminished by the large shipments of gold to the Far East.

Mexican dollars at New York: Sept. 4, 86½; Sept. 5, 86½; Sept. 6, 85½; Sept. 8, 86½; Sept. 9, 86½; Sept. 10, holiday.

Platinum—This metal continues in strong demand. We quote refined ingot unchanged at \$110 to \$115.

Palladium—Unchanged at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 6—Zinc blende, per ton, high, \$50; basis 60 per cent zinc, premium, \$46; Prime Western, \$45; fines and slimes, \$42.50@40; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$45.94; calamine, \$29.66; all zinc ores, \$45.28.

Lead, high, \$70.15; basis 80 per cent lead, \$70@65; average settling prices, all grades of lead, \$66 per ton.

Shipments the week: Blende 5,677, calamine 240, lead 1,047 tons. Value, all ores the week, \$337,030.

The railroads are reported hauling empty cars here and hauling them away again, leaving full ones on sidetracks all over the district. The shipment is very low from lack of cars. Every smelter has hundreds to thousands of tons purchased, with no cars to move it. Lack of shipping facilities creates shortage of storage capacity for ore, and it is being reflected in a reduced production, at a time when outputting should be at its best.

Platteville, Wis., Sept. 6—Blende, basis 60 per cent zinc, \$46 base both for premium grade and high lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$65 per ton. Shipments reported for the week are 1,539 tons blende, 277 tons galena, and 358 tons sulphur ore. For the year to date the totals are 68,107 tons blende, 4,364 tons galena, and 11,110 tons sulphur ore. During the week, 3,411 tons blende were shipped to separating plants.

Other Ores and Minerals

Chrome Ore—Quoted at 75c. per unit, delivered in the East, with considerable business done. Indian chrome ore of 48 per cent grade and upward is offered at \$45 per long ton, c.i.f. New York.

Manganese Ore—This is now offered more freely from South America. Our direct advices from the Caucasus are to the effect that the mining industry there is now paralyzed. However, there is about one million tons of manganese ore mined, but scarcely any is being exported, inasmuch as the freight rates to European and American consuming points absorb practically all that can be realized for the ore. For the American market the latest quotation is 55c. per unit, c.i.f. Baltimore.

Molybdenum Ore—Some foreign inquiry was reported. The present nominal quotation is 75c. per lb. of 90 per cent concentrate, but probably that price could be shaded.

Tungsten Ore—Chinese ore for spot delivery was offered at \$7.25 to \$7.50; Bolivian ore is held at \$12, and Western scheelite at \$15 per unit f.o.b. mines. All business now is done with the proviso, "duty, if any, for buyers' account."

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace size ore, free from fines, c.i.f. New York or other

Atlantic port. Sales of ore containing fines were made at 16c. Market slow and unsettled. Very little ore coming in. Price will decrease with ocean freights.

Iron Trade Review

New York—Sept. 9

Another increase in the unfilled tonnage figures of the United States Steel Corporation was reported today, according to the *New York Times*, the gain for the month of August amounting to 530,442 tons. The gain is slightly less than that which was reported for July, as compared with the June figures, but the difference, it is believed, is due to the fact that the Steel Corporation during August was operating at a much higher capacity than in the preceding month, and the greater deliveries consequently cut into unfilled orders more heavily. The total of unfilled tonnage now amounts to 6,100,103 tons.

Pittsburgh—Sept. 9

The American Iron and Steel Institute reports that 2,746,081 gross tons of steel ingots were produced during August by thirty companies which in 1918 made 84.03 per cent of the total ingot output. This indicates a rate of production in August by the entire industry of 39,100,000 tons per annum, against a 35,700,000 ton rate in July, or an increase of nearly 10 per cent. The August output was quite unsatisfactory in proportion to the plants in operation, as there was little actual idleness, yet the production was only 80 per cent of actual capacity, based on the efficiency shown in 1916. The difficulty seems to be that labor is inefficient.

The Steel Corporation's unfilled obligations, reported today on account of tomorrow being a Stock Exchange holiday, increased 530,442 tons in August, making the total at the end of August 6,100,103 tons. The August increase represented over 40 per cent of capacity, and as shipments were fully 80 per cent of capacity, the bookings must have exceeded capacity by more than 20 per cent. Three successive months have now shown increases averaging over 600,000 tons a month, whereas for six months preceding there were decreases averaging more than 600,000 tons a month.

The labor situation in the iron and steel industry has improved farther. The strike committee of the American Federation of Labor has made a pretense of urging President Wilson to endeavor to arrange a conference between the Steel Corporation and the committee, something President Wilson obviously would not undertake. The committee pretends that it is with difficulty restraining the men from striking, whereas the steel manufacturers believe that even with its utmost efforts the committee could not produce a real strike.

Demand for steel products is on a moderate scale, but appears insistent in some lines because in those lines the mills are already well sold up. The American Sheet & Tin Plate Co. is out

Engineering and Mining Journal

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New York, Saturday, September 20, 1919

Number 12

Market Report for Sept. 20 Will Appear in Issue Of Sept. 27

INDUSTRIAL conditions in New York have made it expedient to close the forms of the *Journal* in advance of the routine schedule date. The usual market quotations are therefore necessarily omitted from this number. The market pages which would have appeared normally in the Sept. 20 issue will be published in the *Journal* of Sept. 27.

Present Status of Deep Mining in California

IN COMMENTING upon the present unsatisfactory condition of deep mining in California, Charles G. Yale, of the U. S. Geological Survey, assigned the following causes: Low prices of metals produced (and this applies to gold, on account of its low purchasing power); strikes and scarcity of labor generally; high taxes and other war conditions; surcharge on electric power allowed the power companies. His statement applies to gold, copper, lead, and zinc mines in California.

With the first three causes the mining industry in all of our metal-mining states has had to contend. As far as prices are concerned, the individual mine must sell its products at the ruling quotations, which are determined by economic conditions. This ruling price and the weight of metals produced determine the gross income of the mining company. Out of this gross income, needless to say, must come wages, taxes, salaries, supply and material costs, power cost, and overhead expenses, as well as any gain to the stockholders of the enterprise.

Gross incomes of mines have been greatly diminished, both from the lower prices of metals and also on account of curtailed production. Many gold and copper mines have closed down in California as a consequence of their inability to conduct operations under the existing conditions, except at a serious financial loss. Other mines are operating without profit. Whatever mines show an operating profit are indeed fortunate.

Under the circumstances labor strikes are particularly to be regretted. Their continuance will not better the status of labor nor improve the position of any individual mine. There are loss in time, deterioration in underground workings, failure to make necessary repairs in equipment, disorganization of the working force, and discouragement of the operating staff, not to mention the inevitable ill-feeling that accompanies the fighting of such questions to a settlement. A mine working on a narrow margin becomes a losing venture after a few such experiences.

Large low-grade properties do not attain low operating costs at once, but must pass through a period during which there is co-ordination of effort and a develop-

ment of plant and labor efficiency that require great skill on the part of a managerial staff. As this is attained, a margin between income and expenditure appears, and the enterprise becomes profitable. It takes a surprisingly small thing to throw the machinery out of order. It requires great patience and hard work to bring it back. If the men who go out on strike with apparently so slight concern would assume the responsibility which is rightly theirs by reason of their participation in the mining industry they would exhaust every reasonable expedient before striking. How many of the striking miners have sought to join forces with the communities in which they live in an endeavor to reduce living costs? Yet this is an eminently practicable way of increasing the "ruling wage." We know of mining companies that have kept down food and living prices in mining communities. It would be the part of wisdom for the mine workers to join forces with the mine management in a campaign to reduce living costs rather than to throw the burden upon the mine to pay increased wages.

In respect to high taxes, mining enterprises must pay their full share not only of the local and state taxes but also of the Federal taxes. The future does not hold forth the prospect of speedy reduction in the amount of the tax. It is not probable that the cost of mining supplies will be reduced materially. In the case of California mines, increases in the cost of power which is served to the mines by public-utility corporations have been made, and have had their influence in making profit margins smaller.

The big mine has played the part in the past of lending stability to the mining industry by providing steady employment to large numbers of mine workers. It will continue to do this if it has a reasonable chance to make expenditure less than income. The product of the mine must be sold in competition in the metal markets of the world. Unlike a public-utility corporation, the mine cannot pass on increased labor and supply costs to the metal consumer. Such increases almost always decrease the margin of profit, and the danger point is apparently being approached.

Both large and small mines need the active co-operation of the mine worker with the mine management, if the mining industry is to prosper.

Scientific Information In the Daily Press

THE quality of the technical information supplied by the general press is such as to provoke amusement among the comparatively small proportion of newspaper readers who have had scientific training. In some cases the reporter, or rewrite man, or whoever prepares such articles, apparently knows nothing whatever about the subject on which he writes, and statements are made which have no foundation in fact. In other instances—and here we find the most amuse-

ment—he has absorbed the gist of some feature of applied science, and in an effort properly to describe it in technical language he unconsciously wanders far afield. He means well, but his manner of expression is as unfortunate as that of the young man who passionately declared to his sweetheart, "If beauty is only skin deep, then you have a hide like a rhinoceros"!

Many scientific societies and Government bureaus furnish press bulletins on technical subjects, and the more careful newspapers look to such sources for material, rather than trust writers of limited familiarity with the subjects discussed. As an example we might cite an article on the "Deepest Well in the World," recently prepared by the U. S. Geological Survey, and contained in their Press Bulletin for August, an excellent article, which was reprinted by the *New York Times* and other lesser papers.

Information on technical subjects is often valuable and interesting to the layman, but it should come from an authority. The source also should be shown whenever possible, if for no other reason than to establish the status of the article in question.

As Others

See the Engineer

A FEW weeks ago M. O. Leighton, chairman of the Engineers, Architects and Constructors' Conference on National Public Works, reported the opinion of a statesman and politician of the better class upon the effort to establish the National Department of Public Works. The opinion contains an interesting estimate of the engineer and is quoted below:

"Your task is appalling. You have been elected to lead engineers into a political reform. They are the most unresponsive citizens we have. Your organization has a praiseworthy purpose, but if it were sponsored by almost any other group of reputable men than engineers there would be more promise of success. If your organization succeeds I believe you will find that it will not be the engineers who have carried it through. Their aloofness and indifference in all matters outside of their own professional sphere are among the unexplainable things in our political life."

The engineer as a representative of a class has of late been the recipient of a considerable amount of advice, the burden of which has been that he ought, for the welfare of the community, as well as for his own, to give more attention to public affairs and in more direct ways associate himself with politics and even political office. To see himself as others see him and to learn that he is unresponsive, aloof, and indifferent, according to our statement quoted, is not exactly pleasing. A more flattering account would be pleasanter. The results of the statesman's essay will be accepted by some, but many, among whom we place ourselves, will be inclined to take issue with the statesman on the ground that he has not taken an accurate sample, but rather has grabbed a "specimen" from the pile which cannot give the result that would have been obtained from a sample.

That engineers as a class are unresponsive is disproved by the attitude of engineers toward the war. They were among the first to volunteer their services, and from the illustrious Herbert C. Hoover to the engineer in the ranks of the American Expeditionary Force there was a hearty response to the needs of the situation. That engineers hold themselves aloof is in

a measure true, for most engineers thoroughly dislike to mix into the mire of politics.

Engineers are not indifferent to public affairs. In many instances it is the observation and the initiative of the engineer that are responsible for improvements in public service. It goes almost without saying that the idea of a National Department of Public Works comes from the engineers, and, through their organization, the Engineering Council, a strong effort is being made to put the idea over.

The opinion of our statesman-politician is worth examining further. Is it not a clever way of side-stepping a responsibility for a condition in the Federal departments for which the politician has primarily been responsible and for which he has been called to time by the engineers? It is begging the question to say that the task is appalling when viewed from the standpoint of the engineers getting back of the movement for a political reform. Would it be less appalling if the politicians were to actively interest themselves in the question? Is there anywhere a proffer of assistance from our statesman-politician to the engineers? No. All that there is, is a shrug of the shoulder and "Your task is appalling because engineers are unresponsive, aloof, and indifferent."

On the other hand, are politicians responsive, in touch with the public weal and attentive? They are, but as far as we are informed most of them are responsive and attentive to only two things—votes and a strong desire to remain in office. They are in touch more with the public pocketbook than the public weal.

We are glad to see that the engineer is interesting himself in public questions. We know that the task will not be appalling to him, for he has faced many a problem in bridge building, tunneling, construction, and management, and the brain power which he has brought to this work will, we believe, prove equally effective when applied to public questions.

Technical Graduates

And Plant Management

TECHNICAL graduates sometimes manage a plant as if it were an experimental laboratory. Part of their training has been in the laboratory, and it is natural that they should acquire the laboratory habit. There is a fascination about experimentation from which it is frequently hard to get away. We do not take issue with this, but we do desire to point out that there is necessity for discrimination. In the operation of a plant it is essential to decide upon a general plan and to carry this out until every detail has become a part of the plan and the working force has been so thoroughly drilled and broken in that a high degree of efficiency is the rule, and everyone in the plant knows exactly what is expected of him. Individual dexterity and skill are the outgrowth of repeated performance which finally reaches a stage under skilled direction when everyone fits into the system easily. Commercial results require plant operation of this order. There is always the breaking-in period of a new plant. During this period unit costs are high and efficiency is low. The more quickly this is passed the sooner will unit costs begin to decrease.

Experimental work properly belongs at the beginning of operations, and at this time the limitations of ore treatment should be worked out in the laboratory by systematic experiments. A knowledge of the type of

ore deposit will convey some indications of the changes to be expected in the constitution of the ore with deeper mine development. Provision can be made at the beginning for radical changes in ore constitution. Flow sheets can be devised from the experimental data.

During the operation of a plant, experimentation may be necessary, but a sharp line should be drawn between the operating force and the men who are conducting such experimental work. Only in rare instances should the line be crossed and interference with regular operation allowed. It is easy to disorganize, and hard, as well as expensive, to return to established routine. Where radical changes are necessary they should be effected promptly, and the working force brought to the new operating routine as rapidly as possible. The technical graduate who recognizes these principles and puts them into practice will earn money for his employer and win recognition as an able manager.

For the Freshman in Our Mining Schools

WITHIN a month the numerous schools of mining scattered throughout the country will be open, and another year's supply of mining and metallurgical engineers will be in the making. Most of these students will come from mining districts or from families one or more members of which have been interested in mining.

Secretly, most men feel that some other calling presents much greater opportunities than their own—the miner envies the commission merchant, with his attractive city or suburban home and nothing to do but buy goods and sell at an advance. And the latter thinks it would be ideal to get away from his confined environment; to ramble about in the open where riches lie buried in the ground and can be had for the digging. Desire for the other fellow's job is a human frailty, but the fact remains that most men, in selecting a profession, are inclined to embark in one with which they are already fairly well conversant. So, as we said, most mining engineers become such from environment. The embryo engineer will go to a mining school and take the course there offered; then he will begin or resume his practical work, and he will know little else than mining.

The profession would be benefited in many ways if more mining engineers were graduates of literary, law, or even medical schools. At least, the mining-school student should endeavor to secure as broad a course as possible. He will find that 95 per cent of the problems he will have to solve depend on plain common sense and experience applied to the elements of mathematics, physics, and chemistry, principally plain common sense. So he should go to a school that offers something besides strictly mining courses, and he should make the most of his opportunities. When it comes time to write for a job, the plum will go to the man who writes the best letter and the gooseberry to the one who drew "A plus" in the science of ore concentration.

One of the principal things a mining engineer is called upon to do today is to handle labor; and to do this he must understand psychology and social problems. He must also be a business man; which means he must have a good working knowledge of economics. And, in general, the higher a man gets in his profession, the more varied his education must have been.

So we say to the prospective student: Do not specialize too closely, and do not scoff at the "arts" student. He may be a wise engineer.

Wildcat Advertising

IN THESE DAYS, when so much is being said of "blue-sky" legislation, and stringent laws have been passed, and in some cases are actually being enforced, it is apparent that something is being done to discourage picking the public's pockets. But the millennium is still a long way off. Audacious advertising of oil promotions and other schemes frequently comes to hand. Attention has been called from time to time in these pages to advertisements that were so impudent as to be actually funny. Indeed, so lurid and barefaced have some of them been, that it seems that even the most credulous would pass them by with a laugh. This advertising has not been limited to any particular section, the most flagrant cases noticed having come from Utah, Connecticut, and Texas.

The Ontario government recently instituted prosecutions under the Ontario Companies Act against four promoters dealing in oil shares of companies of doubtful standing, and one of them has already been convicted. The action taken by the California State Corporation Department on Aug. 4 in issuing a list of companies which have failed to comply with the California Securities Act has been discussed in a previous editorial.

It is not enough, however, to punish the guilty promoter. The agency that prepares the advertisement of a promotion that is bogus on its face, and the newspaper that gives it space, are to a considerable extent partners in the crime. Business it may be, but it is dirty business.

Engineers throughout the country can do much to make the going more difficult for fake promoters. Most of the cases brought to our attention, in fact, have been exposed by members of the profession in the various sections. The crook who wants publicity should have publicity, but it should be of the sort he deserves. Fake promotions injure the mining industry and the engineer himself.

Daylight Saving In Mining Communities

THE advantages of the "Daylight-Saving" Law have been discussed extensively. We believe that practically all mining communities are sorry to see the law repealed; in fact the farmers seem to be the only class which has been made happy. It was a case of determined opposition of a minority overthrowing the half-hearted support of a majority.

To the men working on shift there was probably no particular advantage in the scheme, but to others it threw the work one hour further into the cooler portion of the day, and gave an extra hour for outdoor activity and recreation. Most mining communities are self-contained, and local "daylight saving" can easily be continued next year if the residents of a district wish it. To avoid confusion with railroad time, it might be advisable for the various mining companies merely to ask men working always in the daytime to report one hour earlier. Then there would be no need to change the clocks. Local communities may secure all the advantages of "daylight saving" by adjusting the hours of employment.



LIBERTY PIT OF NEVADA CONSOLIDATED COPPER CO. AT COPPER FLAT, NEV.

Photographs From the Field

THE PEAVINE MINE OF THE STANDARD METALS CO. NEAR RENO, NEV.



The Diesel Engine in the Southwest

The Economy of Power Secured From This Source Compared With That From Steam—Principal Troubles Encountered in Oil-Engine Operation—Necessity Of Employing Trained Operators

By B. V. E. NORDBERG

IN THE southwestern mining country, the Diesel engine may be employed under conditions to which it is particularly well adapted, as little fuel is available other than fuel oil, the bulk of which is shipped from the Californian fields. The two principal kinds which are used are a light grade about 25 Bé. and a heavier variety of from 19 to 14 Bé. The same grade of fuel is used for both steam and Diesel plants, so that a direct comparison can readily be made between economical installations of both types. East or west from the southwestern mining district, there are oil fields, and, with the lessened price of fuel, the cost of operating large steam installations more nearly approaches that of maintaining the Diesel plant. In small units, however, the steam plant is not economical, and small oil engines may find considerable application in the oil districts, as there is little difference in fuel economy between oil engines of different sizes. However, where the climate is cold and heating must be considered, the Diesel engine is of limited applicability.

A properly designed and well-constructed Diesel engine is economical not only in fuel consumption but also in maintenance. Still, no engine, however well built it may be, can deliver cheap power if the attendants are not capable, careful, and trained in the handling of such units. In this age of slight experience with oil engines, good construction is essential, and even more so in the mining field, where continuous operation is necessary. The wheels in a mining camp do not stand still for months at a time, and the problem involves a spare unit, without which no mining power plant should be designed. The larger mining companies understand this well, but the smaller ones usually believe they cannot afford a spare unit.

The electrification of all branches of mining is responsible for making the use of the Diesel engine a big factor in the reduction of cost of power. With an electric hoist installed and a mill driven by motors, the problem is simple, and the engine is usually direct-connected to a generator. With several engines running in parallel, no difficulty whatever is experienced, so that any number of units can be put into the same power house. The only limit is the economical number of units. The smaller the unit for a given type, the greater will be the cost of foundation, building, generator, and accessories. A multiple unit system is a logical method of installation, as it makes a more flexible plant and cuts down the size of the spare unit.

500 B.H.P. PER CYLINDER THE SIZE LIMIT

The question of how large a Diesel engine can be built is still undecided; for marine work the general belief is that the larger the engine the better. A limitation may be set, however, on the size that may be of economic value to the mining industry today. Those central power houses distributing to large mills and hoisting plants would demand as a maximum an oil engine capable of delivering about 500 b.h.p. per cylinder.

Such units can be built with from three to six cylinders. A larger number of cylinders than six is of questionable advantage, owing to the added complication and attention required by the adjustments. More than six cylinders may be suitable to certain types of engines, but, considered purely in the light of a large number of cylinders compared with a few cylinders, the engine with the smaller number possesses the advantage.

POWER INCREASED BY USE OF SCAVENGING PUMP IN HIGH ALTITUDES

Diesel engines in mining districts are usually installed in high elevations, and the maker must proportion his engine sufficiently large to meet the low atmospheric pressure. The amount of fuel that the engine can burn per stroke is less in high elevations than under pressure conditions present at sea level. In the two-cycle type of engine illustrated in Fig. 1, the reduction in power caused by high altitude can be less-

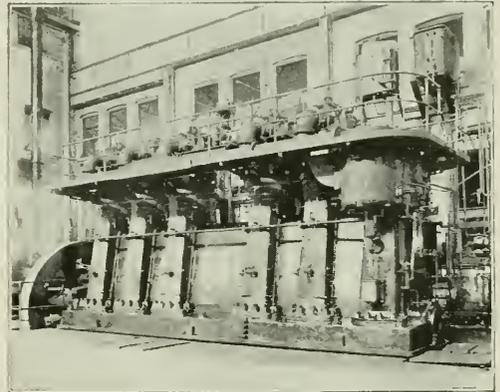


FIG. 1. A FIVE-CYLINDER TWO-CYCLE ENGINE RATED AT 1,250 B.H.P.

ened to a considerable extent by supercharging the cylinder with clean air from the scavenging pump, the position of which is shown in Fig. 2. The pump merely compresses air to a pressure of about 4 lb. per sq.in., which, in this type of engine, is led to the cylinder head through a header and blown through the cylinder when the four valves in the cylinder head are simultaneously opened.

The scavenging air is evenly distributed, flowing downward in an almost solid sheet, and expelling before it the burned gases. This blowing continues until the exhaust ports are covered by the piston. The scavenging valves are so timed that they remain open after the ports are covered, so that an additional amount of clean air is admitted to make the pressure equal to sea-level conditions. With this arrangement the same quantity of fuel per stroke can be burned, regardless of elevation.

the only loss being the additional power required to compress the increased amount of scavenging air. This amounts to the same thing as an additional friction load on the engine, and its rating is reduced by just that amount.

The high-pressure compressor furnishing blast air requires a little less power when compressing air at high elevations, even though the pressure range is greater. The fact that the power of the engine is not greatly reduced is a point of considerable advantage. An engine such as is shown in Fig. 1 is rated at 1,250 b.h.p. at sea level. It has five working cylinders of 250 b.h.p. each, the sixth illustrated being the scavenging air pump.

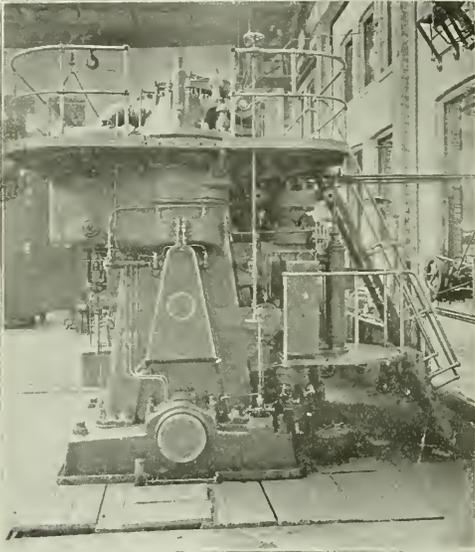


FIG. 2. END VIEW OF DIESEL ENGINE, SHOWING
SCAVENGING PUMP

At an elevation of 5,950 ft. the unit has pulled peak loads of 900 kw. lasting several minutes, easily holding its speed and without the slightest amount of smoke being visible in the exhaust.

Despite the fact that a two-cycle engine has the advantage of being able to develop more power, it is good policy to overtax it as little as possible. In mining work, the loads as a usual thing are comparatively constant. A load factor of between 60 and 70 per cent is not unusual, and it often remains at that figure for weeks at a time.

With several units, a plant may be operated with a load factor of 90 per cent or better. In fact, if given a conservative rating all of the engines illustrated in Fig. 1 operated at above 95 per cent. The unit under any consideration must be able to hold its load easily, and it must be borne in mind that the Diesel engine is a maximum-rated machine in the strictest sense of the word. The maximum rating has been determined only after long experience, and is not the maximum load which the engine can pull, as is sometimes mistakenly supposed. It is such a rating as will cause no trouble due to either excessive heat or diminution of load ca-

capacity in time, other conditions being good. It has finally come to be considered as a mean effective pressure referred to a b.h.p. that is safe. If a mean effective pressure is selected not so low as to impair the fuel economy, nor so high that there is danger of trouble from excessive heat, there should be no trouble in pulling 25 per cent overload at sea level for short periods. If the engine is rated too high, it is more susceptible to factors which may affect its power output. Some of these conditions are:

1. Variable quality of fuel.
2. Load unequally divided among the cylinders.
3. Failure to keep atomizers, fuel pumps, and parts in good running order.
4. Worn piston rings.
5. Cooling-water difficulties.
6. Improper adjustments.

GOOD GRADE OF FUEL OIL ESSENTIAL

As good a grade of fuel oil as it is possible to get should be used in any Diesel engine. This does not necessarily mean a light oil, as heavier grades are more economical; it has reference mainly to the objectionable impurities, which may attack the metal with which the oil comes in contact, impair the lubrication, or cause deposits within the cylinder. In all of these cases it is assumed that the oil is sufficiently atomized to produce complete combustion in the presence of a sufficient supply of clean air. Coarse sand and water can be extracted by a filter. Such impurities as sulphur, ash, coke, and asphaltum can be handled in moderate quantities, but if a fuel is allowed to stand unagitated, strata of various grades of fuel will form, which will not act uniformly in the engine. If a stratum is used that is difficult to burn and causes late combustion, the power of the engine will be reduced. The heat units supplied to the engine will not be entirely converted into work, and more heat will be developed within the engine, resulting in a condition analogous to overload.

UNEQUAL DISTRIBUTION OF LOAD COMMON CAUSE OF TROUBLE

Probably the most common difficulty encountered is caused by the unequal distribution of load among the several cylinders. This is purely an operating difficulty, but as an engine may run for long periods with abnormal loads on some of the cylinders, it is very serious if the rating is too high.

A well-constructed atomizer needs little attention, but even with good care there is a possibility of a leaky valve or trouble with the flame plate. In either case, combustion will be rendered less perfect, and a consequent drop in the governor will throw a greater load on the remaining cylinders. Similarly, a fuel pump that does not function properly causes the load to be shifted from the cylinder which it serves to the others, and loads them abnormally. Worn piston rings are another common defect, but these can be detected from the outside.

BAD COOLING WATER SHOULD BE PURIFIED

In mining districts, untreated mine water, high in scale-forming matter, is commonly used for cooling Diesel engine jackets. Such water would not be considered for use in a boiler. Although no similar water temperatures are reached as exist there, the surfaces with which the water comes in contact are extremely

hot. Along the upper part of the liner or cylinder head, local boiling may be going on, and there scale may be deposited. Such scale accumulation, especially in the piston water space, causes carbonization of the lubricating oil, followed either by piston-ring leakage or friction, which results in an added load on the engine.

Improper adjustments are not as unusual as they should be, and ratings of the engine should be liberal enough to guard against trouble arising from this source. This can be done only in a measure, to be sure. No formula takes into account the human element, so that even if the rating of the engine is liberal, compensation cannot always be made for this fault.

SKILLED OPERATORS REQUIRED

Any or all of the above causes may create sufficient difficulty to give the impression that the Diesel engine is troublesome and unsatisfactory. Conservative rating will exclude all trouble arising from the causes as given. Such minor difficulties would, however, not cause serious results even where units are rated high, provided a skilled operator were in charge. It is unfortunate that more such operators are not available, for all that a well-designed unit needs (and this means an engine built by a concern with a long Diesel experience), is the attention of a careful and intelligent operator, systematic inspection, and immediate attention to parts that show weakness.

DIRECT-CONNECTED COMPRESSORS ADAPTED TO MINING WORK

Fig. 3 shows a plant in which four 1,250-hp. units are running. At the farther end of the power plant, and hidden behind the last unit, is a compressor direct-connected to a Diesel engine, which is interesting, as it is a development growing directly out of the mining

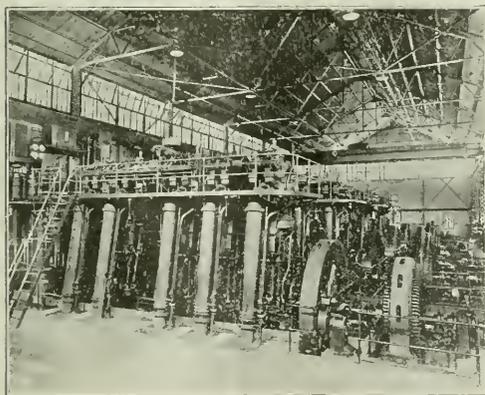


FIG. 3. A 5,000-HP. DIESEL ENGINE INSTALLATION

industry. The capacity of the compressor is entirely dependent upon the speed of the engine, as no variable-capacity devices are employed. In mining work, it is seldom that no air at all is required.

Stopping or starting even a large Diesel engine is not nearly as difficult as in the case of a steam plant, and can be done in much less time, so that if periods are encountered, even several times a day, where no air at all is necessary, the unit can be shut down. Such units are now built to vary between 70 and 180 r.p.m.,

which seems to be sufficient speed variation to suit the demand for air. The Diesel engine of this type, as should be remembered, must accomplish the same amount of work per stroke, whether running full speed or one-third speed, the requirements differing materially from those of the marine types, where the torque varies approximately as the square of the speed. The importance of uniformity of torque is immediately apparent, and the reason for the adoption of the two-cycle engine for this class of work is also clear.

The higher speed of 180 r.p.m. excludes the use of eccentric-driven valve gear on the compressor, so that a special feather valve was constructed, which has been entirely satisfactory. The capacity of the blast air compressor, which is direct-connected to the engine as shown in Fig. 2, determines the minimum speed of the unit. By supplying an additional amount of blast air the speed has been reduced to 56 r.p.m., when the exhaust just began to be visible. Inasmuch as the quantity of blast air varies with the speed, a special governor was designed which makes the engine entirely automatic.

The dimensions of the scavenging pump are the same as for a constant-speed engine, no changes whatever being made in the setting of the scavenging valves. The scavenging pressure varies from about 4 lb. per sq. in. at full speed to about 2 lb. per sq. in. at 70 r.p.m. The pressure of the compressed air also varies as the speed, dropping to a minimum of 330 lb. per sq. in. at 60 r.p.m., at which time the exhaust is invisible, and as even and regular as at full speed. These observations were made on a three-cylinder engine direct-connected to a 4,000-cu.ft. compressor.

CONSTRUCTION OF THE GOVERNOR

The governor employed for the regulation of the unit is a combination of an extremely static governor and an air plunger in communication with the receiver in the discharge line. The air plunger is frictionless, and is loaded by means of weights. In addition, a light spring is used to give a continually increasing load as the plunger is pushed out of its cylinder. This plunger is connected to the fuel-pump mechanism, so that, as it emerges, it decreases the fuel supply to the cylinder of the engine. As the static governor rises, it produces the same result.

In a well-designed Diesel engine driven compressor, the amount of fuel consumed is the same per stroke whether running at high or low speed, so that the mechanism controlling the fuel supply remains in practically a fixed position for all speeds. If the air pressure should drop, the air plunger will descend, giving more fuel to the engine, which immediately picks up speed. The speed governor then rises and cuts down the fuel until the speed is adjusted to correspond to the original fuel consumption. A constant pressure can be maintained with this type of governor with all variations in the rate of air consumption.

ONE POUND OF FUEL REQUIRED TO COMPRESS 1,000 CU.FT. OF AIR

A fuel consumption of slightly less than 1 lb. per 1,000 cu.ft. of free air compressed to 80 lb. per sq. in. has been realized during a test made on the 4,000-cu.ft. compressor described. This unit, as mentioned, is running at an elevation of 5,950 ft. It is interesting to note that the work of compressing 4,000 cu.ft. of air

is less at this elevation than at sea level. The fuel consumption is, however, slightly increased, so that the net result is an approximately constant fuel consumption of 1 lb. per 1,000 cu.ft. of free air. A commercial run covering thirty consecutive days of sixteen hours a day showed a consumption of 1,095 lb. per 1,000 cu.ft. compressed to 80 lb. per sq.in., which includes all the fuel oil used for starting, filling tanks, and leakage.

The compressor has a valve attached to the discharge pipe, which is open during the starting of the engine so that no air is compressed, and closed as soon as the engine is up to speed. The air compressed is determined from the counter reading. An elaborate test was made to determine the volumetric efficiency of the compressor, the weight of air being calculated both from indicator cards and from the flow through a fixed nozzle. In this way a factor was determined, which, if multiplied by the number of revolutions, would give the actual quantity of free air compressed.

COMPARISON OF DIESEL ENGINE WITH STEAM PLANT

In a comparison of the efficiency of a Diesel engine with that of a well-designed steam plant, probably no better illustration can be found than the results from two compressor plants, one operating with steam and the other with a Diesel engine. A very economical steam compressor plant built for the Champion Copper Co. was tested by Professor O. P. Hood, and the work described in the Transactions of the American Society of Mechanical Engineers, Vol. 28, p. 221. The Champion Copper Co.'s compressor has held the world's record for economy, despite the fact that conditions at the plant were unfavorable, as it was impossible to carry any superheat or the specified boiler pressure. The test showed an extremely good thermal efficiency. The steam pressure at the throttle valve was 243 lb. per sq.in., which was the basis for the determination of the number of B.t.u. delivered to the engine. The steam was very wet. The work delivered per million B.t.u. supplied was 194,930,000 ft.-lb.

Herewith are presented data taken from a test made on the air compressor plant built for the Phelps Dodge Corporation at the Burro Mountain Copper Co., Tyrone, N. M.:

AIR COMPRESSOR TEST

3 EG Diesel engine.
750 h.p.p. sea-level rating, direct-connected to a compressor.
Size of air cylinders, 19 and 33½ x 24.
Duration of test, 5 hours.
Total fuel consumed, 924 lb.
Total number of revolutions, 41,520.
M.B.F. referred to L.P. cylinder, 29 lb. per sq.in.
Average r.p.m., 138.6.
Maximum rated r.p.m., 180.
Work per revolution, 101,500 ft.-lb.
Fuel, per revolution, 0.022 lb.
Fuel temperature, 130°F.
Average air pressure, 88 lb. per sq.in.
Quality of fuel used, 19 EG.
B.t.u. content per lb., 19,100.
Duty for every million B.t.u. supplied, engine delivered
238,500,000 ft.-lb. of work, based on i.h.p. of air cylinder.

In the steam plant it must be remembered that the heat units are measured at the throttle, and the boiler-room and steam-pipe losses are not taken into account. Assuming these to be 20 per cent, the 195,000,000 ft.-lb. of work per million B.t.u. supplied dwindles down to about 156,000,000. In the Diesel plant, the duty given is based on the actual fuel delivered to the engine and the amount of work measured in the cylinders. The relative over-all efficiency can easily be seen from these figures.

To such an installation the Diesel engine is particularly well adapted. With a constant load to pull at all

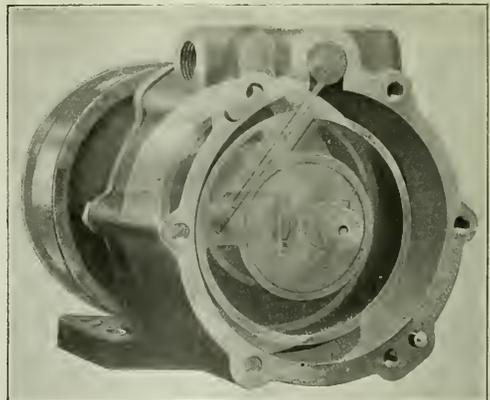
times, its rating can be made such as to be perfectly safe. No means of overloading it are available, so the factors mentioned earlier in this paper which affect the load-carrying capacity of the engine are not likely to cause trouble.

The speed of the compressor continually varies to suit the demand, which makes the average speed low, an advantage which cannot be overestimated. The amount of fuel burned per stroke is a constant and allows an adjustment of the supply of cooling water to be made which need not be changed and which reduces the possibility of overheating the jackets. Little attention need be given to the unit, as the necessity of supplying automatic devices to hold the blast-air pressure constant obviates part of the care necessary in ordinary Diesel plants.

A similar compressor is now being installed in the plant mentioned, the capacity of which is 6,400 cu.ft. of free air per minute, direct-connected to a five-cylinder engine. Further tests on this compressor will soon be made, and though it may not be possible to reduce the fuel consumption, there are other features which may be of interest and which can be discussed at some later time.

A New Pump With a Rolling Impeller

The construction of a new pump placed on the market by the Michigan Machine Co., of Detroit, Mich., under the name of the "Rollway" pump is shown in the accompanying photograph. Its principal working parts consist of two rollers which rotate eccentrically in the pump chamber. A spring is placed in the rectangular slot in the inner roller, which bears against the squared shaft.



INTERIOR CONSTRUCTION OF THE "ROLLWAY" PUMP

and which operates only when the pressure on the pump is as great as the pressure required to compress the spring. When this pressure is reached, the compression of the spring allows the rollers to come to the center of the pump, where they continue to revolve in the liquid without doing any pumping.

The "Rollway" pump is a positive one, but is also self-priming, and may be used within 10 ft. of the level of the liquid to be handled. Foreign matter will not clog it. The pump may be economically operated at speeds ranging from 100 to 600 r.p.m.

Geology of the Gogebic Range and Its Relation To Recent Mining Developments—Part II*

Contact Between the Two General Subdivisions of the Iron-Bearing Formation Is Well Defined—Members Composing Main Divisions Possess Distinguishing Characteristics and Can Usually Be Recognized, Although Contacts Are Gradual

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WHEREVER exposed, either in mine workings or in drilling, the Ironwood formation is found to be made up of two major subdivisions. The contact between the two is always a sharp transition from a wavy-bedded ferruginous chert formation to an even-bedded, more or less heavily ferruginous slate. This contact differs from many of the other contacts between the chert and slate formations in that it is abrupt. In many cases the other contacts between the ferruginous slates and ferruginous cherts are marked by a gradual change, in which material of one character increases through a thickness of a few inches to several feet, whereas the other material decreases. The relations of these two major parts of the Ironwood formation are given in detail in the discussion of the Norrie member. For convenience of reference to these two portions of the formation the name Lower Ironwood is suggested for the basal part and Upper Ironwood for the upper part. These two portions of the iron formation correspond to what in the past have been called tentatively "South Belt" and "North Belt" in some of the work on the western end of the range.

Each of the main subdivisions of the Ironwood formation is made up of distinct members which can be recognized throughout the range wherever exposed in mine workings. The subdivisions of the Ironwood formation and the base of the overlying Tyler are as follows:

Tyler Formation.....	{	Graywacke slates. Iron carbonate slates. Pabst member, cherty and fragmental and ferruginous slate beds.
Upper Ironwood Formation..	{	Anvil ferruginous chert member. Pence ferruginous slate member.
Lower Ironwood Formation	{	Norrie ferruginous chert member. Yale member—interbedded ferruginous cherts and ferruginous slates. Plymouth ferruginous chert member.

Names have been given to the various members of the iron formation and the basal member of the Tyler to facilitate easy reference in discussing them. It is believed that the use of the names of prominent mines of the district for this purpose will be the most acceptable that could be suggested. The names used were selected with the purpose of showing mines where the particular member is well developed, but this was not always feasible, because the names of many of the mines are already in use as formation names in other localities.

The various members are distinguished by the characteristics described in the discussion of the difference between the beds. Three members—the Plymouth, Nor-

rie, and Anvil—are dominantly wavy-bedded granular or fine-grained ferruginous cherts; the Yale and Pence, which separate these three, are dominantly even-bedded ferruginous slates. In distinguishing these members in the mines it is not always easy to determine with engineering accuracy where the contact should be drawn. Many of the contacts are gradational zones, and any bed in these zones can be taken as the contact. Usually, however, there is little difficulty in identifying the contact within a few feet.

A reference to Fig. 17 will indicate the thickness of these members in various parts of the range. The numbered lines represent cross-sections along which the thicknesses of the various members have been measured horizontally, regardless of the inclination of the beds. In denoting the measurements it was thought best to depart from the usual custom of giving actual thickness of beds, and to adopt a method which is more convenient for the mining engineer, because of the fact that mine workings are on horizontal planes. The straight line from which the numbered cross-section lines extend is used to represent the base of the iron formation. Most of the sections measured were in crosscuts extending north from the foot wall. Such of them as are based on diamond-drill data have been reduced to the same system of measurement.

As the change in dip in the various parts of the range is comparatively slight, the sections shown in Fig. 17 will give comparative ideas of thickness of the beds. If actual thickness is desired, the distance given in the figure can be multiplied by the proper factor, assuming that the dip averages 60 degrees.

These various sections were taken as follows: (1) West side of Penokee Gap; (2) Tyler's Fork; (3) Atlantic mine approximately at No. 3 shaft, based on diamond-drill data; (4) Plumer shaft, 5 level crosscut; (5) Pence No. 2 shaft and diamond-drill hole; (6) Montreal No. 29 crosscut, 23 level; (7) Montreal No. 4 shaft, crosscut, 20 level; (8) Montreal No. 4 shaft, 8 level diamond-drill hole; (9) Ottawa 10 level, shaft crosscut; (10) Ottawa 14 level, crosscut near east end of mine; (11) Cary 19 level, No. 16 crosscut; (12) Windsor 8 level, No. 1 crosscut; (13) Ashland mine, 13 level, No. 9 shaft crosscut; (14) Norrie, combined from 14 and 17 levels, "A" shaft crosscuts; (15) Aurora 13 level, "E" shaft crosscut; (17) Davis 4 level, shaft crosscut; (18) Geneva 17 level, crosscut 350 ft. east of shaft; (19) Puritan 14 level, shaft crosscut; (20) Ironton crosscut 500 ft. east, on 17 level; (21) Ironton crosscut 1,860 ft. east, on 17 level; (22) Yale No. 1 shaft crosscut, 11 level; (23) Colby 9 level, No. 2 shaft crosscut; (24) Tilden 9 level, No. 6 shaft crosscut; (25) Tilden 23 level, No. 10 shaft, crosscut 1,250 ft. west of shaft; (26) Tilden 14 level No. 10 shaft, crosscut 180

*Part I was published in the *Journal* of Sept. 13, 1919.

ft. east of shaft; (28) Eureka 15 level, No. 2 shaft crosscut, and (29) Mikado, mostly from diamond-drill foot wall.

The Plymouth member of the iron formation is of particular interest because it is the one from which has come most of the iron ore mined on the Gogebic Range. In character it is predominantly a granular ferruginous chert, with some fine-grained chert beds. It is made up of a number of different beds, which

bed of the Ironwood formation. Its contact with the quartzite below is abrupt, and is noticeably irregular in such a manner as to indicate conclusively that an erosion period intervened between the deposition of the quartzite which forms the foot wall and the deposition of the Ironwood formation. The character of this thin introductory bed varies from quartzite in which the chert is present only as the filling of the spaces between the sand grains to a clear fine-grained chert in which there are only a few quartz grains. In mine maps this

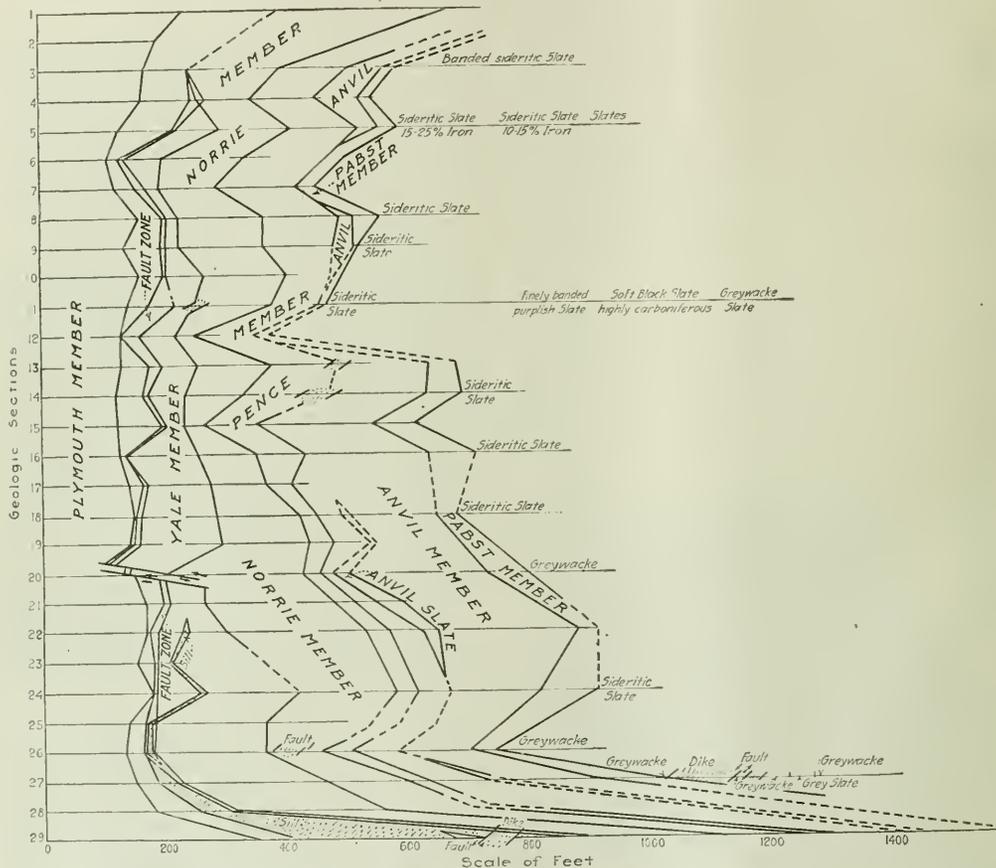


FIG. 17. TWENTY-NINE MEASURED GEOLOGIC SECTIONS ILLUSTRATING THE CORRELATION AND CHANGES IN THICKNESS OF THE VARIOUS MEMBERS OF THE IRONWOOD FORMATION

The line at the left represents the base of the formation. The top section is the westernmost, at Penokee Gap, and the lowest one in the figure is farthest east, in the Mikado mine.

could doubtless be mapped if sufficient time were given to the study.

The lowest part of the member is a thin cherty quartzite, which is sometimes present at the base. It is occasionally as thick as five feet, and rarely reaches a thickness of ten feet. Like the true foot-wall quartzite, it is chiefly composed of rounded sand grains, but it differs in being cemented with chert, rather than with the crystalline silica, which is the characteristic cement in the true Palms quartzite foot wall. Wherever it is present, this cherty quartzite makes the southernmost

bed, where present, is always included with the main quartzite as a part of the foot wall.

Succeeding this cherty quartzite bed, or, in the absence of the cherty quartzite, lying directly upon the Palms quartzite, is a gnarled concretionary jasper and jasper conglomerate. This bed is present in all places where the foot wall of the formation is seen. In some cases the conglomerate nature is strongly evident and in other places almost lacking. Sometimes the red color, a characteristic of jasper, is lacking, and the bed is light gray, or greenish gray in color. Frequently in the

mines, and particularly in the vicinity of orebodies, its distinctive characters are almost wholly lost because of the extensive alteration. This bed is from one to four or five feet in thickness throughout the central portion of the range from the Plumer mine to the Eureka. At Penokee Gap it becomes eight or ten feet in thickness, and at the Mikado mine its thickness increases to forty feet. What is believed by some to be the equivalent of this same jasper in the mines to the east of the great Sunday Lake fault attains a thickness of over 100 ft. Other observers believe this 100 ft. of ferruginous chert to be the equivalent of the whole Plymouth member. I am inclined to agree with the latter, but I should hesitate to state my views positively, because of my meager acquaintance with the formation east of the great Sunday Lake fault.

"FOOT-WALL SLATE" SHOWS CONSIDERABLE OXIDATION

Succeeding the gnarled conglomerate jasper above described there is present almost everywhere in the lower part of the Plymouth member what is known as the "foot-wall slate." This is a heavily ferruginous slate in most places, and usually, where seen in the mines, is thoroughly oxidized so that it is red in color and soft in character. In common with the jasper below it, this slate increases in thickness in the east and west sections shown in Fig. 17. At Tyler's Fork there are ten feet of this slate, with nearly twenty feet of a gradational zone between it and the granular chert beds above. In the Mikado mine it is nearly thirty feet in thickness. On the 23 level of the Brotherton shaft there are two feet of slate about twenty feet north of the quartzite which may be correlated with the "foot-wall slate" in the mines west of the Sunday Lake fault. In most of the mines the slate has a maximum thickness of only two or three feet, and in some cases it becomes so thin that it practically disappears. In almost all cases, however, a thin soft seam is present, which can be correlated with the foot-wall slate.

Above the foot-wall slate appears the main granular ferruginous chert of the Plymouth member. These granular chert beds are excellently shown at Tyler's Fork and at Penokee Gap, in natural exposures, and at the Plymouth and Wakefield open pits, where the mine excavations give an opportunity to view this member. The individual beds vary in thickness from a small fraction of an inch to three or four feet. Alternating with the chert beds are beds of iron oxide of varying thickness, seldom more than an inch, but in a few cases reaching a foot. The iron content of these chert beds is largely in the hematite beds just mentioned. In the chert beds themselves, granules of hematite and minute crystals of magnetite are sometimes so abundant as to make up the major portion of the bed. However, much of the iron is present in the thin layers or beds between the beds of granular ferruginous chert. From this statement it is to be observed that where the bedding is thick, and these bedding planes are far apart, the iron content is likely to be considerably lower than in those where the bedding planes are close together and beds are thin.

Certain rather consistent general tendencies as to thickness of bedding characterize various parts of this granular chert portion of the Plymouth member. The lower part of it, for distances varying from twenty to sixty feet from the foot-wall slates, is frequently characterized by beds one to five or six inches in thickness,

with rather heavy beds of iron oxide separating them. North of this in many sections there is observed a tendency on the part of the chert beds to become much thicker and more massive, and the separating beds of iron oxide to become thinner. This massive phase of the chert is frequently also fine-grained chert, rather than the distinctly granular variety. The thickness of this massive chert is exceedingly variable. In some cases the chert is entirely lacking, and again it has a thickness of fifty or sixty feet. Above it to the north usually occurs the thinnest bedded portion of the wavy-bedded cherts of the Plymouth member. In this portion the chert bands are seldom more than an inch, and oftentimes less than a quarter of an inch, in thickness, and the beds of iron oxide separating the chert beds are approximately of the same general thickness. This thin-bedded portion usually constitutes the uppermost part of the Plymouth member, but in some cases toward the top the chert beds again become thicker.

Near the top of the Plymouth member from the Davis mine west, either just at the top or within ten or twenty feet of it, there is a rather striking bed of yellow flinty chert which is more or less conglomeratic.

East of the Davis mine in approximately the same part of the Plymouth member there is found a thin horizon containing thin beds of brilliant red jasper, which also is somewhat conglomeratic. This yellow flint bed at the west end and the jasper bed at the east end are probably equivalent beds. In no places were the two found together. This striking distinction of color and flinty character in a member which contains practically no other flinty chert beds makes them particularly valuable as horizon markers.

In the Penokee Gap and Tyler's Fork exposures a short distance above the foot-wall slates some thin beds of granular red jasper are found, usually two or three inches in thickness, but occasionally reaching a thickness of a foot or more. West of the Davis mine these red jasper beds and the bed below the foot-wall slate are the only occurrences of red jasper seen in the Plymouth member. East of the Davis mine, however, the granular ferruginous chert of this member shows a fairly large amount of red granular jasper. The red granular jasper differs from the granular chert in character only in the fact that the individual grains are in large part jasper grains. This increase of granular red jasper toward the eastern end of the range is characteristic of all members of the Ironwood formation.

The transition to the Yale member is marked by a rather abrupt gradation from the fine-grained chert (which often succeeds the yellow flinty chert) to a ferruginous slate. The gradation beds are usually less than one foot in thickness.

THE YALE MEMBER

In the Yale member are grouped a number of beds of even-bedded ferruginous slate and wavy-bedded ferruginous chert, each of which is distinct from the adjacent beds, and which occupy the middle part of the Lower Ironwood formation. The base of the Yale is taken as the base of the first ferruginous slate, lying from 100 to 350 ft. north of the foot wall, as shown in Fig. 17. The top is less definite, but is taken as the top of the slate bed 60 to 150 ft. north of the base of the member in the western and central parts of the district, but at a much greater distance north at the eastern end of the range.

Closer study would almost certainly result in dividing the Yale member into several separate members. The best that could be done in the short time available for study of the Michigan end of the range was to group and name as a single member these slates and the included chert beds which lie between the Norrie and Plymouth members. In Wisconsin, where a more detailed study has been made, three slate beds can be traced definitely throughout the various mines and the various levels of each mine, with no considerable difficulty excepting where the great bedding fault has pinched one of them out. These separate slate beds are relatively thin, and vary individually from only three or four feet to thirty or forty feet in thickness. It is entirely possible that they represent discontinuous lenses which cannot be followed throughout the whole range, but it is believed most probable that some of the thicker ferruginous slates represent general conditions sufficiently that a careful study would show them to be continuous from one end of the range to the other. This, however, remains for more extended work to prove or disprove. Whether continuous beds or discontinuous lenses, they are sufficiently abundant to make the Yale member dominantly a ferruginous slate.

By referring to Fig. 17, it will be noted that the great bedding fault lies almost entirely within the Yale member. In some cases, as in Sections 3 and 4, the bedding fault lies in the extreme top of the Yale member and extends even into the cherty Norrie member above it. In Sections 12, 18, 19, 22, and 24, it will be noted that the great bedding fault lies along the lower side of the Yale member. For the major portion of the length of the range, however, this fault follows one of the thickest and best-developed of the ferruginous slate beds in the Yale member, the middle one of the three ferruginous slates of the Yale in Wisconsin. This is a finely laminated ferruginous slate, which, in its less altered form, is a black, slaty iron carbonate, containing so much fine, disseminated, black carbon as to have a graphitic appearance in many places. In its altered form this black slate is no longer black, but is stained red by the iron oxide, exactly as are the other ferruginous slates in this member. Usually, however, its more finely laminated character offers a fairly satisfactory means for distinguishing it.

ABSENCE OF CARBON IN SLATE BEDS

In no case were the other slate beds in the Yale member observed to contain carbon or to have a black appearance similar to the slate previously described. In their original form they are likely to be rather pure; gray, slaty iron carbonate, either free from or having moderate amounts of thin-bedded flinty chert. The oxidized phases are soft and red and not so thinly bedded as the black slate above described.

West of Section 17 in Fig. 17 the upper slate bed of the Yale member is generally free from chert. In the Davis mine and eastward the top of the Yale member is taken as the north side of a thinly and evenly bedded part of the formation which is marked by $\frac{1}{2}$ -in. to $\frac{1}{4}$ -in. flinty chert bands, separated by about equal thicknesses of hematite. This part of the formation is described as "platy" in character, because of the thin, even, continuous beds of flinty chert. My observations have not gone far enough to make sure as to whether these platy beds really belong with the slates of the Yale member, or whether, because of their great chert content, they

should be included with the Norrie ferruginous chert. On account of their even-bedded character, which is in marked contrast with the decidedly wavy beds of the Norrie, it has seemed best to include them in the Yale member.

The ferruginous chert beds which lie between the ferruginous slates in the Yale member are diverse in character. Throughout most of the district they are largely of the fine-grained wavy-bedded type, and either dull brown or a pale greenish gray in color. East of the Davis mine these ferruginous chert beds, like all the rest, begin to show increased amounts of red granular jasper, sometimes in scattered grains in ordinary granular chert and sometimes making up the whole of an individual layer.

In some parts of the ferruginous slates of the Yale member flinty cherts are found. These are particularly characteristic of the transition stages from the ferruginous slates to the ferruginous cherts. The transition zone at the top of the black slate is frequently characterized by a number of one-half-inch to two-inch beds of clear, glassy black flint. Most of the ferruginous chert beds in the Yale member are characteristically low in iron content, and the individual beds are likely to be rather thick. Some of them have a thickness of as much as four or five feet. This is mostly the case with the brown and green fine-grained cherts.

The transition from the southernmost slate of the Yale member to the Plymouth member is usually somewhat abrupt. In some cases, however, it is apparently gradational in character. The transition from the upper slate in the west and the platy flint in the east to the Norrie member is almost always gradational. The possibility is suggested that the Yale member may be separated from the Plymouth member by an interval of moderate erosion. On this possibility, however, little evidence has been accumulated. The relation of the Yale member to the Norrie member is such as to suggest continuous deposition and an entirely conformable relation.

The thickness of the Yale member measured horizontally varies from about 65 ft. in the Ottawa mine, as shown in Section 8 of Fig. 17, to 370 ft. in the Eureka mine, as shown in Section 28 of the same figure. To a large extent this increase in thickness is due to increased thickness of the platy flint beds.

THE NORRIE MEMBER

The Norrie member is made up almost wholly of wavy-bedded granular and fine-grained ferruginous chert, with hematite in beds and grains exactly as in the Plymouth member. The thickness of the individual beds varies considerably from place to place in this member, but there is in general in the lower part of the Norrie a heavily ferruginous, moderately thin-bedded part, succeeded by rather massive, thick-bedded, fine-grained chert, which has low iron content. In most places where it is known, the upper part of the Norrie member is thin, wavy-bedded, heavily ferruginous chert. In places where the Norrie member is thicker than usual there is oftentimes found at the very top a massive, thick-bedded, fine-grained, green chert, which alters in spotted fashion, giving an appearance which has been described as "worm-eaten chert." These leached spots are usually a quarter to an eighth of an inch in diameter.

East of the Davis mine the thin-bedded upper part of

the Norrie contains numerous thin beds of ferruginous slate, which vary from a few inches to one foot or two feet in thickness. The thickness of the Norrie member is as little as 30 ft. in the Windsor mine and becomes as great as 230 ft. in the Yale mine. Fig. 17 shows that the Norrie member varies greatly in thickness in short distances. In some of the crosscuts across the formation the Pence member apparently cuts out the upper beds of the Norrie member, leaving only a few feet of the lower portion.

Marking the top of the Norrie member in a pronounced fashion in the western end of the district, but somewhat less noticeable in the eastern part, is a thin conglomerate made up of flat pebbles of a considerable variety of phases of the iron-formation material. Associated with this conglomerate bed is often found several inches of granular red jasper having a decidedly fragmental appearance. This granular jasper, rather than conglomerate, is the usual phase found east of the Ashland mine.

The considerable variation in thickness of the Norrie, the difference in the character of its uppermost beds, where it is thick, from those which make the top, where it is thin; the abrupt transition in character of beds from Norrie to Pence, and the occurrence of a conglomerate or of a fragmental appearing granular jasper, are all facts which indicate an erosion interval succeeding the deposition of the Norrie and preceding the deposition of the Pence. Though little can be said of the duration of this period, it was probably relatively short compared to the erosion period between the granite and the Palms, or that between the Anvil and the Pabst members.

THE PENCE MEMBER

The Pence member is an even-bedded, thin-bedded ferruginous slate. Practically wherever seen the transition is abrupt from the wavy-bedded ferruginous cherts of the Norrie member, with its beds oftentimes as much as three or four inches in thickness, to the strikingly even-bedded, very thin-bedded Pence member. The conglomerate which marks this transition has been discussed under the Norrie member. West of the state line, where the Pence member is thickest, at the top of the Pence there is a gradation upward into a massive, brown, fine-grained, ferruginous chert, which is sometimes twenty or thirty feet in thickness, but, even though this brown chert is rather thick bedded, the bedding planes show a striking parallelism.

In some parts of the range, more particularly the eastern, the Pence member was apparently, in its original condition, a fairly pure iron carbonate rock with comparatively little magnetite or hematite present excepting in a few localities. In the Wisconsin part of the range, however, are numerous localities where this slate, as seen in its unaltered condition, is to a large extent made up of grains of hard blue hematite with a fair proportion of magnetite.

The chert present in the Pence member seems to vary considerably in moderately short distances. In some parts of a single mine this member is comparatively free from chert, and in other parts certain portions of the member will show an abundance of thin, continuous, flinty chert plates an eighth to a quarter of an inch in thickness. These flinty chert plates or bands are usually of a clear greenish gray or light yellowish gray in color. Where the formation is altered to any

extent, these clear flint bands easily disintegrate into a white chalky chert, which can be crumbled in the fingers like a soft blackboard crayon. Certain beds of this chalky chert make excellent markers for identifying horizons and are especially useful when working out a faulted condition. In the mines on the Wisconsin end of the range, where this member is thickest, about 60 to 80 ft. from the base of the member there is a horizon frequently marked by a number of thin bands of red jasper, which also serve to identify this part of the formation.

Fig. 17 shows that on the western end of the range, the base of the Pence member is found at distances from the quartzite varying from 260 to 400 ft. In the Norrie, Aurora, and Pabst mines it is 300 to 400 ft. from the foot wall, and is known as the "350-ft. slate." In the Yale mine, Section 22 of Fig. 17, it lies 550 ft. from the quartzite, and is called the "550-ft. slate." By tracing the Pence member between these two points it is found that the "350-ft. slate" of the Norrie is the same as the "550-ft. slate" of the Yale, and the "550-ft. slate" of the Norrie is the same as that which lies nearly 900 ft. north of the quartzite foot wall in the Yale.

On the Wisconsin end of the range, the Pence member varies from 80 to 130 ft. in thickness. This thickness continues fairly uniform eastward to the Davis mine, where there is a rather sharp decrease to a thickness of twenty-five to forty feet. All through the eastern end of the range the member will average close to thirty feet in thickness. The top of this member grades with a comparatively small thickness of beds into the granular jasper and granular chert of the lower part of the Anvil member. The Pence member in many localities contains sufficient magnetite to give a magnetic line when tested with the dip needle.

THE ANVIL MEMBER

The lower part of the Anvil member is everywhere composed of wavy-bedded granular chert and granular jasper, with frequent conglomeratic beds. The upper part of the Anvil is much less granular and conglomeratic, and contains more wavy-bedded flinty and fine-grained chert. This member is like the other chert members of the Ironwood formation in that granular jasper is more abundant toward the eastern end of the range. Toward the western end of the range the proportion of granular chert increases and the jasper is relatively insignificant in amount. On referring to Fig. 17 it will be noted that this formation is present in Sections 3, 4, and 5 and is missing in Section 7; is again present in Sections 8 and 9, and then does not appear again until Section 13 is reached, from which point it is continuous to the Mikado mine and probably beyond that to the great Sunday Lake fault, which offsets the formation east of the Wakefield and Mikado mines.

In the western end of the district the maximum thickness shown is in Section 4, where it attains seventy feet. It reaches a maximum thickness of about 300 ft. in the eastern portion of the district around Sections 20 to 22. Farther east, in the Mikado mine, its total thickness was not penetrated in the drill hole from which the section was made. In Sections 18 to 22, 27, and 29 there appears a lens of slate (called the Anvil slate in Fig. 17), which is exactly similar in character to the Pence member in the same sections. Above this slate the formation is almost invariably possessed of a high iron content and of a porous character which makes it a favorable place for that extreme alteration

of the formation which results in orebodies. It is in this member that many of the large "hanging-wall" orebodies have been found in the last few years.

THE PABST MEMBER OF THE TYLER FORMATION

The transition of the Anvil member to the overlying Pabst member is almost invariably an abrupt one. In the eastern end of the range, where the Anvil member is thickest, it is usually followed by a thin carbonate slate, but in the western portion, where the formation has nearly all been eroded away, the transition is usually marked by the beginning of conglomerate and the granular jasper associated with it.

The Pabst member can hardly be defined with accuracy, because of the scarcity of information concerning it. It is known in few places except in diamond-drill holes, and whether it should include the whole of the heavily ferruginous basal portion of the Tyler formation, or be limited to the dominantly cherty portions of this, it is difficult to determine. As drawn in the sections of Fig. 17, it includes only the dominantly cherty parts of the lower portion of the Tyler formation. The slates above this, in some cases for 300 ft., carry considerable percentages of iron in the form of iron carbonate, and probably when sufficient information becomes available should be given a definite name.

The relations of the Pabst member to the formations below are unconformable, and indicate an erosion interval between the deposition of the Anvil member and the beginning of the deposition of the Pabst member that probably was of considerable duration. This is shown by the fact that the Pabst member cuts across and covers at least two relatively small residual areas of the Anvil formation which are entirely separated from the main portion of this formation on the east—indicating that the Anvil member was entirely eroded in places—and also by the universal presence of conglomerates and coarse fragmental deposits in the Pabst member.

From the Norrie mine east the introductory bed of the Pabst member is a thin-bedded, somewhat slaty iron carbonate, which varies from a few feet in thickness up to thirty feet or more. Succeeding this there is usually a bed varying from a few feet up to thirty or forty feet in thickness, which is obviously conglomeratic and fragmental in its nature. This bed varies decidedly in character. In some places it is made up almost entirely of irregular and rounded fragments of iron oxide and is rich enough to be mined for ore. This is called the "fragmental ore horizon" in many of the mines. In other occurrences it is made up almost entirely of fragments of chert and slate, and in still other places it is chiefly fragmental granular jasper. In all its occurrences it is highly variable in character and likely to be interspersed with thin, slaty, flinty, iron carbonate lenses or even impure quartzite lenses. In some places these impure quartzite lenses attain a thickness of thirty or forty feet. One section of the Pabst member, measured in the Tilden mine, is given in detail as follows, beginning at the base and measuring northward:

0 to 22 ft., dense hard ferruginous slate, thinly bedded and evenly banded, and showing much magnetite in tiny crystals scattered throughout the rock.

22 to 37 ft., conglomeratic red granular jasper, with a matrix of hard, red and blue hematite.

37 to 41 ft., granular jasper and red, coarsely crystalline iron carbonate.

41 to 46 ft., mixture of alternating thin bands of impure quartzite, fine-grained massive iron carbonate and granular jasper.

46 to 51 ft., dense, hard, amorphous, greenish-gray iron carbonate.

51 to 52 ft., conglomerate of flat flint pebbles in a matrix of chert and hematite.

52 to 63 ft., dense brown flint, evenly and thickly banded, and amorphous unoxidized iron carbonate. Top of Pabst member.

63 to 67 ft., black iron carbonate slate, very evenly and thinly bedded, and moderately hard.

The foregoing section gives a good picture of the rapidly alternating conditions under which the Pabst beds were deposited. The only places on the west end of the range where the introductory slaty iron carbonate bed of the Pabst has been found are in a drill hole a short distance west of the Pence shaft and in one cross-cut in the Plumer mine. The section from the Tilden mine described above shows an assorted condition of the materials which is much better than is characteristic farther to the west. In the west the Pabst beds are usually a mixture of all of the materials which have been separated into more or less distinct beds in the Tilden section. The Pabst member usually contains enough magnetite to be followed readily with a dip needle.

THE IRON CARBONATE SLATES

North of the Pabst member the iron carbonate slates of the Tyler formation are known for varying thicknesses up to 300 ft. in a few drill holes and in outcrops along Black River. They are very thin, even-bedded carbonate slates similar to the ferruginous slates in the Yale and Pence members. In the region of the Montreal and Plumer mines these sideritic slates contain 20 to 25 per cent of iron, with an occasional analysis as low as 15 per cent for about 150 ft. north of the Pabst member. North of this there is a rather abrupt change to an iron content of about 12 to 15 per cent, with some analyses down to 10 per cent. This continues for another 150 ft., and then there appears the soft gray slate, with only about 5 per cent of iron. Section 11 of Fig. 17 shows to the north of these carbonate slates finely banded, somewhat purplish gray slates, which, in turn, are succeeded about 150 ft. farther north by soft, black, highly carbonaceous slates. These slates seem to be fairly persistent and continuous farther to the west, and their soft character is frequently indicated in the topography by a depression. To the east of this section little is known of the character of the slates this far north of the Pabst member.

UNCONFORMITIES

There are unconformities marked by conglomerates and fragmental deposits at the base of the Plymouth, the base of the Pence, and separating the Anvil from the Pabst member of the Tyler graywacke slate formation. Similar unconformities have been described in other iron ranges of the Lake Superior district, but too little detailed work has been done upon them to make it possible to make proper correlations.

The unconformity between the foot-wall quartzite and the iron formation is not marked by a large amount of erosion, so far as facts are available at present. The quartzite phase of the Palms is everywhere present, and its thickness does not vary over 75 ft., a variation that may be due to original deposition or to erosion.

The unconformity between the Norrie and Pence members possibly represents the erosion of 150 ft. of beds—not a large thickness and probably indicative of a brief erosion interval. Part of this variation in thickness may be due to differences in original thickness, but not all of it. This also represents a brief period of erosion.

The longest period of erosion is that between the deposition of the Anvil member and the beginning of the deposition of the Pabst. The Anvil member is known to vary from nothing to 375 ft. in thickness, and it is probable that this whole variation is due to erosion. This fact and the invariable conglomerate at the base of the Pabst mark this also as probably the longest erosion interval; in other words, the greatest unconformity at present known between the base of the Palms and the base of the Keweenawan.

The conglomerate near the top of the Plymouth member, or at the base of the Yale, is not known to represent any appreciable period of erosion, but it is possible that it may, and evidence on this point should be sought in future work.

There is little doubt that other minor unconformities such as those described would be found in the Tyler graywacke slate if exposures or drilling were sufficiently abundant to show them up.

More detailed work must be done on the Gogebic Range and on all other Lake Superior iron ranges before it can be stated whether or not any of these apparently minor unconformities will necessitate a revision of the present correlation of the Lake Superior Huronian formations.

(To be continued)

Ray Consolidated Copper Co.

The thirty-second quarterly report of the Ray Consolidated Copper Co., covering the second quarter of 1919, states that the gross production of copper in concentrates for the quarter is as follows:

RAY CONSOLIDATED COPPER CO. COPPER OUTPUT, SECOND QUARTER, 1919	
	Pounds
April	3,756,371
May	3,807,538
June	3,742,209
Total	11,306,118
Average monthly production	3,768,706

In addition to the copper derived from the concentrating ores, 361,583 lb. of copper was contained in ores sent direct to the smelter, making the total gross production from both sources for the quarter 11,667,701 lb., as compared with 12,471,729 lb. for the previous quarter.

During the period under view there were milled 391,500 dry tons, averaging 1.827 per cent copper. This tonnage corresponds to a daily average of 4,302 tons, as compared with 4,891 tons for the first quarter. The mill extraction was 79.06 per cent of the total copper contained in concentrating ores, as compared with 77.88 per cent for the previous quarter. The underground development was 3,437 ft., making the total development to date 692,065 feet.

The milling cost was \$1.23 per ton, as compared with \$1.20 for the previous quarter, both exclusive of Federal income and excess-profit tax. The average mining cost of ore milled for the quarter was \$1.63 per ton, of which 4.96c. was the cost of coarse crushing, leaving the net mining cost \$1.58 per ton, as compared with \$1.64 for the previous quarter, both exclusive of income and excess-profit tax.

The average cost per pound of all net copper produced for the quarter was 14.64c. This figure does not take into account credits for the value of the gold or silver, nor for miscellaneous income, and compares with a cost of 15.15c. similarly calculated for the previous quarter. These costs include a charge of 15c. per ton of ore milled for the retirement of mine development expenses, but are exclusive of estimates for Federal income and excess-profit taxes. Miscellaneous income for the quarter, including net receipts from gold and silver produced, amounted to 2.72c. per lb. The financial results of operation for the quarter are:

FINANCIAL STATEMENT, RAY CONSOLIDATED COPPER CO., SECOND QUARTER, 1919	
Net operating profits	\$18,275.04
Miscellaneous income	298,090.34
Total	\$316,365.38
Disbursement to stockholders	788,589.50
Net deficit for the quarter	\$472,224.12

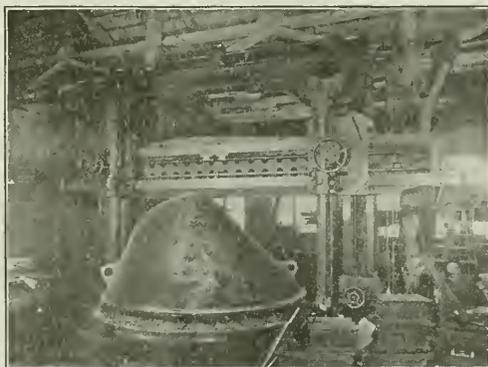
This statement compares favorably with that of the previous quarter, for which the net deficit was \$940,887.55.

The average carrying price of copper for the quarter was 14.80c., as compared with 13.13c. for the previous quarter. A quarterly distribution to stockholders of 50c. per share was paid June 30, and amounted to \$788,589.50. Total of such distributions from the beginning of the company's operations to the end of the second quarter of 1919 amounted to \$22,258,262.67.

The output for the quarter was approximately 50 per cent of normal. Operating conditions have become adjusted to the lesser production, accounting for the decrease in the cost per pound as compared with the previous quarter. During this period, the plants have been kept in readiness to return, upon short notice, to full capacity.

A Large Boring Mill

The photograph shows a large boring mill in the Worthington Pump & Machinery Corporation plant at Cudahy, Ill., turning out a top for a 12-ft. diameter copper converter. This top has a maximum diameter of



A 12-FT. DIAMETER COPPER CONVERTER IN COURSE OF COMPLETION

13 ft. 6 in. and weighs approximately 18,000 lb. The casting is of steel and is arranged to be lined with brick when placed in use. The boring mill is capable of handling work up to 24 ft. in diameter.

Stock-Pile Trestles in Northern Michigan



TRESTLE USED AT THE FRANCIS MINE OF THE CLEVELAND-CLIFFS IRON CO. AT GWINN, MICH.



TYPE OF TRESTLE AT MORRIS MINE, IN THE NORTH LAKE DISTRICT OF THE MARQUETTE RANGE



ONE-LEG WOODEN TRESTLE AT PASCOE SHAFT OF REPUBLIC MINE, REPUBLIC, MICH.



PERMANENT STOCKING TRESTLE AT NO. 3 SHAFT, NEGAUNEE MINE, NEGAUNEE, MICH.
Piers are set at 114-ft. centers. Height to top of rail is 42 ft.

(Photos of this series are by Childs Art Gallery, Ishpening, Mich.)

Notes on Troubles From Colloids in Flotation

Review of the Opinions of Flotation Experimenters on the Subject—Advantage of the Presence of Granular Sand—Physical and Chemical Theories—Effect Of Metallic Iron in the Ore Pulp

SOME notable papers dealing with the effects of colloids on flotation have recently been published. The phenomenon is well known to every operator of the flotation process. It consists in the fact that otherwise good flotation ores cease to be amenable to treatment by the process when they contain more than a certain amount of matter of a colloidal character.

The term "colloidal" may require defining. A. Schwarz¹ calls attention to the formation of colloids from the flotation oils, tars, and like substances, and objects to the term "colloid" applied to ore slime. Though the dispersion of such slime may not be fine enough to fall strictly into the "colloid" class, the word is used here in a broader sense, as it has been employed by many others without implying any assumption about the fineness and the degree of dispersion.

The action of the colloidal material, which exists in all ores to a varying extent and which is produced by the natural decomposition of the ore deposits, has so far received the greatest attention. The phenomenon has occasionally been described as an influence of the primary slime on flotation.² Although slime formed by the crushing of the ore in the milling process (secondary slime) generally shows the characteristic action of the primary slime to a much smaller extent, it has recently been definitely established, through work on molybdenum ore carried out by Will H. Coghill for the U. S. Bureau of Mines, that it may also be decidedly harmful.

How much the flotation qualities of an ore vary with the presence or absence of primary slime is shown in a table given by Rudolf Gahl, representing the flotation qualities of the different screen-sizes of an ore:

SCREEN-ANALYSIS OF ORE DRAWN FROM MILL BINS AND FLOTATION TESTS OF DIFFERENT SCREEN-SIZE:

Screen Size	Per Cent by Weight	Cumulative Per Cent	Per Cent Total Copper	Copper Contents	Per Cent Oxidized Copper	Contents Oxide Copper	Flotation Results Per Cent Total Copper	Tails	Mids. + Conc	Recovery Per Cent
+ 1 inch.....	8	8	0.05	0.324	0.13	0.40	0.22	12.8		70.5
+ 4 inch.....	17.1	47.9	1.34	0.229	0.11	0.19	0.22	17.4		64.7
+ 4 mesh.....	23.0	70.9	1.44	0.332	0.12	0.23	0.17	17.1		89.0
+ 8 mesh.....	4.3	75.2	1.42	0.061	0.12	0.05	0.17	16.3		88.8
+ 14 mesh.....	5.1	80.3	1.77	0.068	0.13	0.07	0.26	16.8		86.7
+ 28 mesh.....	4.1	84.4	2.14	0.080	0.14	0.06	0.61	16.3		74.3
+ 48 mesh.....	3.1	87.5	2.62	0.081	0.19	0.06	0.72	11.3		77.5
+ 100 m. sh.....	2.4	89.9	3.29	0.079	0.24	0.06	0.63	22.5		83.1
+ 200 mesh.....	2.0	91.9	3.16	0.063	0.27	0.05	0.60	20.1		83.5
- 200 mesh.....	8.1	100.0	1.53	0.124	0.43	0.35	1.57	1.48		
Average			1.44	1.441	0.16	0.157				

The various screen products were reduced to a fineness permitting their treatment by flotation and then tested in laboratory flotation machines. The inference may be drawn from the table that none of the sizes from which the primary slime had been removed offered difficulties in flotation, though the screen-size in which it collected did not yield to flotation at all.

In a paper issued by the Bureau of Mines³, Frederick G. Moses explains the phenomenon by pointing out that

the relations between gangue and economic mineral on the one side, and water and oil on the other side, are materially changed by the introduction of colloids, and that, therefore, the flotation qualities of the pulp which depend on these forces are changed also. Similar effects on the molecular surface forces are traceable to physical sources like heat, or to osmotic and electrical influences resulting from the addition of electrolytes. The benefit derived from heat and the addition of salts may therefore, it is reasoned, be ascribed to their action on the surface forces. This explanation, if used as a working hypothesis in experimental work, may well be the means of securing a clearer insight into the basic principles of the flotation process.

GRANULAR SAND AS A REMEDY FOR SLIME TROUBLES

The deleterious influence of primary slime on flotation is too well established to be doubted; it is a fact that many flotation operators know only too well. A question exists, perhaps, regarding the relative damage which it does. Moses mentions that when such slime is diluted by sand its effect is masked. This may be construed to mean that the slime is just as bad after the mixing as before, but it does not appear that Mr. Moses intends to state this, because in another place in his paper he mentions the possibility of mixing the refractory slime with granular ore as a remedy. "Masking" the effect of a harmful ingredient by mixing it with normal ore would certainly be the last thing the metallurgist should do, unless the mixing had other advantages.

PEARCE'S WORK ON THE RETARDATION OF SAND

Questions along similar lines are discussed in another article written by Jackson A. Pearce.⁴ Mr. Pearce, like others, has tried to utilize the known facts regarding colloids, and describes a flotation machine which he built with the object of retarding the passage of sand through it, thereby increasing the proportion of sand to slime which exists in the machine. This proportion, it is needless to say, may be quite different from the proportion that exists in the ore fed to the machine or leaving it. He seems to feel reasonably sure that the success of his machine, which made it possible to treat ores that were refractory in other machines, is due to the application of this principle.

QUESTION OF FLOW SHEET

The combined treatment of sand and slime in a flotation machine, although it seems to be the correct method for the treatment of some ores, cannot claim to serve for all ores, for though it apparently presents advantages for the recovery of refractory fines, it offers the drawback that it introduces coarse grains, which are naturally difficult to lift, into a medium which itself may be quite refractory. In cases where emphasis has to be placed on the best recovery of the coarse mineral grains, it seems to be the best course to treat such granular

¹Chem. & Met. Eng., Vol. 19, 1918; p. 701.
²Rudolf Gahl, "History of Flotation at Inspiration," Trans., A. M. E., Vol. 55, 1917; p. 576.
³Technical Paper No. 200, U. S. Bureau of Mines, "Colloids and Flotation."

⁴Min. & Sci. Press, Vol. 117, No. 15; Oct. 12, 1918; p. 491.

material separately and to avoid all contamination with colloidal matter. This procedure, previously recommended by Rudolf Gahl for certain cases, is also advocated by Mr. Pearce, and apparently practiced by him.

As far as the selection of the proper flow sheet for a certain ore is concerned, it seems to be preferable to treat the combined sand and slime, if no serious difficulties are encountered in the recovery of the coarse mineral, and to provide separate treatment if the flotation of the coarse grains is difficult, provided that the slime by itself is not refractory. In other cases a combination treatment would seem to be the logical solution.

ARE THE PHYSICAL OR THE CHEMICAL QUALITIES OF PRIMARY SLIME RESPONSIBLE FOR ITS ACTION IN FLOTATION?

Although there does not seem to be any doubt that the colloidal primary slime is decidedly harmful in flotation operations, it is not absolutely established that the colloidal properties are what causes the trouble. For it is a fact that that portion of the ore also differs in other qualities from normal ores. The ore freed from slime, for instance, when brought into contact with the mill solution, may give up hardly any soluble constituents to the water, but the primary slime, when treated with water by itself, often sets free noticeable quantities of such salts. Although no analysis of such solutions is available, it seems reasonable to suppose that in the case of copper ores they contain iron and copper salts and probably organic matter also.

To decide what characteristic of the slime causes the harmful effect would seem to be an easy matter. Segregating one part from another should give the answer. This has been tried by thoroughly and repeatedly washing the slime with water. The flotation treatment of the washed slime gave better results than that of the natural slime, but it was still far from being satisfactory. One might, therefore, feel tempted to conclude that the action of the primary slime was due to a combination of its physical and chemical qualities, if certain that all the chemical ingredients that might cause the action had been removed by washing. However, this conclusion may not be safely drawn, as it might well be that the adsorption of the salts to the colloidal slime particles is of such a magnitude as to prevent thorough elimination of the harmful ingredients by simple washing. A possibility seems to remain, therefore, that the colloidal fraction of the ore is not harmful by itself, but that all the harm is done by the chemical products of the natural decomposition.

The fact that small additions of chemicals sometimes are decidedly helpful would perhaps better agree with a chemical theory than a physical one, although the addition of small amounts of chemicals also influences the physical characteristics of ores, for instance, by causing coagulation, which is said to be of prime importance. A comparison of the settling qualities of slime to which various chemicals are added, with the flotation qualities of such mixtures, would help to clear this question. So far, apparently, no such relation has been established.

A reference should be cited here that might be investigated, because it could have a bearing on these questions. It is contained in a British patent granted to A. A. Lockwood⁵ and points out the advantage of

agitating slime with granular, preferably siliceous, sand previous to subjecting it to the gravity-concentration process. The inventor claims that, by doing this, gangue materials that have a tendency to float, like mica, are by the preliminary treatment kept from doing it. The similarity with the case under consideration, where the admixture of sand is regarded as beneficial, because it prevents an excessive amount of gangue material from floating, is apparent, and points perhaps to a relation between the two phenomena.

INFLUENCE OF IRON ON REFRACTORY ORES

In his paper quoted above Rudolf Gahl stated that the presence of metallic iron in ore pulp, refractory because of the presence of primary slime, has a decidedly beneficial influence. This statement has been commented on by various investigators.

Coghill⁶ mentions that in laboratory tests of some Oregon copper ore he found it decidedly harmful to reduce the ore in a disk pulverizer, because this introduces some metallic iron into the ore pulp. This does not, of course, contradict the statement about the beneficial influence of iron in other cases, but it might be interpreted to raise a doubt.

Zachert⁷ offers an explanation of the effect of metallic iron. He ascribes the improvement resulting from the substitution of steel balls for pebbles in a ball mill to magnetic forces which are absent when the grinding is done with an unmagnetizable medium like pebbles.

Mcses⁸ calls attention to the fact that although in his opinion a beneficial influence of the metallic iron in all probability exists, it should not be forgotten that the improvement which has been noticed to result from the substitution of a Marcy ball mill for a pebble mill with center discharge might also be due partly to the substitution of the open-end discharge which the Marcy mill possesses for the center discharge.

The action of the metallic iron offers an interesting problem. The most natural explanation might be that the improvement results from the neutralization of acid in the pulp. The fact that the same action does not result from the addition of iron oxides, or from the addition of other metals, does not necessarily contradict this assumption. Another explanation might be based on the fact that metallic iron must destroy the copper sulphate. Still, the percentage of copper sulphate in a very refractory primary slime may be exceedingly small.

One may be tempted to connect this phenomenon with that of over-voltage met in the electrolysis of aqueous solutions. It is well known that certain metals, when used as electrodes in electrolytic processes in which gases are set free, facilitate the development of the gas and others impede it. To develop gas on the latter requires a higher expenditure of power than the development of gas on the former. The difference in the voltage required, which is a measure of the power, is called over-voltage. The gas also seems to form in much smaller bubbles on metals requiring little over-voltage and in large bubbles on metals that require a high over-voltage. What is required in the flotation process are small gas-bubbles, and the assumption that the presence of small quantities of metallic iron facilitates their formation would not seem preposterous. Most mill men are aware of the fact that when air is blown through a thickened pulp of colloidal slime enormous bubbles of air

⁵*Min. & Sci. Press*, Vol. 116, 1918; p. 194.

⁶*Min. & Sci. Press*, Vol. 114, 1917; p. 663.

⁷*Min. & Sci. Press*, Vol. 114, 1917; pp. 19, 20.

⁸British Patent No. 174; 1915.

will form, which might at once be taken for an indication that such pulp is not suitable for flotation treatment. Thinning the pulp permits the formation of smaller bubbles, and it may well be that thinning pulp of such character brings about changes similar to the addition of iron.

In connection with what has been said on the influence of iron, attention might also be called to an expedient resorted to by chemists, when liquids are to be boiled which have a tendency to bump, that is, liquids which do not boil smoothly but which form a few big bubbles that burst explosively and are likely to break the porcelain or glass vessel in which the boiling is being done. It is the practice of chemists in such cases to add small glass beads or something of such character to the liquid for the purpose of conducting the operation with greater smoothness. May not the addition of sand to colloidal suspensions represent something similar, and therefore facilitate the flotation process?

In conclusion, it may be well to point out that what has been said is not so much meant to establish facts as to formulate questions. Others may find it easier on that account to contribute to their final solution.

Graphical Methods of Presenting Metallurgical Data

Suggestions for Plotting Mine and Mill Statistics To Show Periodical Variations.—System Used

By the Chino Copper Co.

H. M. MERRY, metallurgical statistician of the Chino Copper Co., will present a paper at the Chicago meeting of the A. I. M. E. on "Graphic Metallurgical Control." Construction of charts to show periodical variations in mine, mill, or smeltery operations is commonly done to a greater or less extent in most works, as metallurgical results, their causes and effects, can be much better comprehended when presented in graphic form. Mr. Merry has made a study of the subject, and gives some of the principles which should be followed in the preparation of such charts, well illustrated by numerous examples.

Two kinds of co-ordinate papers are employed. In the semi-logarithmic method, logarithmic horizontal ruling and arithmetical vertical ruling are used. Time is laid off on the vertical lines and values are assigned to the horizontal logarithmic scale. In the other method, called the special arithmetical method, millimetric-ruled cross-section paper, available in 50-yd. continuous rolls 22 in. wide, has been found most satisfactory. Sheets 4 ft. in length, of full width, are recommended for the charts.

The notation of the scale should be so arranged as to display the various factors with due prominence. Assay values of heading and tailing, which are the minimum and also the governing factors, should be exaggerated. Beyond the maximum range of heading assays of valuable metal, the scale may be reduced, the concentrate assay values, dilutions, and extraction falling principally in this range. The tonnage scale should be devised to meet the maximum and minimum variation and may include concentrate production. It is permissible to overlap the tonnage and percentage scales, preferably in multiples of ten, employing lines of different weight or color to distinguish them in conflicting areas. Abnormally high or low points that fall outside the limits of the particular scale should be plotted on the

projection of the scale in which they originate, as breaking scale destroys the proportion of the relationship with other lines.

A record of departmental milling costs and general statistics may be kept on separate similar sheets, changing the scale from logarithmic notation to direct arithmetic, covering the necessary range of magnitudes.

Upon sheets of the same size, a monthly graphic record of tonnage of ore mined and yardage of waste stripped is kept by the Chino company, with incidental costs of various operations. Corresponding deep-mining data can be added or substituted with facility.

Half-Year Pig-Iron Output Decreases*

Pig-iron production in the United States for the first six months of 1919, compared with both the first half of 1918 and the last half of 1918, shows a material loss. If production for the last six months of this year is continued at the same rate as during the first half, the 1919 total will fall 6,495,641 tons below that of 1918. The slump in blast-furnace activity from January to June is responsible for the low production figure. Judging from the improved production of July and the number of idle stacks blown in during the month, the last six months' total will be considerably larger, with the result that the 1919 output may compare favorably with the 1918 output.

According to the statistics compiled by the American Iron and Steel Institute, the production for the six months ended June, 1919, was 16,278,175 tons, 1,949,555 tons less than for the same period last year and 4,546,086 tons less than for the six months ending Dec. 31, 1918. Of the 16,278,175 tons produced, 16,036,218 tons was made with coke, compared with 17,933,932 tons for the first half of 1918 and with 20,488,243 tons the last half of 1918. Anthracite iron, with 67,592 tons, fell from 120,404 tons and 163,188 tons, respectively. Charcoal iron, with 174,365 tons, was about an average of the two six-month periods last year.

Production of pig iron by grade shows the following: Basic, 7,910,295 tons; bessemer and low-phosphorus, 5,181,621 tons; foundry, including ferrosilicon, 2,436,023 tons; malleable, 465,823 tons; forge or mill, 104,874 tons; ferromanganese, 106,056 tons, and spiegel, 38,136 tons. Merchant iron or iron made for the market totaled 4,499,133 tons, and iron made for the maker's use 11,779,042 tons.

Total Value of the Minerals produced in the U. S. during 1918, according to the U. S. Geological Survey, was about \$5,526,000,000, more than half a billion dollars in excess of the value recorded for 1917, but the total quantity produced was less. The value of the metals produced was about 3 per cent greater in 1918 than in 1917. The figures show that less iron ore and steel were produced, but here, again, values were higher. A little more pig iron was made, though the quantity shipped was less. Copper and zinc, not only in themselves but as the components of brass, are perhaps next in importance to iron in the world's industry; and in 1918 they stood high on the list of war metals. A little more copper but less zinc was produced, and the values of both were lower, that of zinc falling about 25 per cent. The output of the war metals manganese and chromite, used in hardening steel, was greater than in any preceding year. Chromite increased 88 per cent in quantity and 275 per cent in value over 1917, and the increases in manganese ore were 136 and 100 per cent, respectively. Less gold and silver were mined than for many years.

*Extracted from *Iron Trade Review*, Sept. 4, 1919.

Sinking the "H" Shaft at the Pabst Mine

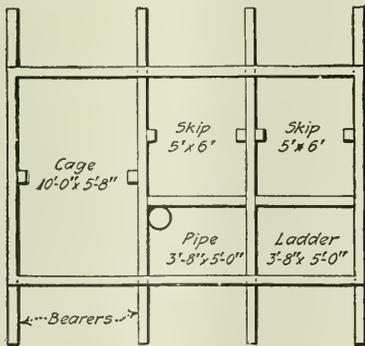
High Drilling Efficiency and Low Maintenance Cost Obtained by Careful Inspection and Overhauling of Drilling Machinery—Well-Planned Sequence of Operations and Arrangement of Equipment Assured Excellent Progress

By A. J. WAGNER

GROUND was broken on June 20, 1917, at the "H" shaft of the Pabst mine of the Oliver Iron Mining Co., Ironwood, Mich., and in March, 1919, the shaft, having a depth of 1,830 ft., was completed. During this period all steel sets, bearers, dividers, concrete lath, and skip runners were placed, and, in addition, all stations were cut, pockets built, and cages and buckets put into operation. When the work was started it was decided to make each part of the job as complete as possible while sinking proceeded, for it was believed that in the long run time would be saved by so doing, rather than to push the sinking and then complete the steel work and equipment later.

It is questionable whether the progress made on the sinking and equipment of this shaft has been equaled in this district. No serious accident occurred from start to finish.

The shaft is vertical, with outside dimensions of 18 ft. 4 in. x 11 ft. 4 in., and is divided into one cage compartment, 10 ft. x 5 ft. 8 in.; two skip compartments, each 5 ft. x 6 ft.; one pipe compartment, 3 ft. 8 in. x 5 ft., and one ladder compartment, 3 ft. 8 in. x 5 ft.

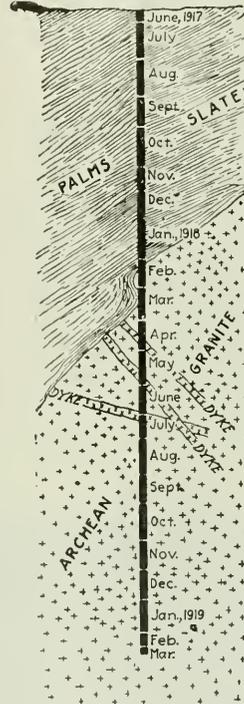


PLAN OF PABST "H" SHAFT

The long axis of the shaft was placed perpendicularly to the strike of the formation, taking the natural ground slippage on the end of the shaft. This is the first shaft so situated on the Gogebic Range. In sinking, the first nine feet was overburden, and this was followed by slate that continued to a depth of 725 ft. At this point granite was cut, and granite with dikes continues to the bottom of the shaft 1,830 ft. from surface. The vertical section in an accompanying cut shows the history, geological conditions, and monthly progress.

The sinking crew consisted of eight miners and one shift boss on each of three eight-hour shifts, making a total of 27 men. These men performed all the work in the shaft, such as drilling, charging, blasting, mucking, and timbering.

The drill equipment at the beginning consisted of twelve Butterfly Jackhammers, Type BCR430, equipped with 7-in. hollow hexagon steel and four-point bits. These were used in the slates to a depth of 589 ft., at which point harder ground required a stronger and heavier drill. Twelve Jackhammer sinkers, Type DDRW13, then replaced the Butterfly machines. The



SECTION SHOWING PROGRESS AND MATERIAL CUT IN SINKING THE PABST "H" SHAFT

factor of primary importance in speed of sinking is to break the ground, and the remarkable accomplishment of the drilling machines used in the "H" shaft made possible the fast record. As will be detailed later, a nine-foot sink the full size of the shaft was drilled, charged, and blasted in eight hours, the actual drilling of the full round, totaling 442 ft., requiring from five to six hours. The drilling time from start to finish of a nine-foot hole in granite averaged thirty minutes.

When material was removed from the shaft at the end of each drilling period the eight used drill machines were sent to the shop with the drill steel, and each machine was opened, inspected, cleaned, and lubricated before it was returned to the shaft. The result was an

extremely low maintenance cost and a uniformly high drilling efficiency. The warehouse record shows a maintenance cost for the year 1918 to have been only \$2.51 per month per machine. As each machine drilled 6,000 lineal ft. in hard ground, the cost of maintenance was \$.005 per foot drilled. As convincing proof of the value of high-grade inspection and careful lubrication it may be stated that, upon completion of the shaft, the drills were mounted and placed in service on the main level drift and on sinking work at other mines.

As 3/4-in. hollow hexagon steel was in stock, this size was used in the sinkers, although they were designed to use 1-in. steel. The drill steel was made up with two-foot starters, and the last drill was eleven feet long. The bits were standard four-point with a 90° cutting edge and 5° and 14° taper. The gage of starters was 2 3/4 in., with 1/2-in. change in gage and 18-in. change in length. The steel was machine sharpened at the collar of the shaft in a No. 5 Leyner sharpener. No difficulty was encountered with steel breakage or inability to make the drills "follow."

Air for the machines was supplied by a 6-in. air pipe provided with a standard manifold. A specially designed header was discarded early in the work, as its use was found to be troublesome.

The cut was drilled so as to remove, when blasted, a "V" at the center of the shaft, and consisted of five rows of five holes each, in each half of the shaft, with three extra holes drilled straight down across the center of the shaft. An accompanying diagram shows a plan and section of the distribution of the holes.

In the diagram fifty-three holes are shown. In slate; fifty holes were drilled, the three center holes marked "B" being omitted. The numbers on the holes refer to the order of blasting. The three holes marked "D" were shot by means of a battery to relieve the cut. The holes numbered 1 were fired first; 2, second, and the others in rotation, and the row numbered 1 was fired first; row 2, second, and succeeding rows in like order, the rows up to 6 being shot and then this part mucked out. Rows 7, 8, 9, and 10 were next fired in sequence.

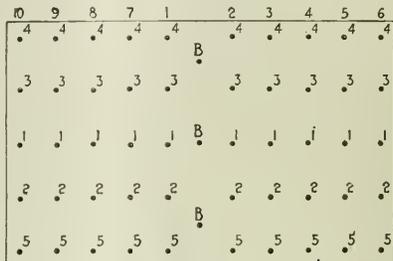


SHAFT-SINKING CREW AT PABST MINE, IRONWOOD, MICHIGAN

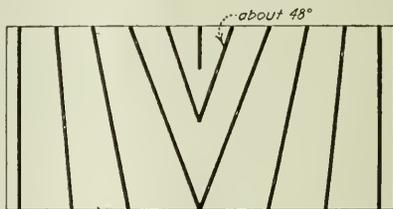
completing the cut. By firing in this order a wiggle, or staggered, effect was obtained, throwing the dirt from side to side, breaking any big blocks loosened, saving the shaft timber from damage, and putting the entire charge off as it was timed to go, without prematurely exploding other holes. Delayed fuses were used and the holes charged with eight sticks of 80 per cent Red Cross gelatine, the detonator being placed in the fourth stick from the bottom. This arrangement is contrary to the rule for placing the detonator, but owing

to the fact that the holes are close together, the collar often breaks prematurely and tears out the detonators that have not been exploded. When this happens some of the holes do not explode and too much burden is placed on other holes.

No cut failed to be pulled clean, and not one steel shaft set was bent, although the sets were kept within fifteen to twenty feet of the bottom. The blasts were timed so close together that the effect was to blend the concussion in one slow, rattling blast.



Plan (Drilling and Blasting)



Vertical Section

ORDER FOLLOWED IN BLASTING MACHINE-DRILLED ROUNDS AT PABST "H" SHAFT

After blasting, the muck was hoisted in two 20-cu-ft. sinking buckets, provided with special guides. At the trestle landing the buckets were dumped while hanging straight on the cable, the rock falling on an inclined shaft cover. This sloping cover was hinged, provided with high sides that formed a chute, and was swung in and out of position by means of air-operated cylinders. The complete cycle of work in sinking was as follows:

TIME REQUIRED PER CYCLE OF WORK IN SINKING PABST "H" SHAFT

Operation	Time, Hours
Take down material and drill entire cut	6.0
Charge holes (first blast)	1.0
Remove material and blast	1.0
Blow smoke	1.5
Muck first blast	8.0
Charge second blast and fire	0.5
Blow smoke	1.5
Muck second blast	6.0
Hoisting water with bucket, per day	1.5
Timbering, per set	5.5
Cutting and blasting hitches	8.0
Installing bearers	3.0

The shaft sets extending through the encountered slates are made of 8-in., 34-lb., "H"-section steel and 6-in., 22.8-lb., "H"-section throughout the remainder of the shaft. They were spaced at 5-ft. centers. Dividers were of steel. Bearers were placed every 100 ft. in depth, four bearers to a set, one under each end plate and one under each cross divider. The bearers are 12-in., 31.5-lb. I-beams, 17 ft. long, cut in the middle for purpose of installing and spliced after being placed.

Hitches 3½ ft. deep were cut to fit the steel, and this was done by drilling one side and the bottom of each hitch, the holes being placed side by side, each hitch requiring nine holes. Iron wedges secure the bearers.

The lath or lining consisted of pre-cast concrete slabs 8 in., 10 in., and 12 in. wide by 4 ft. 10 in. long and 3 in. thick in the slates and 2 in. thick in the granite. The slabs were designed with one vertical edge on each face, beveled to permit easy installation, and held in place by angles riveted to the "H" sections. The lath was wedged from the rear with cedar blocking. Men and material were handled on a cage, and dirt was



HOIST COMPARTMENTS, COLLAR OF PAEST "H" SHAFT

hoisted by buckets, the three hoisting compartments being used.

The equipment on surface was temporary, buildings and headframe as well as machinery. The machinery used was as follows:

Cage Hoist—One herringbone-gear drum, 48 in. x 36 in. Lake Shore Engine Works electric hoist driven by 112-hp. 440-v., slip-ring, General Electric induction motor.

Rock Hoist—One of two drum, 48 in. x 36 in. herringbone-gear, Lake Shore Engine Works electric hoist driven by 150-hp., 440-v., slip-ring, General Electric induction motor.

Surface Haulage—One Armstrong haulage plant, rawhide pinion and iron cut spur gear, geared to handle cars at 900 ft. per min., driven by 220-v., 50-hp., Westinghouse induction motor.

Air Compressors—Two 12-in. and 7½ in. x 12 in. Imperial, compound, short-belt drive, Ingersoll-Rand air compressors, each of 327 cu.ft. displacement at 210 r.p.m. and driven by 440-v., 50 hp., General Electric slip-ring, induction motors running at 1,200 r.p.m.; one 14 in. x 12 in. N. S. B. E., Chicago Pneumatic Tool Co. air compressor, of 487 cu.ft. capacity at 230 r.p.m., driven by 100 h.p. Burks, 220-v., slip-ring, induction motor running at 900 r.p.m., and one No. 5 Leyner drill sharpener.

The work of sinking this shaft was in charge of Gustaf Erickson, mining captain, and under the direction of A. G. Hedlin, head mining captain. A. J. Wagner was in charge of drills and responsible for their performance.

Crude Barytes produced and marketed in the United States in 1918 amounted to 155,241 short tons, one-fourth less than the quantity marketed in 1917, and one-third less than that marketed in 1916, according to statistics collected by the U. S. Geological Survey. The average price per ton was \$6.73, as against \$5.66 in 1917 and \$4.56 in 1916.

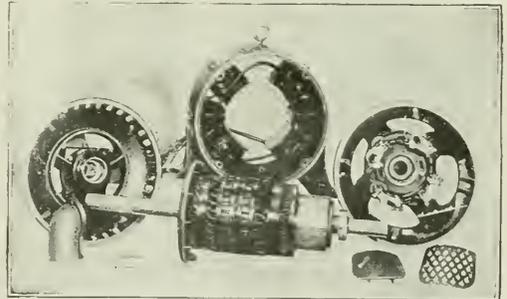
New Type of Direct-Current Motors

In the new type of commutating-pole, direct-current motors and generators which have recently been introduced by a large electrical machinery manufacturer, the following are included: Continuous rated (50° C. rise) motors, for application where the power requirements are definitely known; normal rated (40° C. rise) general-purpose motors; adjustable speed motors for continuous or intermittent service; generators and exciters.

For constant-speed motors, the ratings and speeds are the same as those of 60-cycle induction motors, and they can thus be used interchangeably with induction motors for direct-connected applications without changing the method of drive or the ratio of gearing. Adjustable speed motors, intended particularly for machine tool and similar applications, are provided for 2:1, 3:1 or 4:1 speed range. Generator speeds also correspond to those of induction motors, thus permitting the direct coupling of the machines to form motor-generator sets in various combinations.

The line of ratings now complete covers motors from one-half to 50 hp. and generators from one-half to 40 kw., and larger sizes are under development.

Box-type brush holders are adjustable for tension and suitable for either direction of rotation. Each holder can be removed independently with a screwdriver or wrench. At least two brushes per stud are used. The field coils are wound on metal spools, which prevent movement of the coils, and are protected by an outside layer of enameled wire. The armature core has the laminations riveted together, permitting the removal of the shaft without dismantling the core or commutator, and in the ratings of 20 hp., 850 r.p.m., and larger, the core and commutator are built on a sleeve, so that the shaft can be pressed out of the finished armature without disturbing the windings.



NEW TYPE OF DIRECT-CURRENT MOTOR DISASSEMBLED

An important feature of the machine is the ventilating system. The air being drawn out by the fan mounted on the rear armature head, fresh cool air flows in through the ventilating ducts and takes up the heat. This heated air is forced out through openings in the periphery of the rear bearing brackets. With this ventilation, it is claimed, the internal temperatures are kept low, thus prolonging the life of the insulation.

This type, which is designated as the Allis-Chalmers Type "E," is completely new throughout. The motors are designed for belted as well as direct-connected applications and are particularly suited to machine-tool service.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Magnesite and Other Tariff Bills

Despite the desire of Chairman Fordney of the Ways and Means Committee to have the House consider the bill providing duties on imports of magnesite, the parliamentary situation up to the time that this is written had not permitted him to get the bill before the House. It is expected that the magnesite bill will meet more opposition in the House than any of the other emergency tariff bills. This will be based largely on the claim that the bill will benefit only a few in this country and at the same time will strike a blow at large investments of American capital abroad, as well as increase the price of an important commodity which would be passed on to a very large number of ultimate consumers.

No steps have been taken as yet by the Senate Committee of Finance of which Senator Penrose, of Pennsylvania, is chairman, to take up the emergency bills. The committee is to meet at a date yet unfixed to decide on the action which is to be taken. There is no great amount of sympathetic interest in the bills, however, which are referred to in the Senate Committee as "pop-gun" measures. Many are of the opinion that they must await general tariff legislation. Heretofore, it has been assumed that the general revision of tariff would be undertaken immediately upon the convening of the regular session. It is the general belief now, however, that no such legislation may be expected until after the Presidential campaign.

Leasing Bill in the House

Prompt consideration of the general leasing bill by the House was assured when the Public Lands Committee took up the measure on Sept. 15 and decided to expedite its passage.

It is probable that the House Committee will not look with favor upon an amendment to the bill which would make available to the mining industry a certain percentage of the receipts obtained from licenses. Many members of the House are of the opinion that a portion of the receipts from licenses should be devoted to research which would be of general benefit to the mining industry. As 45 per cent of these receipts goes into the reclamation fund, and 45 per cent to the states, it is felt that at least the remaining 10 per cent should be devoted to the interest of mining, which is materially affected by the leasing bill.

Such an amendment to the bill was prepared by Senator Henderson, which would allow the 10 per cent going to the Treasury to be expended for such investigations by the Bureau of Mines as may be authorized by Congress. He refrained from pushing this amendment only when Senator Smoot, one of the Republican leaders and a member of the Appropriations Committee, went on record favoring special appropriations for various phases of mining research. Mr. Smoot's words in that connection were:

"While I am in sympathy with the object of the amendment, I think the leasing bill is not the proper

place to bring it about. I will join with the Senator from Nevada in securing a direct appropriation for this purpose, and I will say that I have no doubt, as a member of the Appropriation Committee, that there will be an appropriation made for this very purpose."

It is Senator Smoot's idea that at least 10 per cent of all royalty which will accrue under the Leasing Act should be turned into the Treasury to pay the expense of administering the act.

Encouraged by the attitude of Senator Smoot, Senator Henderson expects to push for immediate consideration his bill providing \$140,000 for an investigation of oil shale. In addition, he will introduce soon a bill providing for an investigation looking to the more economical production of slate. Owing to the increased prices of steel, lumber, and other building materials, there is an increased demand for the use of slate wherever it can be substituted for other materials in building and other constructional operations. At present only 5 per cent of the slate quarried is suitable for final preparation. An improvement in mining methods, he believes, will result in eliminating an important portion of the present loss. He has in mind, also, other investigations of interest to the mining industry.

Technical Men Needed as Consuls

A consular examination will be held in the late autumn or early winter. It is the hope of officials at the State Department that a considerable number of technical men will take that examination. The department recognizes that the interest of the United States will be served best if technical men are available to fill vacancies in the consular service at points where their training will be of special value.

For instance, a mining engineer, having passed the examination, would be considered especially for any vacancy at a foreign mining center and likewise a chemist would be considered for a center of the chemical industry.

The scale of pay in the consular service is so low that it is often difficult for a candidate without other source of income to maintain himself at the post to which he might be sent. For this reason many young men well suited for consular work find such a career unattractive. For that reason, as well as others, the department would welcome as consular candidates technical men of means who would be willing to accept such service.

Duty on Talc and Soapstone

Talc, steatite, soapstone and French chalk will be charged duty at the rate of 1 c. per lb. when imported into the United States if a bill introduced by Representative Fordney should become a law. If the product should be sawed or be in the form of crayons or cubes, the duty is to be 2 c. per lb., and manufactures of those articles, if not decorated, are to be subject to duty at the rate of 50 per cent ad valorem. If decorated, the duty is to be 60 per cent ad valorem.

F. J. Bailey on Present Mining Conditions

After a visit to all of the Western stations and branches of the Bureau of Mines, F. J. Bailey, the assistant to the director, who is in charge of the operating division of the Bureau, returns to Washington convinced that the mining industry is entering a new period of activity. Though the change from a war to a peace basis has put an end to some classes of mining, this will be more than offset by activities in other branches, he believes. He is especially gratified with the evidences of increased activities in the gold-mining industry.

One of the striking conditions which came to Mr. Bailey's attention during the trip is the immense amount of improvements which have been made on mining properties during the war period. The betterments which have been established are making for cheaper production and are making possible many of the activities now in evidence. He found that in most of the mining sections the transition from a war to a peace basis had been completed.

That the Bureau of Mines enjoys a considerable prestige among men engaged in the industry became more evident to Mr. Bailey, as a result of his visit to practically all of the important mining centers. He believes that the war gave the Bureau of Mines, as well as other Government agencies, an opportunity to display its worth to the industry. There is a unanimous demand, Mr. Bailey reports, for additional mining research and united effort looking to the solving of the industry's problems.

Exports of Mining Machinery

The exports of mining machinery from the United States during July, 1919, according to the figures of the Bureau of Foreign and Domestic Commerce, are as follows:

Countries:	Oil Well	All Other
Belgium		\$5,188
Italy		3,526
Netherlands		1,102
Norway		16,765
Roumania	\$158,641	
Spain	757	17,345
England	2,156	135,317
Canada	17,535	51,151
Honduras	76	1,000
Nicaragua		5,781
Salvador		901
Mexico	25,675	74,038
Madagascar, Langley, etc.		26
Newfoundland and Labrador		142
Trinidad and Tobago	3,266	
Cuba	724	10,282
Argentina	14,951	980
Bolivia		9,929
Brazil		10,764
Chile		100,144
Colombia		11,173
Ecuador		740
Peru		22,891
Venezuela	13,003	
China		97,093
British India	2,889	4,970
Dutch East Indies	51,496	10,220
Japan		5,130
Russia in Asia		37,346
Australia		1,251
New Zealand		493
French Oceania		2,000
Philippine Islands	640	780
British West Africa		4,102
British South Africa	495	10,689
French Africa	1,850	
Portuguese Africa		27
Totals	\$299,674	\$653,286

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for July, 1919, and the figures for July, 1918, as finally revised, are as follows:

IMPORTS, JULY, 1918, AND 1919

(In pounds, unless otherwise stated)

	July, 1918	July, 1919
Antimony ore, contents	1,119,077	226,246
Antimony matte, regulus or metal	1,400,030	1,219,458
Copper:		
Ore, contents	6,179,353	4,756,444
Concentrates, contents	5,185,245	2,902,900
Matte, regulus, etc., contents	1,533,838	5,758,470
Imported from (in part):		
Mexico	2,104,426	3,610,480
Cuba	3,397,685	4,029,810
Chile	2,120,720	856,000
Peru	3,417,904	3,186,163
Unrefined black blister, etc.	350,175	123,112
Refined in ingots, plates, etc.	19,543,854	18,033,812
Old, etc., for remanufacture	5,389,000	3,116,315
Composition metal, copper chief value	111,891	281,983
Lead	14,145	12,177
Lead:		
Ore, contents	3,597,906	2,711,964
Bullion, contents	2,134,609	12,575,262
Imported from (in part):		
Canada	2,209,572	1,376,588
Mexico	3,495,546	12,758,243
Chile	26,309	383,878
Pigs, bars and old	54,921	561,055
Pyrites, long tons	46,908	63,088
Imported from (in part):		
Spain, long tons	11,905	36,099
Canada, long tons	34,503	24,889
Tin ore, long tons	3,499	1,975
Tin bars, blocks, pigs, etc.	15,567,667	113,120
Imported from (in part):		
United Kingdom	1,467,386	Nil
Strait Settlements	7,653,459	113,120
Dutch East Indies	2,653,136	Nil
Hong Kong	2,733,774	1,896,909
Zinc:		
Ore contents	1,193,916	4,225,489
Imported from (in part):		
Canada	829,327	196,515
Mexico	364,589	2,160,540
Blocks, or pigs, and old	Nil	Nil
Manganese ore, long tons	30,886	15,585
Imported from (in part):		
Cuba	9,702	307
British India	2,700	Nil
Brazil	15,925	9,750
Tungsten ore, long tons	858	452

EXPORTS OF COPPER, LEAD AND ZINC

(In pounds)

	July, 1918	July, 1919
Copper:		
Ore, contents	326,352	3,000
Concentrates, contents	127,000	Nil
Unrefined black blister, etc.	672,000	3,600
Refined in ingots, bars, etc.	64,513,910	42,373,791
Exported to (in part):		
France	30,738,418	13,917,000
Italy	11,311,323	Nil
United Kingdom	199,595,996	7,676,212
Canada	2,766,126	1,406,066
Composition metal, copper chief value	7,690	25,409
Old and scrap	Nil	Nil
Pipes and tubes	173,557	334,563
Plates and sheets	377,148	436,843
Wire, except insulated	1,905,418	5,527,682
Lead:		
Pigs, bars, etc., produced from domestic ore	13,711,872	637,855
Produced from foreign ore	3,046,069	4,664,547
Exported to (in part):		
United Kingdom	7,430,468	3,472,560
Canada	5,880,469	119,650
Brazil	66,249	3,309
Japan	2,658,855	672,000
Zinc:		
Dross	2,023,402	72,000
Spelter:		
Produced from domestic ore	8,859,975	18,715,545
Produced from foreign ore	361,243	1,103,124
Exported to (in part):		
France	6,290,460	5,683,424
Italy	356,000	112,000
United Kingdom	2,186,547	11,442,341
Canada	373,891	340,694
Mexico	2,020	None
Japan	None	2,016,147
In sheets, strips, etc.	1,461,441	2,008,580

Sale of Government Brass

Sealed bids have been asked by the Director of Sales for the entire surplus stock of brass held by the War Department. Fully 150,000,000 pounds will be covered by the sale. It consists principally of sheets, strips, bars, and rods. Full specifications and particulars of the sale may be had on inquiry to the Chief of Ordnance, Washington, D. C.

Dedication of U. S. Bureau of Mines Experiment Station at Pittsburgh

Program of Events Beginning on Sept. 29 Includes a Nation-Wide First-Aid and Mine Rescue Contest—Large Attendance Expected

THE dedication of the U. S. Bureau of Mines station at Pittsburgh will be held on Sept. 29 to Oct. 1. The Pittsburgh Chamber of Commerce will co-operate, and it is expected that a considerable number of members of the American Institute of Mining and Metallurgical Engineers will visit Pittsburgh after the conclusion of the Chicago meeting on Sept. 26. One of the features of the program of events scheduled for the three days will be a first-aid and mine rescue contest on Sept. 30, in which there will be nation-wide participation. The complete program is as follows:

SEPT. 29

- 8:30 a.m., Bureau building open for inspection.
- 10:30 a.m., dedicatory ceremonies in rear of main building, 4,800 Forbes St.
- 2 p.m., special train and automobiles to experimental mine near Bruce-ton, Pa.
- 3 to 6 p.m., mine explosion and inspection of experimental mine and explosives testing plant near Bruce-ton, Pa.
- 6 p.m., return by special train and automobiles to B. & O. station, Pittsburgh.
- 8 p.m., informal reception and organ recital Carnegie Music Hall. Arranged by Carnegie Institute of Technology.

SEPT. 30

- Nation-wide First-Aid and Mine Rescue Contest, Forbes Field, Pittsburgh.
- 9 to 12 a.m., elimination mine rescue contests.
- 2 to 5 p.m., elimination first-aid contests.
- 5 p.m., coal-dust explosion.
- 8 p.m., pageant glorifying the mining industry, Forbes Field.

OCT. 1

- 9 to 12 a.m., final mine rescue contest.
- 2 to 5 p.m., final first-aid contest.
- 5 p.m., coal-dust explosion.
- 8 p.m., smoker, with award of prizes to winning teams.

Henry Clay Callahan

Henry Clay Callahan, prominently identified with the development of the mining industry in the West, died on Aug. 29 in San Francisco. Mr. Callahan was born at Callahans, Siskiyou County, Cal., on Oct. 6, 1852. His father, M. B. Callahan, one of the pioneers of 1849, who came to California in search of fortune, eventually became a prosperous merchant, conducting a business in mine supplies and similar products. The connections of his father, through his business interests with mining men of that time in California, Nevada, and Utah, enabled young Callahan to place himself advantageously. He began his experience underground in Virginia City, Nev., where he obtained employment in the Ophir mine as a carman and miner.

In 1875, at the age of twenty-three, Mr. Callahan went to Utah as superintendent of the South Star

and Titus mines, on Emma Hill. He soon had other interests at Bingham Canyon, Utah, and in Tuscarora, and other mining camps in Nevada. In 1877 he went to Bodie, Cal., to take charge of several properties there.

Mr. Callahan finally established himself in New York as a mining engineer. During the Leadville, Col., excitement he took charge of the Bull Domingo mine, in Custer County. About the year 1880, he was on George Hearst's staff in Arizona and New Mexico. In 1883, Mr. Callahan returned to California and managed the Bonanza King mine, in San Bernardino County, for Thomas Ewing and Daniel Gillett, of New York. About this time he also went to examine the La Union mine, in Costa Rica, for Daniel Gillett, who represented the London Exploration Co.



HENRY CLAY CALLAHAN

In association with Henry Bratnobar and Alfred Wartenweiler, Mr. Callahan went to Australia in 1893 to represent an English investment company there. In Australia he was prominently identified with the development of the Kalgoorlie gold fields, becoming superintendent and manager of the Lake View Consols and several other mines in that district. He was also manager for the London & Globe Exploration Co. In 1900 he was appointed one of the Queen's Commissioners from Western Australia to the Paris Exposition.

As a mining engineer, Mr. Callahan belonged to a conspicuous group of engineers who made mining history in the '80s and '90s by their ability to discover and develop orebodies and by their practical sense in management.

On account of ill health, Mr. Callahan practically retired from active participation in mining affairs in 1906.

Steel Production in Austria-Hungary, according to the *Ironmonger*, amounted to 1,763,745 tons in 1918, compared with 2,920,789 tons in 1917. Of this Austria produced 1,323,800 tons, compared with 2,204,139 tons in 1917; Hungary 426,476 tons, as against 692,429 tons in the previous year, and Bosnia 13,469 tons, as compared with 24,221 tons in 1917.

The Situation at Cobalt

Operators Win, But Victory Is Costly—Practically All Mines Flooded—Resumption of Work Will Require ' Time—Kirkland Lake Miners Still Out

TORONTO CORRESPONDENCE

THE Cobalt strike is over, and the men have gone back to work at the same pay and hours as before. The efforts of the Miners' Union to control the labor of the camp have been definitely broken, and no further trouble from this source need be expected, for a long time at least. Though it was a victory for the mine managers, this kind of victory is as usual a costly one. It is doubtful if the Cobalt camp will ever be as active as before the strike, or that there will ever be as many men employed again.

As far as can be learned the decision of the union executive to call off the strike was due in part to the firm attitude taken by the mine managers and also to the fact that the president of the American Federation of Labor, realizing the hopelessness of the situation, advised the union to throw up its hands. No strike pay was given, and the only assistance from the union was in the form of orders on the stores to those who were in actual want. As the applicant practically had to bare his soul before he got assistance, not much money was paid out.

Practically all the mines are flooded to a certain extent, so that it will be some time before operations are in full swing. It is believed that the resumption of work in Cobalt will have a beneficial effect upon the situation in Kirkland Lake and that the strike will be called off there also.

Minnesota Iron Country Statistics

The mine inspector of St. Louis County, Minn., in his annual report states that there was removed from the county during the fiscal year ended June 30, 1919, a total of 31,828,809 tons of iron ore, of which 9,575,514 tons was produced by underground methods and 22,252,295 tons by open-pit method. There was removed 14,124,832 cu.yd. of stripping. The number of men employed in all operations was 14,212. Fatal accidents for the year were thirty-three, as compared with sixty for the preceding year, which, after deducting the eighteen fatalities of the Sliver disaster, recorded last year, shows an improvement of more than 25 per cent for 1919 in this respect. There were twenty-one serious non-fatal accidents. One hundred and seventeen mines were active and forty-nine idle. Average wages throughout the industry were \$5.55, as compared with \$4.75 for the preceding year, an increase of 17 per cent.

The mine inspector of Itasca County reports that from this county was shipped 6,762,598 tons of ore in the year ended June 30, 1919, and 9,813,319 cu.yd. of stripping was removed. The season was marked by a large increase in the number of washing plants. There were twenty-four operating mines in the county and eighteen idle ones, and in all lines of mining endeavor 4,485 men were employed, at an average wage of \$5.27. Seven fatal accidents occurred during the year, all in open-pit work. Both reports make pleased and long comment on the degree of co-operation afforded by the operator, and one of them frankly admits that the operators have in some instances outstripped the inspector in the effort to reduce injuries and suffering.

Monthly Copper Production in 1919

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE-COPPER PRODUCTION, 1919

	May	June	July	August
Alaska shipments (c)	1,134,272	2,374,843	3,021,912	4,333,009
Arizona:				
Arizona Copper	2,400,000	2,400,000	2,400,000	2,900,000
Calumet & Arizona	4,308,600	4,872,000	4,800,000	4,814,000
Cons. Ariz. Smelting	690,000	625,000	630,000	630,000
Inspiration	6,200,000	6,300,000	6,000,000	6,500,000
Magma	730,548	956,117	903,179	.....
Miami	4,989,580	4,385,865	4,113,452	3,999,120
New Cornelia (d)	1,408,000	2,708,000	2,736,000	3,066,000
Old Dominion	2,564,000	2,015,500	1,629,000	1,937,000
Phelps Dodge	6,783,900	6,680,335	7,239,075	7,150,731
Ray	3,975,000	3,890,000	3,865,000	3,895,000
Shattuck Arizona	Nil	Nil	Nil	Nil
United Verde	1,250,000	3,525,000	4,040,000	.....
United Verde Extension	Nil	2,806,849	4,582,372	3,275,452
California:				
Mammoth	620,000	Nil	Nil	Nil
Michigan:				
Calumet & Hecla	6,796,819	5,439,761	6,208,517	7,586,601
Other Lake Superior (b)	6,500,000	5,750,000	5,750,000	5,750,000
Montana:				
Anaconda	13,500,000	10,530,000	11,122,000	12,600,000
East Butte	1,414,460	1,513,360	1,458,420	2,054,760
Nevada:				
New Mexico:				
Chino	3,583,396	3,615,458	3,626,354	3,321,857
Utah:				
Utah Copper	9,125,000	9,528,000	8,405,863	8,640,000
Eastern smelters (b)	1,400,000	1,400,000	1,400,000	1,400,000
Total reported	83,072,975	85,011,570	87,659,247	.....
Others, estimated	9,580,000	10,845,000	12,710,000	.....
Total United States	92,652,975	95,856,570	100,369,247	.....
Imports: Ore and concentrates etc.	7,946,560	7,732,950	13,417,814	.....
Imports in blister, etc.	15,997,164	19,842,478	18,033,812	.....
Grand total	116,596,699	123,431,998	131,820,873	.....
British Columbia:				
Granby Cons.	1,848,802	2,072,964	2,050,000	.....
Mexico:				
Boleo	1,322,720	1,256,640	1,256,640	.....
Cananea	3,000,000	3,000,000	3,200,000	4,200,000
Phelps Dodge, Mexican properties	1,532,000	1,735,000	2,516,000	3,422,000
Other foreign:				
Cerro de Pasco	4,034,000	4,026,000	3,984,000	5,726,000
Chile	5,066,000	5,003,430	7,161,444	.....
Katanga	2,094,370	4,519,430	4,442,270	.....
Baculus & Johnston	1,970,064	2,100,000	2,174,000	.....

(c) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery. (d) Estimated. (e) Official figures of the U. S. Department of Commerce; includes Kennecott production from its Alaska mines.

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 were as follows:

	1918	1919
January	165,431,568	135,733,511
February	160,011,364	111,649,512
Mar. h	185,325,168	102,040,460
Apr. l	163,207,096	98,808,998
May	181,070,350	92,652,975
June	166,723,509	93,836,370
July	159,329,031	100,369,247

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Granby, Cananea, Braden, Cerro de Pasco, and Chile. As a matter of record, however, the individual figures are given after the total. We also report the copper output of the Boleo and Katanga companies, which does not come to the United States.

The Shipments of Tungsten through the port of Bangkok, Siam, to the United States in the fiscal year ended March 31, 1917, amounted to 131,040 lb., and to 44,800 lb. in the fiscal year 1917-18, according to the U. S. Geological Survey. The production of tungsten practically ceased with the beginning of the current year, but Bangkok dealers in the ore are keen on securing new markets for stocks already on hand, and are ready to guarantee almost unlimited supplies for future shipments.

BY THE WAY

The Largest Oil Reservoir

What is said to be the largest oil reservoir in Great Britain, if not in the world, was built at Rosyth during the war for the oil supply of British war vessels, according to a recent issue of *Ironmonger*. The reservoir is made of reinforced concrete, although it is founded on rock. Its size may be gathered from the fact that its roof area is $7\frac{1}{2}$ acres or 35,493 sq.yd., the area covered by the reservoir and its associated works being $11\frac{1}{2}$ acres. Its walls are 35 ft. high; the amount of rock excavated was 300,000 cu.yd., and the amount of concrete poured, 98,500 cu.yd. The reservoirs capacity is 60,000,000 gallons. To ensure tightness a number of novel devices have been introduced, though when first tested these did not prove adequate, as the floor leaked considerably, and a complete new floor was laid. The reservoir is easily the largest oil reservoir in that country, and probably in the world.

The Fault of Overconfidence

"Some o' these 'ere chaps 'oo is braggin' tha 'ol bloody time," said Cap'n Dick, "is boun' to slip h'up naow an' again. Funny it be, too, m'son, 'ow there be them 'oo've 'eard a thing once or twice an', dam-me, soon they be tellin' un jus' as though it 'appened to they, whether or no. An', min' you m'son, perfectly h'innocent they be as they gaws h'on an' h'on, an' talks bout this an' that. A man 'asn't tha 'eart to call them liars, an' yet 'e naws they be far from 'ittin' tha truth. W'ot beats me is 'ow some o' these 'ere newspaper chaps 'as tha nerve to come h'out with a lot o' tha statements in the daily press that they do—an' tha next day they 'as to take un h'all back; but, min' you, m'son, tha tale is fixed h'up so h'artful that no one naws they wuz wrong at all. An' h'after that they believe they wuz right an' brags bout it, jus' like Billy Trevathan. Billy, 'e'd been to one o' these 'ere circuses with some o' tha boys, an' comin' 'ome they wuz talkin' bout one o' tha dwarfs that they'd seen in tha side-show. 'Dam-me,' sez one o' tha boys, 'e isn't very big, is un?' 'No,' says Billy, 'No. An' I tell e, m'son, h'over in h'ol country I've seen dwarfs twice as big as 'e.'"

D. E. A. C.

Treating 'Em Rough

In the Canadian Mining Institute Bulletin for July, "R. G.," referring to the widespread labor trouble in Canada, says: "It would be difficult, if not impossible . . . to prescribe a single remedy for its adjustment." On another page of the same journal, however, a single remedy used in England in the Fourteenth Century is cited. It was a statute passed in the reign of Edward III, which fixed the rate of wages, and compelled all, except artisans, merchants, or owners of farms, to work, when called on, at this rate of wages, or to go to prison. Another statute provided that if laborers or artificers left their work and went to another county they were to be arrested and brought back. A later law provided that a loafer should be tied to the end of a cart, naked, and beaten with whips throughout the town, "till his body be bloody by reason of such whipping." He was then required to take an oath to return home, "and put

himself to labour, as a true man ought to do." If he made default, the whipping was to be repeated. If he persisted in not working, the upper part of the gristle of his "right ear was to be clean cut off." If still persistent, he was to be tried and executed.

The Gila Monster Not Monstrous

Visitors to the mining camps of Arizona have always been interested in seeing specimens of the Gila monster and hearing the natives tell of the marvelous characteristics of the reptile. One of the most common tales was that the deadly poison which the lizard was supposed to secrete came from food which was assumed to be in an advanced state of decomposition in the creature's stomach. The idea was that the alimentary tract was elemental in form, and partook of the characteristics of many of the desert rivers—that is, it just petered out without ever getting anywhere. Any food getting as far as the stomach was *spurlös versenkt*.

One story was to the effect that a cowboy fastened one of the reptiles on behind his saddle, and later, reaching around behind him, was bitten in the hand. He was rushed to Tucson, but the poison had permeated his system, and he died.

Now along comes Science to prove that, ugly looking as he is, the Gila monster has been grossly maligned. There is nothing unusual in his internal arrangements, and no authentic case of a death from his bite has been found. The cowboy story was true in every word—only said cowboy died several years after the bite. The Gila monster is, however, capable of secreting a poisonous saliva, the degree of toxicity varying in different specimens. The bite is often painful and causes swelling, but investigation shows that it is not in itself deadly.

Early Life in Nevada City

Glimpses of life in Nevada County, Cal., in the '50s, are caught as one reads the account that recently appeared in the *San Francisco Chronicle* of the visit paid by James M. Feeley, of Stockton, Cal., to Nevada City, where he worked a claim sixty years ago. Feeley, who is eighty-four years old, witnessed the great fire of 1856, which virtually wiped out the young town of Nevada City, and was also an eye-witness to the horse-whipping of Henry Shipley, an early-day editor, by Lola Montez at Grass Valley in the early '50s. He visited the site of his claim and cabin on Shady Creek, near Nevada City, the old scenes recalling an incident which he related as follows:

"One day when I returned to my cabin for dinner I found a man sitting at the table helping himself to my pot of beans. I was mad, of course, but restrained my anger when I recognized the intruder as the noted bandit, Tom Bell. I told him very politely to take anything he wanted, as I was not looking for an argument with Tom Bell. Tom ate his fill, thanked me and went away. A few days later I came to Nevada City and sold my gold dust for \$500. While I was going back to Shady Creek I ran across the notorious Tom Bell just as he was in the act of robbing a couple of miners, and I decided at once that my \$500 was lost. But Tom recognized me, and told me to pass quietly on and keep still. That I did, and my money was saved. Thus that pot of beans netted me \$500. Tom was the terror of the boys in the mines for months, robbing right and left and always eluding capture."

PERSONALS

H. D. MacCaskey, who has been one of the prominent members of the staff of the U. S. Geological Survey for many years, has purchased a ranch near Medford, Ore., and will make his residence there. Mr. MacCaskey will continue to represent the Survey in certain matters pertaining to that section.

Donald M. Liddell is in Texas for ten days on professional business.

Reginald E. Hore, of Toronto, has gone to the Wasapika gold area, where he will examine properties.

Eliot Blackwelder, formerly professor of geology at the University of Illinois, has removed to Denver, Col.

G. B. Richardson has been placed in direct charge of the oil and gas section of the U. S. Geological Survey.

Ray J. Barber is now consulting engineer for the Roxbury Gold Mines, Inc., and is situated in New York City.

George G. Fleming has accepted a position in the testing department of the New Jersey Zinc Co., at Palmerton, Pa.

J. M. Armstrong, of the Caribbean Petroleum Co., has been transferred to Maracaibo, Venezuela, from Philadelphia, Pa.

Bailey C. Clark, consulting engineer for the Atolia Mining Co., was at Loring, Nev., recently in the interest of the company.

H. C. Cook, of the Canadian Geological Survey, is making an investigation of the Larder Lake gold field of Northern Ontario.

Walter Harvey Weed, made a professional examination of the Loring district, Nevada, early in September, for New York clients.

Harry Harper, mining engineer, of Santiago, Chile, has removed to La Paz, Bolivia, where he is connected with W. R. Grace & Co.

Fred Sherman Baker, who has been with the Oriental Consolidated Mining Co., at Unsankinko, Chosen (Korea) is now at Columbia City, Ind.

L. E. Booth, formerly with Anaconda Copper Mining Co., has accepted a position with the Inspiration Consolidated Copper Co., at Inspiration, Ariz.

Frank E. Lathé, of the Chile Copper Co., at Chuquicamata, Chile, has been appointed chief chemist for the British America Nickel Corporation at Sudbury, Ont.

W. O. Hotchkiss, State Geologist of Wisconsin, and E. R. Butcher of the Republic Iron & Steel Co., visited the Gogebic Range during the early part of September.

W. H. Gardner, formerly superintendent of the Cyprus mine, at Hibbing, has been appointed superintendent

of the McComber mine, on the Vermilion Range.

E. J. Longyear, J. M. Longyear, R. M. Bennett, and O. B. Warren have completed the annual inspection of the Bennett-Longyear and Meriden Iron interests on the Mesabi Range.

John D. Ryan and J. Leonard Replegle were members of committee of thirteen named by the Secretary of War to meet General Pershing upon his arrival in New York.

Jacob A. Davidson, who made important discoveries in the Matchewan gold area, has been engaged by the Montreal River Gold Mining Co. to examine and report on its holdings.

James F. Rose, of Hibbing, has returned from a reconnaissance survey 250 miles into the wilderness northwest of Ottawa. He was in charge of the work for the Canadian Pacific Ry.



Harris & Ewing

H. D. MACCASKHY

E. J. Lambert and A. J. Carlson, professors of the University of Minnesota, have completed an examination of the Mesabi and Vermilion ranges in the interest of the Minnesota Tax Commission.

W. C. Phalen, of the Bureau of Mines, left Washington on Sept. 6 for Canada where he will study magnesite deposits around Quebec. Mr. Phalen expects to be back in Washington within three weeks.

John G. Bartram, who is with the Petroleum Co. of Oklahoma, has been transferred from Cheyenne, Wyo., to Tulsa, Okla., to take charge of the geological work of the company in southern Oklahoma.

D. Dale Condit, oil geologist, who has been in the service of the U. S. Geological Survey for several years, has resigned to accept a position with S. Pearson & Sons, Ltd., of London, and has been assigned to work in China and India.

Ernest E. Thum, formerly Western Editor of *Chemical and Metallurgical Engineering*, has been appointed associate editor and is now connected with the New York office. L. W. Chapman succeeds Mr. Thum, with offices in San Francisco, Cal.

John W. Allen has resigned as general manager of the mining and transportation department of the Brier Hill Steel Co., Youngstown, Ohio, effective Sept. 6, to accept a position with the National Trading Co., Cleveland. J. Roscoe Stroh has succeeded to Mr. Allen's position, the designation of which has been changed to manager of the mining department.

OBITUARY

A. H. Brown, formerly manager of the Hudson Bay mine, Cobalt, and the Dome Lake, at Porcupine, and more lately mining inspector, died recently at Sudbury, Ont., from pneumonia contracted during a visit to the West Shining Tree gold area.

SOCIETIES

Engineers' Club, Houston, Tex., met on Sept. 4, and a paper on the use of lubricating oils at aviation fields was read by W. M. Davis, supervising engineer of the lubricating department of the Texas Co.

Lake Superior Industrial Bureau.—At the annual meeting, the following officers were re-elected: Francis J. Webb, president; W. P. Chinn, vice-president; E. J. Maney, treasurer; and A. F. Ferguson, secretary. Executive committee is composed of F. J. Webb, E. J. Maney, and George D. Swift.

American Society of Civil Engineers announced a meeting to be held on Wednesday, Sept. 17, to be devoted to a discussion on the need for a National Department of Public Works. Among the speakers who were expected to be present were George W. Fuller, Walter D. Blair, M. O. Leighton, and F. J. MacIsaac.

INDUSTRIAL NEWS

The Mine and Smelter Supply Co., Denver, Co., has become agent for the Gardner horizontal and the Gardner-Rix vertical types of air compressors, single and duplex.

The Chicago Pneumatic Tool Co. announces the appointment of Fred Gehbauer, as special navy yard representative, with headquarters at the Philadelphia office, 1740 Market St.

The Inter-State Machinery Corporation, 538 Commercial Trust Building, Philadelphia, Pa., succeeding the Ralph R. Lewis Co., announces it is retaining the same offices and working under the same management as heretofore.

Krogh Pump & Machinery Co., of San Francisco, advises that it has just made a shipment of sand pumps and spare parts to the United Alkali Co., Liverpool, England, and is receiving a considerable number of foreign inquiries.

The Bucyrus Co., South Milwaukee, Wis., announces that it has opened a Cleveland office at 808 American Trust Building. This office will be in charge of E. G. Lewis, formerly with the New York office of the company, and more recently president of the New Jersey Slag Products Co., Dover, N. J.

The Driver-Harris Co., Harrison, N. J., is now selling its wire-rope products direct to the trade instead of through its former selling agents. The company has increased its facilities to include all grades of rope in 6 x 7, 6 x 12 and 6 x 19 construction, such as drilling cable, elevator and haulage rope, sand lines and similar products in all sizes up to 3 in.

Williamsport Wire Rope Co., Williamsport, Pa., has established an office and warehouse at Chicago under the direction of C. M. Ballard, formerly connected with the Williamsport organization at Cleveland, Ohio. The Chicago office is at 122 South Michigan Ave., and the warehouse at 755 West Quincy St. The company can now make shipments from Chicago to customers in the territory served from that point.

Worthington Pump & Machinery Corporation announces its purchase of the plant, patterns, accounts, patents, and other assets of the Epping-Carpenter Pump Co., situated at Pittsburgh, Pa. The plant will be operated as the "Epping-Carpenter Works." Orders and contracts now in hand will be completed by the Worthington Pump & Machinery Corporation, and all further business will be for its account. Remittances should be made to and all correspondence should be addressed to the Worthington Pump & Machinery Corporation, No. 10 43rd St., Pittsburgh, Pa.

TRADE CATALOGS

Walter A. Zelnicker Supply Co., has issued Bulletin No. 266 containing stock list of supplies in St. Louis, Mo.

Duplex Truck Co., Lansing, Mich., has issued a circular devoted to the interest of motor truck users. Several performances of the company's four-wheel-drive truck are included.

Davis-Bournonville Co., Jersey City, N. J., has issued an illustrated bulletin descriptive of the pyrograph, a boiler-shop cutting machine for trimming and beveling boiler sheets to the correct flange height and calking angle in one operation with oxy-acetylene torch.

Colonial Steel Co., Pittsburgh, Pa., has issued a 25 pp. tool-steel-treating book containing directions for hardening and tempering steel to be used for various purposes. In tabular form are listed various steel products, grade of steel which should be used in their manufacture and drawing color or temperature.

Fireproof Construction, Using Expanded Metal Lath. Northwestern Expanded Metal Co., Old Colony Building, Chicago, Ill.; 6 x 9; 72 pp.; illustrated. Descriptive of the uses of metal lath in construction of partitions and plastering of walls. Stock sizes, weights, and finishes are given in tabular form. Details of construction work with description of lath accessories, viz., channels, corner heads, saddle clips, and others, are included.

NEW PATENTS

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

Alloy of Copper, Nickel, Zinc, Iron, and Manganese. Foster Milliken. (1,314,417, Aug. 26, 1919).

Converter and Smelter. Theodore Miller. (1,314,348, Aug. 26, 1919).

Drill—Rock Drill. Omar E. Clark, assignor to the Denver Rock Drill Manufacturing Co. (1,314,246, Aug. 26, 1919).

Electric Melting Furnace. James D. Shipton. (1,313,746, Aug. 19, 1919).

Flotation—Apparatus for Separating Ore Materials From Each Other. Frederick B. Flinn, assignor, by mesne assignments, to Pneumatic Process Flotation Co. (1,314,316, Aug. 26, 1919).

Flotation Processes, oil and feeding device for. William W. Wolcott. (1,314,296, Aug. 23, 1919).

Granulator. Edward N. Greenleaf and George T. Hansen, assignors to Allis-Chalmers Manufacturing Co. (1,309,800, July 15, 1919).

Hose Coupling. N. B. Braly. (1,310,559, July 22, 1919).

Leaching—Apparatus for Extracting Metals From Their Ores. Edmund S. Leaver, assignor of one-half to Charles E. Van Barneveld. (1,312,488, July 5, 1919).

Ore-Concentrating Apparatus. Jacob David Wolf. (1,310,492, July 22, 1919).

Ore-Concentrating Machine. Frederick E. Small. (1,314,370 and 1,314,371, Aug. 26, 1919).

Ore Concentrator. John F. Kellogg. (1,314,335, Aug. 26, 1919).

Phosphoric Acid—Method of and apparatus for producing phosphoric acid and compounds of the same. Frank S. Washburn, assignor to American Cyanamid Co. (1,314,229, Aug. 26, 1919).

Pipe—Corrosion-Resisting Conduit Pipe. Charles Albert Rose and Gustave Monrath, assignors to Chile Exploration Co. (1,310,715, July 22, 1919).

Pumps—Drainage Valve for Deep-Well Pumps. William H. McKissick. (1,314,070, Aug. 26, 1919).

Reduction—Ore-Reducing Process. Benjamin Q. P. Foss, assignor to The Foss International Ore Reduction Co. (1,311,645; July 29, 1919).

Roasting—Method of Roasting Zinc Ores or Concentrates. Urlyn C. Tainton. (1,310,455; July 22, 1919).

Slag Remover. John H. Abel. (1,303,225; May 13, 1919).

Smelting and Refining Ore, Process of. Leopold Mambourg, assignor to the Mambourg Continuous Iron and Steel Furnace Co. (1,313,309; Aug. 19, 1919).

Steel, Art of Manufacturing. George Hillard Benjamin. (1,314,384; Aug. 26, 1919).

Steel, Carbon-Chrome-Nickel. James Ramsey Speer. (1,314,022; Aug. 26, 1919).

Steel—Production of Refined Basic Steel. William R. Walker. (1,309,162; July 8, 1919).

Sulphides—Method of Making Soluble Sulphides. Raymond F. Bacon, assignor to Metals Research Co. (1,310,151; July 15, 1919).

Sulphur—Method of and Apparatus for Sulphur Mining. Robert E. Carmichael. (1,308,929; July 8, 1919).

Sulphur, Process of Recovery of. Rasik Lal Datta. (1,313,370; Aug. 19, 1919).

Sulphuric Acid, Contact Process for Making. Herbert Henry Meyers, assignor to Armour Fertilizer Works. (1,314,280; Aug. 26, 1919).

Tin—Utilization of Tin Scrap. Daniel A. Wilcox and Disney H. Wilcox. (1,310,381; July 15, 1919).

Washing—Portable Washing Plant. James P. Dovel. (1,309,754; July 15, 1919).

Welding—Electrode for Electric Arc Welding, Emile Languepin. (1,314,273; Aug. 26, 1919).

Zinc—Condenser for Zinc Vapors. Sven Hultd, assignor to Norsk Elektrisk Metalindustri Aktieselskap. (1,311,604; July 29, 1919).

Zinc—Method of Refining Zinc. Sven Hultd, assignor to Norsk Elektrisk Metalindustri Aktieselskap. (1,312,480; Aug. 5, 1919).

Zinc—Process of Alloying Zinc with Iron or Steel. Benjamin F. Dimm. (1,307,853; June 24, 1919).

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

NEW YORK, N. Y.—Sept. 12

South American Gold & Platinum Co. has been unable to develop its properties in Colombia as rapidly as it had desired, owing to the failure to settle the dispute over the Panama Canal. The properties comprise 10,000 acres along the San Juan River and about fifty miles of river bed extending up two tributaries of the San Juan, owned by the Pacific Metals Co. The company's mines can be reached in river vessels via the San Juan. The land blocked out, according to the company's estimate, represents about \$27,000,000 in platinum and gold. One wooden dredge, with a capacity of 40,000 tons per month, has been working and a new steel dredge will be in operation about Oct. 1. Recently the daily production of the wooden dredge was about \$7,000 to \$8,000. The company is a holding company for the Anglo-Colombian Mining Co., a British corporation, and the Pacific Metals Co.

BOSTON, MASS.—Sept. 12

The Nevada Consolidated Copper Co. is defendant in a suit brought against it by Minerals Separation North American Corp. and Minerals Separation, Ltd., (British) in the U. S. District Court at Portland, Me. The plaintiffs allege infringement of patents in the concentration of ores, claiming damages and seeking an injunction to prevent further infringement. By bringing suit against Nevada Consolidated, a Maine corporation, Minerals Separation has involved another Federal circuit, the first, as any appeal on the part of Nevada Consolidated would come to Boston for hearing on the adjudication. The Miami company's case went before the third circuit on appeal in Philadelphia. Butte & Superior appeals have been made in the ninth circuit at San Francisco. Prior to this litigation, three suits have been brought by Minerals Separation for patent infringement, two of them against Butte & Superior, which must now make an accounting. In the third case, that against Miami Copper Co., accounting has been taking place for several months.

GRASS VALLEY, CAL.—Sept. 11

Mine Workers' Protective League at a recent meeting in Grass Valley, Cal., decided to enforce rules of the league throughout the district. It was the sense of the meeting that force is to be used, if persuasion fails, to compel workmen who are non-members to join the league. Membership is now between 900 and 1,000. The mines in the

district are all running except the Golden Center.

ISHPEMING, MICH.—Sept. 13

The Chemical Plant and ore stock house of the Manistique, Mich., furnace of the Charcoal Iron Co. of America was recently destroyed by fire. The loss is estimated at \$150,000. It will be several months before the manufacture of pig iron and chemicals can be resumed there. A few weeks previous one of the buildings of the company's Newberry furnace was burned.

What Effect a Steel Strike will have on the mines of the Lake Superior district it is difficult to predict. The U. S. Steel Corporation has been making heavy shipments of ore throughout the season, evidently anticipating labor troubles. It is believed that some mines will be compelled to close if the furnaces are idle, but the idea of striking is not being taken very seriously in the mining districts. The miners are well satisfied with the wages which they are receiving, and there is no talk of labor troubles on any of the ranges. There is plenty of work, and a miner has no difficulty in getting a place. The sales continue light, although there have been a few inquiries for 1920 delivery.

IRONWOOD, MICH.—Sept. 13

Mine Operators are greatly interested in the impending strike of the steel workers' unions. On the Gogebic Range the unions are not strong, and may not attempt to strike. If steel plants should be forced to close, mines will probably have to do so also, as they already have a surplus stock of ore on hand.

HOUGHTON, MICH.—Sept. 12

Copper has not been moving with any noticeable rapidity from the Michigan ports within the last thirty days. Although there is no large accumulation of stocks on any of the docks, at the same time it is apparent that there has been no insistent demand. Rail shipments are rare.

CLEVELAND, OHIO—Sept. 9

Iron-Ore Shipments from upper Lake ports during August amounted to 4,423,133 gross tons, according to *Iron Age*. This sharp falling off was due to the strike of the dockmen at upper Lake ports, which caused an almost total suspension of the movement for three weeks. The movement during July was 9,173,429 tons, and shipments during August would probably have been about the same had it not been for the strike. The August movement shows a decrease of 5,302,198 tons, as

compared with the same month a year ago. The total shipments for the season up to Sept. 1 fell off nearly 10,000,000 tons, as compared with last year, being 29,804,981 tons, as compared with 39,334,264 tons during the same period a year ago. Shipments are now moving forward in fair volume. The amount of ore on the lower Lake docks showed a decrease on Sept. 1, as compared with a month ago. The amount of ore on docks Sept. 1 was 6,705,062 tons, as against 7,069,893 tons Aug. 1. The amount on docks Sept. 1 a year ago was 8,152,214 tons.

TORONTO, ONT.—Sept. 11

John T. Stirling, of the Alberta Department of Mines, states that a force of men in charge of William Pickles, mining engineer, has been sent to Fort McMurray to start drilling for salt, a deposit of which underlies that town. Previous exploration by drilling disclosed a bed 180 ft. deep lying 480 ft. below the surface. It has not been decided whether the government will mine salt or turn the work over to a company. There is an estimated market for about 45,000 tons of salt in Alberta and the adjacent provinces.

Prospectors' Development Co., Ltd., has been incorporated, and plans the organized development of promising mining properties in Northern Ontario. The company is capitalized at \$2,000,000, divided into \$1 shares. No promotion stock has been issued, the entire stock remaining in the treasury. The following men are identified with the enterprise: John B. Holden, of Toronto; Harry Oakes, president of the Lake Shore mine; H. H. Johnson, of the Tough-Oakes; William Wright, original owner of the Wright-Hargreaves mine; Mr. Bain, of Bicknell, Bain, McDonald & Gordon, and others.

LONDON, ENGLAND—Aug. 23

Organization of the Mexican Corporation has recently been effected by the Camp Bird and Santa Gertrudis companies. Capitalization is \$1,000,000. The majority interest is controlled by these two companies, the balance being taken up by the Consolidated Gold Fields, the Consolidated Mines Selection, the Exploration, the Imperial & Foreign Corporation, the Central Mining Corporation, the Lake View group, and the Lena Goldfields companies. The directorate of the new corporation consists of F. W. Baker, chairman of the Camp Bird and Santa Gertrudis companies; R. T. Bayliss, chairman and managing director of the Exploration Company; Lord Brabourne, director of

Consolidated Gold Fields; W. McDermott, chairman of Consolidated Mines Selection Co.; F. A. Govett, chairman of Lake View & Oroya, and Lake View & Star companies; J. A. Agnew, A. S. Elmore, director of Camp Bird and Santa Gertrudis companies; and H. Guedalla, managing director of Imperial & Foreign Corporation and director of Burma Corporation. The company, it is said, has been formed to acquire certain interests in Mexico recommended by the Santa Gertrudis company.

MELBOURNE, AUSTRALIA—July 21

The Moore Filter Co., of the United States, has been granted leave to appeal to the Privy Council, with regard to its unsuccessful action against the Great Boulder Proprietary Gold Mining Co., for an alleged infringement of patent rights.

Hampden-Cloncurry Copper Mines, Ltd., North Queensland, during the half-year ended Feb. 28, operated with a loss of £53,973, to which must be

added £12,610, written off for depreciation, making a total debit of £66,583. Curtailed production, consequent upon the stoppage of smelting operations in November last, increased wages and decreased efficiency of labor, and high railway freights were contributing factors to this deficiency. Negotiations for the disposal of the copper unsold are still proceeding. The ore reserves are estimated at 218,000 tons, containing 13,020 tons of copper.

In the Westonia Gold Field, in Western Australia, the local mining warden before whom the drainage action between the Edna May and the Edna May Consolidated was heard, decided in favor of the former. The verdict provided that the Edna May Co. be paid £4,747 for drainage charges up to Apr. 1, and £100 per month afterward, with costs. The Edna May Consolidated Co. has also agreed to pay the Edna May Central Co. £400 for past pumping and £50 per month. In the course of a few months the Edna May company will have exhausted its reserves of payable ore and the other companies in the

field will have to face the question of fresh arrangements for drainage. Speaking at a recent meeting of the Edna May company, the chairman of directors said that, after negotiation, it had been agreed upon between the two companies to accept the warden's decision as to damages and costs, but payment would be made as follows: £947 to be paid at once (this had been done), on Aug. 1 £100, on Sept. 1 £1,000, the balance, £3,200, to be paid in ten equal monthly installments on the seventh of each consecutive month, in addition to the contribution of £100 per month for current drainage. Costs to be paid when fixed. He also added that the company had decided it would be better expeditiously to extract the profitable ore developed than to operate a portion of the adjoining mine—the Edna Central. For the half year ended Apr. 30 the Edna May company, which is the principal mine on the Westonia field, produced 13,498 tons, averaging £2 9s. 1d. and the recovery by amalgamation was £36,356. Sands and slimes treated yielded £2,819.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ARIZONA

Cochise County

Calumet and Arizona (Bisbee)—Smeltery produced 4,814,000 lb. of copper in August, of which 3,438,000 lb. was available for company.

Shattuck Arizona (Bisbee)—Operations (and production) will probably be resumed this month, when pumping will be started. Water, which had filled shaft almost to 700 level, has receded about one-half, or about 55 ft.

Gila County

Old Dominion (Globe)—August production of copper 1,937,000 lb.; July, 1,629,000; August, 1918, 2,064,500.

Inspiration Consolidated (Inspiration)—August production of copper 6,500,000 lb.; July, 6,000,000; August, 1918, 9,000,000.

Miami Copper (Miami)—August production of copper 3,999,120 lb.; July 4,113,452; August, 1918, 5,374,198.

Greenlee County

Arizona Copper (Clifton)—August production of copper 2,900,000 lb.; July 2,400,000; August, 1918, 4,300,000.

Maricopa County

Montezuma (Morristown)—Lessees have taken out about three cars of high-grade lead ore. Property idle for nearly fifteen years. Before that time several cars of rich ore shipped from big gloryhole.

Pima County

New Cornelia (Ajo)—Copper produced in August was 3,066,000 lb. cathodes, 320,000 lb. smelting ore, and 166,000 cement copper.

Pinal County

Red Hills (Price)—Shipping carbonate ores from recent development. Plan to resume drilling at early date.

Ray Consolidated (Ray)—Production of copper in August, 3,895,000 lb.; July, 3,865,000.

Potts Canyon (Superior)—Development resumed, having been suspended during war. Sinking new shaft. Ores carry silver, lead, and vanadium. W. E. Deffy in charge.

Yavapai County

U. V. Extension (Jerome)—August production of copper 3,275,452 lb., or over 300,000 lb. less than in July. Reduction caused by changing from blast furnace to reverberatory and also to labor shortage.

Sheldon Mining (Walker)—Company planning extensive development work under direction of Mark Bradley. New compressor and other equipment will be installed.

CALIFORNIA

Amador County

Bunker Hill Cons. (Amador City)—Leveled assessment of 5c. per share to continue development below 2,800 level.

Eldorado County

Melton (Placerville)—J. Q. Wrenn, of Placerville, bought half interest in Eagle King gold quartz mine, better known as Melton mine, situated fifteen miles east of Placerville.

Nevada County

At Bullard's Bar, forty men working under George F. Taylor placing concrete foundation for restraining dam in Yuba River. Work being rushed.

Empire (Grass Valley)—Continuous pumping in this and North Star mines has reduced flow to normal. Work resumed in latter on 6,300 level.

Golden Center (Grass Valley)—Pulled pumps Sept. 5 and will shut down as soon as mill treats ore on hand, owing to high costs and uncertain labor market. Stockholders authorized sale of 187,000 shares of treasury stock at \$1 per share to provide fund for possible future operation.

Tulare County

Blue Mountain (Porterville)—Reported purchased by directors of Golden Center mine, of Grass Valley.

Tuolumne County

Black Oak (Soulsbyville)—Development begun on 1,800 level. North drift will be driven 300 ft.

COLORADO

Garfield County

Champion Oil Shale & Refining (Grand Valley)—Orders placed in Denver for shale plant. N. W. Bansill and M. Mulling, of Las Vegas, N. M., chief

stockholders and directors, recently in Grand Valley to confer with J. L. Herick, manager.

La Plata County

Cumberland (Durango)—Shaft being sunk, to be about 500 ft. deep, to develop Cumberland vein below Red Bed formations. E. B. Miller consulting engineer.

Mineral County

Melissa (Creede)—Leary, Campbell & Co., lessees of Melissa claim on Bachelor Mountain, have opened up oreshoot on "Top Blanket Vein." Plans completed for building mill and aerial tramway.

Pitkin County

Oakland (Aspen)—Alexander and Martin Scott, operating Oakland mine on south side of Queen's Gulch, four miles south of Aspen, discovered high-grade silver-bearing ore in vein 9 ft. wide. Said to include streak few inches wide of solid polybasite. Oakland developed in early days by tunnel several hundred feet long. Several small "feeders" cut in driving this tunnel, but were not prospected. Much activity has resulted in Aspen district.

San Juan County

Silver Lake (Silverton)—Leased to John Giomp, of Silverton. Several groups of lessees and sub-lessees already at work. Shipping to Iowa Tiger mill.

Summit County

Molly B (Breckenridge)—Will resume operations at copper-bismuth-silver mine in Yuba Dam Flats section. H. F. Sandy will be in charge.

Wellington Mines (Breckenridge)—Resumed operations Sept. 2. Is heaviest producer of zinc lead ores in district.

MICHIGAN

Copper District

Allouez (Allouez)—Operating two shafts and will reach normal production within month. Using ten electric motors.

Calumet & Hecla (Calumet)—Have added 500 men to force in last three months.

Seneca (Calumet)—Total of 325 ft. opened in lode both sides from shaft. North side in good copper from start. South side ran into fissure characteristic of Kearsarge amygdaloid but good ground found again. Stockpiling rock from first level to be milled to prevent accumulation as soon as there is enough to keep one head running two shifts. Three sites considered for proposed mill.

Winona (Houghton) — Increasing working force, which now totals 140 men. Former employees returning from manufacturing centers. Stamp mill running. Mining from one shaft. Second shaft expected to be in operation in thirty days.

Copper Range (Painesdale)—Baltic mine producing rock running 34 lb. per ton and Trimountain 30-31 lb. per ton. Continuing to select rock underground.

Gogebic Range

Aurora (Ironwood)—Change house about completed. Will accommodate 400 men. Built of concrete blocks, one story, 138 x 40 ft. Roof of concrete on hy-rib with air space and plaster inside. Steel lockers, 20 x 15 in., in central portion, with wash sinks along side walls, and six showers and toilet room at each end of building. Small basement at one end contains coal bin and two boilers, one for steam heat, other for heating water. Similar change houses are under construction at Norrie and Pabst mines.

Pabst (Ironwood)—At H shaft, engine-house foundations built, and foundation for one hoist ready. Next week work will begin on conduit transmission line from there to G power house. Cables will be in fibre conduits laid in concrete.

MINNESOTA

Mesabi Range

Hobart (Gilbert)—Will start shipping again this fall. Originally opened in 1907, but abandoned after small shipment. Fee owned by Murphy-Dorr-Flinn interests. Recently leased to M. A. Hanna & Co., which has overcome many obstacles in getting property in condition. Large volume of water in development and swampy nature of surface of particular annoyance.

Wade-Helmer (Kinney)—Stripping of portion of Wade, adjoining old pit of Helmer, has progressed to clean-up stage. Sixty-ton shovel engaged in clean-up; revolving shovel in bottom loading dump cars, which are hoisted on skipway and transferred to railroad cars. Wade is North Star lease, Helmer fee owned by state. Cleveland-Cliffs Iron Co. operators.

MONTANA

Deer Lodge County

Southern Cross (Anaconda)—Sinking under way, with heavy volume of water.

Missoula County

Potomac Copper (Potomac)—Arrangements concluded for power line from C. M. & St. P. road, eleven miles away, to property. Installation of air compressor plant to be completed soon.

Powell County

Monarch (Elliston)—Tramway over 1,700 ft. long being constructed to carry ore down mountain side.

Silver Bow County

Anaconda (Butte)—Copper production for August, 12,600,000 lb.; July, 11,122,000 and June, 10,530,000.

Butte & Ramsdell (Butte)—First dividend expected this month.

Butte Bullwhacker (Butte)—Shipments begun to Anaconda leaching plant at Washoe works.

Butte New England (Butte)—Operations suspended, and negotiations under way with Hayden-Stone interests for acquiring property, which adjoins Davis-Daly.

Davis-Daly (Butte)—Tonnage for Colorado mine in August, 144 cars; July, 90. Net earnings for August over \$140,000, against \$92,000 in July. Tonnage being increased.

Elm Orlu (Butte)—Proving-up in connection with controversy with Anaconda company, which is mining ore in portion of Emily vein in Pilot-Butte mine. Elm Orlu claims title because vein uniting with Emily apex inside Elm Orlu, a prior location over Emily or Pilot-Butte claims.

Tuolumne (Butte)—Crosscut on 1,000 level of Main Range mine has cut ore in Spread Delight fissure. Sinking continuing to 1,200 level, where Spread Delight will be crosscut again.

NEVADA

Clark County

Boss Gold (Goodsprings)—Semi-annual report shows net amount received from two cars of platinum-palladium ore was \$15,038.70. Two cars of copper ore also shipped during half year.

Lincoln County

Hamburg (Pioche)—Work soon to be resumed on company account. No leases to be let, though several applications received.

Black Metals (Pioche)—New machinery recently installed working smoothly, according to George Snyder, manager. Increased production assured.

Mineral County

Simon Fagan (Mina)—Shaft still in good ore, with gold and lead increasing and silver decreasing. E. S. Chafey manager.

Nye County

White Caps (Manhattan)—Gross production for August about \$26,000. Ore recently discovered beyond fault on 600 level.

Cons. Spanish Belt (Manhattan)—East heading on Ernst vein on main tunnel level advanced 22 ft. Face shows 5 ft. of good ore.

Pershing County

Nevada Valleys Power (Lower Rochester)—Again able to furnish mines and mills of Rochester district with abundance of power owing to lessened use of water by ranchers. Companies at Lower Rochester and Packard preparing to resume operations with full force.

White Pine County

Nevada Consolidated (McGill)—No copper production reported for August on account of strike.

NEW MEXICO

Grant County

Chino Copper (Santa Rita)—Copper production in August, 3,321,857 lb.; July, 3,626,354.

OREGON

Baker County

Ben Harrison (Baker)—Plans to enlarge mining plant in Greenhorn district and install flotation system. W. C. Fellows, general manager.

UTAH

Juab County

Tintic Drain Tunnel (Eureka)—Power line being strung, and work to be started on air shaft as soon as line completed. Good progress made in driving tunnel. Henry Barney in charge.

Tintic Standard (Eureka)—Railroad to mine expected to be completed middle October.

Salt Lake County

Alta Tunnel & Transportation (Alta)—Has found mineralization at 1,400 ft. depth below old Prince of Wales workings. New find thought to be in Prince of Wales fissure.

Montana Bingham (Bingham Canyon)—During August, fourteen cars shipped bringing net returns of \$20,921. Drifting from tunnel on Fortuna and Mayflower veins, latter furnishing most of ore for present shipments. Old Highland Boy ore bins in D. & R. G. yards at Bingham purchased, and to be moved to portal of Montana-Bingham tunnel, to give additional bin capacity of 250 to 300 tons.

Utah Copper (Salt Lake City)—Copper production in August, 8,640,000 lb.; July, 8,405,863.

Summit County

Park City Shipments week ended Sept. 6 were 3,623,480 lb. ore and concentrates. Shippers: Silver King Coalition, 1,200,000 lb., Ontario Silver, 1,009,000; Judge M. & S., 1,005,000; Daly West, 408,110.

Keystone Mining (Park City)—Proposed to increase capitalization from 700,000 shares to 1,000,000 shares, par value \$1, with view to procuring funds for further development.

Naildriver (Park City)—Compressor to be installed soon. Developing with view to opening more ore before making further shipments.

Park-Utah (Park City)—Work resumed with twenty men. Developing new territory in eastern section of camp, working from Ontario drain tunnel.

WASHINGTON

Stevens County

United Silver-Copper (Chewelah)—Shipped eleven cars of ore in August, also seven cars flotation concentrates, one car table concentrates carrying 20 per cent copper and 80 oz. of silver, and 3 cars of high-grade crude ore. Raise from 1,000 level driven 165 ft. and connection made, which enables removal of large block of milling ore. Ten-foot orebody disclosed 600 ft. north of main drift on 1,200-ft. level. Mill tonnage increased to 175 daily. Eighty-seven men are employed in mine and mill.

Northport S. & R. (Northport)—Suspension of smelting operations on account of labor strike in Coeur d'Alene district has permitted plant improvements. Furnaces being re-lined. About fifty men employed.

Okanogan County

Copper World Extension (Night-hawk)—Property located on Palmer Mountain. Have completed installation of Riblet tramway and are carrying on development work while awaiting favorable smelting conditions for heavy sulphide ore.

Pyrargyrite (Oroville)—Property well developed. Clearing ground for erection of 50-ton mill to treat silver ore. Tables and flotation will be used. Monroe Harmon, manager.

CANADA

British Columbia

Dolly Varden (Alice Arm)—Taylor Engineering Co. will extend railroad four miles next year to aid other properties, according to Dr. King, Minister of Public Works. Dolly Varden producing 100 tons ore daily and shipping regularly to Anyox.

British Columbia Manganese (Duncan)—Shipped two cars of ore from properties at Hill 60. Will ship regularly.

Rock Candy (Grand Forks)—Consolidated M. & S. Co. installing three additional decrepitating furnaces and rotary kilns at fluorspar property near Lynch Creek, near Grand Forks. Furnace and kiln already installed satisfactory. Four units when complete will handle 100 tons daily. A. A. Robertson in charge.

Hedley Gold (Hedley)—Will close mill this fall, on account of high wages and cost of supplies. Present surplus will be used for continuing mine development instead of paying dividends.

Mountain Chief (Renata)—Shipping 200 tons, of which much is bornite.

Noble Five (Slocan)—Syndicate composed of James Dunsmuir, of Victoria, and associates is building concentrator at Cody.

Panama (Slocan)—H. Giegerich, now sole owner, has resumed work. Tunnel in 370 ft.

Ruth (Slocan)—Eight-foot vein cut 600 ft. from portal of tunnel.

Ontario

Peerless (Boston Creek)—Shaft down 150 ft. Lateral work will be undertaken when 200 level is reached.

Bourkes (Bourkes Station)—Shaft being sunk 200 ft. below level. New 12-drill air compressor ready for operation.

Tucker-Welsh Claims (Larder Lake)—Nipissing sampling this property.

Clifton Porcupine (Porcupine)—Boulder vein opened up for 160 ft. on first level. Crosscut being driven to connect with No. 7 vein. Installation of electrical equipment nearing completion.

Dome Extension (Porcupine)—Now completing fourth crosscut into orebody on 600 level. In one crosscut thought to be at widest part of orebody 99 ft. was cut. Stopping under way.

Dome Lake (Porcupine)—Share-

holders ratified by-law for \$100,000 bond issue.

Keora (Porcupine)—Diamond drilling completed. Planned to sink to high-grade orebody indicated by drilling.

Porcupine Crown (Porcupine)—All underground workings dewatered and operations under way to 1,000 level.

McIntyre (Timmins)—About 800 ft. of No. 5 vein opened up on 1,100 level; showing higher gold content than on upper levels. Below 1,000 ft. formation changes, quartz decreasing and being replaced by sulphides, which necessitates finer grinding. Tube mill being installed. On Plenaurum heavy flow of water struck on 1,000 level, rendering deep mining difficult.

MEXICO

Jalisco

Numerous Sales of Properties reported as follows: Cuale mines to Esperanza Mines Co. of El Oro; Lupita mines to Mexico Mines of El Oro; Satorno mines to Dos Estrellas Mining Co. of El Oro; San Pedro Analco mine to San Rafael y Anexas Co.; Guachinango mine to American Metals Co.; Mazata mine to Carlos Romero and a French company which is installing 150-ton cyanide plant; Noce Bueno and Virrey mines to Cia. Real del Monte at Pachuca.

AUSTRALIA

Broken Hill Prop. (Broken Hill)—Head office in Melbourne has announced shipping strike has ended.

BRAZIL

St. John del Rey (Morro Velho)—Gold production first half August £16,500; yield per ton 47s. 2d.

KOREA

Oriental Consolidated (Unsan)—August clean-up \$62,500. Taracol operations suspended seventeen days, owing to scarcity of water. Now in full operation. Completion of Suribong power project delayed by failure of Pelton turbines to arrive.

TRANSVAAL

Rand Gold Output in August 706,000 oz.; July 725,000.

Market Report for Sept. 20 Will Appear In Issue Of Sept. 27

Industrial conditions in New York have made it expedient to close the forms of the *Journal* in advance of the routine schedule date. The usual market quotations are therefore necessarily omitted from this number. The market pages which would have appeared normally in the Sept. 20 issue will be published in the *Journal* of Sept. 27.

CURRENT PRICES—MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

	Large Mill Lots		St. Louis	Chicago	San Francisco	—New York—	
	Pittsburgh	St. Louis				Current	Yr. Ago
No. 10	3.55	4.64	4.57	5.80	4.57	5.50	
No. 12	3.60	4.69	4.62	5.75	4.62	5.55	
No. 14	3.65	4.74	4.67	5.90	4.67	5.60	
Black							
Nos. 18 and 20	4.15	5.24	5.42	6.75	5.30	6.30	
Nos. 22 and 24	4.20	5.29	5.47	6.80	5.35	6.35	
No. 26	4.25	5.34	5.52	6.95	5.40	6.40	
No. 28	4.35	5.44	5.62	7.05	5.50	6.50	
Galvanized:							
No. 10	4.70	5.79	5.97	7.30	6.20	6.85	
No. 12	4.80	5.89	6.07	7.30	6.25	6.95	
No. 14	4.80	5.89	6.07	7.30	6.30	6.95	
Nos. 18 and 20	5.10	6.19	6.37	7.60	6.60	7.25	
Nos. 22 and 24	5.25	6.34	6.52	7.75	6.75	7.30	
No. 26	5.40	6.49	6.67	7.90	6.90	7.45	
No. 28	5.70	6.79	6.97	8.20	7.20	7.75	

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	\$45.00	\$65.00	\$45.00	\$65.00
Standard openhearth rails	47.00	67.00	47.00	67.00
Light rails, 8 to 10 lb.	2.58*	3.36*	2.83*	3.36*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.79*	3.09*
Light rails, 15 to 45 lb.	2.45*	3.00*	2.70*	3.00*

* Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Francisco
	Current	One Year Ago			
Standard rail road spikes, 1/2 in. and larger	\$3.35	\$3.90	\$4.27	\$4.44	\$5.65
Track bolts	4.35	4.90	5.17	Premium	6.65
Standard section angle bars	3.00	3.25	4.22	Premium	4.60

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	—New York—		St. Louis	Chicago
		Current	Yr. Ago		
Beams, 3 to 15 in.	\$2.45	\$3.47	\$4.245	\$3.54	\$3.47
Channels, 3 to 15 in.	2.45	3.47	4.245	3.54	3.47
Angle, 3 to 6 in., 1/2 in.					
Light, 3 to 6 in.	2.45	3.47	4.245	3.54	3.47
Tees, 3 in. and larger	2.45	3.52	4.245	3.54	3.47
Plates	2.66	3.67	4.495	3.54	3.67

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$2.55	\$2.55	\$4-5

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL		Warehouse		San Francisco	Dallas
	Mill Pittsburgh	—New York— Current	Chicago	St. Louis		
1-in. and larger	\$4.20	\$4.72	\$5.65	\$4.72	\$4.79	\$6.05

	CONE HEAD BOILER		St. Louis	Chicago	San Francisco	Dallas
	Mill Pittsburgh	—New York— Current				
1/2 in. and larger	4.30	4.82	5.75	4.82	4.89	6.15
3/4 in.	4.45	4.97	5.90	4.97	5.04	6.30
1 in.	4.70	5.22	6.25	5.32	5.29	6.65
Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.						

WIRE ROPE—Discos from 1 in. list price on regular grades of bright and galvanized are as follows:

	Current	One Year Ago	New York and St. Louis
Galvanized iron rigging			+12 1/2%
Galvanized cast steel rigging			7 1/2%
Bright plow steel			35%
Bright cast steel			22 1/2%
Rigged iron and iron tiller			5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Cincinnati		Chicago	St. Louis	Denver	Birmingham
	Current	One Year Ago				
Straight	\$5.75	\$7.50	\$6.50	\$6.25	\$8.50	\$7.35
Assorted		7.50	6.30	6.40	8.75	7.60

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh: Iron bars..... 2.75c. Steel bars..... 2.35c.

COAL BIT STEEL—Warehouse price per pound is as follows:

	New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
	\$0.12	\$0.16 1/2	\$0.18	\$0.19	\$0.18 1/2	\$0.14 1/2

DRILL STEEL—Warehouse price per pound.

	New York	St. Louis	Birmingham	Denver
Solid	12c.	13c.	15c.	15c.
Hollow	18c.	14c.		20c.

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card of National Tube Co. for steel pipe, Cardy A. M. Byer's for iron, both dated Mar. 21, 1919.

Inches	BUTT WELD		Iron Black		Galvanized Per Cent.
	Steel Black Per Cent.	Galvanized Per Cent.	Inches	Per Cent.	
1 to 3	57 1/2	44	1 to 1 1/2	39 1/2	23 1/2
LAP WELD					
2	50 1/2	38	1 1/2	24 1/2	9 1/2
2 1/2 to 6	53 1/2	41	1 1/2	31 1/2	17 1/2
7 to 12	50 1/2	37	2	32 1/2	18 1/2
13 and 14	41		2 1/2 to 6	34 1/2	21 1/2
15	38 1/2		7 to 12	31 1/2	18 1/2
BUTT WELD, EXTRA STRONG PLAIN ENDS					
1, 1 1/2 and 2	46 1/2	29	1, 1 1/2 and 1 1/2	28 1/2	11 1/2
1 1/2 to 12	51 1/2	39	2 to 12	33 1/2	20 1/2
2 to 3	56 1/2	44	2 to 12	39 1/2	24 1/2
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	48 1/2	37	1 1/2	25 1/2	10 1/2
2 1/2 to 4	51 1/2	40	1 1/2	31 1/2	17 1/2
4 1/2 to 6	50 1/2	39	2	33 1/2	20 1/2
7 to 8	46 1/2	33	2 1/2 to 4	35 1/2	23 1/2
9 to 12	41 1/2	28	4 1/2 to 6	34 1/2	22 1/2
			7 to 8	26 1/2	14 1/2
			9 to 12	21 1/2	9 1/2

From warehouses at the places named the following discounts hold for steel pipe.

	New York		Cleveland		Chicago
	Current	One Year Ago	Current	One Year Ago	
1 to 3 in. butt welded	47%		43 1/2%		57 1/2%
3 1/2 to 6 in. lap welded	42%		45 1/2%		44%
Galvanized					
1 to 3 in. butt welded	31%		34 1/2%		44%
3 1/2 to 6 in. lap welded	27%		30 1/2%		41%
Malleable fittings, Class B and C, from New York stock sell at list plus 12 1/2% Cast iron, standard sizes, 10%.					

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	—New York—		—Cleveland—		—Chicago—	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	\$1.50	\$2.50	\$2.25	\$1.20	\$1.85	\$1.05
Hot pressed hexagon	1.50	2.50	2.25	1.00	1.85	.85
Cold punched square	1.50	2.50	2.25	75	1.30	1.00
Cold punched hexagon	1.50	2.50	2.25	75	1.30	1.00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50-10-75%	50%
Chicago	50%	50%
Cleveland	60-10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York		Cleveland		Chicago
	Current	One Year Ago	Current	One Year Ago	
1/2 by 4 in. and smaller	50%		50%		50-5%
Larger and longer up to 1 in. by 30 in.	40%		40%		40-5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

	Current	One Year Ago
For wrought-iron washers:		
New York	\$1.25	\$3.75
Chicago	\$3.75	\$3.00
For cast-iron washers the base price per 100 lb. is as follows:		
New York	\$6.00	\$3.75
Chicago	\$3.75	\$4.25

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots		Less Than Carload Lots	
	N. Y.	Chicago	N. Y.	Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	\$60.00	\$60.50	\$61.00	\$61.50
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt patch (in 55-lb. cans)	34.00	34.00	37.50	37.50
Asphalt felt	63.00	63.00	67.50	67.50

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply		2-Ply		3-Ply	
	e.l.	l.d.	e.l.	l.d.	e.l.	l.d.
No. 1 grade	\$1.50	\$1.75	\$1.90	\$2.15	\$2.30	\$2.55
No. 2 grade	1.35	1.60	1.70	1.95	2.05	2.30

Asbestos asphalt-saturated felt (14 lb. per square) costs \$156 per ton. Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs \$2.25 per roll in carload lots and \$2.57 for smaller quantities. Shingles, red and green slate finish, cost \$6.00 per square in carloads, \$6.25 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x 12x 12	8x 12x 12	12x 12x 12
St. Paul	\$0.056	\$0.11	\$0.162
Seattle	0.09	0.175	0.30
Los Angeles	0.082	0.154	0.236
New Orleans	0.165	0.22	0.325
Cincinnati	0.078	0.104	0.160
Birmingham	0.072	0.135	0.200
St. Louis	0.08	0.15	0.230

* F. o. b. factory, 4, 8 and 10 in.

LUMBER—Price per M in carload lots:

	8x 8-1n. x 20 Ft. and Under				12x 12-1n. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	\$50.00	\$49.00	\$48.00	\$48.00	\$50.00	\$50.00
Kansas City	51.00	51.25	51.25	51.25	57.00	48.50
Seattle	30.00				31.00	
New Orleans	45.00				48.00	63.00
St. Paul	60.00	60.00	60.00	60.00	68.50	70.50
Atlanta	55.50	57.50	58.00	68.00		

1-n. Rough, 10 n. x 16 Ft. and Under

	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	\$50.00	\$50.00	\$48.00	\$50.00	\$50.00	\$50.00
Kansas City	78.50	64.75	64.75	81.75	77.75	77.75
Seattle	31.00				31.50	
New Orleans	54.00				55.25	63.00
St. Paul	58.00	55.00	54.00	63.00	56.00	56.00
Atlanta	80.00	85.00		65.00	67.50	67.50

2x8 posts 65¢. 1" up to 32 ft., above that add .4¢. † Also tamarac
Los Angeles—Base price, 2x3x16 ft., Douglas fir or hemlock, .43¢.
Detroit—Base price, yellow pine (8x8x20), .43¢.

NAILS—The following quotations are per keg from warehouse:

	Pittsburg	Louis	Dallas	Chicago	St. Paul	San Francisco
Wire	\$3.25	\$3.90	\$5.00	\$3.90	\$5.00	\$5.00
Cut	4.925	5.40	6.40	5.00	6.65	6.65

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Year Ago	Current	One Year Ago
New York	\$2.30	\$2.30	\$2.50	\$2.50
Jersey City	2.27	2.27	2.50	2.50
Boston	2.42	2.42	2.87	2.87
Chicago	2.00	2.00	2.90	2.90
Pittsburg	2.05	2.05	2.71	2.71
Cleveland	2.32	2.32	2.15	2.15
Denver	2.67	2.67	3.07	3.07

Note—Charge for bags is generally 15c. each, 60c. per bbl

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	\$17.50	\$14.50	\$2.90	\$2.65
Kansas City	22.00	21.00	2.30	2.20*
Chicago	18.00	17.50	1.80*	1.10*
St. Louis	20.00	20.00	1.50	1.75*
Boston	22.75	18.25	3.65	3.30
Dallas	2.25*	1.25*		
San Francisco	19.00			2.00*
St. Paul	23.00	20.00	1.60*	1.50*
New Orleans		10.00		11.00†
Atlanta		1.90*	1.75*	1.75*
Denver		20.00		2.15†

* 200-lb. barrels. † Per 100-lb. bbl. ‡ Per ton.
Note—Refund of 10c. per barrel.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel (5 1/2 bbl. lots)	\$2.15	\$2.50	\$2.10	\$2.37	\$2.37	\$2.50
5-gal. cans	2.30	2.00	2.75	2.25	2.57	2.25

WHITE AND RED LEADS—In 500-lb. lots sell as follows in cents per pound:

	Red		White	
	Current	1 Year Ago	Current	1 Yr. Ago
100-lb. keg	Dry 13.00	10.50	Dry 14.00	10.50
25- and 50-lb. kegs	13.25	14.75	14.25	14.75
12 1/2-lb. keg	15.00	14.50	15.00	15.50
5-lb. cans	15.00	16.50	15.00	16.00
1-lb. cans	16.00	17.50	16.00	17.00

MINING AND MILLING SUPPLIES

	Fire		50-Ft. Lengths	
	Underwriters' 2 1/2-in.	Common, 2 1/2-in.	7 1/2c. per ft.	40%
1-in. per ft.	First Grade \$0.50	Second Grade \$0.33	Third Grade \$0.22	

STEAM—Discounts from List
 First grade, 30%; Second grade, 40%; Third grade, 45%
LEATHER BELTING—Present discounts from list in the following cities are as follows.

	Medium Grade	Heavy Grade
New York	45%	35%
St. Louis	40%	35%
Chicago	45%	40%
Birmingham	35%	30%
Denver	35-50%	30%
Cincinnati	30-52 1/2%	40-23 1/2%

RAWHIDE LACING—30% off for cut; 6c. per sq. ft. for side lacing.

MANILA ROPE—For rope smaller than 3 in. the price is 1 to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: 1-in., 8 ft.; 1 1/2-in., 6 ft.; 2-in., 4 ft.; 2 1/2-in., 3 ft.; 3-in., 2 ft. 10 in. Following is price per pound for 3 in. and larger, in 120-ft. coils.

	Denver	Kansas City	New Orleans	Seattle	St. Louis	Atlanta
Boston	\$0.25					
New York	27	27	27	27	27	27
Cincinnati	29	29	29	29	29	29
Chicago	28	28	28	28	28	28
St. Paul	26	26	26	26	26	26
San Francisco	24	24	24	24	24	24

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	\$0.90
Asbestos for high-pressure steam	1.50
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.60
Compressed asbestos sheet	0.90
Wire insertion asbestos sheet	1.10
Rubber sheet	1.50
Rubber sheet, wire insertion	1.70
Rubber sheet, duck insertion	1.50
Rubber sheet, cloth insertion	1.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.20
Asbestos wick, 3- and 1 1/2-in. balls	0.85

REFRACTORIES—Following prices are f. o. b. works:

Chrome brick	net ton \$90-100	at Chester, Penn.
Chrome cement	net ton 45-50	at Chester, Penn.
Clay brick, 1st quality fireclay	net ton 35-45	at Clearfield, Penn.
Clay brick, 2nd quality	net ton 30-35	at Clearfield, Penn.
Magnesite, dead burned	net ton 32.50	at Chester, Penn.
Magnesite brick, 9 x 4 1/2 x 2 1/2 in.	net ton 80-90	at Chester, Penn.
Silica brick	net ton 41-45	at Mt. Union, Penn.

Standard size fire brick, 9 x 4 1/2 x 2 1/2 in. The second quality is \$4 to \$5 cheaper per 1000.
 St. Louis—Fire Clay, \$30 to \$40
 Birmingham—Fire clay, \$41-\$44; silica, \$46.50-\$54.50; magnesite, \$80-\$85 chrome, \$80 to \$90.
 Chicago—Second quality, \$25 per ton.
 Denver—Silica is \$35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Chicago	Material		7 In. x 9 In.		6 In. x 8 In.	
	Plain	by 8 Ft. 6 in.	by 8 Ft.	by 8 Ft.	by 8 Ft.	by 8 Ft.
San Francisco	Douglas Fir—Green	1.48	1.33	1.33	1.33	1.33
San Francisco	Douglas Fir—Creosoted	2.12	2.00	2.00	2.00	2.00

Prices per tie at Missouri mills; St. Louis prices about 25c. bigger:
 Untreated A Grade White Oak 6x6x8 \$0.70
 Untreated A Grade Red Oak 6x6x8 \$0.55
 No. 1 80¢ No. 2 75¢ No. 3 70¢
 7x9 1/2 white oak 1.05
 7x9 1/2 red oak, No. 4 80¢ No. 5 87¢

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels

	New York	Chicago	Carload	Denver
Pure steam-distilled pine oil, sp.gr. 0.925-0.94	\$0.78	\$1.05	\$1.00	\$ 0.85
Pure extractively distilled pine oil	.68	.95	.90	.85
Pine tar oil, sp.gr. 1.02-1.035	.45	.36	.34	.55-.60
Crude turpentine	72	.68	1.68	.30
*Hardwood creosote, sp.gr. 0.96-0.99	1.73			.25-.30

* F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00	14.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50-10.00	11.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

Cleveland	131x131	131x201
	\$52.00	\$58.00
Chicago	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder

	Low Freezing		Gelatin		Black Powder
	40%	60%	80%	80%	
New York	\$0.27 1/2	\$0.30	\$0.31	\$0.31	\$2.40
Boston	0.22 1/2	.24 1/2	.26 1/2	.26 1/2	2.20
Cincinnati	.19	.21 1/2	.23 1/2	.23 1/2	2.25
Kansas City	.19	.21 1/2	.26 1/2	.26 1/2	2.45
New Orleans	.22 1/2	.24 1/2	.24 1/2	.24 1/2	2.45
Seattle	.14 1/2	.18 1/2	.25 1/2	.25 1/2	1.90
Chicago	.18 1/2	.21 1/2	.25 1/2	.25 1/2	2.15
St. Paul	.19	.23 1/2	.26 1/2	.26 1/2	2.45
St. Louis	.19	.23 1/2	.25 1/2	.25 1/2	2.40
Denver	.17 1/2	.22 1/2	.24 1/2	.24 1/2	2.25
Dallas	.18 1/2	.22 1/2	.22 1/2	.22 1/2	2.45

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Denver, 37c.; Chicago, 31 1/2c.; St. Louis, 31c.

SODIUM SULPHIDE—In New York the price per pound is .05c. for concentrated, 3c. for crystals. The St. Louis price is 5c. for concentrated. The Denver price is 7 1/2c. for crystals. The Chicago price is 5c. for concentrated, 3c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 10c. per lb.; Chicago, 13c.; Denver, 22c.; St. Louis, 15c.

ALUMINUM DUST—Chicago price is 1.10 per lb.

MINERS' LAMP CARBIDE—Prices net f. o. b. cars at warehouse points.

	Union		Cameo		Union	
	100-Lb. Drums	Per Ton	100-Lb. Drums	Per Ton	25-Lb. Drum	Per Drum
East of the Mississippi, North of Chattanooga	\$106.00		\$101.00		\$1.52	
Southeastern portion U. S. A.	115.50		110.50		1.63	
Texas (except El Paso)	124.00		119.00		1.74	
El Paso, Texas	126.00		121.00		1.77	
Denver, Colo.	124.00		119.00		1.74	
West Coast	129.00		124.00		1.81	

Engineering and Mining Journal

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Present Industrial Crisis Must Be Met by

Dividing Profits with Labor

UNREST and discontent are world-wide. Dissatisfaction with the existing social and industrial order is practically universal.

In Russia, Bolshevism is virtually a strike against the former and now extinct government; but every other country—every nation in which men think and feel and read—is seething with the spirit of revolt and desire for change, which finds expression in strikes where there is even the semblance of organization to give form to concerted demands. And amid the epidemic of strikes and threats of strikes, unorganized labor—unnumbered artisans and workers, professional and other—must accept such poor solace and hope as may be afforded by protest from soap box, from platform, and in reams of letters to the press and to legislative bodies. The trades unionists, with, in general, a living wage, are demanding further recognition. The vast body of the unorganized, squeezed into semi-starvation by the weight of opposed industrial forces, are in a desperate and dangerous plight.

So deep-seated is the determination to alter present conditions, so vehement is the voice of protest, so all-embracing is its character, as to compel the conclusion that it has a common origin and springs from a common cause. And before a corrective can be administered, that cause must be identified, and a remedy must be sought, found, and applied. First, the facts must be determined; second, the source from which they spring must be established, and, third, a means for resolving the industrial problem must be erected.

Strikes—en masse, or by the individual as he quits his job—and the impulse that inspires and fosters them, are produced by, first, suffering, privation, and want; second, by discontent, arising from (a) insufficient pay; (b) too long hours; (c) oppressive and humiliating conditions of employment; (d) high prices (decreased purchasing power of circulating money medium).

Labor wants, and is incessantly demanding, a share of the profits of industry—and to a marked extent a part, also, in the management. It has been the habit of Labor to insist upon, and of just employers to accord, a *living wage*. Labor is no longer satisfied with a *living wage*. It is demanding a profit from the turnover. And it has learned that lesson from Capital—from Management.

Industry must readjust its practice so as to pay a profit on Labor as well as on Capital. A *living wage* is no better for Labor than for Capital. Capital—Management—demands and takes security, wage, and profit. Labor now demands a *living wage*, security, and

profit. Both Labor and Capital produce *all profit*. Profit should be equitably divided.

It is begging the issue to maintain that Labor will not accept its share of business loss. It does. If a business does not prosper, it fails. Work ceases. The worker must get a new job. If it prospers, he, with Capital and Management, has achieved the result. He must and will share in the profits—plus a *living wage*. The most astute and far-seeing bankers and publicists have been proclaiming this for years. And the managers of Industry, with noteworthy exceptions, immune from the prevailing pestilence, have steadfastly refused to grow in wisdom with the world, and have been sitting tight on the safety valve. And now the machine is showing unmistakable signs of excessive heat. Who permits and encourages the impending explosion must go up with it. Apportioning the blame—fixing the guilt—will not refabricate the destruction.

It is the great privilege of the mining industry to be able to point the way to justice in this acute crisis. The managements and men—twin factors in production—have agreed, in many camps, plants, and communities, upon a plan of operation so fair, so reasonable, so just, that even a child can understand and approve it. Wages of metal miners, under extensively prevailing scales, depend on the market price of the joint production of Capital and Labor. Profiteering in the necessities of life is curbed by approved control of retail distribution. Not in a day has all dissension been dissipated, but the way seems light, and the principle to which adherence has been pledged is on its face acceptable in good faith.

Not all industries sell their product by the pound at periodically determined fixed market prices. But all business men worthy of the designation know how to find the costs of production—and how to apportion them. And the time has come that Labor knows, also, how to find the costs—and the income; and even the rank and file are convinced that Capital is appropriating all, or nearly all, of the profits.

Evolution has made another turn of the wheel. Autocracy—political, social, ecclesiastical, and industrial—lies buried in the soil of France. Accommodation to the new order, readjustment on the new and more equitable basis, is the only alternative to a forced and violent ultimate acceptance of the conditions of the New Era. The sun of industrial feudalism is setting.

Strikes are an abomination. They are costing the world millions every day, and wasting the substance and strength of the race. The imperative need of the hour is machinery for the peaceful and orderly adjustment of industrial issues.

Americans and patriots all—proved and tried—management and men must gather at the counsel table, and with mutual patience, sympathy, forbearance, and determination to do justice, erect an industrial program that all can accept with honor and with self-respect.

Hoover

OF THE triumvirate of heroic figures that emerge from the Great War, Herbert Hoover stands forth with a distinction new to the annals of the race. Destiny accords to few men so overflowing a measure of successful and notable achievement, or such fervent appreciation of public service well performed.

New York has received perhaps two million Americans that served "over there," and the Grand Ballroom of the Waldorf has served as a setting for many important and historic episodes, but on no previous occasion has it assembled a more distinguished or representative American gathering than that which welcomed Hoover, engineer, general, master executive, and man, back to his home and to his own people.

Hoover is now at the very peak of his power—spiritual, intellectual, moral, physical. No other man embodies to such superlative degree the technical equipment, world experience, and tested and proved ability as an organizer of industrial resources. The world's best-loved man, Hoover makes at this hour an impelling appeal to all constructive elements of American citizenship. Tied to no party, owing no faction or class allegiance, he would win to his support all elements of American life that are disgusted and weary of the incessant and futile playing at the 1900 brand of politics that has discredited and disgraced Congress for the last five years. Mention, at the reception in his honor, of his conspicuous availability as the country's next Chief Executive, brought that notable assemblage to its feet as one man, with a roar of cheers as spontaneous as it was sincere.

Hoover has richly earned a rest. He must have it. But he may not, with the consent of the people of America, retire.

That part of Hoover's address, delivered on the occasion of his reception on Sept. 16, dealing with the future of America, constitutes a veritable charter of the coming industrial dispensation. It is his platform. It is just.

The *Journal* presents for nomination for President of the United States of America at the election of 1920, Herbert Clark Hoover, Servant of Humanity.

The Steel Strike

IN HIS refusal to treat with the labor unions in regard to the adjustment of certain alleged conditions in the iron and steel industry, Judge Gary gives two reasons: First, he does not believe that the committee appointed by the unions represents the bulk of the workers, and, second, he maintains that a conference with this committee will be regarded by them as a recognition of the "closed shop."

To this interpretation of the situation, John Fitzpatrick, chairman of the committee of the American Federation of Labor for organizing the iron and steel industries, takes exception, stating that if these are the real reasons they are not sufficient "to plunge the industry into a great labor conflict." According to Mr. Fitzpatrick, employees are therefore compelled to resort to a strike; to quit work in order to prove to Judge Gary that he is wrong in his first surmise. The second reason given by Judge Gary in his refusal is pooh-poohed as having "absolutely no basis whatsoever in the present controversy."

It would be interesting to know, of course, just how many employees of the Steel Corporation are unionists, and, to go a little further, just what number of these desire representation in this instance. Approximate

figures state that the number of those employed by the Corporation totals 240,000. Of these the greater proportion, it may be assumed, are eligible to become affiliated with the unions, the remainder being employed in professional or supervising capacities, and therefore undesirable as union members. Be this proportion what it may—and it seems highly improbable that the Corporation is wholly in the dark as to its employees' affiliations—the word has gone forth that it is essential that Judge Gary must be "shown" the desires of the steel workers, and the manner of demonstrating their position is to take the form of an immense tie-up.

Consideration of the second principle involved brings more or less confusion to the unprejudiced observer. Judge Gary takes the stand that in holding a conference with the representatives he would commit his company to recognition of the closed shop. The union, on the other hand, says that this statement dodges the real issue. To those who have followed earlier controversies between the labor unions and the Steel Corporation, it is a well-known fact that the objection to the closed shop dates back to the very inception of the organization. Apparently, then, the latter is only maintaining a consistent policy. Mr. Fitzpatrick's exception, in light of the above statement, seems paradoxical.

Regardless of circumstances and the arguments presented by both sides of the controversy, the issue seems to be one in which opposing wills clash against each other, both with a firm resolve to see the matter to a finish. Until a settlement is agreed upon, the public must suffer the consequences. And the public is getting tired of strikes. As stated in a recent editorial of the *New York Sun*, "the people are tired of being threatened and coerced, of bleeding through the nose eternally for the benefit of a minority. They think the time has come for a moratorium of trouble until conditions in a broad sense adjust themselves."

An issue of such magnitude as the threatened steel strike is not a matter to be dealt with lightly. It is an intensely serious issue, and one in which there can be permitted no personal aggrandizement.

Certainly the movement will meet with little sympathy from the public if such a motive is suspected. It would not take kindly to the idea that the strike was a possible result of another labor leader's desire to fill Mr. Gompers' shoes.

Mexico

THE Senate Foreign Relations Committee is attempting to ascertain the true conditions in Mexico. Inman's book, "Intervention in Mexico," has been the subject of searching inquiry. Members of the committee have questioned Mr. Inman closely in order to determine whether there was any basis for his accusation that certain interests were spreading false, or greatly exaggerated, reports for the purpose of bringing about intervention. Cross-questioning developed nothing to support Mr. Inman's insinuation.

The *New York Times* suggests that it is unfortunate that the sub-committee having charge of the inquiry is composed of an avowed interventionist, a man reflecting border sentiment, and an opponent of the administration. Perhaps this is not an ideal committee for a judicial investigation of the subject, but it appears from the questions that are being asked that every effort is being made to learn the truth. The fact seems to have been brought out that if a fair and impartial investigation is being circulated in the United States that it will be considered

propaganda in connection with the Mexican situation, its object is to place before the American people an accurate picture of conditions in Mexico, with the belief that the public, when once informed, may be depended upon to insist that evil conditions be corrected.

American mining interests are so extensive in Mexico, and so many American miners are looking forward to the time when they can again resume their peaceful vocation in that country, that we await with interest any constructive suggestions that may result from the present investigation.

Postal Zone Law Should Be Repealed

OUR United States postal service reaches every home and every citizen. It is such an instrument of information and education and unification that to restrict it in any way is to hurt the country. The postage rate should not be determined on the basis of cost. Cheap postage on periodicals and newspapers has made the American nation a nation of readers. This is a national benefit. To raise the postage on publications means that the publishers must add this charge to the price of their periodicals, and thus lessen reading. This is a bad thing. Compare the achievements of those nations wherein magazine reading is universal, with the backward conditions in those nations which have never encouraged widespread reading nor the extensive distribution of periodicals and newspapers.

In discussing the dangers of the postal zone law, Senator Arthur Capper, of Kansas, said: "So clearly and firmly has the American postal principle been held, that postage cost must not determine postage rate, that our postoffice has delivered letters and publications to Yankee whaling ships at Point Barrow Circle for two cents that cost over \$5.60 to deliver. I would ask any thinking citizen if it is not just as important that a Yankee skipper home from a whaling cruise shall be able to understand and vote intelligently upon the great public questions of the day as it is for the citizen who has stayed at home? This principle is sound. Shall not California, Kansas, and Maine have equal postage on all information as an American right?"

"It has been alleged—and maybe some have fallen victims to its un-American and illogical absurdity—that cheap postage on magazines and newspapers is a subsidy to the publishers. It is not a subsidy to the publishers. It is, if you want to use the term 'subsidy,' a subsidy to American readers. You can determine this for yourself. Who receives the benefit or subsidy when the Yankee skipper of a whaling ship off Point Barrow, in the Arctic Circle, receives news from home which costs \$5.60 to deliver? Is that a subsidy to his home newspaper, his periodical or magazine, or is the benefit of that to the ship captain himself and his citizenship and our united and national standards of intelligence?"

In every case of cheap postage the primary and chief benefit is to the receiver. Why should San Francisco pay higher postage than New York merely because certain information happened to be printed in New York? Why discriminate against San Francisco?

Congress is being flooded with editorials from the country newspapers demanding that the postal-zone law be retained. At present they have their field of readers unchallenged. Congress depends largely upon public sentiment. These country newspapers are supplying their readers as well as Congress with misinformation and misstatements of fact as to the Post Office Depart-

ment and postal functions. After peace legislative measures are out of the way, Congress will be ready to consider national legislation which has been impressed upon it as of paramount importance. If you believe that the postal-zone legislation is of importance to you as a citizen, and to the unified national consciousness of this country, then we urge you to write or telegraph to your Congressman to oppose the vicious postal-zone system, and use his influence to secure its repeal.

Promoting Safety

THE prevention of accidents in the mining industry is a subject which has been studied intensively only within the last ten years, but in that time wonderful progress has been made. That accident prevention is not only a humanitarian measure, but a business one as well, has been definitely proved. Practically all of the larger companies have safety engineers who devote all of their time to improving the conditions in mine, mill, or smeltery from the standpoint of the manual worker.

Next week, beginning on Oct. 4, as we state elsewhere in this issue, the Eighth Annual Safety Congress will be held in Cleveland. The Congress deserves and will have a large attendance, for it will serve as a clearing house for new ideas. It is sponsored by the National Safety Council of Chicago, well known as the central organization for the promotion of safety in American industrial plants.

The work of the safety engineer nowadays leads him into varied fields. In addition to putting up a guard rail at the proper place, he must know something of medicine and sanitation; he must know the best form of light and where to put it; he must often be an editor of the works paper; he must be an educator and know how best to teach the workers and inculcate the safety germ into their lives; and lastly, he must be a good mixer, an agreeable fellow who will secure co-operation and whose good ideas will be enthusiastically accepted by the managers as well as by the manual workers.

The men who have studied safety problems will get much good from the Cleveland convention, but it is the class who have never given the subject much thought that will reap the greatest benefit. It is regrettable that more of these men—men who do not even know that there is to be a convention—cannot be present.

There is a general idea among the layman that the one who steps into a mine cage takes his life in his hands. This is due chiefly to three reasons—general unfamiliarity with mines (we fear what we do not understand), the occasional holocausts in coal mines, and the frequency of minor accidents incident to the nature of the work. Such meetings as the Safety Congress provides will help to prevent the last two, and the first reason is something about which we do not need to worry.

Market Report for Sept. 27 Will Appear in Issue Of Oct. 4

INDUSTRIAL conditions in New York have made it expedient to close the forms of the *Journal* in advance of the routine schedule date. The usual market quotations are therefore necessarily omitted from this number. The market pages which would have appeared normally in the Sept. 27 issue will be published in the *Journal* of Oct. 4. The Sept. 20 report appears in this issue.



INTERIOR OF LABORATORY OF INTERNATIONAL NICKEL CO., PORT COLBORNE, ONT.

Photographs From the Field

BAILY ELECTRIC BRASS FURNACES PREVIOUS TO SHIPMENT ON A MEXICAN CONTRACT

Furnaces are of the tilting type, and are rated at 105-kw. electrical capacity, 1,500-25. hearth capacity, and a melting rate of 600 lb. per hour



Development of Reciprocating Air Compressors

Machines of Small Capacity Were Formerly Not Expected To Be Efficient—Change From Steam to Electric Drive Resulted in Many Makeshift Devices—Modern Machines Highly Developed

BY S. T. NELSON

IN CONSIDERING recent developments in air compressors, it is advisable to go back at least ten or twelve years, as at that time the development of the present modern compressors began to evolve from what was then considered to be the acme of perfection in compressor building. Prior to the panic of 1907, which might be referred to as one of the country's cyclic readjustment periods, industry was so busy for a number of years that there was little either of time or incentive to bring about changes in engineering and industrial development. As long as industry travels along in a regular and undisturbed channel, the need of improvement is not usually forced by economic factors, as conditions have automatically so adjusted themselves that the necessary means are forthcoming to keep business going from day to day. Eventually, however, a readjustment period arrives, and compels the realization that a reduction must be made in the cost of production, and that old, stereotyped methods must be revised and new conditions met.

Before the year mentioned, air compressors of about 1,000-cu.ft. capacity piston displacement and up were expected by purchasers to be high-grade, efficient machines. Purchasers of compressors of less than 1,000-cu.ft. piston displacement did not usually insist very strongly on high efficiency, as there was a prevailing notion that a compressor having a capacity of less than 1,000-cu.ft. piston displacement was so small, and therefore so unimportant, that economy in its operation was not considered of vital importance.

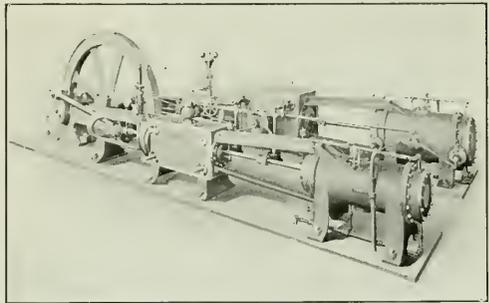
SMALL COMPRESSORS NOT ECONOMICAL

Purchasers were usually told by compressor manufacturers (and it is practically true today) that, under varied operating conditions, the Corliss engine was the most economical prime mover in existence, and, inasmuch as a Corliss engine had to be used in order to secure good economy, it was impracticable to make a smaller compressor than 1,000 cu.ft. of an economical type, as Corliss engines smaller than this size would not show a sufficiently high steam economy to warrant the price. So manufacturers furnished to the trade compressors of the slide-valve type of the most antiquated engineering. In many instances patterns and designs were used that were over twenty years old. This was true not only of the steam end, but of the air end of the compressor as well.

Small mines and factories, often with limited means, were compelled to use these extravagant profit destroyers, there being no economical machines of that size on the market, leaving the large economical machines to the large and profitable mines and industries, and wellnigh in a literal sense exemplifying the old axiom, "Unto every one that hath shall be given; but from him that hath not shall be taken away even that which he hath."

As the readjustment period of 1907 proceeded, en-

gineering thought had to busy itself with the problems "What shall we do to be saved?" and, "What can we do and what must we do to save others?" as those are questions that are forced upon engineers of all kinds, more especially during readjustment periods. So engineers were confronted with the necessity of producing air compressors of greater capacity for less money than the old-fashioned makeshift compressors that had been in use up to that time. The word "makeshift" does full justice to the system then prevailing. Up to that time nearly all builders of the large and economical type of compressors would first select a cross compound engine of a size nearest their requirements. Behind,



OLD TYPE OF COMPOUND STEAM-DRIVEN TWO-STAGE COMPRESSOR, WITH AIR CYLINDERS COUPLED TO REAR END OF STEAM ENGINE

and sometimes in front of the steam cylinders a pair of air cylinders would be placed of a size which could be operated by the steam engine that happened to be on hand or that could be furnished with the least cost of changes to patterns and drawings. Frequently, if the compressor manufacturer did not happen to have a sufficiently cheap Corliss engine of his own, he would fish around among other engine manufacturers until he found one. The compressor builder in that case furnished the air cylinder only, and if ever anything deserved the name "makeshift" the large Corliss compressors of that period certainly did.

If five specifications were furnished for a cross compound two-stage compressor there would be cylinders of as many different sizes as there were bidders. For compressors of 4,000- or 5,000-cu.ft. piston displacement there would be four or five inches difference in the high-pressure cylinder and twice that difference in the low-pressure cylinder, with strokes ranging all the way from thirty-six to forty-eight inches and even up to sixty inches. After the compressor manufacturer had listened to all of the weighty reasons why each bidder had figured on a machine particularly suited for his needs and why there was such a difference in cylinder dimensions between his and the others, the

would-be purchaser found himself in such hopeless confusion that he often had to submit the proposition to a consulting engineer. The latter would decide, at least in most cases, on a size and design such that none of the bidders had either drawings or patterns that would fit, so the result was a new design carrying with it so great a change in drawings and patterns that the cost of the installation was out of all reason. Then it was handed over to the purchasing agent, and the price per pound figured out. Often the contract was secured by the one who poured such a large quantity of pig iron into the sole plates that his price per pound was the lowest, every one being satisfied that he had secured the greatest bargain when he had secured the greatest tonnage. In most cases more vital points were left out of consideration.

ADAPTION OF STEAM MACHINES TO ELECTRIC DRIVE

When inquiry was made for electrically driven compressors, which began to come into use ten or twelve years ago, all builders of large compressors, without exception, would take these makeshift steam-driven compressors, remove the steam cylinders, and place the air cylinders nearest to the frames. Then the electrical companies would furnish motors developed and made especially for these clumsy, heavy, slow-moving affairs, and another makeshift was added to all the others, each one built up by itself and hardly ever any two alike. In many instances the motor alone for one of these slow-running electrically driven steam machines would cost more than a modern electrically driven compressor, including motor.

The conditions outlined had to be corrected if efficiency was to be improved, first cost and building space reduced, and also size of foundations. The only practical solution of the problem was to design compressors of standard types that could be manufactured in quantities. It also became necessary to eliminate the old-fashioned mill and factory engine from the compressor field and design an engine suitable for compressor service and for the particular machine with which it was used. Compressor builders had to cut loose from the hindrance that the factory or mill engine had imposed upon them.

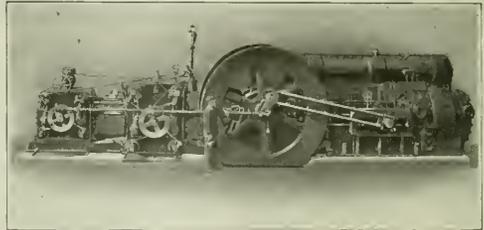
SPEED INCREASED AND WEIGHT DECREASED ABOUT ONE-THIRD

One of the principal compressor manufacturers developed a self-contained, two-stage, tandem, Corliss, compound compressor in five sizes, the capacities in cubic feet of piston displacement ranging as follows: 1,000, 1,500, 2,000, 2,500, 3,000. The fact that these engines were so designed that they could not be used for any other purpose than for driving the compressor with which they were designed to work enabled the designers to use the material of which they were made very advantageously. When consideration is given to the increased speed which was possible owing to changes in design, the weights of these units, for a given quantity of air, were from one-third to one-half of the weight of the old-style, slow-running, cross compound compressor. As a result of the self-contained design, the floor space was reduced to one-third of that occupied by a cross compound compressor of the same capacity. Inasmuch as the strains and stresses were contained within the machine itself, and would not have to be transferred from side to side, as in a cross

compound compressor, which, by the way, depends upon its foundation as a sort of backbone to hold it together, the foundation cost was reduced to about one-third, for all that was needed was a bed to rest upon, the working stresses being taken up in the machine itself. Thus, at one stroke, more was accomplished in the reduction of cost of material and floor space, and first cost of the compressor and compressor foundations as well, than had been accomplished in the line of compressor engineering for over twenty years previously. These machines were made up in quantities of from three to twelve of each size at a time.

MULTIPLE UNITS AFFORDED MORE FLEXIBILITY

If more air was needed than one compressor could supply, two units were installed, which would provide a load flexibility that could not be obtained with the old-style, cross compound machine without seriously affecting its economy. For instance, a 5,000-cu.ft. cross compound compressor could work economically only when running at from two-thirds to full load and speed; so when, as often occurred, only one-fourth of its capacity was required, the air loss became great on account of leakage, and steam loss became excessive on account of cylinder condensation, owing to its slow speed. When two units of the tandem compound type are used, say one of 2,000 cu.ft. and one of 3,000 cu.ft.



MODERN TYPE OF TANDEM COMPOUND CORLISS TWO-STAGE STEAM-DRIVEN COMPRESSOR

capacity, making 5,000 cu.ft. total capacity, either one can be operated at its most economical volume at all times.

Another important advantage attained was in the time required for delivery. In normal times these machines can be delivered immediately, and can be installed as soon as the foundation is built, eliminating the necessity of waiting five to ten months or longer for a machine to be made up to order.

To sum up, the advantages accomplished by this re-designing of the Corliss compressor were: saving of from one-third to one-half of the material; reduction of building space and foundation cost by one-half to one-third; a considerable reduction in the first cost of the machine itself; immediate delivery in normal times, and improved operating efficiency due to the load flexibility.

THE FIRST CRUDE ELECTRICALLY DRIVEN COMPRESSORS

The development and improvement of electrically driven compressors from the crude machines existing previous to the period mentioned is equally interesting. Many electric power plants were being developed, or under consideration. Propositions were under way, so that when electric power became available it would take the place of steam in a great many places. In anticipa-

tion of this event, a large number of the old-fashioned, slow-moving, cross compound Corliss compressors were equipped with pulleys for rope-drive, or belt pulleys, of sufficient weight to act as flywheels as long as steam was used. When electrical energy became available a belt or rope drive was to transmit the power from the motor to the combination rope-belt pulleys and flywheels, the steam cylinders would be disconnected, and by this apparently easy process the transformation from steam to electric drive was to be accomplished.

I will relate one instance that will prove, in the light of recent developments in electrically driven compressors, the impracticability of this scheme. In this case the flywheel that was to act as a pulley for the rope drive was 22 ft. in diameter, and weighed between 60,000 and 70,000 lb. The capacity of the compressor was 5,000-cu.ft. piston displacement. The weight and size of this pulley were in themselves sufficient to condemn this scheme, to say nothing of the first cost of an 800 hp. motor with its rope drive, the addition to the building that would be necessary to house the motor and the rope drive, and the upkeep of the rope transmission. It therefore was decided that it would not pay to change from one to the other, as a modern, up-to-date compressor could be bought for less money, including motor, than the changes would cost, and the newly purchased machine would be more efficient. This case is only one of many.

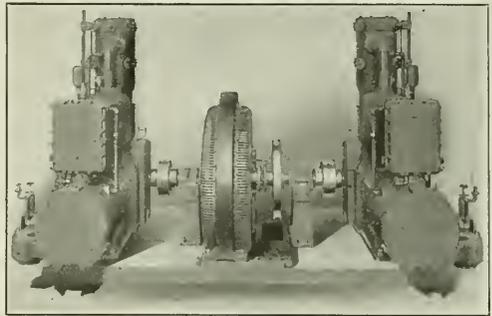
SHORT AND LARGE DIAMETER CYLINDERS THE NEXT STEP

When it was discovered that a compressor so designed that it could be driven with either steam or electricity was an uneconomical, impracticable, and wasteful machine, the development of the purely electrically driven compressor began in earnest. A line of compressors of the cross compound, two-stage type having shorter cylinders and larger diameters than those hitherto used was developed by various manufacturers. This change was made for the purpose of increasing the rotative speed so as to keep the size of the motor, and consequently its price, at the lowest point possible, though a number of compressor builders still wanted to cling to certain details in design and construction that had become standard practice in connection with the slow-speed compressors.

The mechanically moved intake and discharge valves, with their heavy reciprocating valve gears and compressors designed with mechanically moved intake valves and spring-closed poppet discharge valves, were persistently favored. To meet competition, the speeds of these machines were constantly increased beyond the point at which these reciprocating valves and valve gears could be depended on for uninterrupted service, and in consequence breakages and shutdowns were numerous. A number of manufacturers had to recede from the high speeds to slower speeds, which, of course, was a step in the wrong direction, for the reason that it involved the use of an old design of valve gear that was unsuitable for electrically driven machines. These valve gears were not only troublesome at the start, but they became more so because of the difficulty of lubrication, as, even with the best oils procurable for the air cylinders, carbon deposits on the outside of the rolling valves and on the guide plugs of the poppet discharge valves necessitated frequent cleaning and delay in operation.

But when everyone was busy wondering what to do next to overcome this difficulty, the steel makers in this country, unknown to themselves, came to the rescue. Steel plate was then being manufactured from some of the new alloys for saw blades, clock springs, vibratory diaphragms, and like articles, that was much stronger and tougher than the ordinary carbon steel that had been made up to that time. Some manufacturers conceived the idea that a piece of that strong and flexible alloy steel could be used for the intake and discharge valves of compressors in much the same manner as the leather valves used in the blast furnace blowing engines of thirty-five or forty years ago.

The experiment was tried, and it was a success from the start, and the discovery marked the real starting point in the modern electrically driven compressor. The reciprocating valve gears, with their eccentric rods, eccentrics, bonnets, rolling valves, adjustable keyheads, and many other contraptions that had been carried over from the steam-driven compressor, were immediately discarded. So were valve guides, bored-out seats, springs, cushioning devices, and other parts, for the poppet discharge valves. In many cases from 1,500 to 2,000 lb. of reciprocating parts were discarded and



MODERN TWIN ANGLE COMPOUND COMPRESSOR, CONSISTING OF TWO COMPLETE COMPOUND COMPRESSORS, EACH CAPABLE OF BEING OPERATED AS A SEPARATE UNIT

from 10 to 12 lb. of steel plate valves took their place. Because of these easily moved valves, made up of steel plate from .022 to .044 in. in thickness, an additional increase in speed became possible, and lubrication trouble, which had been very annoying up to that time, was practically overcome, as the only parts of the cylinders in a modern compressor that need lubrication are the cylinders themselves and the pistons.

A lubricator having ten or twelve oil plungers was necessary for the operation of the two air cylinders and valve gears of the former type of mechanically moved valves. Under improved conditions it was possible to use two plungers instead of ten. With the increased speed due to the lighter valves came another reduction in the price of the motor.

HEAVY FLYWHEEL STILL A DEFECT

Two objectionable features were still left—the throwing effect of the reciprocating pistons and connecting rods, especially when the compressor was running unloaded, and the heavy combination belt pulley and flywheel in the belt-driven compressor. They also remained the necessity for a heavy flywheel in addition

to the rotor, on the type of compressor that carried the motor on its shaft. These objections have now been met by some makers.

A WELL-BALANCED MACHINE FINALLY DEVELOPED

The angle type of compressor, built on the same lines as the Ball & Wood compound engine, and the large 10,000 hp. angle compound Corliss engines that were built for the Manhattan Street Railway Co. in New York City, solved both the annoyances due to the reciprocating masses and to the flywheel. Placing the two air cylinders at right angles to each other, and fastening the connecting rods of the two pistons to the same crank-pin, placed the reciprocating masses in such a position relative to one another that, by designing the crank so as to contain within itself the weight necessary to balance pistons, piston rods and connecting rods, a machine was secured that would run without vibration. In other words, the shocks and jars due to the reciprocating masses were eliminated by this arrangement, and a perfectly balanced machine was the result. Placing two angle compound machines side by side and connecting them to the same shaft in precisely the same manner as the 10,000 hp. Manhattan Street Railway engines, above referred to, and putting the electric motor on the compressor shaft between the two machines, produced such a uniform working cycle, with eight points of resistance per revolution, that a flywheel became an unnecessary adjunct. So at last the two objectionable features, shocks and jars due to unbalanced reciprocating parts, and the flywheel, were eliminated. The result was one of the most efficient, durable and economical compressors that have been invented up to this time.

Now the users of compressed air may have the same economical operating cost below 1,000-cu.ft. capacity that formerly could be enjoyed only by those whose operations were sufficiently large to warrant compressors of 4,000-, 5,000-, or 6,000-cu.ft. capacity.

Butte & Superior Mining Co.

The twenty-second quarterly report of the Butte & Superior Mining Co., covering the second quarter of 1919, was issued on Aug. 8, 1919. The following statement shows the principal operating features for the quarter, as compared with those for the first quarter of 1919:

OPERATING DETAILS BUTTE & SUPERIOR MINING CO., FIRST AND SECOND QUARTERS, 1919

	Second Quarter	First Quarter
Dry tons of ore milled.....	99,562	71,298
Average zinc content (per cent).....	14.439	15.436
Average silver content (oz. per ton).....	6.475	6.710
Zinc concentrates produced.....	25,905	19,307
Average zinc in concentrates (per cent).....	54.064	54.50
Total zinc in concentrates (lb.).....	28,010,363	21,044,540
Average silver in zinc concentrates (oz. per ton).....	22.113	22.012
Mill recovery (per cent zinc recovered in concentrates).....	97.287	95.606
Direct mining cost (per ton).....	\$5.9774	\$6.4003
Direct milling cost (per ton).....	\$2.7851	\$2.9967
Total direct cost mining and milling (per ton).....	\$8.7625	\$9.3970
Indirect, or general costs (per ton), exclusive of freight.....	\$0.7080	\$1.3760
Total costs (per ton).....	\$9.4705	\$10.7730

Exploration work during the quarter was confined principally to diamond drilling, there having been 626 ft. of drilling completed. Development work done consisted of 3,341 ft. of drifting, 1,674 ft. of crosscutting, 548 ft. of raises and winzes, and 144 ft. of shaft raises. The tonnage of ore developed during the period was somewhat greater than the tonnage extracted, so

that the ore reserves show a slight increase as compared with the previous period.

The amount of ore mined was considerably greater than during the first quarter, but was markedly below normal production, as a consequence both of the low zinc prices prevailing and of the shortage of labor. The cost of mining was \$5.98 per ton of ore, as compared with \$6.40 per ton for the previous period.

The end of the quarter showed a marked increase in the tonnage of ore milled, and there was a continued slight decrease in milling costs. There was milled during the quarter 99,562 tons of ore, at an average cost of \$2.785 per ton, as compared with an average cost per ton of \$2.996 for the first quarter. Mill operations showed a recovery of 97.29 per cent of zinc in concentrates, averaging 54.06 per cent zinc and 22.11 oz. of silver.

In the month of June, as a result of the decision of the United States Supreme Court in the flotation case, the amount of oil was increased to more than 1 per cent, with a resultant slight increase in the cost of milling, due to the additional oil contained therein, but with particularly satisfactory metallurgical results, which clearly demonstrate that no serious obstacle will be encountered in the altered practice.

Financial results of operations for the second quarter, as compared with the previous period, are as follows:

FINANCIAL STATEMENT BUTTE & SUPERIOR MINING CO., FIRST AND SECOND QUARTERS, 1919

	Second Quarter	First Quarter
Net value zinc concentrates at mill.....	\$608,741.45	\$382,156.11
Net value lead concentrates at mill, and residues.....	368,664.01	250,336.85
Metal inventory and quotations.....	150,000.00	0
Miscellaneous.....	25,727.13	19,193.61
Total.....	\$1,153,132.59	\$651,686.57
Operating costs, taxes, etc.....	942,906.51	768,065.42
Profit.....	\$210,226.08	
Loss.....		\$116,378.85

The above statement includes charges for depreciation, taxes, etc., but no allowances have been made for depletion. The average price of zinc used for estimating the profits for the quarter was 6.38c.

On June 2, 1919, the Supreme Court of the United States rendered its decision in the case of Minerals Separation, Ltd., et al. vs. Butte & Superior Mining Co. The decision of the Supreme Court reversed and modified the decisions of the Circuit Court of Appeals for the Ninth Circuit and the United States District Court for the District of Montana. The substance of the decision of the Supreme Court of the United States is that when the Butte & Superior Mining Co. was using a fraction of 1 per cent of oil on the weight of the ore it was infringing the patent of Minerals Separation, Ltd., and that when it was using 1 per cent or more of oil on the weight of the ore it was not infringing the patent of Minerals Separation, Ltd.

As Butte & Superior has clearly demonstrated that satisfactory results will be obtained by the use of 1 per cent or more of oil on the weight of the ore, the injunction enjoining it for using less than 1 per cent will not disturb or materially affect the operations conducted at the Butte & Superior plant.

Manganese Ore Exports From India for the fiscal year ended March 31, 1919, were 385,361 gross tons, as compared with 433,331 tons in the previous year, according to *Iron Age*. Of the former exports Great Britain took 295,230 tons, and France, 57,400 tons, with smaller amounts to Belgium, Italy, Japan, and the United States.

Geology of the Gogebic Range and Its Relation To Recent Mining Development—Part III*

Influence of Faults on the Forming of Orebodies Such That Careful Study Is Necessary in Planning Development Work—Four Types of Faults Evident, Each Bearing a Definite Relation to the Iron Formation

BY W. O. HOTCHKISS

State Geologist and Consulting Engineer, Madison, Wis.

THE strike of the Ironwood formation is shown in Fig. 1¹. The dip in the mines varies little from 60 degrees to the north, excepting where folds or faults have caused local changes. Toward the extreme east and west ends of the range, variations are more common, and the dip varies from a steep northward overturn (in minor instances only) through horizontal to an occasional steep southward inclination.

Folding.—Folds of a minor character are occasionally found in the productive mines, but they are only small drag folds a few feet across. The west end of the range, from a few miles east of Mellen to Lake Namakagon, has been folded on a much larger scale. Fig. 18 shows a section of the fold in Section 9, T.45N., R.2W.,

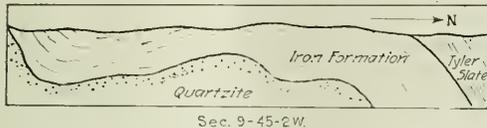


FIG. 18. CROSS-SECTION OF THE FOLD IN THE IRONWOOD FORMATION IN SEC. 9, T. 45N., R.2W., SHOWING THE QUARTZITE, THE IRON FORMATION AND THE TYLER SLATE

about three miles east of Mellen. The fold in Section 18, T.44, R.3W, Wisconsin, is shown in Fig. 19. Just East of Mineral Lake, in Sections 13 and 24, T.44, R.4W., notable crumpling and faulting of the formation on a large scale occur, and this is shown by the small outcrop map, Fig. 20. Farther west the formation has been much folded, but its general northward dip is preserved. At the extreme east end of the range, similar folding has taken place.

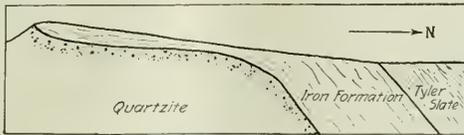


FIG. 19. CROSS-SECTION OF FOLD IN SEC. 18, T. 44N., R.3W., SIMILAR TO FIG. 18

In general it may be said that the minor folding is not known to have played any part in localizing ore deposits. The one important item in the attitude of the beds, from the point of view of the effect on origin of ore, is the 60 degree northward dip.

Faulting.—Throughout the whole extent of the iron formation and the rocks associated with it, faulting is

very common. Many of the faults have been identified in recent mining developments, in drilling, and in geological work, but many more undoubtedly remain to be worked out by more careful and extended observation. Many can be discovered by careful dip-needle work on the magnetic lines marking the Pabst and Pence members. More careful observations on faults will undoubtedly be made, as they are an important element in the formation of orebodies, and therefore a knowledge of the details of faulting is necessary for the proper planning of exploration and development operations.

That faulting occurred at widely different periods is definitely known, as faults of one kind cut across and displace earlier faults. As faulting has not been

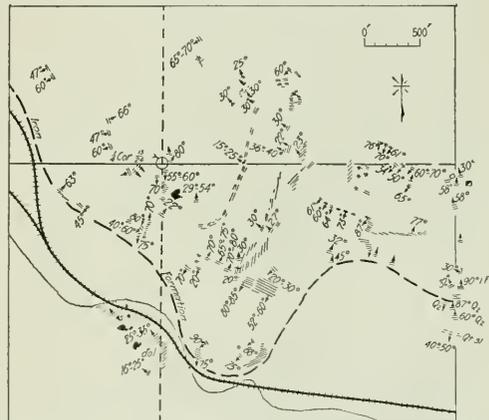


FIG. 20. OUTCROP MAP OF FOLDED AND FAULTED AREA IN SECTIONS 13 AND 24, T. 44N., R.4W.

studied thoroughly in many of the mines, it is impossible to make final statements with regard to the relative ages of all the faults. Few determinations have been made that definitely fix the relative ages. Whether all other faults of the same general types will be found in agreement with the facts thus far observed, only more detailed work will show.

Faults are "planes of weakness" in a formation, and at any time after the first break has occurred further movements may take place. It is not at all unlikely that slight movement is going on along some of the faults in this range. If such movement has occurred, it is obvious that older faults may now appear to displace younger ones. Complications of this sort may possibly be discovered by future observation.

On the basis of the present only partly conclusive data, there are four types of faults of relative age,

*Parts I and II were published in issues of the *Journal* of Sept. 13 and Sept. 20, 1919, respectively.

¹"Geology of the Gogebic Range and Its Relation to Recent Mining Development—Part I," *Eng. and Min. Journ.*, Sept. 13, 1919.

the most recent being given first and the earliest given last, as follows:

1. Faults striking nearly perpendicular to the formation and nearly vertical in dip. These are called transverse faults.

2. Faults striking nearly parallel to the strike of the formation or parallel to eastward-pitching dikes, and nearly perpendicular to the beds. These are called Eureka type faults, from one of the best-known faults of this kind.

3. The great Sunday Lake fault, the only one of its type.

4. Faults parallel to the beds of the iron formation. These are called bedding faults.

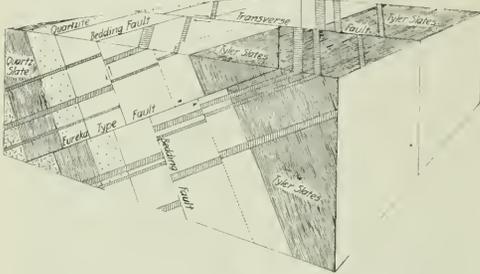


FIG. 21. BLOCK DIAGRAM SHOWING RELATION OF TRANSVERSE FAULTS, EUREKA TYPE FAULTS, AND BEDDING FAULTS

The first two and the last types of faulting and their relation to each other, so far as known at present, are shown in the block diagram in Fig. 21.

The latest faults to be formed are those which cut approximately perpendicular to the beds and are nearly vertical in attitude. These transverse faults may vary rarely as much as 45 degrees from the direction stated. They are the only faults definitely known to have affected the Keweenaw volcanic rocks, but it is probable that faults of the Eureka type may later be found to cut through the Keweenaw. The greatest known fault of this type is that at Penokee Gap. Here the formation on the west side of the fault is set north about 900 ft. relatively to that on the east side. No facts are known that determine the actual direction of throw here, but it is probable that the movement on the fault plane took place in a direction nearly at right angles to the plane of the beds.

Another pronounced fault of this type is that at Potato River Gap. Van Hise described this² as having a horizontal displacement of 280 ft., the west side of the fault moving to the northward.

The two faults mentioned are the only large ones of this type known in the Ironwood formation. Displacements of moderate throw are found at short intervals all along the range. Where the iron formation occupies the crest of the ridge west of Penokee Gap, small notches in the ridge are found every few hundred paces, where the offset of the formation is as much as twenty feet. The notches mark the places where broken fault material has been eroded. In the mines small transverse faults with an offset of only a few feet are common, and some with a horizontal offset of nearly 100 ft. are known.

The direction of relative movement in these trans-

verse faults varies. West of Penokee Gap a number of adjacent small faults show the formation on the west side of the fault offset to the north. Elsewhere, there seems to be little regularity, but too little is known to warrant the conclusion that no regularity exists. The movement between the fault blocks has been slight, and the blocks have probably tilted more or less during the faulting, so that in a single fault it may be found that though one side is offset to the north at surface, in depth the other side may be set north.

Faults of the transverse type have been observed by Gordon³ in the Keweenaw lavas making the ridge north of the Tyler slate formation. Horizontal offsets of as much as 1,500 ft., and many of lesser magnitude, were noted by him. He states, further, that the offset seems to decrease greatly as the faults are followed south. These faults cut the trap range into blocks with high vertical fault-plane cliffs which are very striking when viewed from the mines. In the iron formation the largest of these faults produces an offset which is only a small fraction of the offset in the lavas.

This same effect—of smaller offsets as the fault is followed to the south—is observed in the iron formation itself. Transverse faults, which have offset the beds nearly a hundred feet at the north side of the formation, have produced only twenty or thirty feet of offset at the south side. It has long been accepted that all faults die out with depth. Here is an instance where apparent lateral dying out is due to the fact that the faults were probably formed when the iron formation was nearly horizontal in position. The subsequent tilting has resulted in eroding away the formation, so that there now appears in cross-section at the surface what formerly, at the time when faulting occurred, represented miles of depth from what was at that time the surface of the earth. The transverse faults are known to offset all intrusives in the iron formation and

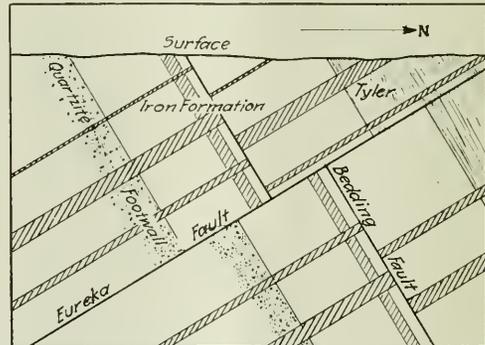


FIG. 22. DIAGRAM SHOWING MOVEMENT OF THE EUREKA FAULT IN THE EUREKA MINE IN CROSS-SECTION

all other types of fault excepting the Sunday Lake thrust. Other evidence, however, is conclusive that the transverse faults occurred long after the Sunday Lake fault.

Extending from the Tilden mine through the Eureka mine, and for unknown distances farther east and west, there is a fault which dips toward the foot wall and strikes nearly parallel to it. In the Eureka mine this fault offsets the iron formation, as shown in Fig. 22. In the Tilden mine this offset is reversed, and the offset

²Monograph XIX, U. S. Geological Survey.

³1906 Annual Report Michigan Geological Survey, p. 464.

is as shown in Fig. 23. These figures are not actual cross-sections of the mines named, but only diagrams to show the offset due to the fault. This fault acted after the manner of a pair of monster millstones. Looking down upon it from the south, the upper block turned as though it were driven by a shaft turning in the

The Eureka fault is offset by the transverse faults, and so must have existed when the transverse faulting occurred. It in turn offsets the bedding fault and the sill, so that these must be older.

THE SUNDAY LAKE FAULT

The Sunday Lake fault is probably the greatest fault on the Gogebic iron range. It has been studied for a number of years by Dr. C. K. Leith and some of his students. A number of the latter have written theses on the structures in this Wakefield area, and one of them, M. C. Lake, geologist for the M. A. Hanna Co., wrote an article which appeared in Crowell and Murray's "Iron Ores of Lake Superior," 1917. A map of this faulted region is shown in Fig. 24, and is adapted from Mr. Lake's map. The base of the iron formation on the east side of the fault is nearly a mile and a half northwest along the fault from the base of the iron formation on the west side of the fault, but whether this is the actual direction of throw of the fault or not is somewhat doubtful. The throw is probably at right angles to the dip of the formation. From all the information at present available, the fault is approximately vertical in its dip, and the strike, as shown in Fig. 24, is approximately northwest. The main movement along this fault plane occurred when the beds of the iron formation series were horizontal, before any appreciable tilting had taken place. The beds on the east side of the fault were then over-thrust upward in a westwardly direction. Associated with this thrust fault there was folding and crumpling of the beds, as shown in the hill of Palms quartz slate at Wakefield. After this fault occurred, there followed a period which resulted in the complete erosion in some places of the Tyler slates on the eastern side of the fault, so that when the Keweenaw lava flows began to pour out, they, or Keweenaw conglomerates, rested in many places directly upon the iron formation.

So far as is indicated by information at present avail-

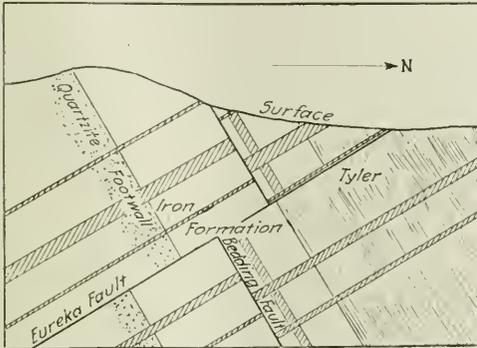


FIG. 23. DIAGRAM SHOWING MOVEMENT OF THE EUREKA FAULT IN THE TILDEN MINE IN CROSS-SECTION

direction of the hands of the clock, the part west of the pivot moved north and that east moved south. The point where there is no offset, the pivot of these millstones, is situated in the Palms mine. The greatest offset known in the Tilden is about 225 ft.; that in the Eureka is about 300 ft.

Other faults of the Eureka type are known in the Asteroid and Mikado mines, to the east, and in the Plymouth and Wakefield mines. Most probably, the faults which set down to the south the great block of formation in which the latter two mines lie are of the Eureka type. Much must be learned about these faults before this can be stated as a certainty. It is entirely

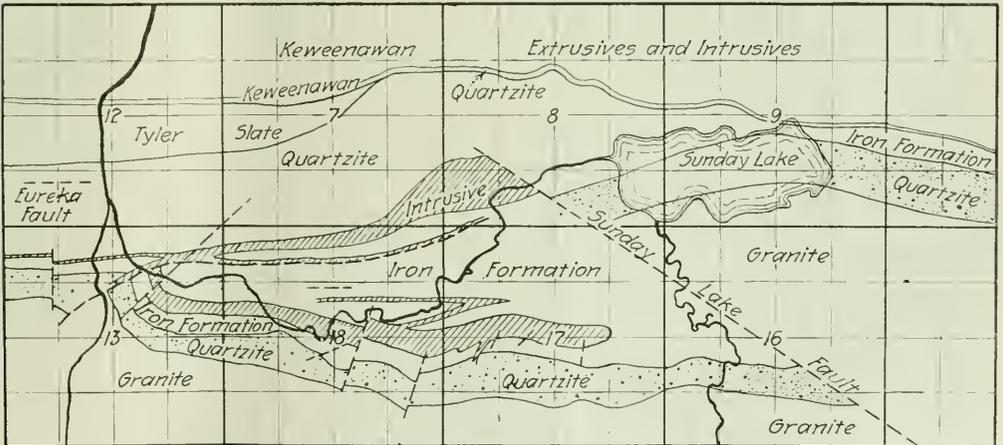


FIG. 24. MAP OF REGION OF SUNDAY LAKE FAULT After M. C. Lake in "Iron Ores of Lake Superior," Crowell and Murray.

possible that they represent a fifth type of fault. Faulting of the Eureka type has been definitely recognized though there may have been a later movement along this west of the Tilden mine only in a few cases of slight fault that has displaced the traps, there is no question displacement, but it is not at all unlikely that larger that the major movement occurred before Keweenaw time. There is no evidence that the bedding fault

cuts through the Sunday Lake fault, and, on the other hand, bedding faults are known in the iron formation east of the Sunday Lake fault. Though it is impossible to say that these bedding faults correspond to the great bedding fault movement west of the Sunday Lake fault, it is not at all improbable that they do. If so, the Sunday Lake fault must have displaced the bedding fault. Furthermore, the bedding fault, in its strong eastward movement of the beds north of the fault, would have produced a notable offset in the Sunday Lake fault if it were the younger of the two.

BEDDING FAULTS

Faulting in the Ironwood formation along planes parallel to the bedding is found near the base of the Plymouth member, in the Yale member, and in the Pence member, and also in the Pabst member of the Tyler formation. So far as my observations have gone, the amount of movement on any of these fault planes is comparatively little, except in the Yale. The great bedding fault is found, for the most part, in or near the black ferruginous slate of the Yale member. This fault does not follow a single bed, but in some places is found at the very top of the Yale member, or even in the lower part of the Norrie, and at other places is found at the very base of the Yale.

The movement occurred sometimes along a single shear plane, but more often along two or three planes—usually all in the Yale member. The main direction of movement along this fault can be best described by stating that the beds above or north of the fault plane have moved to the east. As is the case in many faults, the amount of movement has been greater in some parts of the plane than in others, and the amount of eastward shove of the beds north of the fault apparently increases as investigations proceed west. In addition to this eastward movement of the upper beds, there has been in most places a movement up or down the dip of the beds. In the Tilden mine the beds north of the fault have gone downward. In the Geneva mine, and everywhere to the west, there is an upward movement of the beds north of the fault, and this upward movement increases in amount the farther west the fault is followed.

As mine workings seldom touch the exact spots which make it possible to identify the same portion of a dike on the north and south sides of the fault, it is impossible in most parts of the range to give exact figures as to the movement. The eastward component in the Norrie mine is indicated by the fact stated to me by Mr. Olson, the chief engineer on this range for the Oliver Iron Mining Co., that a vertical dike was offset 650 ft. to the east on the north side of the fault.

In the Montreal mine it has been possible to identify with reasonable certainty the intersection of a westward-pitching dike and an eastward-pitching dike, both on the foot wall and at a point about 300 ft. north of the foot wall, so that the total amount and direction of movement at this point can be estimated closely. In the vertical longitudinal projection of the mine, the intersection of the two dikes 300 ft. from the foot wall is 840 ft. east and 375 ft. upward in vertical projection from the same intersection on the foot wall. Translating this into terms of movement on the actual fault plane would mean that the beds to the north of the fault moved a total distance of approximately 950 ft. eastward and upward, or approximately 800 ft. along the strike of the beds and 200 ft. up the dip of the beds.

The easiest method of measuring this fault is in the mine cross-sections, where the actual offset of the dike in each section can be scaled in places where the same dike can be identified both north and south of the fault. The offset measured in a section like this will, of course, vary with the pitch of the dikes, and does not give any actual measure of faulting, but it does give the approximate distance that would have to be raised in the mine workings from a dike in the foot side of the fault in order to get the same dike north of the fault. Measuring in this fashion, the measurements given in the following table indicate the distance which the two parts of a dike on opposite sides of the fault are displaced in the vertical cross-section. The first measurement is in the easternmost mine where information is available, and the succeeding measurements are progressively farther westward:

Tilden Mine—North side down about 100 ft.

Davis-Geneva—North side up 60 to 100 ft.

Aurora—North side up 150 ft.

Ashland—North side up 200 to 250 ft.

Montreal—North side up 425 to 500 ft.

The bedding fault is displaced by the transverse faults and by faults of the Eureka type. These facts indicate that the bedding fault was present when the other two types of faulting occurred. In its turn, the main bedding fault displaces the intrusives in the iron formation so far as relationships are known at present. Therefore, the bedding fault must have occurred after the intrusives had entered the iron formation. Apparently, also, this bedding fault is offset by the Sunday Lake fault, so that the latter apparently occurred after the bedding fault took place.

INTRUSIVES

Both in the productive as well as in the non-productive parts of the range the intrusives consist of numerous dikes and a sill which is known to extend from the Mikado mine on the east to the Yale mine on the west. The intrusives are much more complicated and much less known in the extreme eastern and western ends of the range, but no attempt is made to discuss these at this time. All of this discussion applies only to the dikes in the productive part of the range and to the sill.

The intrusives in the iron formation are much alike in character, such variations as are noted being chiefly size of grain or difference in color. They are diabase or diorite of medium to fine crystalline character. The sill is parallel to the beds, and, so far as observed, seems to be intruded into the black slate bed of the Yale member. The dikes are nearly perpendicular to the bedding of the iron formation, but usually are somewhat steeper in dip toward the foot wall than this statement would indicate.

The larger number of dikes have an eastward pitch, so that in following eastward along the foot wall a dike will drop from 20 to 35 ft. in going 100 ft. of horizontal distance. Some dikes have less pitch than this and a few are steeper, a very few being known to be nearly vertical in dip and striking directly across the iron formation. In addition to these eastward-pitching dikes there are those which have a westward pitch. In general these westward-pitching dikes seem to be much less constant in direction. In the Cary mine, a west-pitching dike cuts through an east-pitching dike, but it is not known if other westward-pitching dikes are younger than those with an east pitch.

Little is known of the relationships of the dikes to the sill. In the Yale mine a single instance was found where a small dike cut through the sill, proving the dike to be the later of the two to be injected into the iron formation. This is shown in Fig. 25. Whether all of the dikes are of later age than the sill, cannot be stated. It is probable that there are dikes of considerably different ages in the iron formation, but on this little evidence is at hand. There are dikes cutting the Keweenaw trap rocks which are thought to be the same as the dikes in the iron formation, indicating that some of the dikes are Keweenawan or later in age. Other dikes and the sill are offset

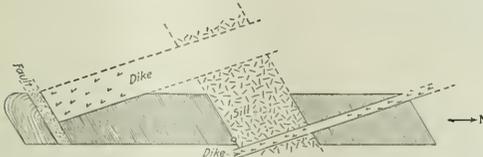


FIG. 25. SKETCH OF WEST SIDE OF CROSSCUT IN YALE MINE, SHOWING SILL CUT BY SMALL DIKE

by those faults which are definitely known to be earlier than Keweenawan, and so must be pre-Keweenawan in age. Further study of the relative ages of dikes is most likely to show that dikes intruded the iron formation at various periods during, and preceding, the volcanic activity of Keweenawan time.

It has been the opinion of some geologists that the openings filled by the dikes were the channels through which the Keweenawan lavas reached the surface, but it seems to me rather improbable that these could have been the main feeders for the lava flows, because of the fact that the iron formation adjacent to the dikes is seldom altered for a distance as great as a foot. Only adjacent to the largest dikes, 50 or 100 ft. in thickness, has the effect of the dikes on the iron formation extended as much as six or eight feet. If these dikes had served as the main channels for the hundreds of cubic miles of lava composing the Keweenawan, it is almost beyond question that they would have altered the iron formation, more particularly the chemically unstable carbonate phases, to a far greater extent than they do. This fact, and the strong evidence that most of the dikes were of an age earlier than the bedding fault, seem to me to indicate strongly that most of the dikes are pre-Keweenawan in age.

SUMMARY OF STRUCTURAL EVENTS

It may be well to summarize at this point the history of the structural incidents in the iron formation and state briefly the evidence which has been given. (1) After the deposition of the iron formation the first event of importance was its intrusion by the great sill. The intrusion of many of the dikes was probably almost contemporaneous with this, and possibly somewhat later, a single instance having been found where a dike cut through the sill. (2) While the beds were still in a horizontal position the bedding fault occurred, cutting the dikes and the sill and shoving the upper beds in an easterly direction. Numerous cases have been found in which the sill and the dikes have been cut by this fault, which, so far as is known at present, is the oldest one on the range. (3) The next event of importance was the development of the great Sunday Lake thrust and the associated crumpling

of the beds, which occurred while the formation was still in a horizontal position. After this fault occurred a great erosion interval, during which the whole of the Tyler slate formation was eroded in places east of the Sunday Lake fault. (4) The next event of importance was the development of faults of the Eureka type. This may have occurred either before or after the outpouring of the Keweenawan lavas which make the trap rock range, but it is my belief that these faults probably occurred after the Keweenawan lavas had been extruded. Most probably the iron formation was still in a horizontal or nearly horizontal position at the time this faulting occurred. (5) The next important structural event in the history of the iron formation was the development of the transverse faults. (6) The last structural event was the tilting of the iron formation downward to the north.

These events have been stated in categorical style to point out the trend of the evidence available at present. It must be kept in mind that this simple statement cannot be complete and that events given here as successive may have been almost contemporaneous.

CHRONOLOGY OF STRUCTURAL EVENTS

Of these structural events, the greater part of the intrusion of the iron formation, the development of the bedding fault and of the Sunday Lake fault, occurred before the Keweenawan lavas were present. The Eureka type faults may have occurred either before or after. The transverse faults occurred after development of the lava flows, and probably before but possibly during the tilting which tipped them to their present steeply inclined attitude.

It is probable that still another structural event occurred in another intrusion by dikes, and that these dikes are the ones which in a few instances have been found to cut into the Keweenawan lava flows. If such dikes exist in the iron formation, however, they should be found to cut through the great bedding fault without being materially displaced, unless later movements along the bedding fault cut them off. No cases of this kind have been identified with certainty so far as the facts are known to me.

(To be concluded)

French Technical Journals

A list of French technical journals, with addresses and terms of subscription, is given below, with the belief that it may be of value to readers of the *Journal*. Many engineers who have served overseas desire to keep up their French, and, at the same time, to keep in touch with engineering matters abroad during the reconstruction period:

L'Echo des Mines et de la Metallurgie, 7, Rue d'Offement, Paris. Subscription (foreign), 55 fr.

La Metallurgie et la Construction Mecanique, 20, Rue Turgot, Paris. Subscription, 25 fr.

La Revue de Metallurgie, 49, Quai des Grands Augustins, Paris. Subscription, 40 fr.

Revue Universelle des Mines, 174, Bould. St. Germain, Paris. Subscription, 40 fr.

Revue Industrielle de l'Est, 40, Rue Gambetta, Nancy. Subscription, 22 fr.

La Technique Moderne, 49, Quai des Grands Augustins, Paris. Subscription, 42 fr.

Le Genie Civil, 6, Rue de la Chaussée d'Antin, Paris. Subscription, 45 fr.

L'Usine, 145, Faubourg St. Denis, Paris. Subscription, 36 fr.

Mine Shafts at Goldfield, Nev.



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A Precedent for Engineers

W. L. Saunders, Speaking at Dinner to Herbert C. Hoover, Eulogizes Masterly Executive
And Engineering Accomplishments of the Food Administrator in
Serving the Cause of Humanity During the War

AN ASSEMBLAGE that crowded the Grand Ballroom of the Waldorf, and that overflowed into the foyer and reception rooms, on Tuesday night, Sept. 16, welcomed Herbert C. Hoover back to the United States. The reception and dinner in his honor were given by the American Institute of Mining and Metallurgical Engineers, who had as guests for the evening many prominent and distinguished citizens.

The dinner and reception were attended by more than 1,200 members and guests of the Institute. Among those invited were A. C. Bedford, J. Parke Channing, Norman H. Davis, Henry S. Drinker, Arthur S. Dwight, John H. Finley, E. H. Gary, George W. Goethals, John Hays Hammond, A. J. Hemphill, Myron T. Herrick, Alexander C. Humphreys, H. H. Knox, Thomas W. Lamont, Pierre Mali, Key Pittman, O. B. Perry, Charles F. Rand, Mark L. Requa, Edgar Rickard, John D. Ryan, Charles M. Schwab, Waldo J. Smith, Henry L. Stimson, Melville E. Stone, Oscar S. Straus, Albert Straus, George Otis Smith, and Robert H. Treman. William L. Saunders, past president of the A. I. M. E., was the toastmaster.

The members of the Institute, their friends and guests greeted with long-continued applause, delivered standing, and amid cheers and "Tigers!" the toastmaster's declaration concerning Herbert Hoover: "Such captains of industry are by education and experience best fitted to steer the ship of state."

Horace V. Winchell, president of the Institute, presided, and before presenting the toastmaster read a score or more of cable dispatches and messages from foreign engineering and civic bodies.

Mr. Saunders' address follows:

This dinner is a simple tribute paid by the family of engineers to one of its masters. He is indeed a master, who, after rising to leadership in his profession, elects to be a servant in the cause of human welfare during a period of great calamity. If there is one reason larger than others for this meeting, it is that we might grasp the hand of our guest and say from our hearts, God bless you, old man. You have done well. We are proud to know you.

As this is a familiar audience to me, suggesting (except that it is bigger) our old Mining Institute dinner days, I am reminded of an incident that occurred up in the iron district of Michigan: A speaker, looking over a familiar audience, began by saying, "Now you know what I am going to say." A large part of the audience cried out "Yes." Whereupon he said, "Well, as you know what I am going to say, I shall not take your time by saying it." He then sat down. Called to his feet again, he repeated the statement, "You know what I am going to say." There were loud cries of "No." He then said, "Will those people in the audience who know what I am going to say please tell those who do not know, and save time for the next speaker?"

Now, as the next speaker is our guest of honor, the logical and popular thing for me to do is to follow the course of my Michigan friend. But in this I am beset with difficulties. The committee in charge of this dinner has overruled its chairman, declining to listen to my argument that a toastmaster at a dinner does not make a speech, but should feature the speakers and not himself. To this they have cruelly replied that everybody knows that toastmasters become so inebriated by the exuberance of their own verbosity that they feature themselves to such an extent that it is hard to even see the features of other speakers, let alone hear their voices.

But you do not know what I am going to say, for this is no ordinary occasion. Never before have men gathered to pay a just tribute of admiration to one who has done the things that this man has done. His work was not built upon precedent; there was no experience, no guide. It was, in fact, a creation. In the words of the Prime Minister of England, his work in Belgium was nothing less than a miracle. Yet it is a fact that those who have been in close touch with the situation say that his greatest work has been done since the armistice was signed.

Truly, this is a period of new things, new changes, new times; a period of agitation which brings to the front new men of true worth. You who are mining engineers know what a good thing the flotation process is, how by violent stirring up of things the metallic values are separated from the gangue and float off at the top. This process has been in action all over the world during the past five years and it has revealed out of the chaos an engineer of the value of pure gold—one

"Of manners gentle, of affections mild,
In wit a man, simplicity a child."

A rugged personality, strong of conviction, modest; thinking never of self; practical, far-seeing, wise, human, brave; with a mind clear in action, a conscience that always functions; one who has saved lives while all others were engaged in destroying them; a rare combination of physical, mental, and moral courage; a real American is this Herbert Hoover.

Who's Hoover, any way, and what is a mining engineer, are questions asked by the man on the street. It is easier to answer the first question than the second. Some of you may remember my saying at one of our Institute dinners: If a man goes digging for clams is he mining or is he fishing? Professor Kemp answered it by saying that his professional experience had taught him that the mining engineer is the clam. There is some truth in this just when we realize that engineers are always digging in scientific fields, giving little thought or time to civic affairs or to human welfare. Huxley has called this a mental twist and he compares it to a ship out of trim because listed by an excess of cargo on one side. Here at last we have the example of an engineer who typifies the modern defini-

tion of engineering which is thus written in large letters on the wall of the engineers' library in New York: "Engineering, the art of organizing and directing men, and controlling forces and materials of nature for the benefit of the human race." How well this modest mining engineer has shown that he has the art of "organizing and directing men"! Of the many thousands working for him, here and abroad, it is said that not only have they given him loyal support, not only are they glad to work for him, but every man of them would take off his coat and fight for him. How well he has shown his capacity for "controlling forces and materials of nature for the benefit of the human race."

This definition of engineering would have been amazing forty years ago. The civil engineer was then a surveyor, a mathematician and a bridge designer; the mechanical engineer an educated mechanic, a designer and draughtsman; the electrical engineer was unknown outside of the school and the laboratory; while the mining engineer was a combination of the geologist and that kind of a chemist who could tell how much phosphorus there was in a steel rail. I make this statement with apologies to Alexander Holley, who in his day was the one and only mining engineer known beyond the fence of the work-shop or mine.

But the engineer is at last coming into his own. We see the dawn of a new day; truly there is a new order of things: The great centers of the world are now industrial centers. The prosperity and strength of nations in peace and war rest now upon the factory system, the shops, the railways and steamships, the mines, the smelters and the public works. And who is responsible for this? Who plans and executes these things? It is the engineer, civil, mining, electrical, mechanical, chemical, and automotive. Such captains of industry are by education and experience best fitted to steer the ship of state. The place for the engineer is not in the dark confines of the hold below, but on the upper deck—yes, on the bridge.

We are told that practically all the executive heads of the organization for the relief of Belgium were engineers. Who but an engineer is as well trained by education and experience to meet emergencies? He must be prepared for extraordinary conditions. He must foresee these conditions and be ready to act quickly. A mine manager—usually a mining engineer—when told that a pump has broken down in the mine, cannot wait for the common remedies, but must provide in advance for experts and appliances to be on the spot at once and cure the trouble promptly. Is not this the one thing above all others which enabled America to play so important a part in the war? Was it not the spirit of the engineer, his capacity to do things and do them quickly?

Surely the war was not won by money, for the enemy was never financially embarrassed. I think we shall all agree that the basic strength of the Allies throughout the war was in the never-dying morale of all the people, including the armies, arraigned against Germany. But what would this strength have availed us but for the resources behind the lines? Modern war resources are mainly coal and iron and the capacity to put these things to practical use on a large scale. The mines would avail little but for the works, and the works might avail little but for the men—the engineers who direct them on modern, scientific lines of high ef-

iciency. Mr. Hoover during the war gave me the first insight into the Battle of the Marne, when he told me that even the Germans underestimated by twenty per cent the volume of munitions required in a modern battle. They drew away too fast from adequate supplies.

And so America, through its engineering and industrial strength, helped to save the world from calamity. Now what individual best exemplifies this? Food played an important part in the war. We have heard the cry that food will win the war. Surely without food no war could be won. It was Mr. Hoover who took care that there should be no food shortage. He did more—he taught thrift to millions of people in all walks of life and in all parts of the world. He preached the gospel of the clean plate. But it is not only in food that our guest stands as an example of achievement; he typifies the engineer, the executive, the man behind the gun. It is easy to see things that lie directly before us, but the best executive is one who builds his fences around the future, who anticipates trouble before it comes.

Little has been said of Mr. Hoover's capacity to think straight in advance, but this is really one of his strongest characteristics. It was first shown when he took charge of the work of sending Americans over when the Great War broke out. His plans were made and negotiations completed with shippers before the organization was made up and before he had any knowledge of how many persons were to go or where the money was to come from. While forming the Commission for the Relief of Belgium, and before he knew who was to pay the bills, he had ordered millions of dollars' worth of food and had chartered ships. When asked why he took such chances he said that it was impossible to believe that the people of the world would not stand behind so wholesome a measure in the interest of humanity, and they did stand behind it nobly and to the end. While Congress was hesitating and amending the Food Act Bill, Hoover was busy organizing every state and territory, even going into counties of each state, so that when the bill was finally passed the machine had been completed and was ready to function. His abiding faith in public opinion is based upon the belief that the people will always support an unselfish effort to do that which is right.

I have said that there was no precedent for the work done by Mr. Hoover. He has established a precedent for engineers, and for us this is one of his greatest acts. I shall not attempt to tell you all that he has done during the past five years. I am incapable of doing so. The things are so big that one stands agast in studying them. We have long known him as an able and successful mining engineer. He is an honorary member of the Institute. He was the first choice of the nominating committee for president of the Institute in 1914, but asked to be permitted to forego the honor because he felt that it was his duty to help feed the Belgians.

Herbert Hoover is a graduate of Stanford University. He first served with the United States Geological Survey, then went to West Australia and China, in mining activities. His work in London up to the beginning of the world war was notable in that he departed from the usual share-promotion schemes of the mining market, developing the properties in which he was inter-

ested purely on technical lines. He would not countenance any inflation of shares which was not represented in the intrinsic value of the properties. When the war broke out he gave up his management and directorships and steadfastly refused to give any attention to his private affairs during the whole period of the war. He began work the morning after England declared war on Germany, taking charge of the relief of American refugees, advancing funds out of his own pocket, and through his friends, furnishing forty-five thousand people with money and steamer tickets to get home. In October, 1914, he organized the Commission for the Relief of Belgium. Through this source nine million people were continually supplied with food, nearly half of them being entirely dependent upon this relief. There were thirty-five thousand Belgians and French engaged with him in this work. He provided seventy steamers in regular service, delivering 4,500,000 metric tons of foodstuffs. The losses in foodstuffs from all causes from the ship to the Belgian warehouse were less than two-tenths of one per cent. There were 200 American volunteers in this work, serving without salary, most of them paying their own expenses. Eighty per cent of them were university graduates. The total overhead expenses of this commission were less than one-half of one per cent. He was responsible for the expenditure of six hundred and fifty million dollars.

Shortly after America entered the war Mr. Hoover was summoned to Washington to take charge of the food situation here. The problem was a large one, as food demands from Europe were centered upon the United States. His organization in every state and county comprised 8,500 men and women, giving their whole time to the Food Administration. In addition to this there were half a million persons registered and ready to be called upon for emergency work. Twelve million families were pledged to support the work. Of the active workers about one-half were volunteers, the others receiving moderate salaries from the Government. It has been estimated that if these volunteers had received the ordinary Government remuneration of \$2,000 per annum the salary bill alone would have been nine million dollars. Most of these volunteers paid their own expenses. Of the paid employees only thirty-four received remuneration of \$3,600 per annum or more. It has been estimated that this administration carried out its functions ninety-two per cent by voluntary effort, seven per cent by persuasion and one per cent by legal authority. A conservative estimate of the advertising voluntarily contributed in this work approximates the sum of eighteen million dollars. A voluntary conservation campaign among hotels and public eating places resulted in the first six months in saving the equivalent of about two and a half million bushels of wheat.

During eight and one-half months in the year 1918 more than sixteen and one-half million bushels of wheat were saved by conservation at the mills. It is impossible to enumerate all of the activities of the Food Administration. One of the minor activities was the Grain Threshing Division, organized for the purpose of helping to eliminate wasteful practices. The expenses of this division amounted to fifty-five thousand dollars, and it has been estimated that the amount of wheat saved was forty-four million dollars.

Immediately after the armistice was signed Mr. Hoover was directed to proceed to Europe to investigate the part that America could play in the relief of the civilian population. Though he had but four days before sailing, he arranged for the purchase and shipment of 250,000 tons of food. It was not until February of the following year that Congress appropriated one hundred million dollars for European relief. At that time several hundred thousand tons of foodstuffs had been actually distributed. Up to a recent date over three million tons of foodstuffs, valued at over seven hundred and seventy million dollars, have been distributed.

This is a brief and altogether inadequate statement of a wonderful record of achievement. Certain things stand out with striking prominence. Mr. Hoover was more than a food administrator. He was a general, an organizer in action. He got men to do things. His faith in the moral support of the people was sublime yet practical. He seemed to know the right methods to follow and the psychological moment to act in order to secure the full measure of support.

And so, dear friend, we welcome you home! We rejoice that your five years of labor have produced so wholesome a harvest. We are glad that you are returning to the practice of your profession. We know that we cannot honor you as you have honored us; but in this inadequate tribute of our love may you find some measure of cheer as you journey to the Sierras and your California home. On behalf of this audience, on behalf of all engineers, on behalf of a war-stricken people, who did not pray in vain, "Give us this day our daily bread"—on behalf of all America, let me say to you in the words of John Milton, Servant of God, well done, well done!

Testimonial to Hoover

AN ILLUMINATED TESTIMONIAL, bearing the Autograph of each person attending the dinner given by the American Institute of Mining and Metallurgical Engineers, on Sept. 16, 1919, at the Waldorf-Astoria Hotel, to welcome the return of Herbert Hoover, was delivered to the guest of honor during the dinner. The text of this testimonial was as follows:

"To HERBERT HOOVER the members and guests of the American Institute of Mining and Metallurgical Engineers, assembled to commemorate his return home, extend the *welcome* due an eminent American citizen, a successful Engineer, a Genius of Constructive Administration, a practical Economist, a Statesman of World Vision.

"In him they honor an Idealist who was able to vitalize the Altruism of America and save from Hunger and Anarchy vast areas of Europe where millions of men, women and children in a score of languages lift their voices to call him blessed.

"He is loved and honored for his gift of leadership and inspiration which called many thousands of volunteers to his aid in the great tasks he undertook and accomplished.

"Realizing that no gift of gold or precious stones could convey the deep feeling of appreciation we wish to express, we simply subscribe our names as fellow engineers, co-workers and admiring friends.

"NEW YORK CITY, Sept. 16, 1919."

Herbert Hoover's Address at the A. I. M. E. Reception in His Honor

FOLLOWING the toastmaster's tribute, at the reception and dinner in his honor, to Herbert Hoover's great services for America and for the world in the last five years, Mr. Hoover delivered an address, which is here presented in full:

I have been asked to speak to you on some of the impressions that I have gained during my service in Europe since the armistice. Two convictions are dominant in my mind. The first comes from contact with stupendous social ferment and revolution in which Europe is attempting to find solution for all its social ills by practical experiments in Socialism. My conviction is that this whole philosophy is bankrupting itself from a startling quarter in the extraordinary lowering of productivity of industrial commodities to a point that, until the recent realization of this bankruptcy, was below the necessity for continued existence of their millions of people. My second conviction is older but has been greatly hardened, and that is a greater appreciation of the enormous distance that we of America have grown away from Europe in the century and a half of our national existence, in our outlook on life, our relations toward our neighbors, and our social and political ideals. The supreme importance of this Americanism neither permits us to allow the use of this community for experiment in social diseases, nor does it permit us to abandon the moral leadership we have undertaken of restoring order in the world.

During the last ten months I and my colleagues have occupied a unique position in intimate witness of the social currents that have surged back and forward across Europe. The enemy collapsed not only from military and naval defeat but from total economic exhaustion. In this race to economic chaos the European Allies were not far behind. By this exhaustion the whole of Europe stood facing a famine, the like of which has not been seen since the Thirty Years' War, when a third of the population died of starvation. In the midst of all this was the struggle of a score of new democracies to establish themselves, with friction along every frontier, and with the destruction of governmental institutions, without financial resources to buy supplies, with the miseries of their people offering fertile soil for every economic patent medicine and for all the forces of disorder, and Bolshevism and anarchy overhanging all, there could be no hope of restoring normal economic life until the completion of peace. In all this situation, with its desperation, greed, century-old animosities, its idealistic and proper aspirations, there was only one hope. That hope, expressed by every city and state, was that the American people, being the one disinterested and uncrippled economic and political force still existing in the world, should again intervene. It was in response to this call that the President, comprehending the real heart of the American people, intervened in Europe a second time and took those steps which resulted in a practical economic organization of Europe, pending the con-

summation of peace and the arrival of the forthcoming harvest.

This second intervention was not a relief problem in the ordinary acceptance. It was not a problem alone of finding foodstuffs for starving populations of the ravaged regions. It was the problem of finding a large margin of foodstuffs and other supplies for the whole of Europe—Allies, liberated peoples, neutrals, and enemies; and in a mass of at least 200 millions of these people formerly under enemy domination it was a problem of finding absolute economic rehabilitation. Further than this, it was a problem of warding off Bolshevism on one side and reaction on the other, in order that the new-born democracies could have an opportunity of growth. Its practical consummation was a problem of the organization of the economic strength of the United States and its co-ordination with the remaining economic strength of Europe, and, in large areas, the imposition of absolute dictatorship over economic forces.

Thus, the shipping of the world required sufficient co-ordination to transport thirty millions of tons of supplies from all quarters of the globe to Europe. It required the provision of credits to those countries whose total exhaustion abolished all hope of normal payment. It required the insistence upon payment from those who had gold or commodities. It required sufficient co-ordination of purchase in this vast quantity of supplies that the markets of the world should be affected in the least possible degree. With the dissolution of the organization of the old channels of communication, river craft and railway rolling stock was hoarded by each state; telegraph and postal communications were broken down; every frontier was the scene of more or less military friction, until at one moment there were twenty-five little wars in progress. Many of these new governments were without experience or even without the existence of departments for the conduct of either the transportation or distribution of supplies.

Thus, it was necessary to secure the erection within their governments of actual departments, to furnish them advisors, to take over the actual operation of thousands of miles of disintegrated railway systems, to open rivers and canals for traffic, to stimulate the production of coal and other primary commodities, to control their distribution through large areas, to find a basis for exchange of surplus commodities from one state to another, to exercise the strongest political pressure to obtain the disgorgement of surpluses into areas of famine, to resort to barter on a national scale where currencies had broken down, to stimulate peoples discouraged and disheartened to efforts in their own salvation, and, finally, but not least, to intervene a charitable hand in the saving of their children and the stamping out of contagious diseases, and through all of this economic disorganization to inspire the maintenance of order on one hand and the defeat of reaction on the other. Beyond this again, the necessity of constant friendly intervention in frontier quarrels to prevent the starting of more wars.

These things have not been solved by the service or direction of any one man. They have been accomplished through co-ordination of the men of good will in twenty governments of Europe and throughout by creation of a thread of American personnel, directed from a single center. On our side it has required the co-operation of Congress, the Grain Corporation, the Treasury, the Shipping Board, the Army, and the Navy. A thousand Americans were sent into those communities with but little authority beyond their own assurance and the confidence on all sides that they were disinterested, that their only desire was to solve a great and human emergency for no political and no commercial advantage. It was our desire to do this from the background, without ostentation; to act at all times through established institutions, to build up their strength for the time they must rely upon their own resources. I cannot pay enough tribute to all these thousand Americans, many of them engineers, men taken from the common life of the United States, thrust into the face of staggering political, economic problems, the solution of which must affect the well-being not of hundreds but of millions. The proof of their performance lay in the fact that Europe has come through the most terrible period of its history with no loss of life from economic causes, with a stronger democracy and a glow in its heart for the United States.

This service of the American people has been accomplished at no mean national sacrifice. From the armistice to this year's harvest there has been furnished over two and a quarter billion dollars' worth of supplies, the majority of which has been given freely upon the undertaking of the assisted governments of repayment at some future date. There has been no demand of special security; no political or economic privileges have been sought. It may be years before we receive any return from these loans, but if that period should never come the American people, by this second intervention in Europe, have saved civilization, and have done so with no thought to the burden or cost to themselves. These matters have been brought to a successful close with the arrival of the harvest and the prospect of peace. What the future has a right to demand from us in further economic support is not yet clear, but it is at least certain that if the world cannot quickly secure the settlement of peace and safeguards for the future through the League the whole of our two great interventions will have gone for nothing, and the menace of reaction will again return against us upon the winds of chaos.

As the executive head of this Allied effort in economic control, I have thus had an intimate contact with the common people and their officials. I have witnessed their improving physical condition, the constant change of currents of social, political and economic forces, their revolutions, and I have had to deal ultimately with the results of all these phenomena. During this period since the armistice, we have witnessed social and political revolution among one-third of the civilized world, and we see the remainder in great social tribulation. No contemporary can properly judge or balance the relative volume of great currents of social agitation. They are matters of mind and not of matter. Yet practical statesmanship requires that within our abilities a constant accounting should be taken of the tangible results of these forces abroad, if the development of our liberal institutions and progress of orderly

government is to be maintained and revolution avoided.

This cataclysm of social change in Europe is the result of the long culmination of social as well as political wrongs; it is no sudden afterthought of war. These forces were projected into actual realization by the collapse of the war, the breakdown in the political institutions that had preceded it, and the misery that has flowed from it. Our soil is not so fertile as that of Europe to many of these growths, because we have a larger social conscience. We have not the vivid class and economic distinctions of Europe, nor have we the depth of misery out of which these matters can crystallize. Nevertheless, in these days of intimate communication, social forces are rapid in their penetration and social diseases are quick in universal infection.

The general revolution of Europe of the last century, starting with the French Revolution, profoundly changed the whole social order of the world, and, while in that revolution the spiritual impulse was the demand for political liberty, there was also a great economic impulse. That economic impulse was primarily the division of the land, and one of the fruits of that revolution was the better distribution of wealth among the agricultural population. Since that time an enormous expansion of mechanical industrialism has been superimposed upon all agricultural states, with a large increase in urban populations. The economic impulse of the revolution to-day is the demand for a better division of the wealth from this industrialism, and this time the agitation arises mainly from the urban population.

These vast masses of humanity in Europe have long been groping for the method of nearer equality of opportunity and better distribution of the results of industrial production. These gropings and these attempts have in recent years been dominated by Marxian Socialism, developed in different degrees of intensity. Broadly, these revolutions have taken two forms: the Bolshevik form, through which there has been overnight communization of all property, and second, the milder form of legislative nationalization of industry. I believe we are now in position to take some stock of and to form some judgment as to the adequacy of these solutions for what I believe every liberal-minded man believes is a necessity—the better division of industrial production.

We require only a superficial survey to see that the outstanding and startling economic phenomenon of Europe today is its demoralized industrial production. Of the 450 million people in Europe, a rough estimate would indicate that they are at least 100 million greater than could be supported on the basis of production, which has never before reached so low an ebb. Prior to the war, this population managed to produce from year to year but a trifling margin of commodities over the necessary consumption and to exchange for supplies from abroad. It is true that in pre-war times Europe managed to maintain armies and navies, together with a numerically small class of non-producers, and to gain slowly in physical improvements and investments abroad, but these luxuries and accumulations were only at the cost of a dangerously low standard of living to a very large number. The productivity of Europe in pre-war times had behind it the intensive stimulus of a high state of economic discipline, the density of populations at all times responded closely to the resulting volume of production. During the war, the inten-

sive organization of economy and consumption, the patriotic stimulus to greater exertion and the addition of women to productive labor, partially balanced the diversion of man-power to war and munitions. Both the pre-war and the war impulses have now been lost, and the productivity of Europe has steadily decreased since the armistice.

It is true that some of this diminution in production has been contributed to by the other factors, but in the larger degree the cause of this steady decrease of productivity, with its shortage of necessary supplies and its rising cost of living, must be sought in the social ferment, with its continuous imposition of Socialist ideas. In this ferment the advocates of Socialism or Communism have claimed to alone speak for the downtrodden, to alone bespeak human sympathy, and to alone present remedies, to be the single voice of Liberalism.

We may examine these phenomena a little more closely. In Russia we have a great country in which the population, with the exception of a small minority, were comparatively well fed, warmly clothed, and warmly housed. They were subject to the worst of political tyranny, were deliberately steeped in ignorance and superstition, yet their productivity was sufficient to enable them to provide these primary comforts and to export more foodstuffs than the United States. Socialism was brought in overnight at the hands of a small minority of intellectual dilettantes and criminals, and this tyranny of minority, more terrible even than the old, has now had nearly two years in which to effect the conversion of the wicked competitive system into the Elysium of Communism. Today two-thirds of the railroads and three-fourths of the rolling stock that they control are out of operation. The whole population is without any normal comforts of life and plunged into the most grievous famine of centuries. Its people are dying at the rate of hundreds of thousands monthly from starvation and disease. Its capital city has diminished in population from nearly two million to less than 600,000. Prices have risen to fantastic levels. The streets of every city and village have run with the blood of executions, nor have these executions been confined to the so-called middle and upper classes, for latterly the opposition of the workmen and farmers to this regime has brought them also to the fring squad in appalling numbers.

If we examine the recent proclamations of this group of mixed idealists and murderers, we find a radical change in their economic and social ideas. They have abandoned the socialization of the land, for they find the farmer will not produce for payment in high-flown and altruistic phrases. They have re-established a differential wage in an attempt to stimulate the exertion and ambition of skilled labor. They have established a State Savings Bank, in order to stimulate production through making provision for family and old age. They are offering fabulous salaries for men capable of directing the large agencies of production. In fact, while in the midst of flowery verbal endeavor to maintain that they are still Socialists, they are endeavoring to restore individual ownership of property and of the results of labor. The very High Priest of Socialism is today vainly endeavoring to save his people from their total destruction by summoning back the forces of production. The apologists of this debacle are telling us that it is due to the Allied blockade, and to

various other oppositions, but any one with a rudimentary knowledge of Russia knows that they did have within their borders ample supplies of food, coal, oil, wool, flax, cotton, and metals and the factories with which to work them in abundance, and that their sole deficiency is human effort.

We could take another example of Bolshevism in the efforts of Bela Kun and his colleagues in Budapest. The distinction between this situation and Russia is that they were dealing with a population of much higher intelligence, of much higher average education, and it required but three months for the working people of Budapest to realize the fearful abyss into which they had been plunged. It was solely due to the efforts of the trade unions in Budapest that the Bolsheviks were thrown out of Hungary.

These are the extreme points where Socialism has had its opportunity for immediate and wholesale application, according to all of the precepts of its advocates. Elsewhere in Europe Socialism has proceeded through established institutions, and we may shortly examine the results here also.

During the war large measures were taken on both sides of the front to secure the mobilization of production and distribution to its maximum use in the struggle. There was effective socialization of vast sections of industry. These measures are being continued and extended today in many places by governments anxious to maintain the stability of institutions, even at the sacrifice of economic safety, but under the threat of minorities of revolutionary action. Yet here again the same prime weakness has proved itself. The only partial success of these measures in war was due to the great patriotic impulse of war. Those who conducted these large operations were men whose initiative and capacity had been selected by the competitive system. These war impulses have been lost, and these organizations with constantly decreasing efficiency even in war now face disaster from further reduced productivity. All these decreases have immediate results in a rising cost of living or the necessity of governments to subsidize commodities—such as bread. There is no better example of this than the coal industry of Europe, and even omitting Russia, this production has fallen from a rate of 600 million tons per annum at the armistice to a rate of 450 million tons recently.

The coal industry is in modern life the very life-blood of the state, and it has proved itself the most susceptible among all the industries to these influences, and its production today is at such an ebb as to jeopardize the entire social fabric. I am convinced that the greatest proportion of European leaders of Socialism today to some extent realize this bankruptcy, and are today endeavoring to cover a retreat with loud complaints as to the failure from other causes. Nevertheless, the realization itself is a great step and is bringing the turn of the tide, and through it Europe is on the road to economic recovery—if she gets peace.

The whole of these various sorts of Socialism are based on one primary conception, and that is that the productivity of the human being can be maintained under the impulse of altruism and that the selection of the particular human for his most productive performance can be made by some superimposed bureaucracy. Their weakness is the disregard of the normal day-to-day primary impulse of the human animal, that is,

self-interest for himself or for his family and home, with a certain addition of altruism varying with his racial instinct and his degree of intelligence. They fail to take into account, also, that there is but one sufficiently selective agent for human abilities in that infinite specialization of mind and body necessary to maintain the output of the intricate machinery of production, and that is the primary school of competition.

My emphatic conclusion is, therefore, that Socialism as a philosophy of possible human application is bankrupt.

Although Socialism has now proved itself with rivers of blood and suffering to be an economic and spiritual fallacy and to have wrecked itself on the rock of production, I believe it was necessary for the world to have had this demonstration. Great theoretic and emotional ideas have arisen before in the world's history and have, in their bankruptcy, deluged the world with fearful loss of human life. A purely philosophical view might be that these experiences are necessary to humanity, groping for something better. It is not necessary, however, that we of the United States, now that we have witnessed these results, plunge our own population into these miseries and into a laboratory for experiment in foreign social diseases.

Bankruptcy of the Socialistic idea, however, does not relieve us from the necessity of finding a solution to the primary question which underlies all this discontent. That primary question is the better division of the products of industry and the steady development of higher productivity. This bankruptcy of the Socialist idea should, if reaction is to be prevented, return the guardianship of this problem from the radical world to the liberal world of moderate men, working upon the safe foundations of experience.

The paramount business of every American today is this business of finding a solution to these issues, but this solution must be found by Americans, in a practical American way, based upon American ideas, on American philosophy of life. A definite American substitute is needed for these disintegrating theories of Europe. It must be founded on our national instincts and upon the normal development of our national institutions. It must be founded, too, upon the fundamental fact that every section of this nation, the farmer, the industrial worker, the professional man, the employer, are all absolutely interdependent upon each other in this task of maximum production and the better distribution of its results. It must be founded upon the maximum exertion of every individual within his physical ability and upon the reduction of waste both nationally and individually. We can well see a vivid confirmation in Europe of the fundamental economic principle that the standard of living and the cost of living is the direct quotient of the amount of commodities produced; that we must secure a maximum production of the industrial machine if we wish to keep our population alive or if we wish to see an increase in the standard of living of our people. From this only can arise the very foundations of the higher activities of life. The application of this proposition must, however, stand several tests. A maximum production can only be obtained under conditions that protect and stimulate the physical and intellectual well-being of the producer. We shall never remedy justifiable discontent until we eradicate the misery which the ruthless-

ness of individualism has imposed upon a minority.

If I were thinking aloud I would say at once that this maximum production cannot be obtained without giving a voice in the administration of production to all sections of the community concerned in the specific problem; that it cannot be obtained by the domination of any one element. I would say that the human race had increased its standards of productivity and therefore of living through the growth of extraordinarily intricate organization of production and distribution based upon stimulation of the individual by the reward it offers. I would also say that it cannot be obtained from the destruction or sudden disturbance of this delicate and intricate organization of production and distribution or extravagance in its products. I would say the road lies along the better division of the more exorbitant profits that arise from these processes and that have accumulated from them. By better division of profits, I do not refer particularly to profit-sharing schemes but to the broad issue of the whole social product. Some are comparatively overpaid, and many comparatively underpaid, for the service they render to the community. Our organization in many aspects is not all that we could desire, but it is the best we have been able to evolve over thousands of years, and the destruction of these processes or of the organization which conducts them has been demonstrated to be the sure road to destitution and fearful loss of life.

It is not that we today have suddenly awakened to this necessity for better distribution of profits. The social conscience of this country has been manifesting itself continuously concerning this matter for years. We have in the United States today a better division of wealth and a greater equality of opportunity than any other nation in the world, and we have thus better foundation upon which to build. We have reason for discontent in the fact that our industrial development has outrun our social progress, and we have reason to hasten those measures that lead to larger justice in distribution of these profits, larger representation of all elements of the community in the control of these agencies to further strengthen our measures for the restraint of economic domination by the few and for the liquidation into the hands of the many of the larger industrial accumulations in the hands of the few that our rapid development has made possible.

Again I wish to repeat, the observation of these forces in Europe has reinforced my Americanism during these last ten months of intimate contact with them; it has revealed to me the distance of our departure from the political, social, and economic ideals of Europe. There has grown in this United States a higher sense of justice, of neighborly service, of self-sacrifice, and, above all, a willingness to abide by the will of the majority in every section of this community. This Americanism is the guarantee of the ability of our people to solve this most momentous internal problem confronting our generation. But these very ideals, this very sense of justice and service for our own people, gives us still further opportunities.

Our sister civilization in Europe is today recovering from a great illness. The many new democracies that we have inspired are striving for our ideals. We alone have the economic and moral reserve with which to carry our neighbor back to strength. To do this is also true Americanism.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical
Industry Dealing With Pertinent
Subjects of Interest

Engineering, Latin and Greek

In the *Journal* of May 17 an editorial entitled "Engineering, Latin and Greek," caught my eye because I have always held some decided views as to the study of the dead languages, and have been on the lookout to find someone who can persuade me that the years devoted to these subjects were not so badly spent as they seem. The only encouragement which I am able to gather from this editorial is that my knowledge of these languages should make me better able to converse with other men who have acquired the same. Of course, this might be said about the study of any other topic, or about any experience, particularly of travel. As I have never noticed myself taking advantage of this prerogative, probably I have thrown away a valuable opportunity.

As the editorial asks for expressions of opinion, I venture to offer such an expression. To acquire my training in Latin, which was no more than what all of us took to pass the college entrance examinations in advanced Latin, necessitated spending an average of ten hours a week, counting home work and class-room recitation, for forty weeks a year for six years, or 2,400 hours. This is equivalent to a modern workingman's year of forty-eight hours a week for fifty weeks, so here is a solid year sacrificed on the shrine of one dead language. Still I am trying to discover any benefit which may be considered worth a fraction of the cost, or which can be compared with the benefit which might have been derived from the same amount of time spent doing innumerable other things which I would have liked to do, but could not do because of lack of time.

The only language to which I can point as an undoubtedly good investment was the eleven weeks' course in Spanish, of one lesson a week. No credit was allowed, because Spanish is not one of the classical languages, but it was the most valuable course for the time spent which I ever took, and was far more practical than any of the other languages, all of which required many times the work. My Greek is of value in that it is handy to be able to pronounce the Greek letters we meet in mathematical equations and in astronomy, but this could be learned in a couple of hours. Also, all the Latin suffixes and prefixes could be learned in a similar time, and that is about the extent of the use of Latin.

If anyone should ask you why hundreds of thousands of youths of the country are forced to spend millions of hours annually wearing out their brains and loading them with stuff that is only to be forgotten, you may tell them, if you want, that this is culture, and we must all be cultured. But if you want to get to the bottom of the truth you should say that the real reason is that some of our most aristocratic universities require it for entrance. Therefore other colleges, not wanting to be outdone by these, also require it, and so preparatory schools must teach it. You may ask why these more

aristocratic universities require it, if it is not worth while. The answer is that the "powers that be" at these colleges grew up in an age remote from these times. They despise modern "break-neck" tendencies and practices; in fact, they personally never took much to sciences, but preferred literature. They value much more the qualities which their own professors admired. They can point out that all the great men of former times studied Latin, and therefore so long as they are on the board of directors they will fight to keep Latin and Greek in their honored places.

ARTHUR O. CHRISTENSEN,
Harvard, 1906, and M. I. T., 1908.
Franklin, N. J., August 8, 1919.

Estimating Screen Efficiency

The article "Estimating Screen Efficiency," by W. O. Borchardt, in your issue of April 12, interests me strongly, because the points raised are similar to those affecting the problem of estimating the efficiency of ore dressing in general, which I have been studying.

Problems of this kind are half solved when they are correctly stated, and their difficulty is due to want of clarity in this respect more than to anything else. For instance, Mr. Borchardt continually refers to the efficiency of a screen, when what he is really writing about is the efficiency of an operation of screening. The efficiency of a screen per se is always 100 per cent; it will pass the whole of its undersize if you shake it long enough. But in practice perfection must be sacrificed to other and generally sordid considerations. Usually, the actual result obtained depends on the physical nature of the material screened. That with a high percentage of oversize is less easy to screen than material containing a low percentage, and the most difficult is that with a high percentage just a little larger than the mesh aperture. So it is with ore dressing: some ores are easier to dress than others, though, in theory at least, perfect separation of valuable content and waste could be made by an infinite series of repetitions, and only then.

I do not wish here to enlarge upon the derivation and use of the formulas I have devised for arriving at the absolute percentage efficiency of an ore-dressing result; anyone interested in the matter can look it up in the September, 1918, issue of the *Mining Magazine*. The point I want to make now is that both problems are similar, in that they are concerned with an attempt to express the efficiency of an operation aimed to separate, more or less completely, two different entities, waste and valuable matter in the one case, and undersize and oversize in the other.

I consider that my method of solving the ore-dressing problem is applicable also to screening. As a matter of fact it is unnecessary to use it in this way, for a simpler method is possible, but I want to do so here as a check.

Let the true percentage of undersize in the material

treated be 40 per cent, and of oversize 60 per cent, of the total weight. Let the percentage of undersize obtained in a particular operation of screening be 30 per cent (of the total weight of the feed, be it understood) and of oversize 70 per cent.

Then,

- $a = \text{per cent oversize in feed} = 60.0 \text{ per cent.}$
- $b = \text{per cent undersize in undersize} = 100.0 \text{ per cent.}$
- $c = \text{per cent of undersize in oversize} = 14.3 \text{ per cent.}$
- $A = \text{weight of feed} = 100.0.$
- $B = \text{weight of undersize} = 30.0.$
- $C = \text{weight of oversize} = 70.0.$

and the percentage efficiency of the operation equals

$$100 \times \frac{\left(\frac{b}{a} - 1\right) \frac{100(a-c)}{b-c}}{100-a} = 100 \times \frac{\left(\frac{100}{40} - 1\right) \frac{100(40-14.3)}{100-14.3}}{100-40}$$

$$= 75 \text{ per cent}$$

This is a very involved way of arriving at the same result as that given by

$$\text{Per cent efficiency} = \frac{100 \times \text{undersize obtained in operation}}{\text{true undersize}}$$

One difficulty which has prevented the solution of the ore-dressing problem is the general failure to recognize that though ore dressing is usually thought of as an attempt to obtain as large a percentage of the valuable matter as possible in a condition as free as possible from waste, it may equally as well be considered an attempt to obtain as large a percentage of the waste as possible in a condition as free as possible from valuable matter. The mathematical treatment from either standpoint should arrive at the same result.

So, with screening, the efficiency of the operation is the same whether considered from the point of view of undersize or oversize, and here I take issue with Mr. Borcherd. t.

Considering the oversize as equivalent to the valuable mineral in the ore-dressing formula, one can state, from the same data as before,

- $a = \text{per cent oversize in feed} = 60.0 \text{ per cent}$
- $b = \text{per cent oversize in oversize} = 85.7 \text{ per cent.}$
- $c = \text{per cent oversize in undersize} = 0.0 \text{ per cent.}$
- $A = \text{weight of feed} = 100.0.$
- $B = \text{weight of oversize} = 70.0.$
- $C = \text{weight of undersize} = 30.0.$

Per cent efficiency =

$$100 \times \frac{\left(\frac{b}{a} - 1\right) \frac{100(a-c)}{b-c}}{100-a} = 100 \times \frac{\left(\frac{85.7}{60} - 1\right) \frac{100(60-0)}{85.7-0}}{100-60}$$

$$= 75 \text{ per cent}$$

the same result as before, and not the same result as would be given by the formula

$$\text{Per cent efficiency} = \frac{100 \times \text{true oversize}}{\text{actual oversize}}$$

for which formula I can see no justification whatever.

So that, having subjected the above form of mathematical treatment of a kindred problem to searching analysis, I am satisfied that the absolute percentage efficiency of an operation of screening is given by the formula

$$\text{Per cent efficiency} = \frac{100 \times \text{undersize obtained}}{\text{true undersize}}$$

W. O. Borcherd states that he does not believe it possible to make comparisons of two screens operating on different feeds or on the same feed at different rates. This is equivalent to saying that it is not possible to

make comparisons between the results of two different processes of ore dressing on different ores, or on the same ore where rates of feed, or point of division between concentrate and tailing, or some other variable differs in the two cases. But this is just what the type of formula I have introduced does make possible. But, mark, it is only the results actually obtained which are thus rated. One is better than another by a definite degree, but this is not to say that the relation would be preserved with the same ore and the same process in each case, if the rate of feed or some other variable was altered. The reason this limitation exists is because it is impossible to equate a curve from a knowledge of only one point on it. If the general equation of the curve is known, then the knowledge of the co-ordinates of one point enables those of any other to be calculated, but the characteristic curve of an ore-dressing or screening operation is not known, and probably never will be.

R. T. HANCOCK.

Jos, Northern Nigeria, June 15, 1919.

Recent Metallurgical Progress

American engineers, especially those of us who have followed the various phases of the flotation litigation, have read with particular interest the references to flotation in Mr. Picard's recent presidential address before the Institution of Mining and Metallurgy of London, excerpt of which was published in the *Journal* of July 12, 1919. Mr. Picard has condensed so large an amount of metallurgical information into the space at his disposition that one should commend rather than criticise his accomplishment in this respect. There is, however, one sentence of about six lines which, in respect to its degree of condensation, challenges one's attention. This sentence says: "With later discoveries as to the partial solubility of essential oils, of the beneficial effect of certain insoluble oils in 'stabilizing' the froths and of sub-aeration procedure, the elimination of any need for pulp-heating, or in many cases for acidification, together with the use of alkaline circuits, etc., modern flotation has made remarkable advances."

It is to be wondered how many of Mr. Picard's hearers recognized in the casual references contained in this short sentence the description of three additional Minerals Separation patents! They are the so-called "soluble frothing agent" patent, the "in-the-cold and without-acid" patent, and the "sub-aeration."

One may rightly question whether the writer of the above condensed sentence may not have subconsciously concluded that the features so casually referred to in this sentence were, as in reality they actually are, merely those factors which are "So varied," yet factors of one and the same process. The U. S. Supreme Court, in its *Butte & Superior* decision, declared Minerals Separation patent 835,120 to be an improvement upon the Cattermole process. It would appear, therefore, that the reagents of the Cattermole process would be also the reagents of 835,120. In this connection, Mr. Picard's statement as to the "dual part" played by certain oils, as well as his allusion to the solubility of oleic acid, becomes of particular interest, and one wonders if these patents, so casually here referred to, can ever be sufficiently differentiated from 835,120, and therefore, also, from the Cattermole, to meet the standard of invention which would be applied to them, should they eventually come before the Supreme Court.

Philadelphia, Aug. 15, 1919.

C. H. HALL.

DETAILS OF PRACTICAL MINING

Suggestions From Practice for the
Superintendent, Foreman,
and Miner

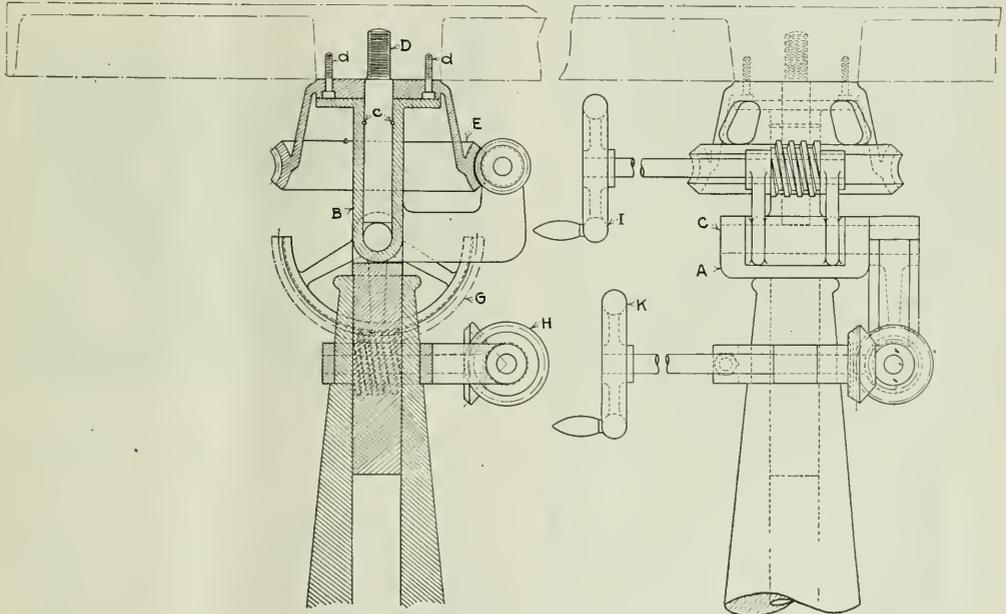
Improved Tipping Device for Oxy-Acetylene Welding Table

By J. T. SMOODY

The utilization of oxy-acetylene welding machines in shop practice is increasing, and during the last few years their adoption at mines has been fairly general. The many repairs necessary to pumps, mine cars, hoisting machinery, and other mine equipment make the oxy-acetylene torch an invaluable asset to the mine shop equipment, and it is believed that a description of the following tipping device for use in connection with an oxy-acetylene welding table will be of interest.

operator to move the table in any plane. When the break in a casting is such that it cannot be welded when placed in a horizontal plane, the broken pieces may be clamped to the table, which is adjusted to the proper plane, thus eliminating the blocking of the casting, which always consumes valuable time. When the desired plane has been found, and while one or two men hold the table, the third tightens the set-screws tapped in the socket to hold the table firmly while the casting is being welded.

The fact that it takes more than one man to operate the table makes its use objectionable where time is an important consideration. Another objection is that



DETAIL OF TIPPING FOR OXY-ACETYLENE WELDING TABLE

The type of table commonly used for welding small and medium weight castings was designed by the Auto-geneous Welding Equipment Co., and was described in *American Machinist*, July 8, 1909. The device consists of a cast-iron base, having a 2½-in. diameter cored hole in its center. The base supports a ball-and-socket joint, to which the table is fastened by means of four cap bolts. The socket is made with a small base on the side and hollowed out at the top, providing a bearing in which the ball-and-flange connecting neck rests when the table is in a vertical plane. This description is sufficient to show that the idea is to enable the

the ball-and-socket joint, when worn and slightly spread, cannot be held in place securely. The accompanying sketch shows a device that I have developed to overcome the above objections and save time in the adjustment of a welding table.

The yoke casting A is placed in the cored hole of the table base and the yoke in turn supports a three-way socket B, which has a vertical and horizontal pin running through it. The horizontal pin C is driven in tight and pinned on, whereas the vertical pin D is loose, and is held in place by two small pins c. The top end of the socket B has a flange on which the

Institute Meeting Opens at Chicago

Engineers in Large Numbers Register at Convention Headquarters at Congress Hotel—
 Proceedings During First Three Days Marked by Spirited Discussions—
 Question of Mine Taxation Receives Consideration

WITH the opening of the semi-annual convention of the American Institute of Mining and Metallurgical Engineers in Chicago on Sept. 22 another chapter in the history of the Institute was begun. When the A. I. M. E. meeting was held in New York last February, the signing of the armistice was so recent an event that it was not possible for the engineers to enter into the proceedings as wholeheartedly as they are doing at Chicago. The questions before the present meeting are of vital importance to the country's industrial progress. About 1,000 persons, coming from every American mining center, are expected to register during the five-day session.

MINE TAXATION

How to tax the country's mines and at the same time make a fair allowance for the wasting assets of the industry, was the subject of a spirited discussion on the opening day between Government agents and mining men qualified to talk on the question. The result of the mine-taxation meeting was a decision to secure close co-operation between the Government and the taxpayer, with the mine owner and mining engineer assisting the former in determining the basis of taxation. Dr. L. C. Graton heads the Government representatives.

A. S. Learoyd, of the U. S. Fuel Administration, in his paper presented at the first session, said that in case of future rationing of anthracite coal, the same system will probably be used as was employed last winter. E. C. Harder and D. F. Hewitt, of the U. S. Geological Survey, in another paper, outlined the extent of the country's newly developed manganese resources. The advantages of physical examination of employees and of certain methods of curtailing forces without destabilizing labor or business conditions in the community were pointed out by Charles F. Willis, of the Phelps Dodge Corporation.

There were also numerous business sessions on the opening day. In the evening the delegates met for a smoker at the Chicago University Club. Dr. F. G. Cottrell, George S. Rice, and Frank H. Probert, of the U. S. Bureau of Mines, recounted their observations on their recent trip through the devastated regions of France and displayed pictures showing present conditions in the various mining and metallurgical districts.

IRON AND STEEL SESSION OPENS ON SECOND DAY

Sessions on "Iron and Steel" were scheduled for the second day of the convention. Among the papers presented were the following: "Blast-Furnace Refractories," by Raymond M. Howe; "Effervescing Steel," by Henry D. Hibbard; "Aircraft Steels," by Albert Sauvour; "Determining Gases in Steel and the Deoxidation of Steel," by J. R. Cain; and "Effect of Time and Low Temperature on Physical Properties of Medium-Carbon Steel," by G. A. Reinhardt and H. L. Cutler.

Moving pictures of the largest plate-rolling mill in the world were shown the members in connection with a business session that lasted throughout the evening. The rolling mill shown is capable of turning out a 240-in. plate.

At the session on "Oil" at the Congress Hotel on the same day, a paper by Dr. Charles Baskerville on "The Value of American Oil Shales" was presented, in the course of which was reiterated the statement that petroleum production in the United States is lagging behind consumption. Dr. Baskerville also said, "The annual production of crude petroleum of 300 million barrels will require a material addition to keep the 477 refineries in operation up to their capacity of 490 million barrels annually. Hence, new oil fields or new sources of crude oil, or both, must be developed. In view of the recent variety of flamboyant advertisements in connection with the shale-oil industry, I hope the Institute will take adequate steps to safeguard, as well as foster, a promising industry. It is no business for an individual who expects quick returns."

THIRD DAY MARKED BY NUMEROUS TECHNICAL SESSIONS

Sessions on "Iron and Steel," "Sulphur in Coal," and on "Mining and Local Resources" were held in the forenoon on Sept. 24, at the Congress Hotel, which was the convention headquarters. At the session on "Coal" attention was focused on the need of improving coal production by better utilization of the supply, and of providing more coal of low sulphur content. E. A. Holbrook, acting chief mining engineer of the U. S. Bureau of Mines, said in his paper that a few years ago 40 per cent of the coal mined was wasted by rejection in the mine or in the setting aside of smaller sizes. Research and greater knowledge are needed regarding costs, rates, and markets, according to Mr. Holbrook.

A warning to the gas industry that low sulphur coals will become scarcer year by year, and that in time the industry will be compelled to use coals that are now considered of no commercial value, was issued by W. W. Odell and W. A. Dunkley, the latter of the Illinois Geological Survey. At another session E. F. Boericke and T. H. Garrett, of the Mineral Point Zinc Co., predicted a growth in importance and output for the Wisconsin zinc district, which they said has in recent years increased its output about 1,300 per cent.

There were also business sessions on Sept. 24 in addition to an extended symposium on non-ferrous metallurgy that was held in the Coliseum in conjunction with the Chemical Industries Exposition. In all 145 subjects are being presented during the week's meeting, the largest number in the history of the Institute.

Charles M. Schwab, General Leonard Wood, and Horace V. Winchell, president of the Institute, were the principal speakers on the program for the banquet on the evening of Sept. 24. The president's reception preceded the banquet. The latter event was followed by dancing in the ballroom of the Congress Hotel.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War-Minerals Relief

The investigatory work in connection with the War-Minerals Relief Act which has been conducted under the direction of J. E. Spurr is far in advance of the decisions by the War-Minerals Relief Commission. Engineers' reports to the number of 150, and 144 auditors' reports, have been turned over to the commission. Seventy-four claims have been analyzed by the chief auditor and chief engineer and reviewed by Mr. Spurr and placed before the commission. In every case where a "request or demand" on the part of one of the Government agencies named in the act is alleged, it has been made the subject of a special inquiry by the investigations division. This work has been carried on by twelve engineers and nine auditors in the field, in addition to the force in the offices at Washington.

Now that the methods of examination have been reduced to a clearly understood system, and with the experience which the force of engineers and auditors has had, it would be possible to carry the work on more rapidly should that become necessary. It is probable, however, that only the present rate will be maintained, so as not to be too far ahead of the decisions by the commission. Under Mr. Spurr, J. A. Battle, Jr., has had charge of the engineers, and C. B. Holmes has been in direct charge of the accountants.

After a more careful consideration of the effect of the Attorney General's opinion, it is believed that slightly more than one-half of the claims filed with the War-Minerals Relief Commission will be eliminated. The Attorney General's opinion¹ was to the effect that claimants must show that an appeal was made to them by one of the five bodies mentioned in the statute. With the claims thus eliminated, there no longer is doubt that the \$8,500,000 appropriated will be sufficient to settle all claims which fall within the statute.

Some claims are being eliminated by the discovery that the claimant may have profited in another operation. The commission declines to pay the loss on one property when others held by the same claimant have been profitable. In one case the claimant established without difficulty a loss of \$2,700, but from another source the commission learned that the claimant had received profit of about \$30,000 in a similar operation.

Economic Conditions in Norway

A feature of recent economic developments in Norway, writes Nels A. Bengtson, trade commissioner for the Bureau of Foreign and Domestic Commerce, is the almost complete shutdown of ten of the largest carbide, aluminum, and cyanide plants in that country. These plants, when running at full capacity, employed more than 6,000 men, but during the last few months they have employed only about half that number. In the early part of August, it is reported, labor troubles developed, which seriously affected the output of the plants.

The mining industries at present are also in a stagnant condition, some of the largest pyrite and copper mines having reported that they can no longer produce in competition with other countries, on account of the difficulty of mining conditions. Many of the older mines report a scarcity of ore, and indicate that they will have to find virgin areas in order to produce according to the pre-war scale.

The electrochemical and electrometallurgical industries, it is said, are also passing through a depressing transition period, from war conditions to a peace basis. It is predicted that some plants will find it difficult to maintain operations when the keen demand and inflated prices prevalent during the war period give way to normal demands and open competition. This, it is thought, will be especially true for such plants as use relatively large quantities of raw materials in proportion to the values of finished products. Norway is, on the whole, it is reported, deficient in raw materials for these industries and has a limited market for their products.

Offsetting these disadvantages, Norway has cheap hydroelectric power available at factory and harbor sites. The well-developed shipping lines, added to the preceding factors, combine to favor the industry, it is said, in which electrical energy is a factor of maximum importance, and consequently are of advantage to those which use relatively small quantities of raw materials in proportion to the value of finished products. It is believed that developments along these lines will characterize future Norwegian industrial progress.

Mining Laws of Nova Scotia

A digest of the mining laws of Nova Scotia was recently received by the Bureau of Foreign and Domestic Commerce from the American Consul General at Halifax. The Minister of Public Works and Mines, he reports, states that no restrictions, either legislative or administrative, which are not placed on British subjects, are placed on aliens, in the granting of mining rights or concessions for the operating of mines, or the distribution of mineral products. There are not at present in the province of Nova Scotia, the consul says, any extensively large mining grants which because of their size cannot be developed by the concessionaires in the immediate future. All ores and minerals, however, are subject to royalties to the Crown.

The right to mine minerals or to prospect for minerals must be obtained from the Mining Department. Licenses are issued for gold and silver prospecting, and for all other minerals, exclusive of gold and silver. Applications for prospecting may be filed by anyone with the Mines Department. The license to prospect, when issued, is valid for eighteen months, and leases run for twenty years, at a yearly rental per area. Practically all leases, it is stated, are renewable for a further period of twenty years, and may be renewed as many as three times thus making the original lease and renewals operative through the period of eighty years.

¹Eng. and Min. Journ., July 19, 1919, p. 107.

American Electrochemical Society Meets at Chicago

Electrochemists Gather in Joint Sessions With Mining
and Metallurgical Engineers—Important
Present-Day Problems Discussed

CONCURRENTLY with the convention of the mining and metallurgical engineers at Chicago, as well as the Exposition of Chemical Industries and other events, the American Electrochemical Society held its thirty-sixth general meeting in that city on Sept. 23 to 26. Headquarters were maintained at the Congress Hotel. Registration of members and their guests began at the hotel early Monday morning, but was later continued at the society's booths on the balcony of the exposition at the Coliseum.

The program of the meeting really began on the following day. During the afternoon a joint technical session on "Iron and Steel" was held, the list of papers presented and discussed being given in the A. I. M. E. program. A further session on the same subject took place in the evening at the hotel.

"Ferrous and Non-Ferrous Metallurgy" was the general subject of the afternoon session on Sept. 24, F. A. J. Fitzgerald presenting a paper on the "Radiant Resistor Furnace," and A. M. Clark one on "Electric Heat in the Typewriter Industry." Other papers discussing the electric furnace were presented by Mr. Fitzgerald and H. G. Weidenthal.

In the evening electric-furnace exhibits in the exposition auditorium were inspected by the members, following which motion pictures showing electric furnaces in operation were displayed. The subjects included "Resistance Type Furnaces for Melting Non-Ferrous Metals"; Detroit Rocking Electric Melting Furnace in Operation; and "Electric Furnaces in the Heat Treatment of Essential War Materials."

The joint session on "Pyrometry" occupied morning and afternoon sessions at the Congress Hotel on the third day. In the evening the members were entertained at a smoker as guests of the local committee.

"Catalysis" was the subject of the symposium in the forenoon of the last day. Prof. H. S. Taylor, of Princeton University, presided over this session. Those who took part included W. D. Bancroft, H. S. Taylor, and W. J. Huff. In the afternoon a demonstration of the manufacture of fluorine was given by Prof. F. C. Mathers and Burr Humiston, and various technical papers were presented. The evening was spent in visiting the exposition.

Safety Congress Convenes

Eighth Annual Meeting of National Safety Council
To Be Held in Cleveland Oct. 1 to 4—Many
Interesting Papers and Exhibits Planned

THE Eighth Annual Safety Congress, under the direction of the National Safety Council, will be held at the Hotel Statler, Cleveland, during the four days beginning Wednesday, Oct. 1. The sessions on the first day will be general in character, the last three days being devoted to special meetings of particular interest to various groups, including the automotive, cement, chemical, construction, electric railway, metals, mining, packing, paper and pulp, steam railroad, textile, wood-working, rubber, and marine industries.

The week of Sept. 28 to Oct. 4 will be observed in Cleveland as "Safety Week," and a special effort will be made to avoid all industrial accidents. During Safety Week in St. Louis, where the annual meeting was held last year, the only death from accident was that of an intoxicated man falling from a wagon, and with the laws now in force it is hoped that Cleveland will, during this week, set a new record in community safety.

In addition to the meetings on Wednesday in which all will be interested, the following papers which will be of special interest to the mining profession, will be read, each to be followed by discussion.

Thursday morning, Oct. 2, Room 341.

9.30—"Mine Accidents, English Speaking vs. non-English Speaking Employees." By A. H. Fay, mining engineer, U. S. Bureau of Mines.

10.15—"Training and Handling of Men." By M. W. Gidley, safety inspector, Copper Queen Co.

11.00—"Labor Turnover and Its Relation to Mine Accidents." By E. E. Bach, chief Americanization Bureau, State of Pennsylvania.

11.30—"Industrial Relations in the Mining Industry." By Charles F. Willis, of the Phelps Dodge Corporation.

Friday morning, Oct. 3, Room 341.

9.30—"Fire Prevention in Anthracite Coal Mines and Necessary Equipment for Fighting Mine Fires." By M. W. Price, efficiency engineer, G. B. Markle Co.

10.15—"Effective Use of Rescue Apparatus in the Fighting of Mine Fires." By T. Ryan, Mine Safety Appliance Co.

11.00—"The Desirability of Standardizing Mine Rescue Training and a Plan for Standardization." By D. J. Parker, mine safety engineer, U. S. Bureau of Mines.

Saturday morning, Oct. 4, Room 341.

9.30—"A Compilation of Chute Types for Loading Ore Into Tram Cars in Metal Mines." By C. A. Mitke, mining engineer, Phelps Dodge Corporation.

10.15—"The Importance of Safety Measures to the Miner." By Major Arthur S. Dwight, chairman, Industrial Organization Committee, A. I. M. E.

11.00—"Need for a Definite Technical Service in the Mining Section of the National Safety Council." By E. F. Tillson, assistant superintendent, New Jersey Zinc Co.

Many mine safety engineers will also be interested in an Employees' Publications Luncheon Round-Table to be held on Thursday, Oct. 2, at 12.30 p.m., at which such topics as the following will be discussed: How to interest the management to appropriate funds for a plant organ. What benefits should a corporation expect to derive from an employees' publication? What can employees' publications do to promote industrial good-will? What kind of material is needed to make the plant periodical a success? How to obtain news items for a plant publication.

On Thursday afternoon a general session will be held on Americanization and the immigrant problem; on Friday noon a luncheon round-table to discuss the safety bulletins and posters; on Friday afternoon a general session on health; and on Saturday afternoon, a general session on safety education.

The entertainment of those attending the Congress has also been given considerable attention. There will be a reception and informal dance in the Statler ball-

room on Wednesday evening; an informal dinner and smoker at the Hotel Winton on Thursday evening, and the annual banquet (informal) on Friday.

One of the principal features of the congress will be the Safety Exhibit which will occupy 14,000 sq.ft. of floor space in Grays' Armory. This will be the most pretentious and elaborate exhibition of its kind ever made, practically all of the leading manufacturers of safety devices being represented. Those who attend this exhibit will learn of all the latest and best ideas in guards, sanitation, and lighting, many features of a practical nature having been recently developed.

International Exposition of Mining Industries

The opening date of the International Exposition of Mining Industries at New York has been changed from Oct. 15 to Dec. 1, owing to the delay of the Government in vacating Grand Central Palace. This decision was made when it was found that the time was not sufficient to prepare the building and exhibits.

The International Exhibition of Mining Industries, as mentioned in the *Journal* of Aug. 2, forms a part of the project that contemplates a permanent exposition of various industries, the scheme being fathered by the Nemours Trading Corporation, of which Alfred I. Du Pont is president. Howard R. Ward, who is manager of the mining industries section, recently returned from an extended trip through the West, and reports that there is widespread interest on the part of manufacturers and engineers in regard to the exhibit. Comprising the advisory committee are the following: H. C. Parmelee, H. R. Ward, S. A. Taylor, Frederick G. Clapp, Ralph Arnold, Kenneth Seaver, H. H. Stoek, and Charles W. Merrill.

Petroleum in Cartagena District, Colombia

The American Consul at Cartagena, Colombia, in a report recently received by the Bureau of Foreign and Domestic Commerce, declares there is a lack of activity in the development of the oil fields in that consular district.

So far as is known, he reports, only two American companies have acquired concessions to explore and exploit lands for petroleum in the Cartagena district. Nothing but preliminary explorations have been made by these companies, although other American companies are making investigations in the same department.

It is understood that three groups of British geologists, representing British capital, are making investigations in the same region, a former member of the U. S. Geological Survey being one of the number.

At present, the American consul reports, exploitation of petroleum wells is at a standstill, awaiting the result of the suspension of the recent decree regarding subsoil rights.

Michigan Copper Output in August

The production of ingot copper from the mines of the Michigan district for the month of August was 13,302,886 lb., a decided increase over the output for July but only 70 per cent of normal production. The outstanding features were the increase in the production of the Calumet & Hecla of nearly a million pounds, the decided increase in the Ahmeek and Osceola mines, and the ex-

ceptionally high-grade yield shown in the Champion mine of the Copper Range, as well as the increase in copper total. La Salle drops out entirely and Superior's output is practically nothing. Winona entered the list of producers for August, but had not operated long enough to get any mineral to the smelter.

The following is a carefully prepared tabulated statement giving the approximate results in actual copper produced at all of the mines in the Michigan copper district. In some of the mines the figures are official smelters' and mine records; in others they are estimates; but the approximations are conservative in each instance.

COPPER OUTPUT OF MICHIGAN MINES IN AUGUST

Mine	Rock Tonnage	—Lb. per Ton—		Refined, August	Refined, July
		Aug.	July		
Ahmeek	55,890	22.2	20.8	1,245,300	958,500
Altoz	13,600	18	14.5	245,800	150,100
Baltic	70,000	34	35	2,800,000	634,500
Calumet & Hecla	165,472	25	22.4	4,136,818	3,292,821
Centennial	5,075	13.9	15	70,500	76,002
Champion	45,000	40	35	1,800,000	1,350,000
Isle Royale	58,865	18	18	1,059,583	935,150
Mass Consolidated	7,143	14	14	100,000	92,321
Michigan	5,000	32.2	20	161,254	184,175
Mohawk	43,157	21.36	23.4	922,209	1,012,575
Osceola Cons.	96,700	14.4	13	817,600	651,000
Quincy	80,000	18	18	1,620,000	1,500,000
Superior	650	17	20	11,000	35,025
Victoria	10,000	12.5	16.5	130,000	108,900
Wolverine	77,493	14.65	13.8	402,822	331,736

Davis-Daly Copper Co.

The report of the Davis-Daly Copper Co. for the quarter ended June 30, 1919, states that much underground development was performed during the period reviewed, and some excellent orebodies were opened, which added materially to the ore reserves.

The Belmont crosscut, which was started in December, 1917, for the purpose of ventilating the mine, has been completed, and has accomplished the cooling of the underground workings materially. The temperature has been reduced from 110 degrees to 85 degrees, permitting full eight-hour shifts, and increasing the efficiency of the men. Surface improvements are under way, and the new skip and steel ore bins will be installed soon, thus facilitating hoisting and increased production. The wage question is approaching settlement, and there is little or no difficulty in securing good and efficient men.

On June 22, shaft sinking at the Colorado mine was begun from the 2,500-ft. level to the 2,700-ft. level. It is planned to connect by crosscut with the downward extension of the orebody found on the 2,500-, 2,300-, and 2,100-ft. levels. Total development for the quarter was 1,938 ft., comprising 801 ft. of drifts, 263 ft. of crosscuts and 874 ft. of raises.

Shipments for the quarter amounted to 10,700 tons, producing 1,859,747 lb. of copper and 72,784 oz. of silver. The average assay of the ore shipped for the period was 8.98 per cent copper.

Total receipts for the quarter amounted to \$257,736.11, and total disbursements were \$185,735.24. The disbursements included \$81,869.71 for development, \$72,758.94 for mining cost, and \$14,950.26 for equipment.

Iron Bacteria are actively engaged in the deposition of compounds of iron not only in surface iron-bearing waters but in mine waters to depths of several hundred feet. A special paper on the subject, "Iron Depositing Bacteria and Their Geologic Relations," has recently been issued by the U. S. Geological Survey. E. C. Harder, of the Survey, who has examined deposits of iron ore in many countries for the special purpose of determining their mode of origin, has recently made close studies of the action of bacteria in forming iron ores, and has made laboratory cultures of various iron-depositing bacteria.

BY THE WAY

Naturally

"Naturalization of Mines Now Being Proposed by Miners" runs a headline in a paper of the Middle West. It is perfectly logical, of course, that this should precede any attempt to Americanize the miners.

Bacteria and the Steel Strike

At a time when the down-trodden steel workers are striking it is interesting to read of the industry of the iron-depositing bacteria and their geologic relations. Among them everybody works, including father, as E. C. Harder shows in his paper on this subject just issued by the U. S. Geological Survey. Mr. Harder gives the results of his laboratory experiments in bacterial iron deposition, considers the probable extent of influence of bacterial action in forming deposits of iron ore, and gives a bibliography containing titles of the papers on work of bacteria in rock and ore deposition. All this reminds us of the saying "from shirt sleeves to shirt sleeves in three generations." What the lowly bacteria has perhaps painfully accumulated, the profligate steel worker squanders, directly or indirectly as you choose, and then impudently asks for more. Go to the iron-depositing bacteria, thou steel worker, learn of their ways, and be wise.

An Impending Calamity

A cloud no bigger than a man's hand has arisen above our horizon, and the barometer is rapidly falling. The wind is rising, and the birds have hushed their voices. Obviously a storm threatens. It does, indeed! Woolsey McAlpine Johnson, of the Potash Patents Corporation, objects to our calling his advertising "bunk." The criticism to which he takes exception appeared in the issue of July 26 under the caption "Potash and Wooden Nutmegs." But the half was never told—lack of space prevented. Many a gem was perforce omitted. For instance, the funds that Mr. Johnson would raise by the bond issue advertised are to be used, among other purposes, to enable him to develop his "Bacchus Barlicawn Bar-none Raspberry Juice," though what this has to do with potash products it is hard to see. Mr. Johnson, however, is to be given credit for having rung all the bells at once. He appeals in one ad. to nearly every trait that ever makes a "sucker" part with his cash. But the postoffice inspectors may get him if he doesn't watch out. What more horrible fate than to fall into Mr. Burleson's hands!

Other Peoples' Worries

The importance of engaging in welfare work, or "industrial relationship work," as one large mining corporation prefers to call it, is now well recognized by mining companies, and thereby a new qualification is added to those that the ideal manager must possess. But the same ideal manager, if by any chance he exists, may be glad if his lot is cast without the Dark Continent. As one reads the account of Dr. Orenstein's testimony before a government commission in South Africa, dealing with the methods of combating pneumonia among the natives, he can almost picture the

executive on the Rand as playing nurse to a lot of black boys. The recipe given for caring properly for the tropical native is that he should be housed in the cubicle type of compound room, given his government ration without stint, plenty of good blankets for his bed and one to put on coming up from the mine, a hot ration before going down, a dry ration at half-shift, and main ration as soon as possible after quitting work. For the rest, he is to be protected from cranks, both medical and lay.

The Clarity of Language

"Every naow an' again, m'son," said Cap'n Dick, "some chap starts h'agitatin' for this 'ere h'Esperanto or universal language. Tha h'only trouble is, m'son, that there is so much h'agitatin' these days that h'unless man belongs to some union of h'other 'e's liable not to be 'eard. But that's neither 'ere or there. Tha point to be h'understood is that there should be some way by means o' w'ich a man could make 'is meanin' clear to tha chap 'oo 'e's talkin' to. There's too much confusion an' babel basut some things that could be made simple if people h'only 'ad proper understandin' an' a fair means o' talkin' to h'each h'other. I am reminded, m'son, o' tha time Tom Trewella bloody near come to blows with 'is butcher for lack o' h'understandin' h'each h'other. Tom gaws daown taown one moornin' to buy a bit o' steak for 'is missus. In 'e gaws to tha butcher shop, an' firs' thing e' sees, standin' h'up on top o' tha counter, is a stuffed bird, tha like o' w'ich e'd never seen. 'Ere, Billy,' sez 'e to the butcher, 'Wot's thee want for tha broad-faced chick?' 'Tha's no broad-faced chick you, 'e's a h'owl,' sez tha butcher. 'Gos' along,' h'answered Tommy. 'W'y, dam-me, 'e's never too h'old for boilin.' Wot's tha matter with thee?"

D. E. A. C.

In Telluride

Rare is the mining camp that does not boast the good old days when it was young and history was lurid in the making. But Deadwood, Cripple Creek and Leadville, Butte, Virginia City and Globe have gone and got religion—or else the movie habit. The heroes of other days now stalk boldly across the screen instead of through the city streets, and in the audience that beholds them the tenderfoot is not to be distinguished from his neighbors.

It is in Telluride that one catches occasionally a glimpse of other days. Some say that no one ever dies a natural death in Telluride. What a twist in the scheme of things that this place, set in its wonderful mountain scenery, should have been and should still so often be the scene of unfortunate events. Man has rivaled nature in taking life. The history of the camp is replete with accounts of robberies, murders, death by snowslides and other causes, and many mysteries are still unsolved. The latest crime occurred on Sept. 10, when four contractors were shot to death on the upper level of the Tomboy company's Montana mine just as the shifts were changing. The gunmen, who were masked, made their escape, and no motive for the crime has been deduced. Level No. 1 of the Montana mine is up in the Middle Basin, within a thousand feet of the top of the range and several miles from the outside workings of any other property worked by the Tomboy company. The writer of fiction who is tired of war subjects may find what he is looking for in Telluride.

PERSONALS

J. B. UMPLEBY, who has been a member of the staff of the U. S. Geological Survey for many years, has resigned to become the director of the school of geological engineering at Norman, Okla. One-half of his services is to be devoted to the school and the remainder to work as a consulting geologist.

Clarke Sullivan, of San Francisco, is in Ely, Nev., on professional work.

F. G. Stevens, of Toronto, has returned from examining mines in Central America.

G. L. Sheldon, formerly of Ely, Nev., recently visited Chaffee County, Col., on examination work.

C. Schuette, formerly on the staff of the Bureau of Mines, has left San Francisco for Nevada.

R. A. Bryce, of Toronto, is opening up a gold property in the Cariboo District, British Columbia.

William F. Ward is engineer for an hydroelectric power project in the district of Ocana, Colombia, South America.

D. L. Cleaves, of St. Louis, has accepted an appointment with the Balbach Smelting & Refining Co. of Newark, N. J.

Major L. A. Barton has returned from overseas service and will resume his practice as soon as he receives his discharge.

Harvey B. Small, manager of the Liberated mine, in the district of Guamoco, Colombia, South America, is in New York.

G. C. Bateman, of Cobalt, has returned from Port Arthur, where he has been examining some of the old silver mines in that district.

J. R. Stroh, assistant manager mining department Brier Hill Steel Co., has been named manager, succeeding **John N. Allen**, resigned.

Benedict Crowell, Assistant Secretary of War, has returned from France, where he had been for six weeks attending to the settlement of Army affairs.

Oscar H. Reinholt, recently returned to San Diego from a professional trip to Sierrro County, Cal., and expects to proceed soon to San Angelo, Texas.

James L. Bruce, manager of Butte & Superior Mining Co., has resigned to become manager of the Davis-Daly Copper Co. He will take up his new duties on Jan. 1, 1920.

Karl C. Parrish, who has been engaged in mining in Colombia for several years, is at present engaged in engineering and developing an addition to the City of Barranquilla.

J. J. Becker, formerly manager of the blast furnace of E. J. Lavino & Co., at Lynchburg, Va., will become manager of a furnace operated by associated interests at Sheridan, Pa. His successor at the Lynchburg plant will be **M. D. Langhorne**.

M. Y. Williams, of the Canadian Geological Survey, who is an authority on the geology of oil areas, and **Joseph Keele**, of the Mines Branch, a specialist in clays, are making examinations along the proposed T. & N. O. railway extension north of Cochrane.

Dr. Charles L. Parsons has resigned his position as Chief Mineral Technologist of the Bureau of Mines to take effect Nov. 1. He expects to open offices in Washington on that date, and in addition to conducting the Washington office of the American Chemical Society, will engage in private work.



Harris & Ewing

J. B. UMPLEBY

OBITUARY

Angus McDonald, one of the pioneers of the Cobalt district and afterwards engaged in mining in Nevada and Colorado, was accidentally shot recently while on a hunting expedition. Mr. McDonald was thirty-three years old.

Nathaniel Stone Simpkins, prominent in the development of the Calumet & Hecla and other copper mines, died recently in Connecticut. Mr. Simpkins is survived by his wife, three sons, and one daughter. He was graduated from Columbia University, New York, with the class of 1882.

John Daggett, former superintendent of the San Francisco Mint and Lieutenant-Governor of California, died on Aug. 30 at Black Bear, Siskiyou County, Cal. Mr. Daggett went to California from New York in 1852 and was among the well-known early Californians. Early in 1853 he entered California state politics and was nominated

for Lieutenant-Governor at the Democratic convention in 1882. In 1893 he was appointed superintendent of the San Francisco Mint. After his retirement from the Mint, Mr. Daggett returned to his mine at Black Bear, Siskiyou County. He led a secluded life up to his death.

SOCIETIES

American Society of Mechanical Engineers held a meeting in New York on Sept. 17. **Dr. William M. Leiserson**, of the U. S. Department of Labor, spoke on "Industrial Unrest."

Mining and Metallurgical Society of America. The New York Section held a meeting at the Columbia University Club, New York, on Sept. 23. **W. R. Ingalls** presiding. The subject "Occupational Training" was discussed by **Prof. Robert Peelle** and other speakers.

INDUSTRIAL NEWS

Pacific Tank & Pipe Co. is to offer \$750,000 ten-year first mortgage bonds, the amount realized to be applied as working capital. The increase in the company's business has rendered this step necessary.

Charles Hardy, metal and ore broker of New York, has acquired a warehouse at Hoboken, N. J., which he states combines unusually good structural features and handling facilities. The building will be devoted entirely to the storage, inspection and sampling of metals, including iron and steel, tin plates, and minerals.

The **Western Electric Co.** recently added a lighting department to its general sales organization for the purpose of fostering the propaganda for better lighting in factories, offices, hotels, clubs, and residences. **E. Cantelo White**, who has had almost fifteen years' experience in the electric-lighting field, will be in charge.

Traylor Engineering and Manufacturing Co. announces that it has booked the following recent orders for mining and crushing machinery: **New Jersey Zinc Co.**, two sets 30 x 16-in. Traylor rolls, with automatic lateral adjustment; **Thomas L. Barrell**, Louisville, Ky., one No. 3 gyratory and one 30 x 12 ft. trommel screen; **Great Western Portland Cement Co.**, one 48 x 60-in. "Bulldog" jaw crusher; **Choctaw Portland Cement Co.**, one 42 x 48-in. "Bulldog" jaw crusher; **W. R. Grace & Co.**, four 36 ft. by 72 in. revolving trommel screens; **Sociedad Minera y Metalurgica de Penarroya**, one 3 x 6 ft. Sheridan shaking grizzly; **Amparo Mining Co.**, one 5 x 20-ft. tube mill; **Chicago Gravel Co.**, one 4 x 12-ft. "Bulldog" grizzly feeder and one 8-in. "Bulldog" gyratory crusher.

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief
of Interest to Engineers
and Operators

SAN FRANCISCO, CAL.—Sept. 17

John D. Hoff has begun suit through his attorneys, Clarke and Clarke, for infringement of his patent for calcining magnesite ore. The defendants are the Magnesite Production Corporation and Moore, Morrison, et al., owners of the Sampson magnesite properties in San Benito County, Cal. The patent is said to consist in a new and improved method of calcining magnesite ore in vertical kilns, by which the by-path process insures a continuous operation of the kiln and a more perfect calcination of the ore for plastic purposes. Mr. Hoff and associates have also begun action to recover the property, which they have under lease and on which they claim to have expended within the last two years more than \$100,000. Operations have been suspended for several months because of the tariff situation and the scarcity of market demands.

RENO, NEV.—Sept. 17

The Silver Peak Chemical Co. is mining what is said to be the only known deposit of water-soluble potash alum in commercial quantity, seven miles southeast of Blair Junction, on the T. & G. R.R., in Esmeralda County, Nev. According to W. B. Roberts, manager of the company, tests made by E. E. Free, of the U. S. Geological Survey, and others, show that the ore now opened up will average 20 per cent pure potash alum. The deposit has been developed by eight shafts, with numerous drifts and crosscuts, for a length of 1,000 ft., depth of 75 ft., and width of 70 ft. The process of extraction will be simple, according to chemists who have made numerous analyses and crystallization tests. The company announces that it has ordered a 100-ton plant and expects to have it in operation within ninety days.

A Vote To Call Off the Strike at Tonopah and Divide, taken recently at a meeting of conservative miners of the district, resulted in 279 votes in favor of the motion and 51 against Governor Boyle and operators expected, therefore, that work would be resumed Sept. 15. At a meeting of the more radical held afterward, a motion was likewise made to call off the strike. An amendment was also offered that Tonopah be declared a scab town, but the meeting adjourned without action on the motion or the amendment. Speakers at this meeting declared the strike had only just begun. The expected resumption did not take place, therefore, on Sept. 15, and the future is uncertain. There were 1,500

miners and mill men in the district before the strike, and it is estimated that of these 500 have already departed.

SPOKANE, WASH.—Sept. 17

Northwest Mining Association, at its meeting held in Spokane on Sept. 12, endorsed the Jones-Reavis bill, now before Congress, providing for the creation of a Department of Public Works, with an engineer at its head, who shall be a member of the President's Cabinet. The association in its resolution urged that Congressmen from the Northwest support the bill. A copy of the resolution was sent to each Senator and Representative in Washington.

WALLACE, IDAHO—Sept. 16

The Strike at the Coeur d'Alene mines has been without disorder thus far. Picketing at the Hecla mine be-

BUTTE, MONT.—Sept. 19

First Break in Metal Crafts Strike in Butte district took place Sept. 18, when the machinists at the Anaconda smeltery at Great Falls, Mont., voted to return to work, accepting the old offer of the company. The Metal Crafts is an independent union consisting of machinists, engineers, and electrical workers. The men in the organization refused to accept the wage offer made by the Butte mining companies at the time of the strike in February of this year. Metal Crafts consist of only 6½ per cent of the total mining labor of the district.

HOUGHTON, MICH.—Sept. 17

Calumet & Hecla's longest underground level will be completed Jan. 1, notwithstanding the fact that operations at the south end are suspended.



DEPOSIT OF POTASH ALUM NEAR BLAIR JUNCTION, ESMERALDA COUNTY, NEV., BEING WORKED BY SILVER PEAK CHEMICAL CO.

came rather offensive at the start, but a warning from the sheriff's office had immediate effect. The force at the Hecla has increased, now totaling about seventy-five men, who are engaged in repairs on pumps and in similar work. No men are employed at any of the other mines except watchmen and those necessary to keep pumps running. There is a fixed determination on the part of the companies to give no recognition to the union. The impression prevails in the district that the Hercules and Tamarack mines, controlled by the Days, will not attempt to resume operations until spring. The Northport smeltery, which handles the ores from these mines and is also controlled by the Days, is closed down.

The drifting to the north continues at full speed. This underground project will be 8,000 ft. long when completed and will connect lower levels of the Red Jacket perpendicular shaft with the lower levels of the conglomerate angle shafts and ultimately will provide a tramway for the lowest level. When this work is completed five shafts of the South Hecla, Nos. 6, 7, 8, 9, and 10, will be operated through subshafts and the rock trammed over to the Red Jacket shaft. Once this work is well under way all pillars can be removed from the South Hecla shafts from a point 8,000 ft. from surface, and the shafts permitted to cave. New miners are being added to the crew of the Calumet & Hecla and subsidiaries at the rate of fifty a day.

Mohawk Mining Co., in the Michigan copper country, is concluding an interesting construction job at the stamp mill at Gay. The drift out under the waters of Lake Superior, through the sandstone, has now attained a lateral distance of 2,100 ft. and has 700 ft. more to go before the raise is cut through to let the water in. When completed, this system will bring water from a point 2,800 ft. out in the lake and 28 ft. under the surface for use in the mill. Long experiments have proved that the spot selected for this intake is practically clear of stamp sand and float ice, owing to the prevailing wind and the topography of the lake. The shaft was sunk 125 ft. from the pump house, and 110 ft. below the level of the lake. At 90 ft. depth below the lake level a pump station was cut. The tunnel work has been under way since last winter. Two weeks ago a cylinder was sunk, with the aid of divers, in the lake bottom, at the point where the upraise is due to hole through. From this cylinder a steel rod has been sunk to the point where it will connect with the tunnel, and the raise will follow the line thus given. The present intake for water used at the mill is near the mouth of the Tobacco River. The work of the pumps has been seriously hampered every winter by floating chunks of ice and by foreign matter that washes up close to the shore.

AUSTIN, TEX.—Sept. 16

Oil Companies operating in Texas to the number of 1,400 have failed to file with the Texas Railroad Commission the information regarding their operations required by recent act. Another call will be made, and action will probably be taken against those not complying.

Suit for Oil Land valued at \$8,000,000 has been entered in the district court of Travis County by the State of Texas. The land in question is 160 acres in Stephens County, and the defendants are Gulf Production Co.; Shamrock Oil Co., of Waxahachie; John F. Lewis, of Dublin; C. M. Caldwell and wife, and B. S. Walker, of Stephens County; N. N. Rosenquest, of Taylor County; and J. L. Mayfield, of Wichita County. Title is in question because the original owner forfeited his rights, and was later reinstated under conditions claimed by the state to be illegal. Defendants are claiming title under original purchase. In addition to the land, the state is suing for \$300,000 damages for oil and gas removed.

Sinclair Oil Corporation will build a model industrial city to accommodate 6,000 population at its projected \$1,000,000 refinery. The site includes 700 acres, fronting on the Houston ship channel. The first unit of the town will consist of fifty bungalows, with others to be built as needed. In addition to the dwelling houses, there will be built a community settlement house, hospital, schools, library, stores, swimming pool, and other community

buildings. The hospital will be planned after that at Gary, Ind.; the schools will give trade and domestic science courses, in addition to the usual studies; the stores will be municipally managed. The larger buildings will be of fireproof construction. C. K. Birdwell, of Houston, is architect, and W. W. Mellin is resident engineer.

BIRMINGHAM, ALA.—Sept. 12

The Sloss-Sheffield Steel & Iron Co. is again in the market with some offerings of iron, and with further business in sight its prospects are bright for the coming quarter. This company is planning to build fifteen or twenty new cottages at its mines as well as a new church for negroes. It is said that more men are employed now at the company's mines than ever before.

Business in the Birmingham iron industry is becoming better as the last quarter draws near. No orders have been accepted for 1920 delivery

NEW YORK, N. Y.—Sept. 18

Adolph Lewisohn & Sons, Inc., was chartered at Albany, N. Y., with \$6,000,000 capitalization and Adolph and Samuel Lewisohn directors. The company is authorized to conduct a general real-estate business and engage in mining and refining of metals.

BOSTON, MASS.—Sept. 17

Balaklala Consolidated Copper Co.'s lawsuit against the United States Smelting Co. for recovering approximately \$34,000 claimed to be due in settlement for copper has been shifted from the California state court to the Federal court. The litigation resulted largely from the cessation of quotations published by the *Engineering & Mining Journal* closely following the armistice last November. A smelting contract between the two companies was based on these quotations. One difference between the contestants has to do with whether the next published quotation of the *Journal* constituted



AT CAMP OF BIG MISSOURI GROUP, SALMON RIVER DISTRICT, BRITISH COLUMBIA. WILLIAM SLOAN, PROVINCIAL MINISTER OF MINES, IN FOREGROUND. SNOW IS ON THE GROUND, THOUGH PICTURE WAS TAKEN IN MID-SUMMER

so far, though it is known that consumers are urging the acceptance of orders totaling close to 100,000 tons.

Much concern is noticeable in the iron and steel circles of the district over the expected strike of iron and steel workers set for the last part of this month. Just what is the strength of the unions in the Birmingham district is not known, but it is said in some quarters that about 40 per cent of the district is organized. The strike, should it last for any length of time, will seriously affect all industries. It is particularly to be regretted at this time, when so many concerns are just beginning to rally from the setback of the first half of the year. Some of the companies are planning to push construction work in case all other operations are stopped.

An electric haulage system costing \$100,000 was completed about Sept. 1 at the Virginia mines. The work was begun Mar. 1. This will effect a lowering of tramping costs.

the basis for settlement of whether a market for the metal existed in the period between the dates of published quotations.

Louis Ross is entitled to recover only \$100,000 from Albert C. Burrage, instead of a percentage of profits, which Ross alleged to be about \$25,000,000, made by Burrage in the sale of mining properties in Chile to the Guggenheim interests, of New York. This is the decision given by the Supreme Court in Boston on Sept. 10. The court ruled that Ross was bound by the agreement made with Burrage in 1912, under which Burrage had the option of paying Ross \$100,000 or transferring to him 5 per cent of the securities coming to Burrage as profit from the exchange of the options on the mining properties brought to his attention by Ross. Burrage elected to make the cash payment. The court declared the plaintiff entitled to a decree directing the defendant to pay the \$100,000 forthwith.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
for Easy Reference

ALASKA

August Shipments of domestic copper matte, etc., from Alaska to United States totaled 7,816 gross tons; copper contents, 4,333,009 lb., valued at \$793,650.

Kennecott (Kennecott)—August production of copper, 8,224,000 lb., including output of Braden Copper Co., against 5,873,560 lb. in July. Increase 40 per cent, due to improved market.

Salt Chuck (Ketchikan)—Recent car shipment returned 36.96 per cent copper, 6.1 oz. silver, 1.27 oz. gold, 0.10 oz. platinum, and 2.93 oz. palladium. Andrew G. Larson, of Spokane, engineer in charge, says some shipments are higher and some lower in value than this. Property on Prince of Wales Island.

ARIZONA

Cochise County

Shattuck Arizona (Bisbee)—Produced in August 386,027 lb. copper, 708,526 lb. lead, 33,383 oz. silver, and 51 oz. gold. This came from ore taken out in development work in June, July and August, which was smelted in August.

Phelps Dodge (Douglas)—Smeltery copper production for August was as follows: Copper Queen branch, 5,264,000 lb.; Moctezuma Copper Co., 3,422,000; Burro Mountain branch, 234,000; custom ore, 337,000; total Douglas smeltery, 9,257,000; Detroit branch (Morenci), 1,315,731; total, 10,572,731.

Gila County

Arizona Commercial (Globe)—August production about 600,000 lb. copper from 6,000 tons ore. Average copper content of ore produced in first eight months of 1919 was 5.66 per cent. New No. 2 shaft expected to reach 12th level early in 1920. Large tonnage commercial ore cut in two crosscuts on 10th level; also in 7th level crosscut.

Old Dominion (Globe)—Good ore showing continues in virgin ground on 16th and 18th levels east. Production at 60 per cent capacity.

Greenlee County

Arizona Copper (Clifton)—August production of copper, 2,900,000 lb.

Pinal County

Grand Pacific (Superior)—Over 300 ft. of development done in August. Extracting ore from two intermediate levels. Ore in upper levels running high in copper.

CALIFORNIA

Calaveras County

Carson Hill Gold (Carson Hill)—Milled 2,500 tons first ten days of September, averaging \$17 per ton. Push-

ing development work on 875 level, where good ore was opened. Will make further payment on American Zinc Co. loan on Sept. 20.

El Dorado County

Lyman (Placerville)—L. A. Bender developing property. Shaft down 50 ft.; cutting tunnel at 40-ft. depth, providing ventilation.

Ohio (Placerville)—Under development since July 23 by W. G. Rossi and Boro Soderhjelm, of Placerville. Barrel gravel mill, bins, and gas engine installed. Drift run to connect with tunnel in adjoining mine for ventilation. Blocking out breast of average gravel. Will start mill soon.

Ralston (Placerville)—High-grade cemented gravel reported found in old Ralston deep-gravel gold mine twenty miles northeast of Placerville. Property worked by W. H. Duffy, with small crew; formerly owned by William C. Ralston.

Rising Hope (Placerville)—Blocking out good tonnage of hard cemented gravel with view to installing ten-stamp quartz mill. Gravel too hard for pres-

tral tunnel leased to Carl Gunnison, W. Thompson, and Emmet Tuck, who are raising to known orebody above. Freeman lease showing up well in heading being driven east from tunnel.

Community Sampler (Idaho Springs)—Has erected new 35-ft. mixing floor and expects to build ore bins on ground west of sampler recently bought from L. A. Hafer.

Golden Edge (Idaho Springs)—Under lease to A. Weinberger, who has small force cleaning up preparatory to starting development.

Lamartine (Idaho Springs)—Operated by C. H. Speiser, who is concentrating ore at Oneida mill.

Lake County

In St. Kelvin District a leasing company has secured control of the Griffen property. The Colorado Power company is extending its line to the portal of the old Griffen tunnel. This tunnel is over 1,000 ft. long, with a good showing of low-grade gold ore. Further development work will be done on the vein when new surface plant and equipment are installed.



SMUGGLER UNION MINING CO.'S MILLS, TELLURIDE, COL., LOOKING NORTH UP MARSHALL CREEK

ent barrel gravel mill. George W. Engelhardt, general manager; Charles M. Henson, superintendent.

COLORADO

Clear Creek County

Big Five (Idaho Springs)—Block of ground on Edgar vein 800 ft. from Cen-

Montrose County

Cashin (Paradox)—Preparing for production. Erecting buildings and adding to equipment. Contract let for 100-ft. shaft. Property has good body of high-grade copper and silver.

Radium Ore Sampler (Montrose)—

Has installed motor-truck system and is hauling ore by night.

Pueblo County

Colorado Thrift Oil & Gas (Fountain)—Has purchased heavy drilling machine for drilling well near Fountain.

San Miguel County

Shipments from Telluride district in August were: Tomboy, 51 cars of concentrates; Smuggler, Humboldt, and Black Bear, 46; and Cimarron, 3.

IDAHO

Shoshone County

Amazon-Dixie (Wallace)—Mine recently examined by A. W. Ellenberger, capitalist, of Cleveland, who, with other Cleveland associates, has financed company. Will provide \$150,000 and more, if necessary, to install electric power and electric hoist, and to sink 400 ft. from present 1,100 level, making total depth from surface 1,500 ft., or 800 ft. below main working tunnel, from which shaft is sunk. Ore on 1,100 level improved as compared with showing above. Mine situated in Montana near Idaho line at Sildix Station, on Northern Pacific.

Bullion (Wallace)—Diamond drill cut 14 ft. copper ore, carrying gold and silver. Same shoot located in upper tunnel and in shaft 400 ft. above. Strike taken to prove large body commercial ore. Mine on St. Joe side of divide, six miles from C. M. & St. P. road. Old grade of logging railroad, within three miles, which may be utilized.

Success (Wallace)—Working two sets of lessees, shipping lead-silver ore only. Operations otherwise discontinued, on account of strike.

MICHIGAN

Copper District

Lake Superior Copper again going out by rail in small lots to domestic manufacturers.

Quincy (Hancock)—Remodeling of smeltery on Portage Lake begun; will take five months. Enlarging main furnace building, in which will be installed two furnaces of capacity of 100-tons fine copper per day. Will equip plant with gasoline locomotives, new boiler plant with economizers, and new cranes. Plant handles custom ore as well as Quincy ore. Preparing to ship by rail lot of 750,000 lb. sold within fortnight.

Oseola Con (Houghton)—North Kearsarge has two laterals toward Ahmeek boundary in better copper than previously opened in this low-grade property.

Victoria (Houghton)—Adding to force and planning to put mine on two shafts.

Winona (Houghton)—Working Nos. 1 and 4 shafts. Underground force, 100. More men needed.

Mohawk (Mohawk)—Has full crew below and on top for first time in two years. Three shafts working, Nos. 4, 5, and 6, the first yielding best rock.

MINNESOTA

Mesabi Range

Tioga (Chisholm)—Fee owners and operator conducting joint drilling campaign to determine whether or not any ore lies below present main level.

MONTANA

Silver Bow County

Anaconda (Butte)—Rolling mill at Great Falls, Mont., in August converted 6,000,000 lb. refined copper into finished rods and wire. Plant running at capacity. Great Falls copper refinery at two-thirds capacity. Zinc plant still down.

North Butte (Butte)—August production of copper 1,450,122 lb.; July, 1,005,810; August, 1918, 1,931,837.

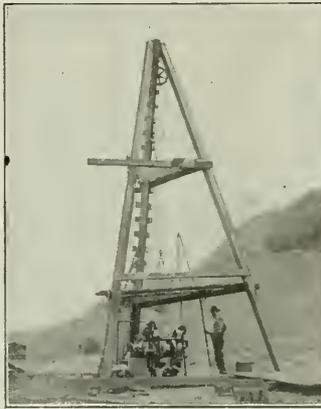
NEVADA

Lyon County

Douglass (Dayton)—Douglass tailings dump below Dayton again being reworked. Tailings from Comstock ores. Last effort to rework unsuccessful.

Nye County

Tonopah Belmont (Tonopah)—Dividend declared Sept. 15 a reduction of 10 per cent, owing to recent strike of miners at Tonopah.



DIAMOND DRILLING IN TONOPAH DISTRICT, NEVADA, BY TONOPAH EXTENSION MINING CO.

Pershing County

Jose-Davis M. & M. (Loring)—Has ordered 30-ton mill now on road. In Shepherd workings ore developed on tunnel level for 100 ft. in length and 60 ft. deep; 200 tons broken, which management figures runs \$200 per ton. W. I. Beauchamp manager and E. E. Roberts, former Congressman, president.

Loring Treasure Hill Mines (Loring)—East vein of Loring Treasure Hill can be traced for 1,500 ft., with high-grade streak on foot wall, many specimens showing visible gold.

Mayday Group (Loring)—On main vein a barren-looking black quartz assayed high in gold and is being developed to see if commercial body can be found. On southwest end of claim a

silver-copper ore was found from which specimen assay went \$102.50.

Nevada Honey Bee (Loring)—Under J. H. Bell, superintendent, twenty men are sinking Malley shaft and driving Benedetti tunnel. Former down 110 ft. First shipment from Honey Bee went \$34.06 per ton. Company is financed by New York interests.

NEW MEXICO

Sierra County

Silver Monument (Chloride)—Taken over by Jack McCuthin and associates.

Lady Franklin (Lake Valley)—Running mill tests on silver ores preliminary to deciding process for new mill.

SOUTH DAKOTA

Custer County

Climax (Custer)—Shaft retimbered, and development of mica deposits begun. Shipments of mica will be made soon.

Lawrence County

Deadwood Lead & Zinc (Deadwood)—Concentrator in operation for only a short time. Scarcity of water given as reason for suspension.

Eagle Bird (Deadwood)—Incorporated with Fred Pennington, president, and Burt Rogers, secretary and treasurer. Securities being sold, and probable that work on ground on Squaw Creek will be started this year.

Custer Peak (Englewood)—Concentrator and mine closed down.

Pennington County

National Tin (Hill City)—Cowboy shaft enlarged to three compartments. Timbering of new compartment nearly completed. Drift being driven on 300 level. Machinery installation being made at mill, and plant should be ready for operation during October.

Egyptian (Keystone)—No work being done at property. Understood that company will be formed to finance further development.

TEXAS

Fort Bend County

Development at Blue Ridge Field giving encouraging results. Circle Oil Co.'s No. 1 Scott well 2,700 ft. deep, and good showing of oil made in bailing. West Production Co.'s No. 1 Luscher well also about 2,700 ft. deep, with oil showing. Both wells at considerable distance from original discovery, making possible extension of field.

Hardin County

Saratoga Field Completions: Regna Oil Co., No. 5 Ogden, set screen at 1,300 ft.; Peerless Oil Co., No. 6 Kirby, making small production by pumping; Sun Oil Co., testing No. 133 McShane well; Weldon Oil Co. also testing well.

Harris County

Macks Oil & Water Well Screen Co. has just let contract to W. C. Hendrick Construction Co. for two reinforced-concrete buildings. Entire plant when completed will consist of eight buildings. Main office 821 Kress Building, Houston.

Jackson County

At Edna, Texas Co. will drill on large ranch of L. Ward. Other drilling near Edna will be done by F. Seliner & Co., of Houston, on Kroop farm, near Vanderbilt; Coast Line Oil Corporation, on Calhoun farm, three miles southeast of Edna; and S. G. Drusher and associates, on Drusher land, northwest of town.

Jefferson County.

Texas Steel Co. (Beaumont)—At meeting of stockholders Sept. 3, four new directors elected: B. A. Steinhager, W. F. Graham, E. L. Boydkin, and R. S. Collins, all of Beaumont. Pig-iron plant at Rusk, Cherokee County, closed temporarily, owing to Railroad Administration raising freight rates. Suit filed for overcharges and \$50,000 damages.

Lampasas County

Nineteen Locations made in county and derricks built. Wells being drilled are: Howell No. 1, on White Ranch; Key well, on Baxter ranch; Smith well, on Smith ranch; Groves No. 2 well at 600 ft.; St. Mary, on Le Compte ranch, at 700 ft., narrow oil-bearing strata being penetrated at 600 ft.; New York syndicate, drilling two wells on line between Lampasas and Coryell counties.

Liberty County

Recent Completions in Hull Field: Gulf Production Co., No. 1 Thomas installing pump; Big Four Oil Co., No. 5 Hannicker bailing at 2,500 ft.; Republican Production Co., No. 18 Dolbear abandoned; will drill another well. Field production about 8,000 bbl. daily.

Nueces County

Corpus Christi O. & G. (Corpus Christi)—White Point gas well, flowing wild for three years, successfully capped. Pipe line will be laid to supply Corpus Christi, and possibly Taft, with gas. Heavy concrete block laid around well to prevent it from breaking loose when valves closed.

UTAH**Salt Lake County**

Garfield Smelting (Garfield)—Cloudburst on Sept. 18, falling directly on A. S. & R. smeltery, put plant out of operation for several days.

Utah County

Pacific Gold M. & M. (American Fork)—Property taken over by owners. Has been under lease.

WASHINGTON**Okanogan County**

Arlington (Concunully)—Most consistent shipper of silver ores in district. Property well equipped and credited with good production. Two carloads good-grade silver ore in bins awaiting shipment. Property ten miles from Concunully.

Carl Frederick (Concunully)—Silver property nineteen miles southwest of

Concunully; starting 120-ft. raise to explore high-grade ore showing in surface cut. C. Bernhard, manager.

Kankakee (Nespelem)—Lessees have struck native gold ore in ledge and have penetrated 11 ft.

Trinidad (Tonasket)—Silver property nine miles southwest of Tonasket has shaft down 35 ft. in mineralized zone carrying silver and lead. Starting a drift to get under favorable showings uncovered above.

Snohomish County

Boston American (Monte Cristo)—Preparing to start up after shutdown during war. Home office, Everett, Wash.

Good Hope (Monte Cristo)—Working small crew and trying to have state open road to Index to make shipping possible.

CANADA**British Columbia**

F. J. Albo, of Rossland public schools, has won this year's scholarship for the Kootenays, offered annually by Consolidated Mining & Smelting Co. of Canada.

Carmi (Carmi)—W. H. Sawyer, superintendent, installing 75-ton concentrator.

North Star (Kimberley)—Has shipped first car since tramway and buildings were burned by forest fires this summer.

Beatrice (Lardeau District)—New Era Mines, Ltd., bondholders, plan to drain workings, ship dumps, and develop orebody further. Fourteen hundred feet of tunnel already driven, bunk houses built, and 1,500-ft. aerial tramway installed. Property ten miles from Beaton, B. C., and comprises three Crown-granted claims above timber line. Reached by four-mile motor road and six-mile pack trail.

Eureka (Nelson)—H. H. Vincent, president of Vincent Development Co., which is developing Eureka-Granite-Poorman property for Inland Mining Co., states survey of proposed 6,000-ft. extension to tramway is complete and contract for construction will be awarded immediately. Car of concentrates ready for shipment to Trail.

Cork Province (Slocan) — Recent shipment flotation concentrates returned 51.5 oz. in silver, 65.8 per cent lead, 5.2 per cent zinc. In same car were bull-jig concentrates that returned 29.2 oz. silver, 43.6 per cent lead, and 8.9 per cent zinc. Company will ship no more bull-jig concentrates. Publication of report of R. H. Stewart expected soon.

Lucky Jim (Slocan) — Spokane stockholders trying to work out plan to reorganize and secure 1½c. a share from each of 6,000,000 shares outstanding. This would give \$90,000, of which about \$70,000 would be used to pay all obligations.

Black Prince (Slocan)—First car shipped for year. Ore silver-lead.

Utica (Slocan)—Ore being taken out by Poyntz, McLellan, and MacDougall, lessees.

Belmont Surf Inlet (Surf Inlet)—August earnings \$25,457, compared with \$11,999 in July and \$24,888 in August, 1918. Labor situation, which has been hampering operations, now improving.

Consolidated M. & S. (Trail)—Ore receipts from Aug. 21 to 31 inclusive were 11,551 gross tons. Largest custom shipment was 1,023 tons, from Mandy mine, The Pas, Manitoba. Company's Sullivan and Kimberley mines contributed 7,467 tons and Centre Star, of Rossland, B. C., 1,084 tons.

Nova Scotia

Nova Scotia S. & C. (Sydney)—Planning to erect new byproduct plant at Sydney mines, to cost over \$2,000,000. Will necessitate enlarging present plant and erection of new blast furnace.

Ontario

Kerr Lake (Cobalt)—Will reduce capital from \$3,000,000 to \$2,400,000 by payment of part of capital to shareholders of record Sept. 22.

Waldman (Cobalt)—Leased to F. B. Mosure.

Miller Lake O'Brien (Gowganda)—Operations curtailed owing to low water for power purposes.

Kirkland Porphyry (Kirkland Lake)—Kirkland Porphyry having gone into voluntary liquidation, Orr property, held under option, will return to original owners. Option price \$523,000.

Dome (Porcupine)—Output for August shows increase, tonnage treated being 25,000 tons, or 3,000 over July.

MEXICO**Sonora**

Greene Cananea (La Cananea)—August production 4,200,000 lb. copper; 179,470 oz. silver; 880 oz. gold.

Market Report for Sept. 27 Will Appear In Issue Of Oct. 4

Industrial conditions in New York have made it expedient to close the forms of the *Journal* in advance of the routine schedule date. The usual market quotations are therefore necessarily omitted from this number. The market pages which would have appeared normally in the Sept. 27 issue will be published in the *Journal* of Oct. 4.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Sept.	Silver			Sept.	Silver		
	Sterling Exchange	New York, Cents	London, Pence		Sterling Exchange	New York, Cents	London, Pence
10	415 ¹ / ₂	112 ¹ / ₂	61	15	417 ¹ / ₂	113 ¹ / ₂	61 ¹ / ₂
11	415 ¹ / ₂	113	61 ¹ / ₂	16	413 ¹ / ₂	113	61 ¹ / ₂
12	415 ¹ / ₂	112	60 ¹ / ₂	17	413	113	61 ¹ / ₂
13	417	112 ¹ / ₂	61				

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

Daily Prices of Metals in New York

Sept.	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	N. Y.	St. L.	St. L.		
10	...	...	...	5.75@5.85	7.25@7.30		7.25@7.30
11	22@22 ¹ / ₂	54 ¹ / ₂	5.95@6.00	5.75@5.85	7.20@7.30		7.20@7.30
12	21 ¹ / ₂ @22 ¹ / ₂	54 ¹ / ₂	5.95@6.00	5.75@5.85	7.10@7.20		7.10@7.20
13	21 ¹ / ₂ @22 ¹ / ₂	55	5.95@6.00	5.75@5.85	7.10@7.20		7.10@7.20
15	21 ¹ / ₂ @22 ¹ / ₂	55@55 ¹ / ₂	6.00@6.25	5.90@5.95	7.10@7.20		7.10@7.20
16	21 ¹ / ₂ @22 ¹ / ₂	55@55 ¹ / ₂	6.20@6.25	5.90@5.95	7.10@7.20		7.10@7.20
17	21 ¹ / ₂ @22 ¹ / ₂	55 ¹ / ₂	6.20@6.25	5.90@5.95	7.10@7.20		7.10@7.20

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M.	Spot	3M.	Spot	3M.
	Spot	3M.							
10	100	100 ¹ / ₂	109	281	274 ¹ / ₂	25 ¹ / ₂	26	40 ¹ / ₂	41 ¹ / ₂
11	100	100 ¹ / ₂	109	280	272 ¹ / ₂	25 ¹ / ₂	25 ¹ / ₂	40 ¹ / ₂	41 ¹ / ₂
12	100	100 ¹ / ₂	109	282 ¹ / ₂	274 ¹ / ₂	25 ¹ / ₂	25 ¹ / ₂	40 ¹ / ₂	41 ¹ / ₂
13	...	...	...	...	...	...	...	...	...
15	101	101 ¹ / ₂	110	285 ¹ / ₂	280	25 ¹ / ₂	25 ¹ / ₂	41 ¹ / ₂	42 ¹ / ₂
16	101	101 ¹ / ₂	110	287	279 ¹ / ₂	25 ¹ / ₂	25 ¹ / ₂	41 ¹ / ₂	42 ¹ / ₂
17	101	101 ¹ / ₂	110	289	279 ¹ / ₂	25 ¹ / ₂	26 ¹ / ₂	42	42 ¹ / ₂

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

Metal Markets

New York, Sept. 17, 1919

Copper and zinc continued very dull, with some exhibition of weakness in zinc. On the other hand, lead turned very strong, and the market advanced, as was foreseen last week.

The stocks of metals in the hands of the British government on Sept. 1, with the comparative figures for August stated in parentheses, were as follows: Copper, 31,415 tons (41,697); lead, 94,138 tons (120,971); zinc, 34,724 tons (39,540); aluminum, 22,919,680 lb. (23,520,000 lb.); nickel 5,328,760 lb. (5,491,480 lb.); antimony, 7,584,640 lb. (9,880,640).

Reports from London continue to be to the effect that industrial affairs in Great Britain are becoming distinctly better. Port congestion, however, is a bar to some trades. It takes longer to

get lead out of a government store than to bring it from Australia.

Transatlantic freight rates declined sharply this week, reflecting the increasing easiness in shipping conditions. Rates to British ports were quoted at \$15; to Hamburg at \$16; to Dutch ports and Antwerp at \$12. Freight rates to French ports were booked at \$15, with indications that even lower might be done. From San Francisco to Hong-kong the rate advanced to \$15, while to Kobe it declined to \$12.

Copper

The dullness in copper continued. No business was done by the principal producers. Some business was done by agencies. The major part of the business, however, continued to be done by brokers reselling for consumers and speculators. The volume of this business was less than in the previous week,

and the hope was again expressed that such accounts were about cleared up. However, Japanese houses, upon advices that copper had declined in Japan, became sellers on Sept. 12, and at about the same time British houses renewed offerings of ingot bars. They intimated a price of £113 to £113¹/₂, c.i.f. New York, which would be about 21c. delivered here.

In this market the differential between ingot bars and wire bars continued to prevail, and, indeed, became rather wider than previously, for the former were offered at 21¹/₂c. New York, while business was done in wire bars at 22¹/₂c. Toward the close the market seemed to exhibit an easier tone, and there is no doubt that wire bars could be obtained from some quarters at 22¹/₂c. delivered, which would be 22.10c. New York.

Copper Sheets.—The base price of copper sheets is 33¹/₂c. per lb. Market steady. Demand strong. Copper wire is quoted at 26@26¹/₂c. in carload lots, f.o.b. mill. Market dull.

Tin

A fair business was done at slightly higher prices, tin of 99 per cent grade closing at 55¹/₂c. American producers are now making about 1,250 tons per month. Straits tin in this market was quoted at 56c. on Sept. 11-13, 56¹/₂c. on Sept. 15-16, and at 56¹/₂c.@56³/₄c. on Sept. 17.

Singapore quoted c.i.f. London £280 on Sept. 11, £281¹/₂ on the 12th, and £286 on the 15th.

The statistical position of tin is thought to be improving. London is bullish.

Lead

The labor troubles in Idaho and the threat of trouble at one of the important smelteries near St. Louis increased the tightness of a statistical position that was already strong. The largest producers have their books full of orders for a month ahead, and there are only a few producers who are able to offer any lead for prompt or early shipment. Shortage of railway cars makes shipment difficult even by them. In view of these circumstances, it was not surprising that an active demand for lead should develop. Following this, the A. S. & R. Co. advanced its price to 6¹/₂c. on Sept. 15. Orders were taken at that price for October shipment. The aggregate of business during the week came to a fair total.

About the end of this month, or early next month, the St. Joseph Lead Co. will resume smelting at its plant at Herculaneum which has been idle since Feb. 14.

Zinc

The demand continued sluggish. Some producers became tired of waiting and made up their minds to sell. This resulted in a further decline in price. However, there were always bids somewhat under the market, which checked any tendency toward rapid movement downward. The market closed at 7.10c. to 7.20c., with nobody appearing desirous of buying and nobody seeming to be very anxious to sell.

The Eagle-Picher Lead Co. has bought the plant of the Robert Lanyon Zinc & Acid Co. at Hillsboro, Ill.

Zinc Sheets—The quoted price of zinc sheets is \$10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market was quiet. We quote spot at 8½@8¾c. and futures at 9@9¼c.

Bismuth—We quote \$2.96.

Cadmium—Unchanged at \$1.40.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c.

Quicksilver—Upon renewed buying the market advanced to \$105. San Francisco telegraphs \$100@105 firm.

Silver and Platinum

Silver has advanced to 61½d. on the information that the government of India has fixed the exchange value of the rupee at 2s., a rise of 2d. Market steady; China buying limited offerings.

Mexican dollars at New York: Sept. 11, 87; Sept. 12, 64½; Sept. 13, 86½; Sept. 15, 87½; Sept. 16, 87½; Sept. 17, 87½.

Platinum—The Government stock is reported all sold. Knowledge of this and the development of a strong demand caused the market to become very excited. We quote refined ingot at \$130 to \$140. It is possible that some sales were made at even higher prices.

Palladium—Unchanged at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 13—Zinc blende, per ton, high, \$49.70; basis 60 per cent zinc, premium, \$46; Prime Western, \$45; fines and slimes, \$42.50@40; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$44.38; calamine, \$30.70; all zinc ores, \$43.55.

Lead, high, \$70.35; basis 80 per cent lead, \$70@65; average settling price, all grades of lead, \$66.36 per ton.

Shipments the week: Blende, 4,573; calamine, 291; lead, 1,037 tons. Value, all ores the week, \$280,860.

The car situation has reached a point where further loading must await emptying some cars. Over 20,000 tons are now in transit, about 575 cars. Filled cars have moved away more rapidly, but, with heavy wheat shipments in transit, no empty cars are to be had. Some shipping is being done to nearby points in coal cars. Two smelters are idle at Henryetta on account of labor trouble and lack of ore.

Platteville, Wis., Sept. 13—Blende, basis 60 per cent zinc, \$45@46 base for premium grade and \$45 base for high lead or Prime Western grade. Lead ore, basis 80 per cent lead, \$66 per ton. The zinc market was dull, and buyers of the high grades were not inclined to bid for ore at the week end. Shipments reported for the week are 1,934 tons blende, 125 tons galena, and 528 tons sulphur ore. For the year to date the totals are 70,041 tons blende, 4,489 tons galena, and 11,638 tons sulphur ore. During the week 2,909 tons blende was shipped to separating plants.

Other Ores and Minerals

Chrome Ore—Offered at \$32 per ton, delivered in the East, without finding buyers.

Molybdenum Ore—Quoted nominally at 75c. per lb.

Tungsten Ore—The market is quite disorganized, owing to the uncertainty of tariff legislation. Chinese ore was offered at \$7.40.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace-size ore, free from fines, c.i.f. New York or other Atlantic port. Sulphur companies reported to be selling at prices as low as \$14@15. Market unsettled.

New York—Sept. 17, 1919

Although it is probable that conservative influence in the labor world will prevail and that there will not be a general strike of iron and steel workers, the threatened suspension of work has been a disturbing factor in the market during the past week and still causes apprehension, says *The Iron Age*.

The net result of the agitation is that little buying has been done. The desire of consumers and distributors to secure material has been more pronounced than in the earlier talks of strike, but so has been the hesitancy of the producers to add to their commitments.

The demand for pig iron is not now active, and an Illinois foundry inquiry for about 10,000 tons for delivery in the first half of next year thus gains prominence. Persistent reports of weakness of basic continue, and there is a limited demand for all steel-making irons. Stove manufacturers in the Central West are having difficulty in maintaining full operation on account of scarcity of molders. The demand for stoves is greater there than the supply.

On ship material the Government has again obtained base quotations of 2.50c., Pittsburgh, for plates and 2.40c. for shapes. The former price is widely possible on attractive lots, but 2.45c. is the general market for structural material.

Buyers for oil-well developments have been pressing to get covered owing to the imminent stoppage of steel plants. Demand for oil pipe promises to last over at least two years.

Tin plate makers, with stocks in consumers' hands now well exhausted, look to having a banner year in 1920. Black sheets have sold in the Central West for \$3 above regular prices.

Pittsburgh—Sept. 16

Wednesday night, Sept. 10, the special committee of six of the general committee constituted by twenty-four unions to organize the iron and steel industry announced that it was calling a strike for the industry to begin Monday, Sept. 22. The news created some surprise, both because it was thought the organization was not strong enough to produce a strike and because it was believed that in any case such a move would be deferred in deference to President Wilson's desires until the results of the White House conference on labor on Oct. 6 could be measured. The common view seemed to be that the chances of a strike of any magnitude following the strike call were relatively small.

When the report appeared yesterday morning that the strike call was to be rescinded there was scarcely a ripple in the trade. The original order was issued only after a prolonged debate among the labor organizers, and it is generally believed that Mr. Gompers personally is opposed to a strike being called at this time, particularly as the President has urged that there be a labor truce until after the White House conference on labor Oct. 6. It appears that Mr. Gompers has no direct authority in the matter, which is subject to the decision of the unions involved; but it is understood he has urged the union heads to recall the order and that at their meeting to be held in Pittsburgh tomorrow they will probably do so.

Though the claim repeatedly made by the labor agitators that the iron and steel producers wish to precipitate a strike is wholly unfounded, it is true that the manufacturers would prefer a strike and a settlement of the whole matter rather than an indefinite prolongation of the agitation. The manufacturers believe that the great majority of their employees are satisfied and do not want to strike, but it is clear that the agitation of the last few months has considerably lowered the efficiency of the men. It is reasonably certain that no large part of the men are actually organized, but there is a possibility that if a strike were once started it would grow. The policy of the manufacturers is well defined. They would simply close the works that would be affected and let them stay closed.

The steel market has been quiet, the mills being well filled with business for several months to come, based on the present rate of production, which is below capacity, chiefly because men are not working at normal efficiency. In oil-country goods there is a definite scarcity, due to the large amount of oil development planned, and inability to secure as much material as is desired in the Texas oil field will result in a condition that will involve the expiration of many leases without the prescribed drilling being done. In other lines there is no definite scarcity.

Fabricated steel-lettings in August represented 78½ per cent of fabricating

shop capacity, but large building projects involving the use of structural steel are not coming out at the pace of a few weeks ago, and there is no railroad demand except for a limited volume of material for car repairs. Nevertheless, the current make, representing 80 to 85 per cent of the entire productive capacity, is readily absorbed, and it does not appear that buyers are accumulating any stocks, although, on account of prospects of traffic difficulties later in the year, they would like to fortify themselves. Box cars are scarce, even at the present time, causing considerable tonnage of sheets to accumulate at mills. Tin plate is moving freely and wire products are moving fairly well.

Steel prices steady, and it is practically the universal feeling among producers that price advances should not be made. Of course, there is no possibility of any decline. Plates, which were set at 2.65c. by the March 21 schedule, have sold at 2.50c. more often than at the full price, and the 2.50c. price is now more often regarded as the real market price for desirable orders.

Pig Iron—Although it was the declared policy of furnacemen not to sell for next year, news is now coming out of a considerable volume of transactions, at current prices, through consumers giving their regular sources of supply the option of taking the business or seeing it placed elsewhere. An occasional sale of foundry iron for this year's delivery is made at \$1 advance, but this is not general. Bessemer and basic are quiet in the open market, but requirements under contracts are heavy. We quote prices unchanged: Bessemer, \$27.95; basic, \$25.75; malleable, \$26.25 @ \$27.25; foundry, \$26.75; forge, \$25.75, f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40.

Steel

Steel—Mills are having difficulty in meeting requirements under sheet bar contracts, but are generally succeeding, and there is hardly any open-market inquiry. Billets are quiet. We quote: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; rods, \$52.

Ferromangalys

Ferromanganeses—Representatives of British ferromanganese producers are not quoting openly, as the complaint was made before the Federal Trade Commission charging them with "dumping." Their last quotation was \$95, c.i.f. Domestic producers continue their asking price of \$110, delivered, but it is understood this price could be shaded. Consumers are showing no interest in the market.

Coke

Coke—The furnace coke market presents an easier tone, but producers are still asking \$4.75 for spot or prompt. Foundry coke shows better demand, with light offerings, and \$6.25 to \$6.50 is generally secured, depending on brand. The minimum has advanced \$1 a ton within three or four weeks.

MONTHLY AVERAGE PRICES OF METALS

	Silver					
	New York			London		
	1918	1919	1919	1917	1918	1919
Jan.	75.690	88.702	101.125	96.682	44.356	48.438
Feb.	77.585	87.716	101.125	97.742	42.978	48.027
Mar.	73.861	85.082	101.125	96.742	42.978	48.171
Apr.	73.879	85.349	101.125	96.963	47.215	48.586
May	74.745	89.505	107.135	97.940	48.950	52.104
June	76.971	92.500	110.430	99.065	48.873	53.896
July	79.010	99.625	106.394	110.483	51.433	53.133
Aug.	83.407	100.292	111.370	83.418	47.577	55.835
Sept.	81.741	101.125	111.370	83.418	47.577	55.835
Oct.	87.332	101.125	111.370	83.418	47.577	55.835
Nov.	89.960	101.125	111.370	83.418	47.577	55.835
Dec.	85.960	101.125	111.370	83.418	47.577	55.835
Year	81.417	96.772	108.450	80.587	47.516	52.104

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

Copper

	Copper					
	New York		London		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	96.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.709
Mar.	23.500	15.856	110.000	76.821	125.000	82.671
Apr.	23.500	15.246	110.000	77.300	125.000	82.200
May	23.500	15.864	110.000	77.300	125.000	82.200
June	23.500	17.610	110.000	83.062	125.000	85.900
July	25.904	21.604	110.913	89.376	131.913	103.040
Aug.	28.000	22.319	122.000	87.300	137.000	106.429
Sept.	26.000	(a)	122.000	(a)	137.000	(a)
Oct.	26.000	(a)	122.000	(a)	137.000	(a)
Nov.	26.000	(a)	118.447	(a)	133.167	(a)
Dec.	(a)	(a)	118.447	(a)	133.167	(a)
Year	24.628	(a)	115.630	(a)	130.507	(a)

(a) No market. (b) See note on page 490.

Tin

	Tin					
	New York		London		1919	
	1918	1919	1918	1919	1918	1919
January	(a)	85.508	67.702	293.227	248.557	248.557
February	(a)	92.000	69.801	311.523	261.963	261.963
March	(a)	(a)	67.934	318.575	238.843	238.843
April	(a)	(a)	65.500	329.963	255.277	255.277
May	(a)	(a)	72.500	364.217	234.998	234.998
June	(a)	(a)	71.240	331.925	238.263	238.263
July	(a)	(a)	68.000	360.347	253.272	253.272
August	(a)	67.226	380.903	273.625	273.625	273.625
September	(a)	(a)	343.993	(a)	(a)	(a)
October	(a)	(a)	327.000	(a)	(a)	(a)
November	(a)	(a)	323.550	(a)	(a)	(a)
December	(a)	(a)	327.138	(a)	(a)	(a)
Av. year	(a)	(a)	260.138	(a)	(a)	(a)

(a) No average computed.

Lead

	Lead					
	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.785	5.432	6.684	5.316	29.00	27.227
February	6.973	5.067	6.899	4.784	29.00	28.675
March	7.201	5.226	7.091	4.922	29.00	27.952
April	6.772	4.982	6.701	4.729	29.00	28.845
May	6.818	5.118	6.704	4.773	29.00	28.852
June	7.011	5.340	7.511	5.070	29.00	28.244
July	8.033	6.429	7.750	5.409	29.00	28.455
August	8.050	6.798	7.750	5.583	29.00	24.750
September	8.050	(a)	7.750	(a)	29.00	(a)
October	8.050	(a)	7.750	(a)	31.20	(a)
November	8.050	(a)	7.750	(a)	31.20	(a)
December	6.503	(a)	6.324	(a)	30.00	(a)
Year	7.413	(a)	7.222	(a)	30.10	(a)

Zinc

	Zinc					
	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	2.836	7.272	7.661	6.923	54.000	56.045
February	7.814	6.523	7.639	6.273	54.000	46.150
March	7.461	6.000	2.86	6.134	54.000	50.000
April	6.800	6.463	6.715	6.119	54.000	56.118
May	7.314	6.429	7.114	6.079	54.000	35.477
June	8.021	6.907	7.750	6.551	54.000	45.763
July	8.088	7.873	8.338	7.523	54.000	41.815
August	8.958	7.789	8.635	7.439	54.000	39.338
September	8.442	(a)	7.750	(a)	54.000	(a)
October	8.801	(a)	8.451	(a)	54.000	(a)
November	8.491	(a)	8.088	(a)	54.000	(a)
December	8.163	(a)	7.813	(a)	56.500	(a)
Year	8.150	(a)	7.800	(a)	54.180	(a)

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

Pig Iron, Pittsburgh

	Pig Iron, Pittsburgh					
	Bessemer		Basic		No. 2	
	1918	1919	1918	1919	1918	1919
January	\$37.2	\$33.60	\$33.9	\$31.40	\$33.95	\$32.40
February	37.2	33.30	33.9	31.40	33.95	32.40
March	37.23	32.34	33.9	31.40	33.95	32.12
April	36.1	29.35	33.95	27.13	33.95	28.15
May	36.20	29.35	33.9	27.13	33.90	28.15
June	36.26	29.35	33.16	27.13	31.16	28.15
July	36.60	29.35	33.40	27.13	31.16	28.15
August	36.60	29.35	33.40	27.13	31.16	28.15
September	36.60	(a)	33.40	(a)	31.16	(a)
October	36.60	(a)	33.40	(a)	31.16	(a)
November	36.60	(a)	33.40	(a)	31.16	(a)
December	36.60	(a)	33.40	(a)	31.16	(a)
Year	\$36.67	(a)	\$33.70	(a)	\$34.45	(a)

As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

	N. Y. Exch.†	Sept. 16	Boston Exch.†	Sept. 16
Alaska Gold M.....	21		Adventure.....	114
Alaska Juneau.....	22		Almeck.....	419
Am. Sm. & Ref. Co.....	1032		Almahong.....	449
Am. Sel. & C. Co.....	72		Am. Sel. & C. Co.....	15
Am. Zinc.....	23		Ariz. Com.....	15
Am. Zinc, pf.....	58		Ariz. S. M. Co.....	50
Ariz. Com.....	20		Ariz. S. M. Co.....	50
Batopilas Min.....	21		Butte-Balabala.....	49
Bellevue Steel.....	20		Butte-Balabala.....	49
Butte-Balabala.....	20		Calumet & Hecla.....	416
Butte Cop. & Zinc.....	11		Carson Hill.....	53
Calumet & Hecla.....	20		Central Ariz.....	178
Chile Cop.....	23		Copper Range.....	252
Chino.....	43		Crocker-Hughes.....	43
Chile Fuel & Iron.....	186		Day, David.....	11
Crocker Steel, pf.....	994		East Butte.....	173
Dome Mines.....	13		Flagstaff.....	43
Federal M. & S. pf.....	11		Granby.....	162
First Nat. Bk. of N. Y.....	303		Hancock.....	112
Great Nor. ore, etc.....	44		Helen.....	5
Grain.....	423		Helena.....	5
Ill. States Steel.....	611		Isle Royale.....	83
Homestake.....	75		Keweenaw.....	41
Inspiration Co.....	601		Lake.....	43
International Nickel.....	26		La Salle.....	43
Kennecott.....	354		Masson Valley.....	154
Lackawanna Steel.....	80		Mason Valley.....	154
Mexican Petrol.....	215		Mayflower.....	20
Mobwa.....	80		Mobwa.....	70
Nat'l Lead, com.....	804		Mobwa.....	70
Nat'l Lead, pf.....	104		New Anfield.....	4
N. Y. Canal.....	125		N. Y. Canal.....	125
Ontario Min.....	61		North Butte.....	111
Open Pit.....	20		North Lake.....	111
Public S. & S. Co.....	92		North Lake.....	111
Republ. S. & S. pf.....	104		North Lake.....	111
S. J. Joseph Lead.....	104		North Lake.....	111
Sloss-Sheffield.....	67		North Lake.....	111
Tennessee C. & C.....	103		North Lake.....	111
U. S. Steel, com.....	114		North Lake.....	111
U. S. Steel, pf.....	114		North Lake.....	111
U. S. Steel, pf.....	114		North Lake.....	111
Va. Iron & C. Co.....	61		North Lake.....	111
Wilmington Pup.....	84		North Lake.....	111

* Bid prices. † Closing prices. ‡ Last quotations.

Engineering and Mining Journal

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Volume 108

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Number 14

Strikes

AS ONE picks up the morning paper today one unconsciously glances over the headlines for the latest news regarding strikes and to learn who is the next to announce that he will join the procession. To many it is merely a matter of curiosity, and they think little of the principles involved, unless they chance to come in personal contact with the results of the strike.

What difference does it make to the average reader in Kansas City whether the steel-works men strike or stay at work? It may be a long time before he feels any of the effects of such a strike, but he will feel them sooner or later, and learn that he has a vital interest in this and every other strike. In the same way, the miner may not at first see much connection between a strike in Pittsburgh and his work in the Anaconda copper mine, but there is, nevertheless, a very close connection.

A strike that calls out 2,000,000 men, or only a fraction of that number, from such an important industry as the manufacture of steel, is sure to affect that industry seriously, but the disorganization cannot stop within the plants that convert iron into steel. The closing of steel mills means less demand for pig iron, fuel, fluxes, and ore. It means the tying up of ships and the sidetracking of empty freight trains. It means the slowing down of iron-ore production and less money coming into the producing communities. A cessation of steel production means that the brakes must be set upon those industries into which steel enters as a principal or important element. What building or manufacturing industry is there which does not require steel in some form? The dynamo, the motor, and the trolley all call for iron and steel. The slowing up of such industries hits the copper market, and the Anaconda miner will then realize how a serious strike at Pittsburgh may touch his peace and happiness.

The miner is not in a class that is independent of other industries. He is more or less dependent upon every industry that influences the life of the community. He is more dependent upon the orderly progress of industry than is any capitalist, and he has more power than any capitalist to put a curb on strikes, although he has seldom used it. Some workmen realize the interdependence of industries: that some cannot go on while others stand still. With the realization of this fact the sentiment against strikes will grow.

For example, when a steel strike is proposed, there may be expressions of sympathy for the object of the strike, but there will be also a protest from those whose labor is to transport and use the steel. There will be a protest from miners of ore, fuel, and flux. The protest will come from so many directions and from so many labor organizations that leaders will hear and heed those protests. We have faith in the belief that the miners will not be the last to raise their voices in the discouragement of all industrial strikes.

The Dawn of Sanity

THE age of lunacy that had its inception when Germany invaded Belgium has revealed how many there are of our fellow men that ought at least to be sent to the psychopathic ward of the nearest hospital for prolonged observation. The question of sanity is perhaps after all, a relative one. In the case of Germany it seemed as if the entire nation had lost the function of reasoning. There is no doubt that the Bolsheviks are either criminal or crazy.

But as the wave of unreason has swelled higher and higher, first in one country and then in another, at last sweeping over even our own country, the dawn of sanity seems at last breaking—and in the country where society first ran amuck. This is the case if a recent dispatch in the *New York Times* is to be believed. The German workman is undergoing a great change of attitude toward economic questions. Many now favor a reduction in the cost of living rather than higher wages and are advocating a ten-hour day, as against one of eight hours, as the only means of increasing production and easing the present hard conditions of living. Surely this is cheering news to us—to some of us at least. Even as socialism and perhaps bolshevism came out of Germany, let us hope that this new-old thought will overwhelm the world.

Mexico

THE *Journal* has been accused of following the lead of "the yellow daily press and agitating for intervention by the United States in Mexico," and it is further suggested that we would do better to cling to technical matters and leave politics alone.

As to "following the lead" of any press, yellow or otherwise, we plead not guilty. We have our own sources of information and endeavor to make accurate statements relative to conditions on the other side of the Rio Grande, whether that information leads to the conclusion that Mexico is capable of solving her own problems, or to the conclusion that it would be better for Mexicans and all other peoples that some one should lend her a helping hand. Many of our readers have concluded that we advocate military intervention because the elimination of conditions to which we have called attention seems possible in no other way.

As to eschewing politics and clinging to technical matters, it is quite difficult to draw the line as to what are and what are not political questions. It has been said that anything in which a large number of people are interested, or in which a small group of the public is interested, is a political matter.

If we should eliminate from our columns matter in which many are interested and devote them entirely to a discussion of technical subjects in which only specialists are concerned, we should fail in the fulfillment of

our objective. This is our excuse for frequent reference to Mexico—if, indeed, such is needed.

We have no enmity toward Mexico or the vast majority of Mexicans. We do not covet her riches or her undeveloped resources. We have but one desire—peace and happiness for the Mexican people. When this is an accomplished fact there will be no question of protecting the lives and property of foreigners. The latter will be as secure as the former, and no one can ask for more. If political and industrial conditions in Mexico are adjusted in the interest of her own citizens, her difficulties with respect to foreigners will begin to take care of themselves.

Mexico is potentially one of the richest countries in the world. It has every climate, from tropical to north temperate. The fertility of its soil is unsurpassed, and its backbone is a range of mountains stored with base and precious metals. We desire to see the potential become actual.

In recent years no ruler of Mexico has taken the presidential chair who has had the resources or following that would enable him to establish a government giving ample guarantee of law and order. For this reason only those industries that can stand a heavy tax have been able to do business at all. Among these the mining of gold and silver has continued at some points and the production of oil has increased. Other industries have led a precarious existence or have been entirely stifled.

The present incumbent is by no means lacking in ability, and he knows full well that present conditions cannot continue indefinitely. He also knows that the amount of taxes now collected is very large, but that it does not go toward the liquidation of indebtedness. By far the greater part goes to the support of a military organization upon which he cannot depend. It costs him more to maintain this organization than it does to fight.

Perhaps at times we have taken too gloomy a view of the Mexican situation. We would be glad to see some bright spots in it, and if those who are living on the further side of the Rio Grande will only call our attention to those things that go to make the high lights, we will be glad to give them prominence in the pictures we draw of Mexican conditions.

Wanted: Steel,

Copper, and Coal

FOOD is not the only thing for which Europe is calling; her need for the product of our mines is as great as that for the products of our soil. Her demands for the output of the mines may not be as great as the latter, but the need is there, and the only reason she is not insisting upon their more extensive shipment is the fact that she has but limited means of paying for them. There is no need for the cultivation of a foreign market. It already exists. It is a seller's market, and there will be no haggling over prices, if only some means of paying can be found. This matter is primarily a banker's problem, but producers and operators are vitally interested in seeing that it is solved intelligently and quickly.

Though the United States is pre-eminently fitted to supply foreign markets with steel, copper, and coal there are many other products of mines and smelters equally favored with an unsatisfied demand from abroad.

Although the market exists, ships will not carry our products to it unless they can return with one of three things: products of those countries, coin, or promises to pay. Except to a limited extent, the countries needing our metals are not yet producing; they cannot pay in produce. They have some gold, but they need that at home more than we need it here. The main thing they have with which to barter are their promises to pay, and the immediate question is, What shall be the form of these promises? What form shall they take to be serviceable to those who can furnish the desired products, but must have cash with which to conduct business?

It is not a matter of short-time credits such as Germany and England have used in the past to encourage foreign commerce; these our banks could furnish. The promises to pay that must now be given may mature years hence. Our producers and their bankers cannot carry such a load.

These credits must be established by the American people as a whole—not the Government of the United States but the people themselves—those who bought Liberty bonds, savings banks, life-insurance companies, the miner, the laborer, the banker, the poor and the rich. Savings from all sources must go into foreign loans just as they went into Liberty bonds.

While the war was in progress a fifth of our people loaned money to the Government, which promptly turned \$10,000,000,000 over to our allies, that they might spend it in this country. The money was spent, and it was in this way that we managed to keep ships passing to the other side loaded with millions of dollars' worth of material, the fleets returning in ballast or only lightly laden.

Our post-war financial problem has changed but little. The demand for goods is not quite so urgent. The Government must pass over to its people the risks and opportunities of peaceful trading. We must take the bonds or promises of foreign countries or foreign firms without the guarantee of our own Government coming in between, and we must do this not for the benefit of foreigners but for our own good and convenience.

We have the means; we are the wealthiest people in the world—not boastfully, but in fact—but we need to be educated to the necessity and opportunity that lies before us; otherwise this potential market will not become a reality. This is not a political problem; it is not a moral obligation that should be fulfilled. It is purely a commercial proposition, but one in which we are all interested, whether we have nothing or have much to do with commerce.

The task that lies before us is hard, but not too great for a nation that has done what we have done during the last two years. The marketing and purchase of foreign securities in the United States is something new to our people, and yet it can be done. In the \$10,000,000,000 that we have loaned Europe we have done this very thing, only that the United States guarantees payment of interest and principle. Now it is the part of investment bankers and those directly interested in production and export to show the investing public the advantage of foreign investments and virtually to guarantee their safety.

Already substantial loans have been made abroad, but they are small as compared with the needs of the various Allied powers, and our public has not yet been asked to participate in the purchase of the securities

corresponding to these loans. The investment trust seems to be the most practical agent for handling this business. Such a trust may investigate and loan to many branches of industry in large or small amounts, issuing its own securities with credit based upon all of the promises to pay. In this way the risk to the purchaser is reduced to a minimum and the premium paid by the borrower is as low as possible.

If at times the inquiries from abroad for the product of our mines seem light, it may be well for the producer or trader to ask himself a question: What am I doing to stimulate the market in the United States for foreign securities? As that market varies, so will foreign trade, and as foreign trade varies, so will domestic mineral production.

Sad Plight of the College Instructor

THE successful practice of the engineering profession in all its various branches rests upon the technical education of its members. Administrators may be born, and reach eminence in the management of engineering enterprises without the aid of college diplomas, but the engineering details are worked out only by those who have passed through schools of both theory and practice. Schools of theory have for years depended for their success upon the untiring devotion of a class of men who seldom attain eminence outside of their particular sphere of teaching.

If the world owes every man a living, as socialistic doctrine claims, it certainly owes it to the educators who have the responsibility of training our youth. It is an unpleasant truth that no class of workers receives less public attention, less credit, and less compensation for services rendered to humanity than college instructors and professors. This has been serious in the past, and lack of adequate compensation has forced many an able instructor to abandon that work for which he was temperamentally fitted, and has compelled him to enter the field of professional practice in order that he might support a growing family. Bad as this state of affairs has been in the past, it is far worse now, and the plight of many of our most efficient college men is serious.

The importance of engineering education to public welfare is so fundamental and far reaching that its neglect is more than serious—it is a calamity; and yet our thoughtless and unappreciative public is guilty of this very neglect today. Though the public, the mass of the people, receives the benefit from the practice of the engineering profession, few have a clear conception of the extent to which life and happiness depend upon its practice, and fewer realize the necessity of adequately supporting the source from which an engineer's usefulness is derived.

Within the last few months the American people have shown that they have some appreciation of the work of the public-school teachers, and have generously come to their support, but the instructors in the institutions of higher learning have been overlooked. This is not the fault of the boards of control, for the men composing these bodies know the conditions and would rectify them if they could. The colleges simply lack funds. They cannot pay their instructors the wages of longshoremen. Instructors must suffer or abandon their professions.

Although every college in the country appreciates the disadvantages under which its staff labors, Harvard, one of the richest institutions of learning, has been among the first to undertake a campaign to rectify the evil of an underpaid faculty. During the first week in October Harvard graduates will undertake an intensive drive for \$11,000,000 or more, for an unrestricted endowment fund for the university. Harvard is only one of many institutions where the instructors in engineering have received only about one-third of the compensation of competent locomotive engineers. We would not belittle the responsibility of the latter, but we would like to see the material appreciation of the former magnified to its proper proportions.

All engineers know the importance of keeping in our colleges able teachers of those subjects in which they have specialized, and it is now clearly the engineer's duty to put his shoulders to the wheel, and assist in every possible way in maintaining the standards of education that have been established. It will be a labor without compensation other than the knowledge of having done something worth while. We have faith that they will respond.

The Need for Propaganda Among the Uneducated

THAT education is one of the best solutions of the present industrial unrest is nowhere better proved than in the strike of the steel workers. Reports indicate that most of the native-born Americans were inclined to stick to their jobs and that the groups of strikers and trouble-makers were almost 100 per cent foreign. Although the American laborer has not enjoyed a liberal education by any means, he has had many more opportunities in this direction than the immigrant. The agitator finds his most fertile field to sow the seeds of industrial discontent in the uneducated masses from southeastern Europe, and the Bolsheviks thrive in darkest Russia. These people cannot see beyond their own noses, and fall easy victims to any one who will make the most extravagant promises regarding wages and hours of work. Under the present conditions, labor cannot harm itself more than to cut down production, and thus raise the cost of living, by striking. There are signs that the labor unions are waking up to this fact.

It is unfortunate for the country that more propaganda is not being circulated among the uneducated classes in an effort to bring before them some of the elementary principles on which the social order is founded. To say that the mill worker reads and hears one hundred reasons why he should try to get more pay or work shorter hours to one argument that he should produce as much as possible for the good of himself and the nation is hardly an exaggeration. Why cannot we have a little more Federal and state educational propaganda among the men who are now obliged to listen to the agitator or nobody? The speakers required must not be of the "high-brow" type; they must be taken from the ranks of the better class of workers, and their messages must be delivered in the halls which are frequented by the classes they wish to reach. Their bulletins must be printed in languages which can be read. How much progressive Americanism and sound economics are being printed in our country in the Slavic languages today?

Possibilities of the Oil-Shale Industry

Probable Extent of the Business Shown—Differences Between American and Foreign Practice—
Relative Value of Oils and Byproducts—Commercial Methods of Retorting
Already Developed—Refining Not Difficult

BY H. M. ROESCHLAUB
Petroleum Engineer, Denver, Col.

THAT the manufacture of oil from oil shale is destined to become one of the greatest industries in the United States is now a matter beyond dispute. The dominant position of oil in the industrial world today is a matter of common knowledge. The economic life of the country demands that this production be not only maintained, but actually greatly increased; also, considerable apprehension is now being felt in high sources as to the outlook from drilling operations.

In the latter part of May, 1919, an exceedingly pessimistic report by the U. S. Bureau of Mines was

passing almost entirely into the political and economic control of foreign governments; that the United States is thus likely to pass from the position of dominance into a position of dependence, and that in 1918 the United States imported 39,000,000 bbl. of oil, in addition to using from our reserve stock about 27,000,000 barrels.

It is estimated that the demand on the oil industry will reach about 800,000,000 bbl. per annum by 1927 and that all known and probably all underground reserves will become entirely exhausted by 1928. It is therefore apparent that some other source of oil must



LEDGE OF PAPER SHALES LYING NEAR TOP OF MOUNTAIN

transmitted to the House Committee on Appropriations through Secretary Glass of the Treasury Department. This report states, in part, the actual conditions which cause the present apprehension pertaining to the oil situation, and sets forth the facts that the underground reserves of the United States are 40 per cent exhausted, and that domestic production from drilling is probably near the peak stage; that the consumption of petroleum is increasing far more rapidly than the domestic production; that the oil contained in the vast reserves of oil shale is not yet available; that petroleum has become the fundamental basis of the industrial and military life of the nation; that gasoline has become the motive power for approximately 6,000,000 automobiles and trucks, for airplanes, farm tractors, motor boats, and numerous other industrial purposes; that fuel oil has become necessary for our navy, our merchant marine, and larger industrial plants; that the potential supplies of crude oil outside of the United States are rapidly

be found and that immediate preparations must be made for its development in order to supplement the present source. That the oil shales in the several Western states will constitute this new source is recognized by both Government officials and petroleum experts; in fact, these shales are considered of such potential value that the Government has reserved a total of over 132,000 acres, of which 45,440 acres are in Colorado and 86,584 acres are in Utah, as a naval oil reserve.

SCOTCH SHALES

Considerable publicity has been given the oil-shale industry, during the last year, setting forth operations abroad and the enormous industrial possibilities in the United States. Scotland appears to be the foremost country in this industry at this time. There, oil and several valuable byproducts have been obtained from shales for over seventy years, during which time the industry has been paying enticing dividends, in spite of

the comparatively high mining costs and slow processes of eduction. Scotch shales produce an average of around 25 gal. of oil per ton, together with a considerable quantity of ammonium sulphate, 50 to 60 lb. per ton, by far the greater portion of which is exported, principally to the United States and Japan, where it is used in commercial fertilizer.

UNITED STATES SHALES

In Colorado, Utah, Wyoming and Nevada there are enormous bodies of oil-producing shales, which will give, upon distillation, from two to three times the oil per ton that is obtained from Scotch or other shales abroad, together with a marketable amount of ammonium sulphate. They will not, however, produce as much ammonium as do the foreign shales; but it is estimated that the commercial shales in these four states will produce many times the oil that has been and will be obtained from oil sands within the United States.

OIL CONTENTS AND VALUE

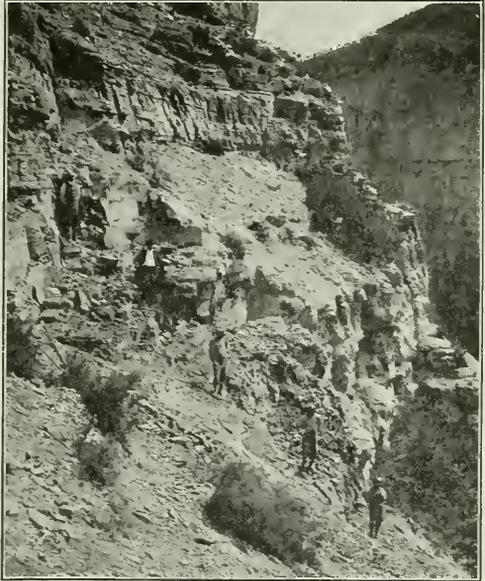
Though the U. S. Geological Survey states that the oil-bearing stratum in Colorado averages 1,500 ft. thick, it is not reasonable to assume, of course, that this entire area is commercial shale. The strata of commercial shales—that is, shales capable of producing around one barrel of oil per ton—have been variously estimated to range from thirty feet up to several hundred feet in thickness, but a safe estimate would be fifty feet. This would mean that each acre contains 110,000 tons of commercial shales, capable of producing that many barrels of oil upon proper distillation.

PHYSICAL CONDITIONS

These shales lie in high mountains rising for many hundreds of feet above the surrounding country. A considerable shale area is accessible by well-built roads, and the country contains, readily available, all the necessary timber and water for operating purposes. It must be taken into consideration, however, that by far the larger portion of this vast area is not now accessible. This section contains numerous deep canyons, from the sides of which the shale can be readily distinguished, but many of these canyons have no outlet by which a shipping point can be reasonably reached, and the shales cannot, therefore, be considered of commercial value at this time. There are, however, several main streams well back into the shale area which make available for immediate operation sufficient commercial shale to meet all operating requirements for some years. The same conditions exist in Utah, Wyoming, and Nevada, so that it can be readily understood that no apprehension need be felt regarding the insufficiency of commercial shale. Practically all of the accessible shale lands, however, have been acquired by right of location and are now held by individuals and companies as vested rights. No shale land of commercial value is now available for further location in so far as my investigations have disclosed.

The location of the shales above the valleys will make the mining and transportation to the retorting plants economical and workable on a large scale, with a smaller outlay for equipment than is required abroad. Another advantage is that, the shale beds being exposed, the tonnage and oil content of any given area can readily and quickly be ascertained at a nominal cost, something after the manner of computing the contents of a large timber tract, which condition permits the placing of the reduction plants at the most advantageous points.

Though Utah has a larger area than Colorado, it appears that the strata in Colorado are larger (they lie in blanket or flat formations), and carry a better average oil content. Wyoming also has a larger area than either Colorado or Utah, but the strata there are much smaller and carry less oil content than either Colorado or Utah. Nevada also has commercial shales, in a more limited area than either of the states mentioned, but they are rich in places and in good workable veins. The Nevada shales also carry some phosphates, which is not a commercial content of the Colorado or Utah shales. In both Colorado and Utah gilsonite is also found in the shale fields, together with a brown formation much like gilsonite, which should be of considerable commercial value. There are at a number of points small veins of elaterite, but in most instances too small to receive attention from a commercial standpoint.



TYPICAL FORMATION OF COLORADO OIL SHALES

These shales, known as the Green River Formation, contain no liquid oil, and are, therefore, not susceptible to evaporation, nor is the oil capable of being educed by the use of solvents. What they do contain is an unfinished hydrocarbon, which requires the application of heat in a manner permitting the eduction process to be carried out. This is chemically termed destructive distillation, and is not a complicated process, but is one that can be accomplished in a number of different ways.

DESTRUCTIVE DISTILLATION

The fundamental principles to be taken into consideration in successful distillation (retorting) of oil shales are that when the hydrocarbon shales are heated, the oil is expelled from them as a boiling liquid; that the heat must be maintained at the proper temperature to vaporize this liquid for removal from the retort; that the normal temperature of these oil vapors is 305 deg. to 310 deg. F., and if they are allowed to remain in the retorting chamber after volatilization, and their tempera-

ture be raised in an appreciable degree, they will be converted into a permanent or fixed gas which could not be condensed and therefore would cause a loss of oil. The amount of the oil vapors thus converted into a permanent or fixed gas will be governed almost entirely by the style of retort used and the length of time required for the removal, at their normal temperature, of these oil vapors into a cooler atmosphere. At all times the distillation should be carried on at the lowest temperature consistent with the complete eduction of the oil and its conversion into vapor, and in this manner the maximum amount of oil will be obtained and the minimum amount of permanent gas. Though a certain amount of permanent gas will inevitably be produced, any excess over the minimum will necessarily be at the expense of oil recovery.

There is no question that the oil from some shales can be educed at a lower temperature than others, though some of the shales may require a longer exposure to the heat. These factors must be carefully taken into consideration and determined regarding the specific shales to be handled. The first eduction stages will be reached at a temperature of around 150 deg. F., and this should be gradually increased until a maximum temperature of approximately 700 deg. F. is attained, at which point practically all of the oil will have been educed, with the possible exception of a small part of the heavier and less valuable constituents, which may require a higher temperature for vaporization to remove from the retort. Their value, however, hardly justifies the time and extra heat necessary for their recovery. The lower the temperature at which the oils can be educed and vaporized, the better the grade of crude that will be obtained, and a consequent larger proportional recovery of gasoline will result.

The operating conditions abroad and in this country will differ in several material ways. Abroad there is a nearby market for all the permanent gas produced, it being used for domestic purposes, a condition which will not exist in American shale areas. There, a fuel is used for retorting purposes which is entirely foreign to the shale; and mining is done mostly by hand-drilling, and a considerable per-ton expense is entailed in bringing the shales from the beds underground to the retorting plants. Scotch and other foreign shales are in comparatively small strata and irregular in formation, which creates a high operating expense chargeable to each ton of shale retorted.

In this country practically the reverse of the conditions noted will prevail. The gas produced will probably be in excess of the amount required for retorting purposes, with no available market. The mining will be done with machine drills, either electric or compressed air. American shale beds lie well up in the mountains, permitting the use of gravity in delivering the shale to the retorting plants; and the shales here are found in much larger strata, permitting a cheaper breakage of the shale. And though the wages in this country are undoubtedly more than they are abroad, the conditions here will probably result in a cheaper per-ton cost.

In Scotland and elsewhere abroad the primary objects of operations differ from those which will prevail in this country. The industry has been carried on there primarily for the recovery of the ammonium sulphate, with the permanent gas the secondary objective, and the oil recovery has always been merely of subordinate consideration.

It is apparent that a retort in which the shales enter at their normal temperature in a continuous stream, and while being passed along are continually stirred (to prevent fusing) and are from time to time brought in direct contact with the heated walls of the retort, with gradually increasing heat until they have reached the final eduction temperature desired, when they are ejected, would constitute the most economical method of distillation. A matter which must be taken into consideration is the fact that if the shales of the United States are allowed to lie dormant in the retort during the eduction period, they have a tendency to become fused or matted, and are therefore difficult to remove. In several experiments along this line it has become necessary to blast the spent shales from the retort. They must be kept moving at all stages of the eduction period to achieve satisfactory results.

What is required in this country is a simple retort which can be economically and easily constructed, giving a reasonable tonnage per day, designed primarily for the recovery of the oil and embodying none of the complications, either in construction or operation, of a retort of which the principal function is the recovery of byproducts. Such a retort will obtain a certain percentage of the attendant byproducts, but not the maximum, and will undoubtedly be found to be the most profitable system of operation on American shales. If it should be desirable to obtain the maximum of ammonium sulphate, it would be more feasible to construct a retorting plant along special lines to handle the shales primarily for this purpose, but such a retort would be much more complicated, both in construction and operation, and also more costly than one built for oil recovery as its principal objective.

PERMANENT GAS

Western American shales, when heated to a temperature ranging up to 700 deg. F., will ordinarily produce from 2,500 to 3,500 cu.ft. of permanent or fixed gas per ton, in addition to the oil vapors. This could be materially increased by raising the temperature of the vapors, but at the expense of oil. This gas contains approximately 450 B.t.u. per cu.ft. It will require from 350,000 to 500,000 B.t.u. to retort one ton of shale under ordinary conditions, depending to a large extent on the style of retort and efficiency of the heating arrangement. If only 50 per cent efficiency is obtained, it will require from 1,400 to 2,200 cu.ft. of gas per ton of shale to produce the requisite heat for eduction purposes for the recovery of the oil, assuming the maximum temperature at 700 deg. F., and it would, therefore, appear that there will be ample gas for retorting requirements, with a sufficient excess to generate the necessary steam power for all operating purposes. Should the production of permanent gas be found not sufficient, however, the shale itself can be readily used for heat generation, and will be found a cheap fuel, although special arrangements will be required for its use.

One of the peculiar features of the permanent gas production is the fact that the lower-grade shales, those producing from 10 to 20 gal. of oil per ton, will produce appreciably more gas than is obtained from the richer shales, although it does not appear that the very rich shales, those producing around 100 gal. of oil per ton, vary to any great extent in the amount of permanent gas produced from those shales yielding around 40 to 50 gal. of oil per ton. The lower-grade shales also appear to burn as readily, and apparently produce as

much heat, if not more, than the higher-grade shales, when burned under proper conditions.

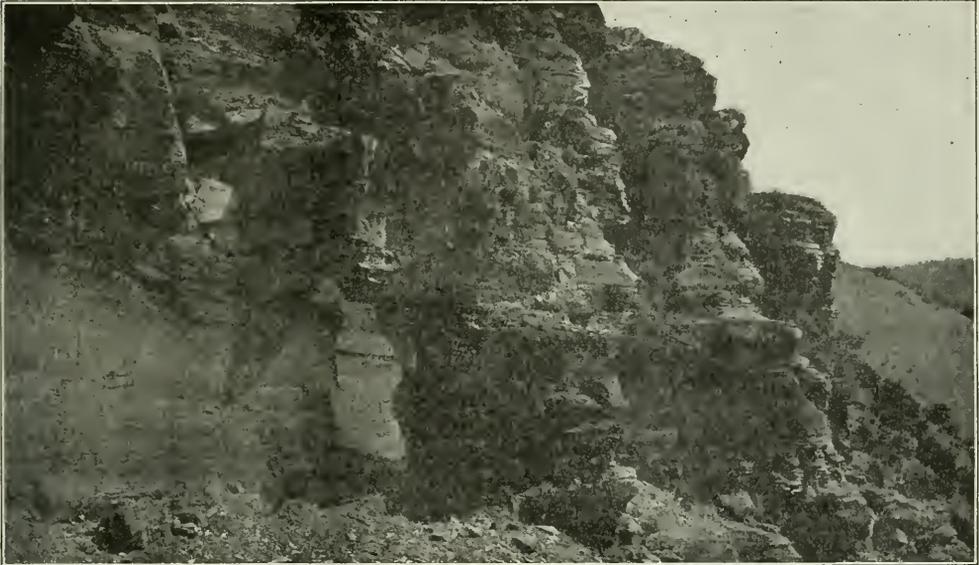
Mining will not be found to be a complex problem. It has been suggested many times that oil shales can be mined by steam shovel or open-cut methods, but though there may be a few isolated localities in which these methods would prove practicable, the principal processes of obtaining the shales for retorting purposes will be somewhat in the manner of coal mining with the room and panel systems, or by stoping, as is done in metal mining. The shales will be found in wider strata than is customary either in coal or metal mining, and the mining can therefore probably be done more cheaply.

Western American shales lie in flat or blanket formation, and where compressed air or electric drills are

slow for practical work, that ball mills would not do at all, and that there are a number of other crushing machines which are not adaptable to oil shales. There are, however, several mills which give the desired results. These are embraced in the rotary-hammer type, or the pan mills, of which there are a number of types from which to make a selection. It may be necessary, in order to increase the capacity of the crusher proper, to first pass the shales through a jaw crusher, thereby reducing the pieces from man-size to several inches before passing to the fine crusher.

BYPRODUCTS

The question of byproducts to be obtained from the oil recovered from the shales, as well as the spent shales themselves, is a much mooted subject. A number



MASSIVE SHALES IN COLORADO

used, some difficulty may be encountered with seams if straight drifting on the veins is undertaken, more especially on what are termed the paper shales. It will, therefore, be found more advantageous to drill the veins at an angle, which will also give a better breaking effect from the powder.

At almost any point in the shale area, veins of from six to twenty feet in thickness, carrying a commercial oil content, can be found. These can be economically worked by running in either on the bottom or immediately below the vein and removing the vein matter by means of inclined stopes. The drilling can be done at an angle across the vein, and the shale can be broken into a loading chute, from which it can be drawn into cars for tramping to the crushers, without hand shoveling, thereby greatly reducing the cost of this operation.

CRUSHING

During the early stages of the investigations, the question of crushing caused considerable apprehension, on account of the pliability and lack of fracturing qualities of the shales. It was found that rolls were too

of statements have been made as to the great number of byproducts to be obtained. Probably most of them came direct from an encyclopedia. Although there appears to be no question as to the practicability of obtaining several valuable byproducts, such as ammonium sulphate and fertilizer, the facts must be taken into consideration that different temperatures and methods of conducting the shales through the retorts will not only produce varied byproducts, but varied characters of the same byproducts, and it would therefore be folly to attempt to make any statement even approximating accuracy with respect to them. There is no question that a number of byproducts can be and have been found, in laboratory work, but the industry has not progressed sufficiently to justify the assumption that any number of them can be obtained commercially.

Though the more valuable oils are recovered from the shales at temperatures ranging up to 700 deg. F. and as rapidly as this temperature can be reached and maintained, ammonium sulphate, probably about 10 lb. per ton, will also be recovered. However, to obtain the maximum amount of this product, it will not only be

necessary to construct an entirely different style retort than one primarily for oil recovery, but the temperature must be carried to a minimum of 1,300 deg. F., and possibly as high as 1,600 or 1,800 deg. F., together with the injection into the retort of super-heated steam, to convert all the nitrates into ammonium sulphate. In order to accomplish this it is necessary to free the shale of all carbon, which requires an intense heat. The process is, therefore, much more complicated than the simple recovery of oil. It is questionable whether the price and marketability of this product would justify the necessary expenditure for the special retorts and additional operating costs necessary for its recovery in maximum amounts. The life of a retort used for this purpose would also be materially shortened.

FLOTATION

The matter of using the residue shale oil, i. e., that remaining after removal of the gasoline and lighter lubricants, has been seriously considered, and the fact that several well-known engineers give it their unqualified endorsement as a flotation oil speaks well for its future use in this field. It must be remembered, however, that the demand is limited, only about 500,000 bbl. now being used per year. When many companies are producing shale oil, and trying to dispose of their residue oil for flotation purposes, the market will probably be flooded. Undoubtedly, however, the entire supply could be used for this purpose for several years, during which time other industrial uses can probably be discovered.

FERTILIZER

One of the promising fields for byproducts at present appears to be the utilization of the spent shales for fertilization purposes, as they contain from 0.5 to 6 per cent of nitrates and small amounts of potash and phosphoric acid. If this can be worked out on a commercial scale, considerable additional revenue should be derived from this source.

PRECIOUS METALS

Analyses of the spent shales from the Colorado area are said to have shown recoverable gold, silver, and platinum, but these mineral values undoubtedly came from a very small area, as the general formation and nature of the shale bedding would not indicate that these metals could be found in commercial quantities, and they should not at this time be given serious consideration.

REFINING

Though crude shale oil may differ somewhat from the crude produced from oil sands, and probably will require a slight deviation from present refining methods, the refining should not be a complex problem. When the methods are once determined, the refining of shale oil will be as readily accomplished as that of ordinary crude oil.

The expenditure necessary for refining shale crude and the construction of refineries for that purpose will not differ materially from ordinary refining, and such expenditure will be based entirely upon the finished products into which the crude oil will be manufactured. Should it be found practicable to work the residue oil into a flotation oil by merely removing the gasoline and lighter lubricating oils, both construction and operating expenses will be comparatively small, but if it be desired to obtain the paraffin and heavy oils and

greases, a larger expenditure, both for construction and operation, will be required.

Shale-oil gasoline and lubricants are at least equal in every way to those products obtained from the oil sands. The shale oil should, and in most instances probably will, crack into around 50 per cent gasoline, of a quality equal to that of the commercial gasoline now obtainable.

AMERICAN METHODS

As already stated, the process of treating the shale is simple destructive distillation, and the efforts of American engineers so far have been devoted for the most part to mechanical efficiency. This involves the handling of the shales through the retort in a continuous and automatic manner; keeping them moving at all times to prevent fusing; bringing them intermittently into contact with the walls of the retort for the required heating; immediate removal of the oil vapors from the interior of the retort without raising their temperature; reasonable running capacity commensurate with installation costs; as nearly perfect heat efficiency and control as possible; the continuous and automatic ejection of the spent shales from the retort, and, finally, a reasonable installation cost and minimum operating expense.

Several purely American methods are now available which incorporate these mechanical requirements to such a degree as to justify the installation of retorting plants. Several of them have been tested on a sufficiently large scale to prove their efficiency for commercial operation.

I wish, however, to put forth a word of caution, as several of the American methods which have been tested have been found inadequate or imperfect. Great care should govern the selection of the method to be used, as an error in this particular will cause considerable delay and additional expense.

The recovery of contained products from American shales is purely a mining and manufacturing industry, with vast quantities of raw material readily available at a cost only of taking it, which will be comparatively small. The new shale should yield about one barrel (42 gal.) of crude oil per ton. A favorable feature is the fact that the necessary plants, both retorting and refining, can be constructed with no danger of an exhaustion of the supply of shale. When once these plants are installed, their production should be without material fluctuation for many years, possibly for several generations, and though it will require a reasonable amount of capital to embark in this industry, it is by no means such an enormous amount as to be prohibitive, nor will it be as great as many industrials require the earnings from which are much less and more speculative than the oil-shale industry.

The certainty of the production of oil on a commercial scale with an unquestionable market for the product should appeal to capital and relieve to a considerable extent the speculative features. That the time and conditions are now right for the exploitation of the Western oil shales on a large scale is a matter which appears to be beyond question.

One of the Richest Gold Pockets which has been found on the continent occurred in the Croesus Mine, in northern Ontario, where a yield of about \$85,000 per ton was obtained. Six samples of this ore, valued at \$10,000, were purchased by the Ontario government.

Geology of the Gogebic Range and Its Relation To Recent Mining Development—Part IV*

Deeper Mining Shows Greater Extension of Orebodies—Conservative Estimates State Ore Depth To Be 4,000 Ft., and Dependent on Extent of Water Circulation, Which Is Effective Agent in Altering Iron Formation to Ore

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THE ore deposits of the Gogebic Range may be classified either according to the mode of origin or according to their form. Based on mode of origin they are divided into (1) those originating chiefly by the leaching of silica from some part of the

form with the two greater dimensions parallel to the beds and the least dimension across the beds; and (2) those having a very long axis—sometimes two or three miles—parallel to the foot wall and dike trough in which they lie, and relatively short dimensions at right angles to the long axis. The flat tabular orebodies include the fragmental ore deposits in the Pabst member and also numerous small orebodies in the Ironwood formation.

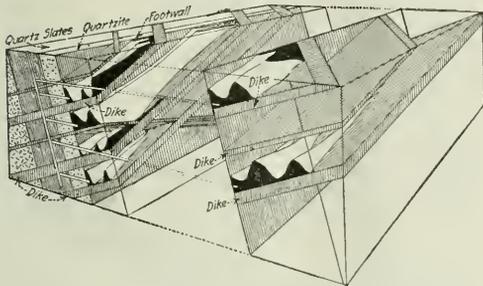


FIG. 26. BLOCK DIAGRAM SHOWING RELATION OF OREBODIES TO DIKES AND THE GREAT BEDDING FAULT

oxidized iron formation, and (2) those which owe their existence chiefly to the erosion of iron formation and the segregation of the iron oxide by this process. This last class is not important and includes only certain rich beds in the Pabst member—the so-called “fragmental ore zone”—and similar bodies found east of the Sunday Lake fault, where pre-Keweenaw erosion cut into the iron formation and worked it over, washing out much of the decomposed chert and leaving local deposits rich in iron oxide. The only case of this Keweenaw ore which I have seen is in the Sunday Lake mine.

The orebodies in the Pabst fragmental zone are usually thin and of limited extent. They give way on all sides to less well-assorted material, which makes the main mass of this member. Orebodies of this class are influenced little, if any, by dikes or faults, and are likely to be found just as wide and rich below a dike as above it.

In the first class, those derived from oxidized-iron formation by the leaching out of silica, belong all the main productive orebodies of the range. These may be derived from any part of the iron formation, as any of it may alter to ore under favorable conditions. Usually, however, these orebodies are confined to five horizons in the Ironwood formation. This is discussed in detail later under “Influence of Various Beds on Localization and Form of Ore Deposits.”

Classified according to form, the orebodies again fall into two divisions; (1) those having a flat tabular

The form and mode of occurrence of the orebodies which occur in dike and foot-wall troughs is evident from Fig. 26. For the sake of clearness, this has been drawn as though that part of the formation north of the great bedding fault were bodily shoved north to permit seeing behind it. From this figure it is apparent that the orebodies follow down the pitching troughs, and that an orebody found at the surface in one place may be found at great depth in an adjacent property. These orebodies may be described as great inclined spindles. In many cases they taper off at each end and are largest in the middle. Some of them extend from the surface to the greatest depths that mining has penetrated them. Others are entirely underground and do not appear at the surface. One of these last is a Puritan orebody shown in Fig. 27. A general idea of the vertical cross-section and vertical longitudinal projection of such an orebody is given in Figs. 28 and 29. From these figures it is seen that

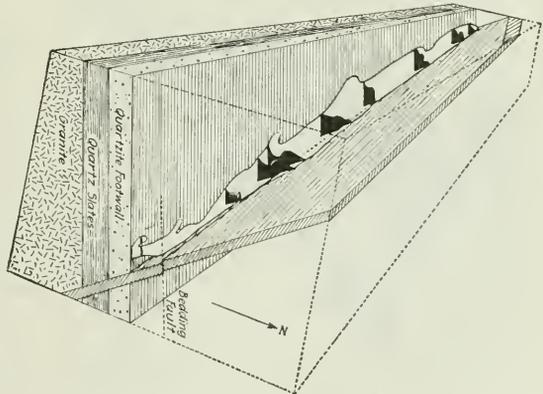


FIG. 27. BLOCK DIAGRAM SHOWING FORM AND MODE OF OCCURRENCE OF AN OREBODY IN THE PURITAN MINE. The top of this diagram is deep below the surface. The orebody pinches out at both ends

the longest dimension in the cross-section is usually parallel to the foot wall.

The depth to which these orebodies go is not known. Mining has extended to a depth 2,500 ft. vertically

*Parts I, II, and III were published in issues of the *Journal* of Sept. 13, Sept. 20, and Sept. 27, 1919, respectively.

from the surface, and nothing has been found to indicate the stoppage of conditions favorable to the development of orebodies. In fact, it is the general history of the range that the deeper that mining has gone the larger have been the orebodies. Predictions as to the ultimate depth at which ore will be found are worth little. It is conservative, however, to estimate that ore will extend at least to a depth of 4,000 ft.,



Fig. 28

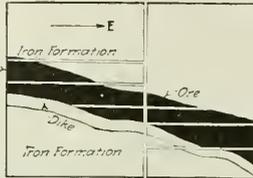


Fig. 29

FIG. 28. CROSS-SECTION SHOWING RELATION OF A TROUGH OREBODY TO FOOT WALL AND DIKE

FIG. 29. LONGITUDINAL SECTION OF PART OF A TROUGH OREBODY, SHOWING RELATION TO DIKE

and it will be surprising if it does not go considerably deeper.

The form of the orebodies and the depth to which they extend depend upon the depth to which vigorous water circulation has extended. The structural factors controlling water circulation were discussed under "Alteration of the Iron Formation," and there listed as foot walls, dikes, faults, physical condition of beds—porosity—and folds.

One additional factor enters to control the depth to which the formation has been altered to ore, that of the slowing up of the water circulation by depth.

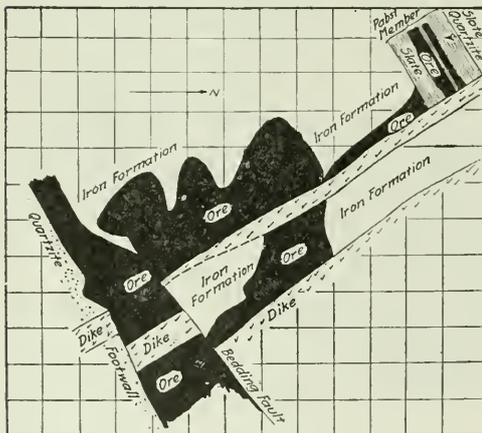


FIG. 30. CROSS-SECTION OF AN OREBODY EXTENDING FROM FOOT TO HANGING IN THE AURORA MINE

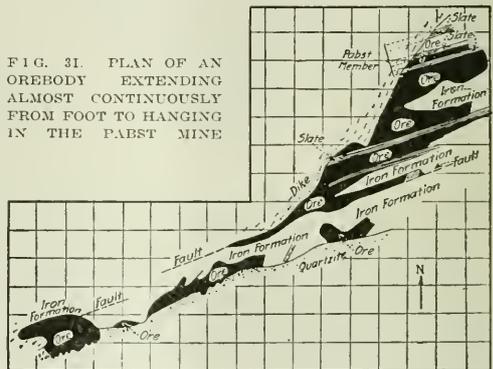
The first five factors undoubtedly continue to vastly greater depths than profitable mining can go. The effect of the last can be told only as deeper exploration discloses the facts. The slowing up of the water circulation should not be considered on the basis of present relief of the surface and present climate, but rather on the relief and climate of the geologic times,

just after the beds were tilted to their present positions. Then the relief was greater and the water circulation more vigorous, on account of the greater hydrostatic head. The climate of those times was also much more arid than at present, and the water table consequently relatively lower, so that more of the formation was doubtless above the permanent level of the ground water and subject to the action of an abundance of oxygen.

INFLUENCE OF VARIOUS BEDS ON LOCALIZATION AND FORM OF ORE DEPOSITS

The porous or impervious nature of the iron formation, and the amount of the iron oxide originally present, are facts which relate themselves to particular beds and structural conditions. Some beds are relatively very porous and permit ready circulation of water. Others are tight and impervious, and the circulation of water is relatively impeded. Some beds contained much iron originally, and some little. Some are porous and had much iron in them. Others are porous and contained little iron. Some are tight and

FIG. 31. PLAN OF AN OREBODY EXTENDING ALMOST CONTINUOUSLY FROM FOOT TO HANGING IN THE PABST MINE



had much iron, and others are tight and had little iron. These characteristics of the beds may be tabulated as follows:

1. Porous with high original iron content.
2. Porous with low original iron content.
3. Impervious with high original iron content.
4. Impervious with low original iron content.

In similar structural situations beds of these types are altered to ore in the order given. It must be borne in mind that any part of the iron formation is capable of alteration to ore, but it is obvious that a tight, lean bed will be the last to be so completely altered.

In the most favorable situations the whole formation from foot to hanging is altered to ore on a dike. Such an orebody is shown in Fig. 30, which shows a vertical cross-section in the Aurora mine. In plan an orebody of this sort has the appearance shown in Fig. 31, which shows part of one level in the Pabst mine. It will be noted that the "capping" of slightly leached iron formation is irregular in form. Certain beds project down between tongues of ore. From the discussion that has preceded it is obvious that the reason for this irregular form of the orebodies lies in the differing character of the beds. Those beds that are leanest and tightest project farthest

into the ore; those that are richest and most porous have altered to ore to the greatest distance above the dike.

The orebodies shown in Figs. 30 and 31 are characteristic of the largest bodies, in which the alteration of the formation has been most extensive. If one go to the opposite extreme and select the smallest orebodies that have been mined one finds that they are subject to the same conditions. Looking at Fig. 30 and imagining the pendant tongues of "capping" extended downward till they reach the dike, and so cutting the large orebody into several small isolated bodies, will give a correct picture of the way in which the smaller orebodies occur.

Alteration of the iron formation began first in the most porous beds where they were just above dikes large enough to control the water circulation. The porous beds that contained the largest percentage of iron, and so the smallest percentage of silica, were leached soonest of their silica, and were the first to be altered to ore. As this process continued, the

In the Wisconsin end of the range, where it has been most closely studied, there are four chief ore-producing beds or horizons. In the order of their past record of production, these would rank as follows in Wisconsin:

1. The basal part of the Plymouth undoubtedly has produced more ore than any other horizon. This is shown at A, Fig. 32.
2. The upper part of the Plymouth has probably produced the next largest amount of ore, as large foot-wall orebodies have always included this horizon when they became thicker. This is shown at B, Fig. 32.
3. The horizon of the great bedding fault has probably been the third most productive in Wisconsin, as practically the whole production of the Atlantic and Iron Belt mines came from this horizon. This is shown at C, Fig. 32.
4. The horizon of the top of the Norrie and base of the Pence has to date probably produced least, but it bids fair to take third if not second place in importance, as the Montreal hanging orebody lies in this horizon. This is shown at D, Fig. 32.

In Michigan, another member of the iron formation becomes of great importance, the Anvil member. It contains the new large hanging-wall orebodies of the Colby, Yale, Ironton, Anvil, and others. This is shown at E, Fig. 32. As it is a thick member, relatively porous and high in original iron content, it is practically a certainty that many other large orebodies will be discovered in it.

Further north than the orebodies of the Anvil member come those of the Pabst member of the Tyler formation. There are thus six different principal horizons at which separate orebodies are found:

1. In the lower part of the Plymouth member.
2. In the upper part of the Plymouth member.
3. In the bedding fault horizon—either in the Yale member or basal part of the Norrie.
4. Near the contact of the Norrie and Pence members.
5. In the Anvil member.
6. In the Pabst member.

Small orebodies have been found in other horizons, and as exploration extends some of these may prove to have considerable importance locally.

Unfortunately, time has not permitted sufficiently thorough study of the Michigan end of the range to identify with equal certainty the stratigraphic position of the orebodies there, but from the observations made it is clearly apparent that the orebodies occur in nearly, if not exactly, the same horizons as in Wisconsin. It is to be expected that their relative importance is not the same, and each mine should be studied carefully in relation to its own history and in relation to neighboring properties to see which horizons north of the foot wall have given the greatest amount of ore in the past and which offer the most promise for the future.

INFLUENCE OF FAULTS ON LOCALIZATION AND FORM OF ORE DEPOSITS

In the immediately preceding part, the influence of porosity and original iron content of various beds of the formation on the form and occurrence of orebodies was explained. It was illustrated with cross-sections, as these show the chief effect of these factors; and as these factors are characteristic of various

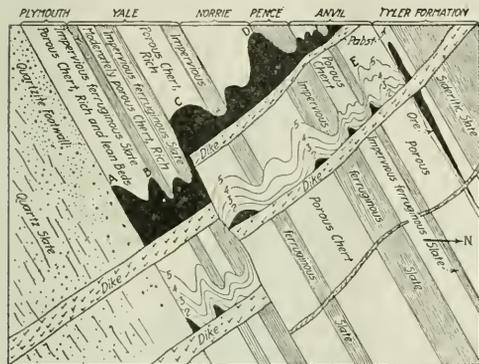


FIG. 32. CROSS-SECTION SHOWING FINAL FORM (ON UPPER DIKE) AND VARIOUS EARLIER STAGES (ON SECOND DIKE) OF AN OREBODY EXTENDING FROM FOOT TO HANGING

Black is ore

amount of material altered to ore increased, so that the orebodies grew larger and larger, until, in the most favorable situations, the leaner and tighter parts of the formation which at first separated the orebodies were finally altered to ore, and the orebody extended from foot wall to hanging, as shown in Figs. 30 and 31.

A series of cross-sections might be drawn showing this progressive enlargement of the orebodies, or it could be shown on a single section, as in Fig. 32. In this the whole thickness of the iron formation is indicated. The small black areas on the second dike down indicate the first parts of the formation to be altered to ore. The numbered lines outside this indicate outlines of the orebody in the successive stages of its development. The black area on the upper dike shows a cross-section of the final stage, that represented by line No. 5 on the second dike.

Fig. 32 shows also the various members into which the iron formation is divided. This section is not an actual section from any mine, but is a composite to illustrate the principles governing the form and occurrence of the orebodies as seen in cross-section. In any actual section the relative thickness of the various members would vary from that shown.

beds it might be expected that ore would be continuous along these favorable beds, but it is found that the ore-bodies are not continuous. They bulge and then pinch out gradually, or they come to an abrupt end against rock. Certain parts of the formation seem to be barren and entirely unleached, and even almost wholly unoxidized. In mine workings the formation above a certain dike is often found to be altered to ore, though between that dike and the next one below, possibly 200 or 300 ft., the formation may be slightly oxidized. Between the second dike and the third, still farther down, the formation may again be oxidized and leached, and contain ore. Not only are there alternate barren and productive parts in depth, but along the strike of the formation some parts are productive and some are barren.

These facts are due to the general conditions, before stated, which control the water circulation. They are not attributable to original differences in the beds, but, in large measure, result from the effects which the faults have produced in the circulation of the underground water.

Owing to the slight throw in the foot wall which many of the transverse faults show, they have not been regarded as important, and most of them have doubtless not been recognized at all. Only within the last ten years or so has the great bedding fault been generally accepted as an important factor in localizing ore deposits. These two types, the bedding fault and the transverse faults, are present everywhere along the productive part of the range, and so have been of greatest influence.

Both types of faults cut across all dikes and displace them, more or less, so that the impervious troughs made by the dikes and the foot wall are broken, and the water finds its way down the faults to deeper parts of the formation.

The transverse faults have permitted water to have ready access to certain thin, unusually porous and rich beds of the formation almost regardless of dikes, and in this way have been responsible for some if not all of the thin blanket type of orebodies along the foot wall. They also are frequent causes of "bulges" in the long "trough" orebodies. The increase in water circulation which reaches the trough where such a fault crosses it, particularly when the throw is not sufficiently great to completely separate the ends of the dike, causes greater activity in leaching of the silica. This results in an enlargement of the orebody. Cases are not uncommon where a transverse fault is followed up or down for long distances by a chimney of ore in the broken material of the shear zone.

The longitudinal fault has broken up the formation and permitted ready channels of flow for water. Where this water comes to a dike and flows along it, leaching of silica occurs, and if the process goes far enough an orebody results. The water in some instances spills over the edge of a large dike into the fault and is caught on the dike below on the foot-wall side. Orebodies of the form shown in cross-section in Fig. 33 are developed in this manner.

In addition to the effect on specific orebodies, of which the above statements are instances rather than a complete discussion, the faulting has had the more general effect of shaking up some blocks of the formation, and so making them more porous. Possibly, also, it has compressed other blocks, and so decreased their original porosity. In the movements that have taken

place in the formation, those blocks of formation lying between dikes and between transverse faults have most probably acted as units. They can be regarded as the individual gigantic stones making up a great piece of masonry. As this "masonry" was tilted and settled and sheared, the resulting stresses on the individual units would break some of them and possibly compress others; some would be made more porous and some less so. The effect of this action cannot be observed; it can only be deduced from a mechanical consideration of what must have happened when the formation was faulted. However, it serves to explain why certain blocks of the formation contain ore and others do not; why between one pair of dikes there is good ore and between the next pair there is none, and why an orebody extends a certain distance along the strike, and the same beds which carried the ore are utterly unleached a few hundred feet farther along the strike. This mechanical effect on the various blocks of the formation cannot be foretold at present. It simply

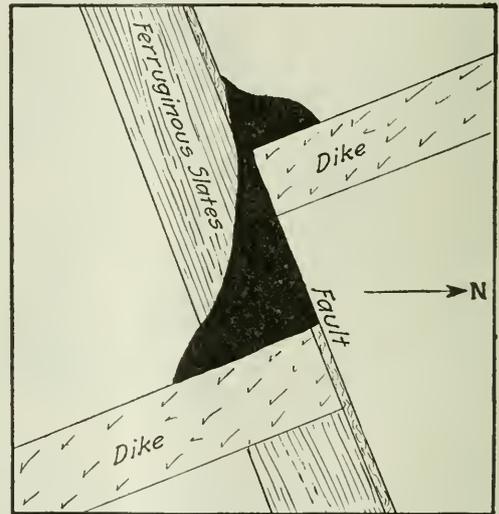


FIG. 33. CROSS-SECTION SHOWING AN OREBODY DEVELOPED ALONG THE GREAT BEDDING FAULT

aids in understanding the facts after they are discovered.

In concluding the discussion of the origin and occurrence of the ore deposits, it may be well to summarize the matter briefly. In form the orebodies are long, spindle-shaped bodies, or flat tabular bodies. They are found chiefly in six different horizons, but any part of the iron formation may alter to ore. The principal factors controlling form and localization are: First, the character of individual beds, porosity and original richness in iron; second, the structural factors, dikes, foot wall, and faults; and, third, the topography and climate of the geologic time just after the formation was tilted to its present conditions. All these controlled the water circulation, which has been the effective agent in altering the iron formation to ore.

Most of the exploration on the Gogebic Range is done by underground work, the driving of drifts and

crosscuts. Though this is the most expensive method, it is much more satisfactory than drilling, for the reason that it gives thoroughly dependable samples. Drilling is both difficult and expensive, owing to the much leached, vuggy character of the formation in the productive part of the range. The most satisfactory method of exploration is a combination of drilling and underground work.

From the preceding discussion of the occurrence and origin of ore deposits it is obvious that properly planned exploration should aim to test the best of the promising ore horizons on dikes of sufficient size to control the water circulation effectively. If the posi-

up to the dike from below or running an inclined raise parallel to the dike. It is evident from Fig. 35 that if a crosscut were run along the dike every orebody shown would be found. Furthermore, every foot of such a crosscut would be valuable exploration. It would disclose whether other horizons, in addition to those already known, were ore bearing, and it would exhibit the effect on the formation of the ore-forming, silica-leaching water, in the most favorable situation possible—where it has been concentrated on a dike. If each dike of ore-bearing size were tested by two or three such crosscuts, few orebodies of minable size would be missed.

It will be noted that in the foregoing discussion it was assumed that the position of the dike was known. If the positions of the dikes are not known—the usual case in exploration—the first problem is to locate them. For this purpose the drill is entirely satisfactory and cheapest. Holes inclined northward parallel to the formation, and drilled in pairs so that one is north of the fault and one south, are best for this purpose. Once the dikes are located it is relatively easy to plan underground work or surface drilling to crosscut the formation and explore the larger dikes at points where they intersect the horizons most favorable for finding ore. In later exploration for orebodies a single vertical or cross-cutting hole can sometimes be planned to test favorable horizons on several successive dikes.

It may seem at first thought to be an unwise expenditure to “explore for dikes,” but when it is recalled that the ore is found lying on these dikes and at six or more different horizons in the iron formation the importance of knowing just where the dikes lie is obvious. It is the first essential to successful exploration.

DIFFICULTIES OF SATISFACTORY DIAMOND DRILLING ON THE GOGEBIC

Diamond drilling for ore is likely to be very unsatisfactory on the Gogebic Range. The formation is not uniform. It is vuggy, and soft in spots, and

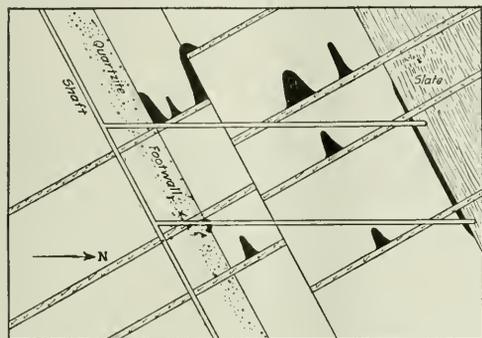


FIG. 34. CROSS-SECTION SHOWING TWO EXPLORATORY CROSSCUTS AND THE EASE WITH WHICH OREBODIES CAN BE MISSED BY PROMISCUOUS EXPLORATION EVEN WHERE OREBODIES ARE UNUSUALLY NUMEROUS

Black is ore

tions of transverse faults are known, it is best to explore in their vicinity. If the positions of dikes are known, crosscuts can be started to reach them at the desirable horizons. The usual method has been to run a crosscut straight across the formation, more or less blindly, in the hope of intersecting an orebody. If such a crosscut finds an orebody, it is purely a matter of luck. It may miss an orebody with great ease. Furthermore, it may never approach anywhere near a dike, and so be wholly wasted as effective exploration.

The way in which such a crosscut can miss ore is indicated in cross-section in Fig. 34. This figure is drawn to show orebodies in all six of the best horizons and yet show how two crosscuts can miss practically all of them. As such crosscuts are expensive, and little has heretofore been known as to real objectives for them, relatively few have been driven. The obviously necessary percentage of failure has been such as to discourage effective exploration away from the foot wall.

Fig. 35 shows the plan of the orebodies on one level with a straight crosscut, which does not explore the dike except for a small part of its extent, and that in an unproductive part of the formation. This figure also has been drawn to show orebodies in all six horizons on this one level, a case that would rarely occur, and yet it is evident that it is easy to miss all the ore north of the foot wall.

The best direction to run an exploratory crosscut is parallel to the dike. If any ore exists, it will be found. If the dike is not pitching, it can be tested by raising

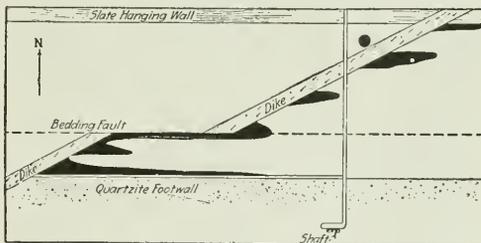


FIG. 35. PLAN SHOWING AN EXPLORATORY CROSSCUT AND THE EASE WITH WHICH OREBODIES CAN BE MISSED, EVEN WHERE UNUSUALLY NUMEROUS

Black is ore

hard and dense in others. Faults, and the broken ground associated with them, are abundant; and even though in many cases they displace the formation but a few feet, they have broken the ground. In formation of this character it is exceeding difficult to get reliable samples. The water and sample may be entirely lost in vugs or in open ground. If the hole is drilling in ore after having penetrated a soft, leached ferruginous chert, the drill rods will

wear off the decomposed chert from the sides of the hole and contaminate the sample. In more than one case that has come to my attention this contamination has been sufficient to take away any impression that an orebody had been penetrated. These are some of the difficulties of diamond drilling. There are many others, such as the necessity for carefully casing close to the bit, trouble with caving ground, reaming, cementing, and all the obstacles that occur in connection with the mechanical operation of drilling.

Notwithstanding all these difficulties, drilling is an absolutely essential method of exploration on the range. Some of them have been mentioned to bring out the difficulty of interpreting the results. Extreme care is necessary, and a full record of every fact in connection with the drilling of the hole, i. e., how many feet per day, amount of sample recovered per foot in each run, loss of water, caving, sticking bits, hardness or ease of drilling—in short, all that the drill runners learn of the nature of the ground, and all that can be obtained from careful study of the samples recovered—should be recorded. In this way often it can be correctly estimated that a 48 per cent assay from the sludge will be minable ore when a drift gets into it. In general, it may be stated that the results of drilling are likely to represent the iron content of the material penetrated as somewhat lower than it really is.

The most satisfactory method of exploration is to use the diamond drill to locate the most promising parts of the formation and then get into these by underground workings.

MANY FUTURE DISCOVERIES PROBABLE

The foot wall may be said to be fairly well explored, as deep as mining has gone in almost every property on the range in so far as these workings have extended. There are large areas, both east and west of the productive portion, that offer excellent promise for the future. Another element of great promise for the future consists of the possibility of further discoveries, (1) along the foot wall between areas that have been mined; (2) away from the foot wall; (3) in greater depth. It is my belief that exploration of the formation well away from the foot wall has only fairly started. Many large orebodies doubtless remain to be discovered north of present foot-wall workings. The success of several mines in finding in the hanging as large or larger orebodies than they ever had on the foot will lead ultimately to a thorough exploration of the whole thickness of the formation.

With unexplored foot-wall areas, greater depth, and the unexplored "hanging" part of the formation to develop, this range is reasonably sure to produce several times as much as it has in the past before final exhaustion of its high-grade ores.

The Troublesome Ruble

"I finally got through Siberia, but it was some stunt, and I certainly was glad I had no Government expense account to worry over, even with the Bureau of Mines auditor to help me," wrote H. Foster Bain, of the U. S. Bureau of Mines, from Shanghai last August. "How would I ever have made a motor car at 800 rubles for the afternoon look reasonable? But if I had not had the car, one of us never would have found a place to sleep the first night. Also, the rubles varied in

value from day to day, and there were three different kinds to worry over aside from the counterfeit. The latter was so common that no one took account of it for bills of less than 100 rubles. I bought my first rubles with yen, having bought the latter with pounds credit in London, and having no idea what the pound will be worth in New York, say in three months from now when the draft turns up. I got ninety rubles for ten yen. These proved to be Romanoff rubles, and while in the stores, restaurants, and shops they pass only at par, after spending part of them I discovered that speculators would pay 150, or 50 per cent premium, for them in exchange for Omsk rubles, which are as good as any at the eats places, so I sold what I had left. Then I bought more Omsk rubles at twenty and at eighteen per yen. Then I got more from the bank at 165 per pound—about thirty-three per dollar—(the street rate was forty-six per dollar). They paid me mainly in 500-ruble notes, and nobody would take them because of lack of change. The cashier could not or would not make change, and I narrowly escaped having to adopt the native custom, and go swimming without a bathing suit. In that case, by taking up a collection of the change in the party, including the ladies, disaster was averted. Mainly we bought change, bargaining for it like potatoes and paying from 10 to 30 per cent premium. Meanwhile, rubles continued to fall until the last day my assistant was in Harbin, when he could have obtained 140 for a real honest-to-God dollar.

"Now, with this as a background, ask the auditor how a man should charge up a meal that cost sixty rubles? Oh, yes, there is one more complication. Occasionally, we could work off a United Cigar Store coupon as part payment at some variable sum. There was an explosion, though, one night in a restaurant when Kinney had landed one on a waiter. He reasoned it must be American money, and gave it in change to an American Captain. The Captain was no sport, but went right up in the air. The waiter was firm that whatever it might be "Amerikansky," it was "ten rubles our money," and we snook before the row ended.

"There are some compensations even for trouble with rubles. Yours for peace and sound money."

Increase in Steel Corporation Orders

Unfilled orders on the books of the United States Steel Corporation, Aug 31, were 6,109,103 tons, compared with 5,578,661 tons on July 31, according to *Iron Age*. This is an increase of 530,442 tons, against an increase for July of 685,806 tons, and an increase for June of 610,545 tons. The unfilled orders a year ago were 8,750,042, or 2,649,939 tons more. The table below gives the unfilled tonnage for the Steel Corporation at the close of each month beginning with January, 1916:

UNFILLED TONNAGE OF U. S. STEEL CORPORATION

	1919	1918	1917	1916
January	6,684,268	9,477,853	11,474,054	7,922,768
February	6,010,787	9,288,453	11,376,697	8,568,96
March	5,430,572	9,056,404	11,711,644	9,331,001
April	4,800,685	8,741,882	12,185,083	9,829,558
May	4,282,310	8,337,623	11,886,591	9,937,791
June	4,892,855	8,918,866	11,383,287	9,640,450
July	5,578,661	8,883,801	10,844,164	9,593,592
August	6,109,103	8,759,042	10,407,049	9,660,537
September		8,297,905	9,833,477	9,522,584
October		8,353,293	9,009,675	10,015,260
November		8,124,663	8,892,106	11,058,542
December		7,379,152	9,381,718	11,547,286

The largest total of unfilled orders was on April 30, 1917, when it was 12,183,083 tons. The lowest was on Dec. 31, 1910, when the total was 2,605,747 tons.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical
Industry Dealing With Pertinent
Subjects of Interest

Pulverized Coal at the Tennessee Copper Co.

The article on pulverized coal in the blast furnace, published in the *Journal* of Aug. 16, is interesting, and a discussion of it may prove much more so if some of those who have tried coal will tell their previous and probably unsuccessful efforts to use it as a blast-furnace fuel.

In 1910 or 1911 one of the many Japanese engineers and metallurgists who visited the Tennessee Copper Co. at that time asked if any attempts had been made to substitute coal for coke at the company's plant. He told of its use at one of the larger copper-smelting plants in Japan, the one with which he was connected, and described the method used there. After leaving Copperhill he wrote a short description giving a sketch of the apparatus that had been developed, and stated the percentage of coal that was required, which, as I remember, was less than 4 per cent. His results were so interesting that it was decided to make a simple trial in one of the blast furnaces at Copperhill. This was done, but the coal interfered with the color of the acid made from the furnace gases, and it was decided to postpone the work at least until the production of acid had been brought up to a reasonable quantity and the consumption of niter brought down.

It is probable that the experiments were not taken up by the new management, but, no doubt, the extreme prices of coke current in 1916 or earlier induced new experiments resulting in the success since achieved.

The method practiced at the Japanese furnaces, and which was tried first at Copperhill, was not to use powdered coal but fine coal up to pieces about 1 in. in diameter. The powdered coal was screened out, as I remember, and the coarser pieces were charged through the tuyère. This meant that the coal, on being blown into the furnace, did not burn completely as soon as it reached the hot interior of the furnace, but lodged in the interstices and burned slowly. A small amount of coal was charged intermittently, but on account of its slow burning gave no chance for back-firing or explosions. Eighty-pound air was used, as that was the only air easily available for the experiment. The tuyères soon brightened up, instead of being dark and cold, and the results seemed satisfactory. It was tried only on one or two tuyères and was used on different tuyères with the idea of doing away with the great amount of tuyère punching that had been found necessary to insure the fast running of the furnaces and the high grade of gas that was desired at the acid plant.

It was not practicable to continue the hand screening and charging of these small amounts, and so the tests were again postponed to some future time when operations should become normal, after completion of the bedding plant and additions to the acid plant then under construction.

This reminiscence is given, not with any idea of detracting from the excellent work carried through by Mr. Cavers, but to show that once in a while even Americans get valuable ideas or suggestions from the Japanese.

It was recognized that the blast furnace was not an economical apparatus for smelting, because the heat balance showed that there was sufficient heat from the reactions to do the smelting without any fuel, such as coke or coal. The trouble was that the heat was generated too high up in the furnace and the tuyère zone was too cold. Much of the heat from the coke and the sulphur is generated so high up in the furnace that it is almost valueless for the smelting operation and simply superheats the gases, which have to be cooled before going to the acid plant. By the introduction of and the burning of the fuel lower down in the furnace, the heat is obtained at the point most needed, which is the reason why a smaller amount of fuel will do the work.

It is particularly interesting to note that a charge as low as 12 per cent sulphur has been smelted with coal replacing part if not all of the coke, as this indicates a much greater field of endeavor than the semi-pyritic work at Copperhill.

It is also particularly gratifying to me to feel that another important advance in the art of metallurgy owes at least part of its beginning to the boys at Copperhill.

N. H. EMMONS, 2D.

Camp Wabasso, Laconia, N. H., Aug. 19, 1919.

The Engineer in Politics

Again engineers are reminded editorially in the Aug. 16 issue of the *Journal* of their political and civic shortcomings. Granted that the criticism of the profession as a class is warranted, individually (as this editorial must be interpreted) is it?

Let us follow the engineer from his inception in the business until he attains some measure of success. At college he is taught that his is the career which depends for its success upon individuality, force of character, and constant application to his work. His curriculum is technical. His instructors are technical. The whole atmosphere created in his particular department of training is technical. If his nature is one which absorbs this techno-culture, he spends his evenings at home alone, loading up on all the theory that his textbook provides, so that in class and laboratory he can make application of the principles he has acquired. He has not the time to take part in athletics that his classmate in liberal arts has; his course requires more hours to graduate from the four short years of training allotted for the groundwork of his calling. He gets a "corking" good course in mathematics because he needs that in his mechanics.

Chemistry is important, for it is so essential to get

the right combinations in the metallurgical laboratory and to pass examinations involving calculation of blast-furnace charges. Mineralogy must become second nature with him if the undergraduate engineer wants to be a geologist. He must be accurate. He must be exact and exacting (especially with respect to himself). His English ought to be correct, for otherwise it *might* spoil some future report; but he is supposed to have learned that subject at high school, and it would be unwise to neglect the technical subjects in college for history and literature, except, of course, to read the "technical journals" in idle moments. Sometimes he is counseled to take a "year" in Spanish, because there is a possibility he may be called to a job in Latin America, but that is not absolutely essential, as he can "acquire Spanish in the field."

Political economy and sociology the student recalls in some vague sort of way, perhaps because of the economy part. He has to practice it as well as hear it so much that it becomes the one great principle he gleaned from college life. Theatres, dances, social clubs are all right in their place, but during the college semester, nay-nay! They take time from study and make him sleepy during the lecture on the Dikelocephalus Period of the Lower Paleozoic (or is it the Upper?). Debating societies are good, in fact, fine in their way, especially if the discussions are on technical subjects. But then, the liberal art students get the most out of them, for they usually argue current topics, which don't help a fellow much when it comes to sampling a mine. Anyway, those fellows are studying to be lawyers and need to cultivate talking.

Again, does our embryo engineer ever hear a lecture on the benefit a workman derives from his union or that it is a good idea for the boys in the class to organize and hang together or deal collectively on such matters as might affect their welfare? Under such conditions our young engineer completes his college work and enters the profession to be put in full charge of a No. 2 shovel in a narrow stope by an ambitious and plodding superintendent who received his first practical experience in the same way.

Now the engineer discovers that there are other things to be learned than the subjects he thought he had mastered in college. Besides the practical knowledge which he acquires by time only, there is the business side, which somehow the "profs" overlooked. After shift he has to turn in and study accounting and system. The camp in which he launches his career is perhaps isolated. There is not much social life, and he has become more or less of a recluse anyway. If he was not studious at college he must work now to make up for the time he lost there. During the next fifteen years, if he has force and good judgment, he rapidly progresses along these lines (shifting to numerous places) until he is mine or mill foreman, or perhaps in exceptional cases he may have attained the superintendency of some prospective mine in Podunk or another equally well-known location. He at last has time to take a long breath, to sit down and reflect and to investigate the other fellows around him.

It is probable that the engineer now finds that Bill, who took liberal arts, is U. S. District Attorney in some lively city, where he settled after leaving college. He has acquired a large circle of influential friends and a comfortable home. Tom, who was always a good fellow and just got by with his general-science studies,

also scraped through "medical," joined several of the prominent clubs in the city of a half million people; stayed there; became generally liked for his happy personality and charitable deeds, and is now favorably endorsed for Congress, with the solid backing of his medical associates, who seek much needed reform in laws affecting health and social welfare. So with the other fellows who entered their various lines of work at the same time he did. They settled down to a business, settled on a ranch or settled in some professional capacity in growing or populous communities. At any rate they *settled*. Then he inventories his own qualifications for public office. He finds in himself, as compared with the average 100 per cent public official, the following:

	Per Cent
Age	100
Mentality	150
Judgment	200
Executive ability	300
Morality	100
Popularity with public	30
Popularity with corporations who know him	100
Popularity with corporations not knowing him	0
Oratory	10
Soberity	60
Tra-ability under party domination	2
Willingness to admit defeat	0
Influential friends	5
Support from his colleagues	7
Average	75 to 82

If he is ambitious to do something for his community, his profession, or his country, he knows from long experience with the cold-blooded figures of fact that he cannot be elected over the professionally political Bill or the naturally political Tom; so he stretches the friendship of the old college days to get what he wants through them.

As an individual he is not responsible for these conditions. His college training, his environment, his professional training and his business as a whole are against him. His success as a mining engineer depends upon his experience in various fields. He does not remain in one community long enough to establish a sphere of permanent influence. The people with whom he comes in contact, like himself, are nomadic; a few years finds them scattered to all parts of the globe. The mining engineer is essentially a pioneer, and as such he does not want to settle down. He thinks at times he would like the quiet, steady life of his business brother, but when he tries it he does not stay. He must be conquering Nature and solving Nature's problems. If he were not so he would not be an engineer.

But more particularly the engineer knows, when he aspires to political honors, he is not going to be backed up by his profession. It has not been organized on that basis. Its principles and its precepts in the past have been "each individual for himself." There has been no collective thought or action to further his interests or his business. While miners and muckers, hoistmen and mechanics, even the unskilled laborers, organized for collective bargaining with organized capital, our engineers, our technical societies, and our technical press derided the idea of keeping pace. It was not included in the ethics and was beneath the dignity of engineers to organize in anything resembling a union, as engineers are the direct representatives of Capital, and as such cannot place ourselves on a par with Labor. We must not limit the amount a skillful engineer might earn by adopting a minimum scale of fees or salaries, regardless of how little compensation the struggling youngster of our profession was getting.

The result has been that many of the younger members have dropped from mining and taken up more lucrative lines of endeavor. Some of these men have gone into politics, but naturally they have entered in their new roles and not as engineers. Yet withal, the outlook is not hopeless. The war brought the mining engineer into prominence for his efficiency and executive abilities and gave him some encouragement. Some of the profession who did not stay with mining too long are notable exceptions to the rule. The Governor of Nevada is a mining engineer. Several of the important commissions of this and other states have engineers at their heads or as members. It would be interesting if the *Journal* could inform us as to the number of engineers acting as city managers.

This last medium of dragging the engineer into the limelight is the greatest opportunity we have for ultimately producing the "engineer-politician." As city manager he has full and unrestricted outlet for his technical ability, and, with his usual inborn desire to get to the bottom of things, generally will assimilate the qualifications necessary for election to public office.

These individual instances, the more liberal tendency of the technical journals so noticeable of late, and, most important of all, the consolidation of the Engineering Societies to gain recognition of the engineer as a *human being*, are great strides in the right direction. Now let us start propaganda in our technical schools for more liberal training in sociology, literature and general culture, and the engineer will lead the world.

F. DEAN BRADLEY.

Goldfield, Nev., Aug. 26, 1919.

"Wildcat" Oil Wells

To those not familiar with the terminology of the oil industry the expression "wildcat" oil well carries with it, but not justly, a suggestion of opprobrium. In mining, a "wildcat" proposition usually is more than an unreliable or an unsafe speculation; an insinuation of dishonesty is more often than not intended in the use of the expression. This is generally not the case with oil wells. The New Standard Dictionary (Funk & Wagnalls) gives as one meaning of the term "wildcatter," "one who drills for oil where it is not known to exist." By deduction one obtains the definition of a wildcat well as one that is drilled, or being drilled, where oil is *not known* to exist. This is vastly different from drilling where it is *known not* to exist. Therein lies the difference between a speculation, or gamble if you will, and the obtaining of money under false pretenses. In general, the wildcat oil well is merely one drilled in territory where no oil has been found, whether there are any indications of success or not.

Gulf, Tex., Aug. 17, 1919.

ALBERT G. WOLF.

Further Tests With Coke and Powdered Coal at Copper Cliff

In the *Journal* of Sept. 13, reference is made to the experiments on the application of pulverized coal in the blast furnaces at the smeltery of the International Nickel Co., of Canada, Ltd. The text you published has, unfortunately, given many interested parties the impression that the company's experiments have been unsuccessful, particularly as you state "it is probable that the work connected with same will soon be terminated." I have just returned from a

visit to Canada, and wish to correct impressions that have been made. It is true that in the experiments recently carried out in an effort to smelt copper-nickel ores without coke the results have not been encouraging. However, it has been demonstrated that a combination of the use of coke and powdered coal is practicable, and the following comparative results obtained from two furnaces of the same size, with the same furnace charge and blast pressure, over a period of six days, will show the possibilities from an economic point of view:

	No. 7 Furnace Coal and Coke	No. 8 Furnace Coke Only
Ore, tons	2,802	3,023
Charge, tons	3,043	3,188
Coke, tons	225	411
Coal, tons	192	
Total fuel, tons	417-13 80'	411-12 90'
Fuel cost	\$4,869	\$6,370
Fuel cost, per ton ore	\$1 74	\$2 11

The cost of grinding the coal and the extra labor connected with the coal feeders would be about \$0.07 per ton of ore, which would make the fuel cost per ton of ore for No. 7 furnace, operated with the fuel combination, \$1.81.

The data at present at hand do not offer much encouragement that the furnaces at this smeltery may be operated on coal alone, but it is possible that a means may be found to overcome the difficulties encountered. The smelting of Copper Cliff ores has always been a difficult problem, and it is gratifying that the combination coal and coke method has accomplished so much, and will undoubtedly be considered by all engineers and metallurgists interested in the subject as being distinctly encouraging.

I might state that though it is true that experiments have been terminated at this time on the basis of replacing all the coke, it is intended, after constructional changes in the furnaces have been effected, to resume experimental work, with a view to obtaining the best results possible on a combination of fuels.

W. L. WOTHERSPOON,

General Manager, Garred-Cavers Corporation.

43 Exchange Place, New York, Sept. 20, 1919.

Can a Geologist Explain?

There are twenty-two creeks and gulches in the Barkerville area of British Columbia that are, or were, rich placers. They flow in every direction except south, even southeast and southwest. In other words, not one rich south-flowing creek has been found in that area in fifty-eight years, although every well-situated, south-flowing creek has been prospected. Cariboo schists, striking approximately northwest and southeast, underlie all of the creeks mentioned, no matter what their direction of flow.

There is no simple and easy explanation, such as gradient too steep or too flat, or course of the creek along the strike of the rock, or mushy bedrock. Apparently, the south-flowing creeks should be as rich as the others, but the gold, in quantity, is not there. In the area mentioned, this is the rule without exception. I would like to know why. Also, does the rule hold good in other northern districts? Who can tell us about the Klondike, Alaska, and Siberia? Does any particular direction of flow indicate a poor placer creek in Australia or South America? If so, why? If not, we come back to the original problem: why are the south-flowing creeks of Cariboo so ornery?

HENRY BOURSIN.

Ozone Park, N. Y., Aug. 30, 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War-Minerals Act Does Not Cover Ferromanganese

Producers of ferromanganese do not come within the purview of the War-Minerals Relief Act, according to an opinion just handed down by the Attorney General. The opinion was asked in connection with the claim of \$561,346.62 by the Anaconda Copper Mining Co. for losses sustained in producing and preparing to produce ferromanganese. In his opinion the Attorney General said in part:

The sole question for determination is whether Congress intended to pay for losses not only incurred in mining manganese but also in manufacturing manganese into an article of commerce known as ferromanganese.

The only uncertainty that could possibly exist as to the meaning of the statute appears to arise out of the word "produce," which is applicable to both mining and manufacture, and mine owners as well as manufacturers are referred to in the statutes as producers. There are, however, certain provisions of the act which definitely limit the application of the word to mining operations.

The claim of the Anaconda Copper Mining Co. evidently is based upon the contention that ferromanganese is an intermediate metallurgical product of manganese and is embraced within the provision for payment of losses to producers by reason of the specific mention of intermediate metallurgical products in the act of Oct. 5, 1918, and the adoption of the minerals enumerated in the law of Oct. 5 in the first paragraph of Section 5 of the act of Mar. 2, 1919. There is, however, no basis for this contention, as the intermediate metallurgical products, metals, alloys, and chemical compounds covered by the act are all specifically named, and, as there is no reference to ferromanganese, the rule of law *expressio unius exclusio alterius* applies.

The Attorney General upholds his conclusions by a careful review of the discussion while the measure was the subject of legislative consideration and of the conference reports.

The Tariff Situation

In the opinion of Senator Penrose, of Pennsylvania, the chairman of the Committee on Finance, the proper time to consider tariff revision would be after the Presidential election. He further declares that he is opposed to piecemeal tariff legislation, such as is being conducted by the House of Representatives, as it is certain not to deal fairly with all interests concerned.

Senator Penrose expects to call his committee together in the near future, with the purpose of reaching a decision as to the action which the committee will take toward the emergency tariff bills which have been passed by the House and are now before it. It is expected that the committee will support Senator Penrose in his stand, which seals the fate of the tungsten, zinc, and chemical glassware bills, so far as separate legislation is concerned. Those bills have been before the Senate committee for some time, and their friends have made every effort to move the Senate committee to action.

The matter of a general revision in the tariff is not regarded with enthusiasm by any of the Republican

leaders. They feel that world conditions are in a state of change and must reach a more stable status before intelligent action can be taken. Many are of the opinion that the enactment of a general anti-dumping bill would protect American interests until it is possible to form a better conception of international trade relationships.

Any specification of all scientific instruments in one group, with a single rate of duty applying to all articles in the group, should be avoided, in the opinion of the U. S. Tariff Commission, which has reported on the subject at the request of the Committee on Ways and Means. These instruments are of such extremely varied character that the most widely divergent competitive conditions exist. To attempt to group them together would result in conspicuous inequities. In the case of certain instruments not now manufactured nor likely to be manufactured hereafter in this country, the Tariff Commission declares, a tax on consumers without stimulation of domestic production would result.

The study made of the situation by the Tariff Commission develops that in many cases articles now are being produced in the United States which are superior to those formerly imported.

Gold and Silver Production

Gold production during the calendar year 1918 shows a decrease of \$15,104,000 as compared with the production of 1917. Silver output during 1918 was less than that of 1917 by 3,930,223 ounces. Final figures for the 1918 production, by states, have been issued in a joint statement by the Bureau of the Mint and the U. S. Geological Survey. The statement is as follows:

GOLD AND SILVER PRODUCTION OF THE UNITED STATES
(Gold, Value; Silver, Fine Ounces)

	Gold		Silver	
	1917	1918	1917	1918
Alabama	\$2,200	\$700		2
Alaska	14,671,400	9,424,700	1,207,164	802,743
Arizona	5,180,600	5,583,000	6,962,257	6,831,465
California	20,929,400	16,784,400	2,107,107	1,432,812
Colorado	15,974,500	12,724,700	7,291,495	6,900,266
Georgia	6,500	4,500		45
Idaho	754,800	701,400	11,402,542	9,396,009
Illinois			7,116	8,218
Maine		700		6,338
Maryland			538	164
Michigan			684,225	516,294
Missouri	300	60	63,344	42,314
Montana	3,673,200	3,280,700	14,555,034	16,378,263
Nevada	6,932,500	6,700,440	11,217,654	9,931,969
New Hampshire				691
New Mexico	1,085,400	687,080	1,535,807	773,662
North Carolina	10,800	4,400	590	100
Oregon	1,687,300	1,265,700	172,152	129,150
South Carolina	1,700			
South Dakota	7,372,900	6,699,400	190,382	161,232
Tennessee	5,500	5,600	106,975	105,829
Texas	100	20	587,945	579,158
Utah	3,522,100	3,153,000	13,360,905	13,492,555
Vermont	100	1,000	403	4,891
Virginia	1,300	400	4,500	1,814
Washington	488,200	333,800	266,112	300,000
Wyoming	3,700	900	3,400	1,255
Continental U. S.	\$82,304,500	\$67,356,600	71,727,6476	7,797,139
Philippines	1,446,100	1,290,000	12,715	13,000
Porto Rico	100	100		
Total	\$83,750,700	\$68,646,700	71,740,362	67,810,139

Gold production in fine ounces in 1918 was 3,320,784, compared with 4,051,440 in 1917.

The Institute Session on Mine Taxation

CHAIRMAN ALLEN opened the session on Monday at 11 a.m. He introduced the subject of mine taxation by giving two definitions of a mine, namely, the commonly accepted designation, "A mine is a wasting resource," and a new definition which demands careful consideration, "A mine is a manner of wasting resource." The underlying thought in the latter is of special interest in the consideration of the subject of mine taxation, particularly in connection with the principles of depreciation and depletion. It is found that the allowance for depletion is not a simple problem that can be solved by assuming a fixed annual reduction in the value of the ore reserve, because of constantly varying conditions, both as to the changing economic operating problems and the irregular changes in the present value of the reserve as a result of current development of new orebodies.

The chairman introduced L. C. Graton, of the Internal Revenue Commission, who addressed the meeting and presented the results of the commission's study of over 35,000 mines which had been valued for taxation purposes by the Bureau of Internal Revenue. Mr. Graton requested co-operation and suggestions from mining men, and the discussion which followed served to indicate some important features of taxation which had not been fully covered by the work of the commission.

R. V. Norris discussed the question from the coal-mining company's point of view and expressed the belief that all coal operators would co-operate with the Government in every possible way to help solve the mine-taxation problem and that they regarded Mr. Graton's works as highly illuminating. He insisted that the commission should recognize a distinction between metal mining and coal mining, in that the latter was more like manufacturing, and should be so regarded.

W. O. Hotchkiss, of the Wisconsin Geological Survey, pointed out the importance of a carefully selected personnel on the commission and expressed the hope that the Government would provide adequate compensation, so that able students and investigators of the mine-taxation problem could be retained until their important work was completed.

Paul Armitage, of New York, discussed the problem from the lawyer's standpoint and offered examples to show that the depletion method, as contemplated by the law to be consistent, must take into account the his meaning by considering the elements of time and value as co-ordinates and pointing out that be a curve falling either above or below a straight line. He believed that the Treasury rule must be changed.

Dedication of Pittsburgh Experiment Station of Bureau of Mines

PITTSBURGH CORRESPONDENCE

DEDICATORY ceremonies of the U. S. Bureau of Mines Experiment Station at Pittsburgh began Monday, Sept. 29, with Van. H. Manning presiding. The attendance at the ceremonies was large and representative. The invocation was delivered by S. B. McCormick, Chancellor of the University of Pittsburgh, and was followed by an address of welcome by Mayor E. V. Babcock. Response to the latter was made by First Assistant Secretary Vogelsang, who represented Frank K. Lane,

Secretary of the Interior. Governor William C. Sproul, in his speech, promised co-operation between state and Federal organizations and employees, and announced his intention of introducing radical proposals, during the next legislative session, which would tend to make mining communities more inviting. J. Parke Channing, representing H. V. Winchell, president of the American Institute of Mining and Metallurgical Engineers, discussed the present unrest in metal mines.

Other speakers emphasized the work being done by the Bureau for the conservation of life and natural resources. A number of references were made by speakers to the late Dr. J. A. Holmes, who was the first director and originator of the Bureau of Mines.

After luncheon a special train was provided, and visitors were taken to the experimental mine at Bruceton, where a mine explosion was shown and other experimental work was demonstrated by members of the Bureau.

September Mining Dividends

Dividends paid by 28 United States mining and metallurgical companies in September, 1919, amounted to \$11,080,134, compared with \$23,553,456 paid by 36 companies in the corresponding month last year. Canadian, Mexican and South American companies paid \$1,760,664.

Yukon Alaska Trust, a holding company, made its usual disbursement of \$1 per share (\$203,433).

Interesting features this month were the resumption of dividends by Calumet & Hecla, which had not paid since December, 1918, and by Ahmeek, Isle Royale, and Osceola, which passed their last quarterly payments. Calumet & Arizona increased its payment from 50c. to

United States Mining and Metallurgical Companies		Situation	Per Share	Total
Ahmeek, e.	Mich.		\$1.00	\$200,000
Am. Sm. and Ref., com.	U. S.-Mex.		1.00	609,930
Am. Sm. and Ref., pld.	U. S.-Mex.		1.75	875,500
Argonaut, g.	Calif.		.05	10,000
Bingham Mines, com.	Utah		.25	37,500
Caledonia, l. s.	Ida.		.01	26,050
Calumet & Ariz., e.	Ariz.		1.00	612,520
Calumet & Hecla, com.	Mich.		5.00	900,000
Chino, e.	N. M.		.75	652,485
Copper Range, e.	Mich.		.50	197,500
Creson Cons., g.	Calif.		.01	122,000
Eagle & Blue Bell, l. s.	Utah		.05	44,580
Fairview Round Mountain, g.	Nev.		.02	19,048
Federal Min. & Sm., pld.	U. S.		.50	60,005
Golden Cycle, g.	Ariz.		.03	45,000
Hecla, l. s.	Ida.		.15	150,000
Homestake, g.	S. D.		.50	125,580
Isle Royale, e.	Mich.		.50	75,000
Kentecott, e.	Nev.		.50	1,393,053
Nevada Con., e.	Nev.		.37 1/2	744,790
Orville Dredg., g.	Calif.		.12	82,380
Osceola, e.	Mich.		1.00	96,157
Quincy, e.	Mich.		.50	110,000
Ray Con., e.	Mo.		.50	788,580
St. Joseph Lead., com.	Mo.		.25	352,369
So. Hecla, l. s.	Utah		.15	39,457
Tintic Standard, l. s.	Utah		.08	93,400
United Eastern, g.	Ariz.		.07	93,410
United Verde, e.	Ariz.		1.50	450,000
Utah Copper, com.	Utah		1.50	2,436,735
Canadian, Mexican and South American Mines				
Cerro de Pasco, e.	So. Am.		\$1.00	\$898,224
Kerr Lake, s.	Ont.		1.00	600,000
Mexico Mines of El Oro, g.	Mex.		1.44	262,440

\$1 per share, and Federal Mining & Smelting, preferred, reduced from \$1 to 50c. Among the Canadian companies, Hedley passed its dividend, and Kerr Lake, though it did not pay its regular dividend, made a capital distribution of \$1 per share, as a result of reducing its capital stock from \$3,000,000 to \$2,400,000.

The totals for the first nine months of the year are as follows, the 1918 figures being given in parentheses: United States mining and metallurgical companies, \$72,547,069 (\$129,402,031); holding companies, \$1,113,438 (\$1,718,438); Canadian, Mexican, Central and South American companies, \$12,163,034 (\$14,070,925).

Chicago A. I. M. E. Meeting

Session on "Milling and Industrial Organization" Held At Congress Hotel, Sept. 22—Reduction of Labor Forces, Physical Examinations and General Welfare Authoritatively Discussed

CHICAGO CORRESPONDENCE

THE A. I. M. E. session on "Milling and Industrial Organization" opened on Monday, Sept. 22, at 2 p.m., with F. K. Copeland presiding. The paper on "Chilean-Mill Practice at the Portland Mill," by Luther W. Lennox, was introduced by George M. Taylor, general manager of the Portland mine and mills, at Victor, Col. Mr. Taylor reviewed briefly the investigations made by Mr. Lennox, and pointed out the increased efficiency resulting from a readjustment of the crushing practice at the Portland mills. The paper was discussed by R. B. T. Kiliani, of Denver, Col., who referred to Miami practice, and by C. H. Benedict, of the Calumet & Hecla Mining Co., who commented on methods of crushing employed in the Michigan copper district.

The papers on "Graphic Metallurgical Control," by H. M. Merry; "Mill Operations at the United Eastern During 1917-1918," by Wheeler O. North, and "Crushing Practice at New Cornelia Copper Co.," by W. L. Du Moulin, were read by title, and discussion was postponed. The three papers by Charles F. Willis, namely "Methods of Curtailing Forces at the Copper Queen," "Educational Methods at the Copper Queen," and "Physical Examinations Previous to Employment," were introduced and read by J. W. Reid, who pointed out that the Phelps Dodge Corporation had given careful study to the problem of curtailing forces, and that the salient principle of its present practice was to lay off first those employees who would have the least to lose by such action.

C. H. Benedict discussed the problem of reducing labor forces, and outlined methods employed at Calumet & Hecla properties, where the men are divided into three classes: (a) men with dependents, (b) single men, and (c) returned soldiers. He said that returned soldiers were offered their old jobs in every case, but that in some instances, where the job was filled by a man with a dependent family, the soldier refused to accept the offer and sought employment elsewhere.

The subject of educational methods was discussed by George M. Taylor, who thought that the scheme outlined by Mr. Willis would not be successful in a mining camp like Cripple Creek, Col., where most of the mining operations were carried on by lessees who were more often employers than employees, who were frequently well-educated men, and whose general intelligence was in any event well above that of the average miner.

The paper on physical examinations was elucidated by Mr. Reid, who said that the practice was sometimes resented by labor unions because it was not fully understood. It was pointed out that many miners did not realize that the physical examination was for their own protection, as well as for the purpose of safeguarding the company against liability on account of accidents to men who were physically incompetent to perform the tasks assigned to them. Large mining companies have learned by experience that a man who is physically unfit is almost sure to be hurt sooner or later and is a great liability to the company.

The three papers by Mr. Willis led to a general discussion of the various methods employed by mining companies toward labor uplift and efficiency. A. M. Plum described the "bonus" and "dividend" systems employed in the Platteville, Wis., zinc district for the purpose of increasing tonnage production. Robert Ammon, of Mascot, Tenn., outlined the operation of the "Industrial Democracy Plan" which has been installed in his district, and explained some of the problems involving negro labor wherein it was necessary to limit the individual's earnings in order to maintain efficiency at a maximum. Charles W. Goodale spoke of the "Brawley" system used at Butte, Mont., and stated that a wage of \$5.75 per day was sometimes augmented by a bonus as high as \$1.25 per day. C. H. Benedict distinguished between "bonus systems" and "profit sharing."

A. I. M. E. Smoker

Program of Entertainment for Visiting Engineers Replete With Novel and Interesting Features—
Chu Chin Chow (?) Achieves Sudden
And Unexpected Eminence

CHICAGO CORRESPONDENCE

ON MONDAY evening, Sept. 22, 1919, the American Institute of Mining and Metallurgical Engineers held an interesting and entertaining smoker, in the Gold Room of the Congress Hotel, Chicago. Through the untiring energies of Bradley Stoughton, the members of the Institute had the rare privilege of hearing an address delivered by Mr. Chu Chin Chow, an eminent Chinese mining engineer and metallurgist, who, according to his interpreter, spoke of the vast undeveloped mineral resources of China, and the financial and political assistance his country hoped to receive from the United States.

Sidney Smith, cartoonist for the *Chicago Tribune*, supplied mirth in the form of caricatures of members present, and some of their acquaintances.

George S. Rice delivered an illustrated lecture on the present status of the mining industry in the war zones of France and Belgium. Many of the pictures of famous mining plants, before and after the German fiends of destruction had demonstrated their efficiency, served to impress upon the minds of the audience not only the utter lack of sportsmanship of degenerate kultur, but also the herculean labors which confront the French mining engineers who must and will revive their wrecked industries.

Dr. F. G. Cottrell exhibited many interesting war-zone pictures, and described numerous power and industrial projects in Belgium, France, Germany and Italy, not the least interesting of which was a plant in Northern Italy where power was developed by utilizing low-pressure steam of volcanic origin.

One of the features of the evening's entertainment was a one-act comedy which served as a happy vehicle for character sketches of such well-known personages in the mining world as Hoover, Jackling, Rickard, and Hammond. The evening held not a dull moment, for all intervals between main features on the program were appropriated by a male quartet or an orchestra. The members who were present felt truly sorry for those who were not.

BY THE WAY

American Auspices

A bit of British humor may be found in a recent issue of *The Capitalist*, where an officer of the Baku Russian Petroleum Co., (1909) Ltd., is quoted as stating at a company meeting that, "Under the so-called Peace Treaty, just concluded in Paris under American auspices, the new Republic of Azerbaijan—which embraces Baku—was apparently to be recognized by the Great Powers, and the importance of the oil industry as a national asset should eventually ensure its proper treatment at the hands of the new authorities."

A Fuelless Engine

The millennium in engine design has again been achieved, this time in a fuelless engine designed by one C. C. Thorn, of a company that styles itself "The United Powers Co. (when organized), San Francisco." The company purposes renting automatic power of all kinds, including mechanical power, inertia power, leverage power, gravity power, compound power, and hydraulic power. The engine "gets its power from its own energy, developed by its own mechanism without fuel." Three million horsepower on a 40 x 40-ft. tract is possible, it is claimed. The engines work automatically and are always under perfect control. United Powers Co.'s shares are \$100 each. "You cannot get too much for a good investment."

Not the Proper Education

A few years ago in a mining town of California it happened that a Cornish mining captain was elected as a member of the local school board. Just before the end of the school term the physics teacher in the high school resigned, and the school board met to elect a successor. As it was so near the end of the term, the board experienced some difficulty in finding a good instructor. Finally, a member of the board suggested the name of a young mining engineer who was employed as assayer at one of the local mines. The qualifications of the young man were discussed at some length, and during the greater part of the conversation Cap'n Frank sat with a look of disgust on his face. When he could hold in no longer he gave vent to his feelings as follows: "Wot! 'E teach physics for we? Wot do 'e naw 'bout un? Why, dam-me, I wouldn't 'ave 'e to doctor a bloody dog for me."

A Grave Situation

An unusual protest against mining operations has recently been made by the people of Oronogo, Mo., against the Oronogo Mutual Mining Co. The latter, it is charged, is mining under the town cemetery. The citizens have held a mass meeting and appointed a committee to investigate. One miner stopped work when he claimed to have discovered that he was mining under his daughter's grave, and others with relatives buried in the cemetery have also threatened to quit. The company admits that it probably will work under the cemetery, although this is not being done at present. It is operating at a depth of 180 ft., and the management points out that no possible damage can be done

by mining at this depth. The work is sheet-ground mining, and much powder is being used. The company has a lease from the city council, the members of which argue that the town is poor and the royalty will help in keeping the cemetery in good condition.

Murdered Truth

Hill City, S. D., has a ghost. The manager of the Cowboy mine, Alexander Roy, says so. According to Mr. Roy, the spook manifests itself by giving forth in the mine workings wild screams such as ladies give when they are being choked to death, although at times when it gets tired it growls like a buzzsaw. Mr. Roy has come to the conclusion that the sounds are due to a magnetic vortex caused by a concentration of the earth's magnetism by the metal in the ore. This vortex, according to Mr. Roy, has a form like a smoke ring, or a doughnut, perhaps, and by its whirling gets the air all stirred up, so that it just naturally whirrs, too, and makes the sounds described. Study of this phenomenon, according to Mr. Roy, is as valuable as Newton's study of the law of gravitation. If tin can thus centralize magnetic waves, he says, it can be used to overcome the power of gravitation, so that the airship of the future can be built of tin. Mr. Roy evidently has a tin lizzie in mind. It seems, offhand, that the tin market does not require stimulation by ghost stories. As far as the affairs of the Cowboy mine are concerned, a ghost is hardly a live asset.

Leave the Gun at Home

"Speaking of horrors," drawled Britton, as he and the doctor left the change house, "I recall an experience at the Lazarus mine, shortly after graduating. Like many a tenderfoot, I wore a six-shooter. After taking a few samples above the main tunnel level I put my sacks into a larger sack and sealed it, rolling the bundle in my coat and tucking it up on a timber above the winze platform. Descending an old rickety ladder, I was chipping off bits of ore here and there when I was startled by a loud report. Almost instantly came a scream from the level above, followed by the fall of a heavy body that shook the ladder above me. Both candle and hammer dropped from my grasp, and I clung to the ladder to keep from falling. Instinctively I reached to my holster and found it empty. Later it transpired that a drill boy, who had just brought in the lunch of a miner, was attempting to pick the pockets of my coat. As it dawned upon me that it was my own gun that had been fired, I also realized that but a moment before a living person had stood above me. Huskily, I halloood; but no response came. Lighting matches and holding them over my head, I could make out a huddled bulk sagging over a ladder rung near the top. Calling again to know if help was needed, I could not even see the body move. Bending down to see if anyone below had witnessed the tragedy, I felt a drop of warm liquid strike my neck; and then quite a succession of larger drops. The terrible thought struck me that literally someone's blood was upon my head. A wild notion of flight seized me, but the only outlet was up that single ladder. Mustering my courage as well as I could, I crept tremblingly up. When near the top of the ladder I gently grasped my coat and samples. On the platform I found a perforated dinner bucket, from which the last drops of coffee were dripping. I never inquired about the gun, as I had no further use for it."

PERSONALS

S. K. Dahl has gone to Venice, Cal.

Carl J. Trauerman, well-known mining engineer of Butte, Mont., is visiting in Boston and New York.

Edward Mosehauer, of the United Metals Selling Co., has gone abroad to represent the Copper Export Association with headquarters in Geneva.

Frank A. Kennedy and Edward Collins, of Duluth, Minn., are making several mine examinations in the Seven Devils District in Idaho.

Louis D. Huntoon has resigned as secretary of the Mining and Metallurgical Society of America and is succeeded by F. F. Sharpless.

Preston Locke, of Spokane, Wash., representing the American Smelting & Refining Co., recently visited the Portland Canal and Salmon River districts of British Columbia.

R. H. Crozier, who until recently was mill superintendent of the Hampden-Cloncurry mines, Kuridala, Queensland, has been appointed manager of the ironstone quarry of Burma Mines, Ltd., Namtu, Burma.

Forrest B. Smith, general field representative of the American Mining Congress, spent part of September in San Francisco in the interest of the annual convention of that body to be held at St. Louis, Mo., in November.

Harry S. Denny has been appointed Deputy Civil Service Commissioner for the occupied area of Cologne. Mr. Denny was for a number of years assistant consulting engineer for the General Mining and Finance Corporation.

Adolph Knopf, of the U. S. Geological Survey, has returned to Rochester to complete a survey of the district which he began two years ago, but which was interrupted that he might devote attention to the search for minerals used in the manufacture of munitions.

C. F. Kelley, president of the Anaconda Copper Mining Co., accompanied by John Gillie, manager of mines, and Frederick Laist, general manager of smelters for the Anaconda, inspected the company's properties at the Boston & Montana reduction works at Great Falls, Mont., recently.

A. H. Lawry, formerly superintendent of the Goldfield Consolidated Mines Co., in Nevada, is now consulting engineer in charge of the Tonopah Divide and other properties controlled by George Wingfield in Divide. Mr. Lawry succeeds William Sharp, who was appointed temporarily after A. I. D'Arcy resigned.

James L. Bruce, general manager of the Butte & Superior, has resigned, effective Jan. 1, 1920, to accept the general management of the Davis-Daly Copper Co., taking charge of the latter

Sept. 15. Mr. Bruce will attend to the affairs of the Butte & Superior up to the first of the year, in addition to his duties at the Davis-Daly.

Captain C. E. Grunsky, Jr., has resumed his engineering work in San Francisco with the C. E. Grunsky Co., a reorganization of the American Engineering Corporation. Captain Grunsky had been with the U. S. Army for two years, during which time he saw active service at the front and supervised the valuation of war losses in French mines.

George W. Metcalfe, general manager of the mines and smeltery at Kennett, Cal., is leaving to take up other work for the United States Smelting, Refining & Mining Co. He will be succeeded by O. J. Egleston, who has been chief engineer for the same company in its Western field. L. D. Anderson, at present manager of smelters at Salt Lake City for the company, will succeed O. J. Egleston as chief engineer. K. H. Kervin formerly superintendent of the smeltery at Kennett, has gone to the copper refinery at Chrome. Frederick Lyon, managing director, has retired owing to ill health. George W. Heintz, for years local manager at the Salt Lake offices, will be transferred to the Eastern office and his place taken by Clarence E. Allen, who has been manager of mines and is in turn succeeded by D. D. Muir, Jr., formerly local manager of the exploration department and later in charge of the zinc plant at Baxter Springs, Kan.

SOCIETIES

American Iron and Steel Institute will hold its sixteenth general meeting at the Hotel Commodore, New York, Oct. 24 and 25.

American Foundrymen's Association held its twenty-fourth annual meeting in Philadelphia, Sept. 29 to Oct. 3. The various sessions were at the Bellevue-Stratford Hotel, and the exhibition at the Commercial Museums.

Institute of Metals.—At the meeting at Sheffield, England, on Sept. 24 and 25 an additional paper to the original program was presented by Zay Jeffries, of Cleveland, Ohio, on "The Micro-Mechanism of the Ageing of Duralumin." Dr. Jeffries went to England to present his communication in person.

Electric Furnace Association held a meeting in Chicago at the Congress Hotel on Monday, Sept. 22, the day before the meeting of the American Electrochemical Society. There was a business session in the morning, for formal reorganization, election of officers and other important business. Following a luncheon, a general session for the afternoon was arranged, to which were invited all who are interested in the electric furnace and its products.

Engineers' Club of Northern Minnesota resumed the regular monthly meetings at the public library in Hibbing on Sept. 20. The members were entertained by a film of the General Electric Co. showing the electrification of the Chicago, Milwaukee & Puget Sound Ry. A committee was appointed to investigate the merits of the electric shovel as applied to Mesabi Range operations, and also to study the practicability of changing the present steam shovels to fuel-oil burners.

INDUSTRIAL NEWS

The Western Electric Co. has recently opened a branch, consisting of a sales office and warehouse, at 334 East Bay St., Jacksonville, Fla. The house is in charge of A. H. Ashford. Electrical supplies and specialties will be carried in stock.

New Jersey Zinc Co. has sent out a statement on the use of rolled zinc for making stencils, and detailing its advantages over other materials. Negotiations are being carried on to supply Japanese producers with zinc stencils for stamping silk designs to replace the hand methods now practiced.

International Exposition of Mining Industries will open in the Grand Central Palace, New York, on Dec. 1, instead of on Oct. 15, as originally planned. Howard R. Ward, manager, has returned from an extended tour through mining centers, to prepare for the opening. Failure to have the quarters ready for occupancy by the exposition is the reason for delay, the building having been used by the Government.

Colburn Flotation and Engineering Co., Denver, Col., has issued an illustrated circular describing the Colburn vacuum flotation machine. A number of advantages are claimed for the machine, which, it is stated, uses both mechanical and air agitation without the cost and complication involved in compression of air outside the machine. Also, it is said that the vacuum may be varied according to the ore. One valve regulating the sand discharge from the last spitzkasten is the only regulating valve used.

American Ore Reclamation Co., 71 Broadway, New York, has issued a 24-p. pamphlet describing the operations of the company, which is engaged in the licensing and engineering of plants for the sintering and desulphurizing of iron-bearing material, and acts as consulting engineer in operations involving the treatment of iron-ore material that can be beneficiated by sintering. The company operates principally under the Dwight & Lloyd patents for continuous down-draft sintering and is also licensed to use the intermittent process with separate tilting pans, the Heberlein, the up-draft process, and the rotary kiln.

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief Of Interest to Engineers And Operators

GLOBE, ARIZ.—Sept. 25

The American Association of Engineers has just organized a Globe-Miami Chapter with fifty-one members. C. P. Griffith is temporary chairman and R. L. Russell is temporary secretary.

"Safety-First Week," will be observed Oct. 19 to 25 under the auspices of the Globe-Miami District Mine Rescue and First-Aid Association, which will aid in extension of its work to cover civic features outside of the mines. This will include household and street accidents, fire, industrial accidents and school education along safety lines.

The Salt River Valley Water Users' Association is to build a steam-power plant near Phoenix, to equalize the service from its hydro-electric plants at Roosevelt and valley points. The Inspiration Consolidated Copper Co. has been getting an irregular power supply from the Roosevelt dam works and has had to rely to a large degree on its own steam-power service, supplemented from the reverberatory furnaces of the International smeltery. Now it is understood there is to be guaranteed a steady power supply from the Roosevelt system. In addition, there is to be connection at Phoenix, with the same system by the Arizona Power Co., from its hydro-electric works on Fossil Creek, Yavapai County.

SALT LAKE CITY, Utah—Sept. 17

Mine Rescue Car No. 11, of the U. S. Bureau of Mines, which has been visiting mining camps of Utah, has been in Salt Lake City at the Oregon Short Line station since Sept. 22, and will remain for two weeks. Classes in first-aid work are being held by the crew of the car.

Commercial Club of Salt Lake City has organized a mining division, so that there may be a group within the club to look after matters of especial interest to the mining industry. A committee of thirty-five mining men has been formed, with John N. Hayes, of the Utah Copper Co., chairman, and Frank Pingree, of the National City Bank, vice-chairman. A. G. Mackenzie was made secretary. At a meeting on Sept. 12, a resolution in favor of lowering freight rates on ores and concentrates from Salt Lake Valley to Eastern refineries was adopted.

The Campaign for Americanization of Foreign Workers in the various mining camps of the state, as provided

ance at school on the part of all persons between the ages of sixteen and forty-five, who are unable to read and write the English language, is meeting with success, and those affected are showing themselves anxious to comply with the regulations. At Bingham, a committee of fifty was organized among the foreigners, on which every mine as well as each of the nine nationalities in the camp was represented. This committee has made it a point to reach every person affected by the law, furnishing information as to the requirements, the date of opening classes, and other pertinent facts in connection with the law. School opened Monday, Sept. 22.

JOPLIN, MO.—Sept. 27

Shipping Conditions have greatly improved in the Joplin-Miami district in the last week, following the appointment of Ross A. Blanchard, assistant traffic manager for the American Zinc, Lead & Smelting Co., as representative of operators, smelters, and the U. S. Railroad Administration, with headquarters at Joplin and Miami, in an attempt to relieve the situation. Regional Director B. L. Bush, at St. Louis, promised cars up to 65 per cent of the district's demands, and all the coal cars that could be used, and although Blanchard did not reach the district until Sept. 22, much relief already has been received.

DULUTH, MINN.—Sept. 22

The Bendixen Bill, levying a 5 per cent tax on iron ore, was vetoed by the Governor on Sept. 19 after passing both Senate and House. The vote in the former was 38 to 28. The bill was expected to raise about \$6,500,000 a year in taxes.

HOUGHTON, MICH.—Sept. 29

Labor is becoming more plentiful in the Michigan copper district. Many Finnish miners are returning to the mines from the farms, desirous of having underground employment for the winter. Mines are constantly adding to their forces, but putting practically all new employees at work underground, and none on surface. Additions now are made at the rate of 100 a week. This will not increase the output of copper as much as might appear at first glance, because all new underground men are put at development operations, getting the mines ready to better the total output when demand requires it.

The steel strike has no effect on the

indirect reflection in the demand for metal. The strike of boatmen also is without effect here, as all mines of this district have their coal supplies on hand to run on full time until July 1, 1920.

The metal situation in the Houghton district is not clearing up. There is 50,000,000 lb. of copper on hand. The Lake Superior smelting plant, a subsidiary of the Calumet & Hecla, at Dollar Bay, closed last June, and still has 15,000,000 lb. on the dock, unsold. No new mines reopened this week.

A gift of a life insurance policy to every employee was announced on Sept. 29 by Calumet & Hecla, Osceola Consolidated, Ahmeek, Allquez, La Salle, Lake Milling, Smelting & Refining, Superior, Isle Royale and Whitepine companies, employing eleven thousand men. The policies range from \$1,000 to \$1,500, payable to any named beneficiary, dating Oct. 1, 1919, without medical examination and without cost to the recipient. The miners, who have always had to pay high rates for life insurance, are jubilant.

ISHPEMING, MICH.—Sept. 27

Drilling for Iron Ore Near Escanaba will be undertaken by a company recently organized at that city. Some exploration work was done there years ago. The contract has been awarded to E. J. Longyear Co. Escanaba is not considered to be on any of the Michigan iron ranges, but is the shipping port for the Menominee Range. If ore is found it will be considered to be an extension of the eastern Menominee Range.

Titles of Lands of the Ayer Estate, of Boston, are being searched by attorneys representing the Chicago Title & Trust Co., and it is reported that the lands are to be sold en bloc. The Ayer estate has large holdings in Houghton, Ontonagon, Iron, and Gogebic counties, in northern Michigan, some of which are in the mineralized belts. If the deal goes through it will be the largest transfer of lands to take place in the Lake Superior district in several years.

The Steel Workers' Strike is having its effect in the Lake Superior district, but it is difficult to state at this time what the extent of the curtailment in the district will be. Some of the train and shovel crews were laid off during the first week, operators not caring to load boats that they fear may not be unloaded when they reach lower Lake ports. If the seamen decide to

region will be seriously handicapped, although a strike at this season would not result as disastrously as one earlier in the year. The time is fast approaching when Lake shipments stop for the year, and the seamen have little to gain if they do decide to go out in sympathy with the steel workers. No mines have been closed as yet, although the managers of two Mesabi Range operations have been advised from the East that they may have to suspend operations on short notice. However, all of the open-pit mines will be closing for the year within a month or six weeks. The Minnesota Steel Co. is operating its plant at West Duluth, the men having decided to remain at work. There are no strikes anywhere in the entire Lake Superior district, the ore-dock and coal-dock workers, who were idle for a few weeks, having gone back to work. The United States Steel Corporation has been preparing for labor troubles for several months. Though the independents have been slow in getting ore down to Lake Erie, the Corporation has been stocking ore at its furnaces.

HOUSTON, TEX.—Sept. 25

Crown Oil & Refining Co., at annual meeting of stockholders, held Sept. 15, elected the following officers: George E. Colvin, president; J. W. Colvin, vice-president; H. F. Montgomery, secretary; and C. F. Robinson, treasurer. Directors are: R. L. Young, J. C. Stribling, George E. Colvin, J. W. Colvin, all of Houston, and J. W. Dubould, W. D. Ahern, and F. S. O'Reilly, of New York. Reported that refinery now under construction at Pasadena will be completed by Jan. 1, 1920, with capacity of 5,000 bbl. daily, and that, contrary to reports, this refinery will not be sold.

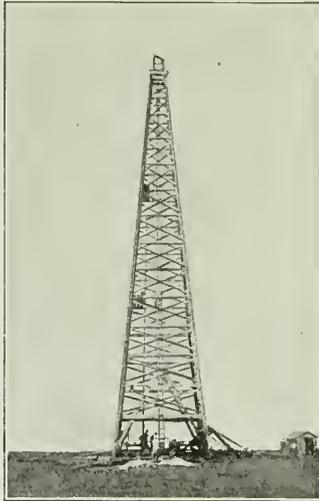
Eagle Petroleum Co., of Houston, has been recently organized. Officers are J. A. Reynolds, president, C. E. Morgan, vice-president and general manager; C. E. Gates, secretary and treasurer. Company has purchased Swastika lease of fifteen acres in Markham field, Matagorda County, upon which are three producing wells; Swonger & Vicar lease, at Batson, Hardin County, where two wells are producing and a third will be drilled at once; and leases at Stratton Ridge, Brazoria County; High Island, Galveston County, and in the Homer field of Louisiana. Company is a close corporation, with no stock for sale.

BIRMINGHAM, ALA.—Sept. 25

The Opening Day of the Steel-Workers' Strike found the plants of the Birmingham district practically untouched. Approximately 500 men in the entire state responded to the walk-out orders. The Steel Corporation's subsidiary, the Tennessee Coal, Iron & Ry. Co., lost about 70 men at its big Fairfield plant, 30 or 40 at the By-Products, and fewer than 150 at the steel plants in Ensley. Fewer than 150 men are said to have left the American Steel & Wire Co.'s mills.

All plants in Bessemer are running, and few strikers are to be seen on the streets. The opening of the strike found all mines along the southern end of Red Mountain operating with their normal Monday crews. In some places the force was below normal, but this was later found due more to the "Monday-after-payday" effect than to the strike. It is understood the Muscoda mines, one of the principal mining properties of the Tennessee Coal, Iron & Ry. Co., has more than doubled its force of deputies and watchmen. The plant of the Anniston Steel Co. at Anniston, Ala., which employs more than 300 men, and that of the Gulf States Steel Co. at Gadsden, were not affected at all by the strike.

It is expected that the union leaders in the Birmingham district will call for a sympathetic strike. It is to be noted that some of the companies are putting men back to work who struck but have asked for reinstatement. The independent companies expect to be drawn into the struggle soon. The employees of the Woodward Iron Co. have



DERRICK 112-FT. HIGH AND ROTARY DRILLING RIG AT 3,000-FT. OIL WELL MATAGORDA COUNTY, TEXAS

already been ordered out, but have made no response.

In the face of severe criticism, Governor Kilby, of Alabama, and his followers succeeded in passing the bill providing for a tax on coal and iron ore. The companies in the Birmingham district and elsewhere in the state made every effort to prevent its passage, but without success.

Rail is being rolled at the steel mill of the Tennessee Coal, Iron & Ry. Co., at Ensley, Ala., for shipment to Japan, and a dozen or more flat cars were spotted on Sept. 22 to be loaded. The order, it is understood, calls for a large tonnage.

NEW YORK—Sept. 26

Phelps Dodge Corporation intends to launch a campaign of intensive underground development work at its Mornci property, and, at a later date, will probably erect a modern concentrator which can treat to advantage low-grade copper ores. Various new installations and equipment will be necessary in connection with the mining of these ores and their beneficiation, but, it is stated officially, absolutely no definite plans have been made as yet. Such plans will be developed in the course of the next six months.

BOSTON—Sept. 27

Arizona Commercial Mining Co., of Globe, Ariz., again brought same suits, under Massachusetts laws, against Iron Cap Copper Co., also of Globe, immediately after the Massachusetts Supreme Court in equity session had handed down a decision that the two suits were beyond its jurisdiction. These last actions, however, were suits at law and disregarded the finding of the court in equity session. In brief this means that the cases will be now tried by a court and jury and a decision finding for either the plaintiff, with damages, or for the defendant will be handed down.

WASHINGTON, D. C.—Sept. 25

The Anglo-Persian Oil Co. is negotiating to effect a complete absorption of five Scotch mineral-oil companies, according to a consular report from London to the Bureau of Foreign and Domestic Commerce. The Scotch companies which will be affected by this transaction are the Pumpherton, Broxburn, Oakbank, Young's Paraffin Light & Mineral Oil Co., and James Ross & Co., having an aggregate capital of approximately £2,860,000. The Anglo-Persian company will undertake to supply the Scotch companies, it is stated, with enough crude oil for refining, so that they can return an ample dividend to their shareholders, and the directors of these concerns are urging the stockholders to accept the proposal of the Anglo-Persian company.

TORONTO, ONT.—Sept. 27

The Mines of Cobalt are gradually getting back to normal, following the cessation of the strike. In the majority of cases, however, the lower workings are still flooded, but within the next week or so all the properties should be working at capacity. Owing, no doubt, to the fact that a considerable number of men are rustling, there is a decided increase in the efficiency of the men.

About a week ago the miners of the Kirkland Lake district took a vote as to whether or not the strike in that camp should be called off. So far, the result of the vote has not been announced, but it is probably that the strike will cease, and work be resumed. If work is not started soon, the probabilities are that all the properties will remain closed until next spring.

THE MINING NEWS

Progress of Mining Operations
Condensed and Classified
For Easy Reference

ARIZONA

Cochise County

Central (Dos Cabezas) — Development begun on sixteen copper claims. Group adjoins Mascot. E. A. Ely in charge.

Centurion (Dragoon)—Cleaning up drifts, and shaft preparing to operate after two-year shutdown.

Middlemarch Copper (Gleason)—Closed for several weeks on account of miners' strike for higher wages. Will start work with new force soon.

Arizona United (Johnson)—Voluntarily raised wages 10 per cent Sept. 1.

Greenlee County

New Year's Gift (Duncan)—Compressor being installed.

Maricopa County

Eyrich (Phoenix)—Free-milling ore sampling over \$12 developed to extent of 9,000 tons in 300-ft. shaft and 300 ft. of drifting. Main exploration will be on 500 level. Property in Winifred district, eighteen miles north of Phoenix. John F. White manager.

Abe Lincoln (Wickenburg)—Work resumed with three shifts after several weeks' shutdown. Shipments being made.

Dragon (Wickenburg) — Fifty-ton mill to be started soon on gold-silver-vanadium ore. Shaft to be deepened from 260 ft. to 1,000 ft. About 2,000 ft. of underground development already done. Operated by Los Angeles company, headed by James G. Scarborough.

Pima County

Vulcan (Tucson)—Sold to William Kemp and associates, of New York. Property, in San Xavier district, has been held by W. R. Ramsdell, Epes Randolph, Charles Walker and James N. Pemberton.

Yavapai County

Gadsden (Jerome)—Closed down for repairs.

United Arizona (Jerome)—Completed timbering of main shaft to 875 level and installing new hoist. Property in Black Creek district, thirty miles from Jerome. Operated by Phoenix company, headed by C. H. Dunlap.

Verde Squaw (Jerome)—Second diamond-drill hole caved at 330 ft., after passing through 15 ft. of well-mineralized schist.

Hidden Treasure (Prescott)—Property in Groom Creek section, under development by Jerome company, headed by C. H. Bennett, of Clarkdale. J. H. Morrison, mine manager.

Tuscumbia (Prescott)—Old silver bonanza in Bradshaw Mountains be-

ing put in condition by Jerome company, headed by George Kingdon, manager, of United Verde Extension. New surface equipment being installed.

Yuma County

Ranier (Salome)—Two-compartment shaft down 80 ft. New hoist and compressor equipment being installed. William T. Gnash in charge.

New King of Arizona (Yuma)—Lower-grade ores to be worked in new mill. Operation made possible by development of water, impounded near mine, in Castle Dome mountains.

ARKANSAS

Marion County

Beulah (Rush)—Under lease to Arkansas Zinc Co. Sinking shaft to 51-ft. level, where zinc ore has been proved by drilling. Now down 14 ft.

Mattie May (Rush)—Small force of miners at work on property. Mill completed.



LA GRANG HYDRAULIC MINE, TRINITY COUNTY, CAL., NOW CLOSED DOWN

North Star (Yellville)—Will start active mining and milling operations at once.

Independence County

Polk-Southard (Batesville) — Independence Mining Co. operating Polk-Southard manganese mine, has produced since May 31 800 tons of high-grade boulder ore, averaging 50½ per cent metallic content. Shipments of this made on last year's contract.

CALIFORNIA

Amador County

Keystone (Amador City)—Preparations nearly completed for operation on large scale. Wooden timbers in upper part of shaft being replaced by concrete, which is expected to eliminate expense caused by settling ground around shaft. Hoisting equipment being overhauled.

Central Eureka (Sutter Creek)—Twenty-five stamps of forty-stamp mill now in operation. Development work confined principally to 3,700 south drift, which is 81 ft. from shaft and contains 5 ft. of quartz averaging about \$17 per ton. Restraining dam for impounding tailings being enlarged and strengthened.

Calaveras County

Triple Lode Gold (Angels Camp)—Old Blair gold-quartz mine, idle for sixteen years, to be operated by new California company, headed by T. L. Brophey. Hoist installed at old shaft, and former workings being unwatered.

Finnigan (Carson Hill)—Bonded by James R. Keith Co., of San Francisco. Old mill dismantled and site selected for new mill. Property adjoins Morgan mine.

Kern County

Rand Silver Con. (Randsburg)—Persistence of high-grade contents proved to 75-ft. depth by uncovering of third rich streak at this depth. Width of new shoot 5 ft. Crosscutting begun at 50-ft. level, where second high-grade pocket was found. Lessees working in six different places. Deep-est shaft 80 ft.

Modoc County

High Grade (Alturas)—Acquired by Lester Reynolds, who will operate during winter.

Nevada County

Alta Hill (Grass Valley)—Roy King has taken option on fifteen parcels of land noted in past for yielding placer gold, but which show no quartz outcrops. Undertaking based on geological study of district. Development planned by tunnels.

Idaho Maryland (Grass Valley)—Deed of conveyance recorded transferring holdings of Union Hill mines to Idaho-Maryland Mines Co. Sale includes all claims and machinery.

Placer County

Rising Sun Con. (Colfax)—Electric power line under construction from sub-station at Colfax. Pumps and hoists installed, and unwatering of shaft has reached point between second and third levels.

Plumas County

Walker Copper (Portola)—Hauling concentrates to railroad in four 5-ton trucks. Mill capacity increased to about 200 tons per day. Concentrates run from \$8 to \$12 per ton in gold and silver, in addition to copper contents. Right of way secured for aerial tramway, to reduce shipping expense.

Walker Consolidated (Portola) — Property adjoining Walker Copper mine and including Alta-Alice group of claims to be prospected by two diamond-drilling outfits.

Sierra County

York Finney (Downieville)—Bonded by James F. Hunt, former district attorney, who plans to unwater shaft and drift north and south on gold-quartz vein.

Hilo (Sierra City)—Bernhardt Brothers waiting for rain to wash large amount of gravel stored on dumps.

COLORADO

Hinsdale County

Golden Fleece (Lake City)—Mill being overhauled and re-equipped for flotation. Dump will be re-treated. Concentrates to be shipped to Salida.

Sulphuret M. & R. (Lake City)—Extending tunnel to connect with old shaft to improve ventilation. When completed will develop on larger scale. At present shipping small tonnage of \$50 silver-lead ore.

Ouray County

Revenue Tunnel (Ouray)—A. S. & R. Co., lessee, has let four development contracts and ordered 10,000 ft. of timbers. J. Gordon Hardy, consulting engineer.

Yankee Girl (Ouray)—Hoisting silver copper ore from famous old chimney. Acid water on lower levels hindering reopening.

Saguache County

Rawley (Bonanza)—Owners will operate mine, which has been idle since 1912. Property has large amount of \$20 ore blocked out.

Summit County

Laurium (Breckenridge)—Blue Flag Gold Mining Co., of Cripple Creek district, cleaning out old workings of Laurium group, in Illinois Gulch. Property recently visited by J. F. Erisman, president.

Warrior's Mark (Breckenridge)—To be operated after long idleness by Warrior's Mark Mining Co., recently incorporated by Samuel Klous, of Boston, County Treasurer George Robinson, and County Assessor William Keogh.

Teller County

Acacia Gold (Cripple Creek)—Has resumed sinking South Burns shaft on Bull Hill from 1,450 level to 1,550 level. Will crosscut at latter depth to Shurtloff vein.

Caley mill (Cripple Creek)—Property on Iron Clad Hill being dismantled by Morse Machinery Co., of Denver.

KANSAS

Joplin-Miami District

Miami Zinc & Royalty Co. will build mill on Wauchessette lease west of Treece, Kan. Property good producer with hand jigs. Company operating Oko mine, south of Picher. W. H. Tylee, of Boston, president, and T. F. Lennan, of Joplin, vice-president and general manager.

Silver Fox (Baxter)—New mill, replacing one destroyed few months ago by fire, almost completed.

Oberman (Jefferson City, Mo.)—Sinking shaft on ground leased from Wright estate, recently purchased from A. E. Bendelari and others. Tract has been well drilled.

Andrew Bros. (Joplin)—Empire tailings mill purchased and being moved to Wyandotte lease, at Galena.

High Five (Joplin)—Has completed sinking of new field shaft and connected it with mill by tramway.

Union Metals (Joplin)—Sinking of No. 8 shaft begun at Waco property. No. 7 shaft virtually completed.

MICHIGAN

Copper District

Calumet & Hecla (Calumet)—Operating two shafts two shifts daily on Osceola lode and all shafts two shifts daily on Calumet conglomerate. Building new railway from Ahmeek direct to stamp mill is being discussed. Experimenting with electric smelting, but not successfully. Survey of smeltery situation under way, but no decision as to extent of rebuilding operations at Hubbell plant.

Wolverine (Kearsarge) — Working two shafts, Nos. 3 and 4. Eight lower levels producing good copper. Operations back of foot wall in upper levels satisfactory.

Lake (Lake Mine)—Michigan shareholders favor resumption of operations. Sixteen facings in copper rock when work was suspended. Sufficient men for basis of new crew residing at property.

White Pine (White Pine)—Two shafts now working, and crew increasing steadily.

Gogebic Range

Mines on Gogebic Range made record shipments recently when 200,000 tons of ore was forwarded to Ashland docks in three days.

Village of Wakefield will soon vote on proposition to incorporate as a city. Limits would be established so as to include Wakefield Iron Co. and Plymouth open pits, as well as several underground mines. May mean increased taxes for mines concerned.

Newport (Ironwood)—"K" shaft sunk and station cut on 26th level, where development work will soon begin.

Oliver (Ironwood)—Mines began to stock again Sept. 25. Condition probably temporary and owing to lack of boats at Ashland docks rather than to steel workers' strike.

Pabst (Ironwood)—Hoar loading

machine ordered for power plant for loading coal from dock into cars. Cars trammed to elevator at boiler house, raised to top of coal bins, run over automatic weighing machine, and dumped. Seven 150-hp. return-tubular and three 400-hp. water-tube boilers in two batteries, former supplying hoists and compressor, latter turbo-generators.

Plymouth (Wakefield)—Drifting continued at 125-ft. depth in drainage shaft sunk from bottom of pit. Only two shovels working in ore.

Marquette Range

Cliffs Shaft (Ishpeming)—Good progress being made with new concrete shafthouses. Expected to be completed before cold weather. Will be first of this type on range. Quarter million tons of ore in stock will be carried over.

Mary Charlotte (Negaunee)—Half of crew of 150 miners of Breitung Hematite mine transferred here. Over 350 now working at Mary Charlotte. All ore in stock to be shipped.

MONTANA

Silver Bow County

Anaconda (Butte)—August copper output of Washoe and Boston & Montana smelteries 12,600,000 lb., compared with 11,122,000 lb. in July and 10,530,000 lb. in June. Scarcity of experienced miners reported. Company speeding up on development work.

NEVADA

Clark County

Yellow Pine (Goodsprings)—On Sept. 1 management voluntarily raised wages of muckers, trammers and laborers 25c. per day to \$4.75. Miners, machine men, timbermen and millmen received 50c. per day advance.

Esmeralda County

Atlanta (Goldfield)—Deep workings being abandoned and pumps pulled from main Atlanta winze from 1,750 level. Winze and 1,750 level will be allowed to fill. Future work in Atlanta will be done from 1,465 level of Grizzly Bear.

Mineral County

Candelaria (Mina)—An eight-drill Chicago pneumatic compressor shipped to Candelaria, and accommodations for force will be built at once.

Nye County

Louisiana Con. (Tybo)—Contract for surveying and installing transmission line from Manhattan to Tybo, to furnish power for mine and smeltery, let by Nevada-California Power Co. F. W. Draper manager of the Louisiana Consolidated.

White Pine County

Boston & Ely Con. (Ely)—Stockholders on Sept. 10 voted to sell property and assets of Ely Northern Copper Co. to Boston and Ely Consolidated Mining Co. for \$77,445. Transaction completes merging of Boston Ely, Smoky Development Co., and Ely Northern Copper.

McEllin (Hamilton)—Fifty-ton concentrator, being built by Sayers and Tilford, lessees, to treat dump, almost completed. Estimated dumps contain 80,000 tons which will run \$12 per ton.

NEW MEXICO

Grant County

Hanover-Bessemer (Fierro) — Shut down on account of steel strike; 300 men affected.

OKLAHOMA

Joplin-Miami District

American Z. L. & S. (Joplin)—Has taken working option on forty-acre lease south of St. Louis, Okla., and has several drills at work.

Rialto (Miami)—Purchased by E. S. Warner, of Buffalo, Mo. Will be operated after year's idleness. Situated south of Picher camp.

Niangua (Picher)—Followed recent purchase of Hare mine on adjoining lease with purchase of Diamond Joe mine, northwest of Quapaw. Building underground hopper at latter plant, which will be known at Niangua No. 3. Henry Medlin, of Miami, manager.

Vantage (Picher)—Annual election of officers resulted in naming Dr. C. D. Clapp, of Moberly, Mo., president; W. C. Cole, Bethany, Mo., vice-president; W. W. Innis, Miami, Okla., secretary-treasurer; R. P. Sharpe, Miami, director and general manager.

TEXAS

Brazoria County

West Columbia Field Production for second week in September reported approximately 36,000 bbl. daily.

Hurricane at West Columbia destroyed eleven derricks and did considerable other damage on Sept. 14.

Eastland County

Gulf Production (Pleasant Grove)—Oil well brought in unexpectedly night of Sept. 13 was ignited. Difficulty expected in smothering fire.

Harris County

Operations at Humble Field: Syrian-American Oil Co., No. 4 McDonald, abandoned; Texas Co., testing 178 Herman at 1,250 ft., and abandoned No. 28 Koehler 2,420 ft.; Brazos Oil & Refining Co., abandoned No. 5 Fuller well.

Jefferson County

Deep Wells at Spindletop now drilling are Texas Co., No. 1 Fee, 2,400 ft. deep, and No. 2 Fee, 2,200 ft.; Wilson & Broachi, No. 1 Green, 2,100 ft.; Crown Oil & Refining Co., No. 1 McFadden, starting to drill.

Liberty County

Big Four Oil (Hull)—Brought in No. 5 Hannicker well at 2,570 ft., flowing 25 bbl. daily by heads.

Hull Field Production second week in September about 2,600 bbl. daily. Recent completions: Big Four, No. 5 Hannicker well; Humble Oil & Refining Co., No. 1 Palmer; and Gulf Production Co., No. 1 Thomas.

Matagorda County

Texas Co. (Markham)—No. 6 Meyers well making heavy gas pressure from 3,100 ft.

Texas Gulf Sulphur (Gulf)—Hurricane Sept. 14 destroyed three derricks. Allen Texas (Matagorda)—Derrick on No. 1 Baer well at Big Hill destroyed by hurricane Sept. 14. Drilling may not be resumed.

UTAH

Juab County

Lehi Tintic (Eureka)—Board of directors elected: George Nicholls, president; W. H. Trask, vice-president; C. D. Anson, G. B. Doyle, J. A. Barclay, and Charles Zabriskie, manager.

Sioux Con. (Silver City)—At meeting of Knight mining companies held in Provo, Sept. 10, taking over of this property announced.

Salt Lake County

Little Cottonwood Transportation (Alta)—Has increased rates, beginning Sept. 15, with permission of Public Utilities Commission, all increases

Utah Copper (Salt Lake City)—Company has invited employees to select representative committee of three to consult with management on subjects of mutual interest.

CANADA

British Columbia

Cork-Province (Slocan) — R. H. Stewart, mining engineer, has recommended expenditure of \$100,000 as necessary to insure continuous ore supply, also that shaft be deepened and equipped, that more power be developed, that drifts and raises be driven on new level, and possibly additions be made to mill.

Boston-McCrea (Boston Creek)—Electrically driven mining plant will be installed.

Coniagas (Cobalt)—Now treating 225 tons of ore and 250 tons of tailings daily.

La Rose (Cobalt)—Has found high-grade ore in vein at No. 3 shaft of University. Workings now being dewatered.

Mining Corporation (Cobalt)—Developing gold property in Caribou district, British Columbia.

Nipissing Extension (Cobalt)—Has taken over old Farrar property. Company capitalized at \$3,000,000. A. J. Young, of Northern Customs Concentrators, president.

Green-Kirkland (Kirkland Lake)—Camp buildings erected and twelve men engaged in prospect work.

Murray-Mowgridge (Larder Lake)—Shareholders have ratified deal to reorganize by selling assets to new company called Murray-Mowgridge Mines, Ltd., in consideration of 1,928,870 shares of new company. New York interests have agreed to underwrite 200,000 shares of stock, with which to wipe off existing obligations, completing purchase price on certain properties, and furnishing funds for development. Property being developed on 200 level, and shaft will be continued to 300 level.

MEXICO

Baja California

Boleo (Santa Rosalia)—August production of copper, 1,597,040 lb.

Sonora

Nacozari Con. Copper (Douglas, Ariz.)—Deep development and drainage tunnel advanced approximately 200 ft. monthly during last three months, with formation showing almost continuous network of small seams of chalcopryite, with bornite streaks at intervals. General formation now showing monzonite and rhyolite porphyry. Main breast now 3,900 ft. from portal and within 300 ft. from oxidized outcrop. Moderate tonnage of \$300–\$400 silver ore coming from San Pablo mine. San Pablo drift will soon connect with San Pablo working shaft, thus providing drainage and ventilation. Company's wagon road to Nacozari now in good condition for auto truck.

BELGIAN CONGO

Katanga (Elisabethville) — August production of copper, 5,026,488 pounds.



MOUNT NELSON FROM SITTING BULL CABIN, WINDMERE MINING DIVISION, BRITISH COLUMBIA

asked by company having been granted except in case of low-grade ores, for which increase of 30c. per ton allowed, instead of \$1, as proposed.

Monetaire Mining (Alta)—Suit filed by N. V. Jones against board of directors—D. J. Williams, president, M. H. Kriebel, Paul Platt and Mrs. M. A. Williams—and Monetaire Mining Co., to declare void alleged action of board in appropriating \$14,000 as president's salary for seven years back and in levying assessment of 1c. a share. Conspiracy to defraud alleged.

Bingham & Garfield (Bingham Canyon)—Restraining order asked by Col. E. A. Wall, to prevent company from constructing tracks across Klondike, Starless, Keystone, St. Patrick, and Sarsfield claims, owned by him, interference with extraction of ore deposits from claims being alleged as ground for suit.

THE MARKET REPORT

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver		Sept.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
18	414½	1137	61½	22	414½	114½	62½
19	415½	114	62	23	415½	115½	62½
20	415	114½	62	24	417	116½	63

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

Daily Prices of Metals in New York

Sept.	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.
18	21½@22½	55	54½	6.25	5.95	7.10@7.15	7.10
19	21½@22½	54½	54	6.15@6.25	5.95	7.10	7.10
20	21½@22	55½	54	6.15@6.25	5.95	7.05@7.10	7.05@7.10
22	21½@22	54	54	6.15@6.25	5.95@6.00	7.05@7.10	7.05@7.10
23	21@21½	53½	53	6.15@6.25	5.95@6.00	7.00	7.00
24	20½@21	53½	53½	6.25	5.95@6.00	6.95@7.00	6.95@7.00

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

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.12c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Sept.	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
19	100½	101½	110	281	275½	25½	26½	41½	42½
20	100	100	110	278½	273½	25½	26	41½	42
22	100½	100½	110	278½	273½	25½	26	40½	41½
23	100	100½	110	276½	273½	25½	26	41½	42½
24	99½	100½	110	277	274½	25½	26½	41½	42½

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

Metal Markets

New York—Sept. 24, 1919

The predominant feature in all of the metal markets this week was the steel strike, the coming of which was clearly foreseen for several days before the event. Under this influence, there were further recessions in the price for copper, spelter, and tin.

Copper

About the same conditions prevailed as in the previous week, except that prices were lower. There was the same differential of about 3c. per lb. between wire bars and ingot bars. Big producers did no business. They received some inquiries from consumers, with intimations that the latter would not pay the producers' price, but would pay something above the market price established by the smaller agencies and brokers. The principal producers, however, refused to entertain such overtures.

A small tonnage of copper was sold for export to Germany.

Copper Sheets—The base price of copper sheets is 33½c. per lb. Demand strong. Copper wire is quoted at 26@26½c. in carload lots, f.o.b. mill. Market is dull.

Tin

The approach of the steel strike inspired tinsplate manufacturers to refrain from buying, and in some cases to offer tin for resale. This precipitated a sharp decline. At the beginning of the week Straits was quoted at 56½@56½c. At the close, business was done at 54c.

Lead

Some pretty good business was done by those producers who had prompt lead available, and in general they realized the full price for it. However, some rather large business was done at a sharp concession by one manufacturer who had a good buyer. There is still a considerable quantity, estimated at about 2,500 tons of lead, for sale by second-hands, but to a considerable extent this is in out-of-the-way markets. For example, a considerable tonnage of lead in Boston was offered at 6c., and relatively low offers were made on lead at Baltimore and Cleveland. Though the quantity of second-hand lead in this market appeared to be small, if it existed at all, producers selling from the refineries in the New York district had to meet the competition of second-hand lead from places like Hartford.

Zinc

A small business was done from day to day at declining prices, but the aggregate was small. The steel companies requested postponement of deliveries, and brass manufacturers had no interest in buying. The demand for high-grade zinc was as dull as for Prime Western.

Zinc Sheets—The quoted price of zinc sheets is \$10.50 per 100 pounds.

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market continued quiet and unchanged at 8½ and 8¾c. for spot. Futures were quoted lower, 8½ and 9c. being mentioned.

Bismuth—Unchanged at \$2.96.

Cadmium—Unchanged at \$1.40.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c.

Quicksilver—The advance continued, and \$109 was reached and maintained for a day or two, the market then receding to \$105. This probably occurred under the influence of the expected arrival of 500 flasks of Italian quicksilver from Genoa. San Francisco telegraphed \$102, steady.

Silver—Owing to the large and incessant demand on China account, silver has advanced rapidly, during the last week about 3c. per ounce, and closes firm at the highest price prevalent in a long time.

Mexican dollars at New York: Sept. 18, 87½; Sept. 19, 88½; Sept. 20, 88½; Sept. 22, 88½; Sept. 23, 89½; Sept. 24, 90½.

Platinum—This market continued to be excited. The metal is in strong demand and the supply is scarce. We quote refined ingot at \$130 and \$140.

Palladium—Unchanged at \$120.

Chromium Ore—No business reported.

Manganese Ore—No business reported. The ideas of the buyers and sellers are far apart.

Molybdenum Ore—No business reported.

Tungsten Ore—There was no change in the situation.

Joplin, Mo., Sept. 20.—Zinc blende, high, \$47.20; basis 60 per cent zinc, premium, \$43.50; Prime Western, \$42.50; fines and slimes, \$40@37.50; calamine, basis 40 per cent zinc, \$30@26. Average settling prices, blende, \$43.09; calamine, \$28.22; all zinc ores, \$42.76. Lead, high, \$71.15; basis 80 per cent lead, \$70@65; average selling price, all grades of lead, \$66.84 per ton.

Platteville, Wis., Sept. 20.—Blende, basis 60 per cent zinc, \$43.50 for premium grade and \$42.50 for Prime Western grade. Lead ore, basis 80 per cent lead, \$70 per ton.

Pig Iron—Prices unchanged.

Steel—No market. Prices are quotable unchanged.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver		Sept.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
25	420	118 3/4	63 1/2	29	423	117	62 1/2
26	424	119 1/2	63 1/2	30	417 1/2	118 3/4	64
27	426	118 3/4	62 1/2	Oct. 1	418	119	64

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

Daily Prices of Metals in New York

Sept. Oct.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	N. Y.	St. L.	St. L.	St. L.	St. L.	
25	21 @ 21 1/4	53 1/2 @ 53 3/4	6 1/2	5.95 @ 6.00	6.95 @ 7.00			
26	21 1/2 @ 21 3/4	53 1/2 @ 53 3/4	6 1/2	5.95 " 6.00	6.95 " 7.00			
27	21 @ 21 1/4	53 1/2 @ 53 3/4	6 1/2	5.95 " 6.00	6.95 " 7.00			
29	20 3/4 @ 21 1/4	53 1/2 @ 54	6 1/2	5.95 " 6.00	6.95 " 7.00			
30	21 @ 21 1/4	53 1/2 @ 54	6 1/2	5.95 " 6.00	6.85 " 6.90			
1	21 @ 21 1/4	53 1/2 @ 53 3/4	6 1/2	5.95 " 6.00	6.85 " 6.90			

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Sept Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M.	Spot	3M.	Spot	3M.
	Spot	3M.							
25	100 1/2	100 1/2	110	277	274 1/2	25 1/2	26 1/2	41 1/2	42 1/2
26	102	101 1/2	110	277 1/2	275 3/4	25 1/2	26 1/2	41	41 1/2
27	...	...	...	...	...	25 1/2	26 1/2	...	...
29	101	100 1/2	110	272	270 1/2	25 1/2	26 1/2	41	41 1/2
30	102 1/2	101 1/2	110	274 1/2	272 1/2	25 1/2	26 1/2	40 3/4	41 1/2
1	103	101 1/2	...	274 1/2	272 1/2	25 1/2	26 1/2	40 3/4	41 1/2

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

Metal Markets

NEW YORK, Oct. 1, 1919.

The market this week was dull and uninteresting. However, it began to appear as if there might be some of the skies in the copper situation. Transatlantic freights were again easier without there being any change in quotations. Freight to Hamburg could be arranged at \$13, and to French and Dutch ports at \$10. To British ports \$15 was asked, but probably \$12.50 could be done. An embargo on shipments to England by American boats was put into effect Monday noon, but British boats continued to sail. The rates from

San Francisco to Hongkong and Kobe remain at \$20.

Lucien Nachmann has joined the copper sales department of the American Smelting & Refining Co. Mr. Nachmann is a thorough expert in the metal selling business. He was in New York from 1890 to 1905 as representative of Brandeis, Goldschmidt & Co., and from 1905 to 1915 was in London as a partner in the same house.

The War Department reported on hand, as of Sept. 10, the following stocks of Metals: Brass (70-30), 79,207 tons; Brass (60-40), 28,636 tons; total brass, 108,311 tons; copper, 363 tons; pig lead, 1,000 tons; zinc, 10,820 tons.

COPPER.

Another week passed without the big producers doing any business, but the smaller agencies did a little. Copper continued to be offered from second-hands, but the supplies seemed to be greatly reduced, and ingot bars were no longer offered at such relatively low prices as previously. One small sale to Germany was reported, and one domestic consumer placed a million-pound order. All of the big producers received more inquiries from domestic consumers, and that fact in itself was regarded as encouraging.

TIN

Business was dull during the early part of the week, but was better on Monday and Tuesday of this week. However, the market went off today on some lower offers from London. This was rather surprising, in view of the opinion entertained in some quarters that the strike in Great Britain would check the shipment of tin from there.

In the early part of this week spot Straits was quoted in this market at 55c., but at the close it was offered at 54 1/2c., with the intimation that 54 3/4c. might be done on a fifty-ton order.

Singapore quoted £276 1/2, c. i. f., London, on Sept. 26; £279 1/2 on Sept. 29; and £280 on Sept. 30.

LEAD.

The market was rather dull, although some fair business was done on certain days. Every producer was firm in demanding 6 1/2c., New York. Some business was done around 6c., this representing the cleaning up of some speculative holdings. Cheap lead is still offered at points outside of New York, including Boston, but a good deal of this is strategically misplaced. A consumer buying at those prices and paying the freight to where he wants to use the lead is apt to find it rather costly, after all. Such experiences have been reported. On the other hand, speculative transactions might have different results.

The mines of the Coeur d'Alene continue closed, with the exception of the Bunker Hill and Sullivan.

The St. Joseph Lead Co. has not yet resumed smelting at Hercules, but expects to do so within a few days. The Doe Run brand of refined lead will be produced again, and will be offered at a premium of \$4 per ton over ordinary lead.

ZINC.

There was scarcely any buying by consumers. On the contrary, producers in general were in receipt of requests to defer shipments. This

was but natural, in view of the steel strike. On the part of the brass manufacturers the liquidation of the immense stock of brass held by the Government is going to throw a shadow over the markets, including that for spelter. Such buying of spelter as there was this week was mainly of speculative character.

Antimony—The market was quiet. We quote spot at 8½¢, and futures at 9@9½¢. The Chinese and Japanese houses are not at all keen about selling, their expectations being for higher prices.

Quicksilver—The market was quiet at \$105, with a fair demand and an absence of selling pressure. San Francisco telegraphed \$99.

Platinum—The market was more quiet, with quotations unchanged at \$130@140 for refined ingot.

Palladium—Unchanged at \$120.

Chrome Ore—Quoted at 80¢ per unit, delivered at Eastern works.

Manganese Ore—Quoted nominally at 50¢ per unit, c.i.f., Baltimore.

Molybdenum Ore—Quoted nominally at 75¢ per lb. of molybdenum sulphide.

Tungsten Ore—The situation remains unchanged. No business was reported and no quotations were mentioned. One buyer offered \$7 per unit, which price was regarded as too low.

CONDENSED FORM:

Copper Sheets—33½¢ per lb. Demand strong. Wire, 25½@26½¢. Market weak.

Zinc Sheets—\$10.50 per 100 lbs.

Aluminum—33¢ per lb.

Bismuth—Unchanged at \$2.96.

Cadmium—Unchanged at \$1.40.

Nickel—Ingot, 42¢; shot, 43¢; electrolytic, 45¢.

Pyrites—Spanish pyrites is quoted at 17½¢ per unit for furnace size ore, free from fines, c.i.f. New York or other Atlantic ports. Sulphur companies reported to be selling at prices as low as 14@15¢. Market unsettled.

Silver—The silver market continues firm. China continues to be the main support to the market. Shipments from San Francisco during August are reported as 9,900,000 oz.

Mexican dollars at New York: Sept. 25, 91¾; Sept. 26, 91¾; Sept. 27, 91½; Sept. 29, 89¾; Sept. 30, 91¾; Oct. 1, 91¾.

PITTSBURGH—Sept. 30.

The iron and steel strike started yesterday week, Sept. 22, and candid iron and steel manufacturers now admit they expected a somewhat larger one than occurred. Taking the industry as a whole, about 35 per cent of the men struck at the outset, and then there were various rearrangements. Where any large number of men at a plant or in a district struck, they intimidated the rest and got them out; where only a few struck they went back to work. For two days the decreases in employment exceeded the increases, and then for two days more there was an even

balance. By Friday morning more men were going back than were going out. Districts closed tightly were the Mahoning Valley, Cleveland (not including Lorain), and the Wheeling district, the Calumet district (Chicago and Gary) going down more than half, the South and East being scarcely affected, Johnstown and Buffalo, however, closing almost entirely.

Municipal Pittsburgh was little affected; the Monongahela Valley, an important part of the Pittsburgh district, developed 25 to 35 per cent unemployment, and the Shenango Valley 40 to 50 per cent. The Monongahela and Shenango Valleys at once became pivotal points, and developments there were watched narrowly, it being regarded from the outset as certain that if these districts would hold for the manufacturers Youngstown and other districts would eventually yield. After three or four days, conditions in the two valleys began to improve, and the improvement has continued to date. It is almost positively assured that the strike is a failure, but, taking the industry as a whole, the increase in employment from the low point is a small percentage and the increases in tonnage production is small, and Cleveland, the Mahoning Valley and the Wheeling district are closed as tightly as at any time, and resumption there may possibly be a matter of many weeks. There is no trustworthy information available here as to late developments in the Calumet district.

Pig iron and steel production, on the whole, is at a lower proportion to capacity than is employment. The strike is of course considered from the point of view of employment, not that of tonnage output. It is of minor consequence to the manufacturers how much they produce, and as to consumers, they have shown a remarkable spirit of co-operation, and, much as they would like to have deliveries, they are making no complaints. Producers are endeavoring to distribute their output in such manner as to give the widest employment among their customers. Shipments are no greater than production, if at great.

Pig Iron—As the strike is one of common labor almost exclusively, the blast furnaces are harder hit than the steel producing and steel rolling mills, and some steel mills have had production curtailed by shortage of pig iron as well as strike within the mill. As so many merchant furnaces are situated far from the centers where the strike is strongest, the total merchant furnace output makes a good showing, and pig iron is not likely to be made especially scarce. This analysis is confirmed by the continued good demand for foundry coke; furnace coke has gone begging. The Mahoning Valley furnaces are all down, but in the Shenango Valley four of the six at Sharpville, all down at one time, are now operating; two at West Middlesex were not closed, and the scattered western Pennsylvania furnaces are in most cases operating. Market quotations are unchanged: Bessemer, \$27.95; basic, \$25.75; malleable, \$26.25@27.25;

foundry, \$26.75; forge, \$25.75, f.o.b. Valley furnaces, with \$1.40 freight to Pittsburgh.

Steel—There is approximately an even balance between closing of mills that produce and that consume billets and sheet bars. Prices remain: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; rods, \$52.

Ferromanganese—One or two English producers are quoting \$95, c.i.f., for 80 per cent ferromanganese, the majority being out of the market. It is thought in trade circles that one or two will always be in the market. Before the complaint of "dumping" made before the Federal Trade Commission, nearly all the English producers were quoting. Hearings on the complaint thus far have not been public. Domestic producers continue their quotation of \$110, delivered. There is no demand.

Coke—Shipments of furnace coke on many contracts have been suspended on account of the strike. Operators endeavored to meet the situation by drawing ovens less frequently, but coke accumulated and has been offered at \$4 or less without finding takers. One buyer bid \$3.25. Foundry coke has been in excellent demand, and prices are if anything stiffer, fairly good grades commanding \$6.25 in open top cars and \$6.50 in box cars, per net ton at ovens, Connellsville region.

NEW YORK—Oct. 1, 1919.

Buying has been checked but not suspended by the iron and steel strike, according to Iron Age. Bookings are chiefly with the furnaces and mills not seriously affected.

The continued favorable progress of the strike is all that the producers expected. Where protection is sufficient to prevent intimidation workers are returning. Much encouragement is taken from the refusal of the Bethlehem employees to go out and from the conditions in the pivotal Monongahela Valley. The continued absence of marked rioting, usually a sign of a collapse, points to a drawn-out issue.

Following the 30,000 tons of basic iron reported last week, the American Bridge Co. has closed on 15,000 tons more. The basic market is now stronger at \$1 per ton above the basis of these sales. Fresh inquiries for about 10,000 tons of foundry iron for next year have appeared in New England. The Middle West is taking iron from western Pennsylvania, involving an added freight cost.

Plate mills willing to take on further commitments have no difficulty in getting 2.65¢, Pittsburgh, though 2.55¢ was quoted on 4,800 tons for Japan.

The scarcity of steel bars, for months in demand, is putting activity in bar iron, and advances for prompt shipment are not unlikely.

Producers remain firm in their determination to shut down mills if it is not safe to run them, and consumers are expressing an unqualified support. It remains that without relief in thirty days the automobile industry will begin to feel the pinch.

Prompt blast-furnace coke is lower, due to an accumulation at ovens.

THE MINING INDEX

Listing Special Articles of Interest
And Value to the Miner
And Metallurgist

This index is a convenient reference to the current literature of mining and metallurgy published in all the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers are not ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for \$1, 33 for \$5, and 100 for \$15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

COPPER

- 474—ALASKA—Mineral Resources of the Western Talkeetna Mountains. Stephen R. Capps. (U. S. Geol. Surv., Bull. 692-B; 183 pp., illus.)
- 475—CEMENT COPPER BRIQUETTES, Water and Chlorides in. Edward Keller. (Bull. A. I. M. E., Sept., 1919; 43 pp.)
- 476—CHILE—El Trabajo a la Vida en el Mineral "El Teniente." (Bol. Minero, Soc. Nacional de Minería, April and May, 1919; 75 pp., illus.)
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- 479—PRODUCTION OF Copper in the United States in 1918. Advance Statement. B. S. Butler. (U. S. Geol. Surv., 6 pp.)
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- 494—GOEBIC RANGE—Geology of the Goebic Range and its Relation to Recent Mining Developments. W. O. Hotchkiss. (Eng. and Min. Journ., Sept. 13 and 20, 1919; 153 pp., illus.) To be continued.
- 495—HYDRO-ELECTRIC PLANT—The McClure Hydro-Electric Plant. (Eng. and Min. Journ., Sept. 13, 1919; 33 pp., illus.) 20c.
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IRON AND STEEL—METALLURGY

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Salutatory

THE accession to office of the new editor, and his assumption of the editorial "we," came at a singularly inauspicious time, being signalized by a presumably purely coincidental printers' strike and the suspension of the Engineering and Mining Journal for the first time in its history. The assumption of the coincidental nature of the strike is strengthened by the fact that about two hundred other New York periodicals similarly suspended.

The strike which caused this hiatus is of unusual interest in that it represents a contest between organized labor, as commonly so understood and represented by the American Federation of Labor, and certain local unions, which are characterized as "out-law" unions, and whose demands for shorter hours and larger pay at this time have been denounced by the American Federation as springing from a radical, un-American, and Bolshevik program.

Whatever may be the ultimate explanation of the particular disturbance which has upset the periodical publishing industry of New York, there may well be more coherence and significance in the present widespread strike disease than is proclaimed from the housetops, and in the signs that strikes emanate from propaganda foreign and opposed to the more intelligent policy of organized American labor, which proved its patriotism and its enmity to revolutionary doctrines during the war. The existence of such propaganda indicates a guiding central organization, concerning which we have no adequate information, and which, therefore, is secret. The existence in the United States of such an organization, devoted to the overthrow of existing society and government, is known in a general way from various evidence and bits of testimony; as is also the fact that the real headquarters of this movement are not in the United States but in Europe. Russia is the source whence the missionaries of these subversive doctrines and the funds for its anti-American campaign are most commonly reported to have come. On the other hand, a magazine correspondent asserts positively that the real head of the movement is a Prussian, whose headquarters are in Switzerland, of whom Lenine and Trotzky are emissaries and subordinates, and that from these Swiss headquarters campaigns of strikes and other movements for the sapping of government are directed in various parts of the world.

In this connection, one recalls with curiosity the statement of the chairman of an investigating committee of the New York Senate the other day to the effect that the present industrial strike epidemic is

due to a German plot to control the world's commerce. Whether such is the basis of our present difficulty, or whether some of these unintelligent strikes are in part or in whole due to the hilarious joy-riding of the wage-earner trying to find out how far his luck will carry him, we have no means of estimating; but our judgment is that the organized radical movement will be found strongly underlying.

The Mining Engineer And the State.

IN HIS presidential address at the Chicago meeting of the American Institute of Mining and Metallurgical Engineers, Horace V. Winchell touched a high note in appealing to mining engineers not to neglect public duties in their absorption in their chosen profession. We shall publish this address soon. Meantime, we wish to second the appeal of Mr. Winchell in this regard. No body of men is more qualified to be of public service than mining engineers. Contrary, perhaps, to the common impression in the East, they are a class of men holding to an unusually rigid ethical code; they are seasoned and resourceful, and they have conspicuously the advantage of being on easy and equal terms with all classes and castes. Therefore, they are Americans in the highest sense and are qualified to serve their fellow citizens and the common weal better than most other classes of men.

It is in a way unfortunate that the conservatism of the engineer, which is a natural accompaniment of his experience and insight, should have kept him so largely aloof from public affairs and from active interest in public questions. The war tended to call the mining engineer from this seclusion and brought him to the fore, where he served with success, not only in the Army but in many other responsible emergency positions, where his special training and acquired initiative were of value.

The present days are hardly less grave and important. The violent and vociferous minority which is campaigning to smash the Constitution and substitute for the ideals of democracy the oligarchic yoke of the bigot, can only be successfully subordinated and relegated to its proper proportions by a live interest and activity in public affairs and all questions of the day by such men as the mining engineers and others of like type.

It is a duty no less imperative at the present day than that which the mining engineer owes to his family, to serve the democratic state actively and sternly, and not contribute by impassivity to the rule of an ignorant minority.

The cultivation of honest politics as a national sport would solve most of our problems. We have a larger fund of intelligence and common sense than other nations, and the problem is to get it into action.

The Neglect of the

Non-Metallic Minerals

THE non-metallic minerals have been considered as of minor importance in the mining industry. With the exception of such substances as phosphate rock, limestone, dolomite, and recently magnesite, attention has been concentrated largely upon the metallic minerals.

In recent times we have seen the development of the alloy steels, with the resulting benefit to the structural engineer, in the manufacture of the high-speed engine and tool steels. Tungsten in illumination, radium in medicine, Monel metal where tensile strength and non-corrosive qualities are required, antimony in type metal and shrapnel lead, arsenic in agriculture, the copper-tin-lead-antimony alloys for anti-friction metal, alloys of nickel and chromium as resistance substances in electrical work all have been developed by the persistent effort of technologists, mostly within the last two decades. The use of zinc as roofing material and for electrical fixtures, as well as for many other purposes, is being advocated by the American Zinc Institute. Recent efforts have been made to introduce the use of lead in galvanizing as a substitute for zinc.

The utilization of products of non-metallic minerals has not kept apace with their associates in the mining field. This may be because the latter have offered a greater promise of success to the investigator and inventor.

Just what possibilities lie within the realm of the non-metallic mineral industry, no one would be justified in attempting to predict. As there is comparatively little present use for many minerals of this class, deposits remain undeveloped, and where these occur with other minerals, at present more valuable, they are usually rejected as waste. Imports of pottery are being made in large quantities into this country when it is entirely probable that some domestic clay deposits could be further utilized.

About 20,000 tons of strontium hydrate manufactured from celestite was reported to have been used in Germany for the extraction of sugar in the beet-sugar industry in one year, and barium compounds have also been put to a like use. The manufacture of barium salts was almost entirely confined to Germany before the war. Since the German-owned patents have become available to enterprising American manufacturers, there has resulted the development of the extensive American deposits on what promises to be a large scale. Our sulphur production under normal operations far exceeds the demand. Is it certain that none other than the present uses can be found for this important mineral?

Sufficient research work should be conducted by Government agencies, scientific bodies and by private enterprise to discover further the utility of the non-metallic minerals. The committee on Non-

Metallic Minerals of the American Institute of Mining and Metallurgical Engineers has undertaken to further this purpose by the collection and dissemination of information among possible producers and consumers. State geologists and individuals with opportunities of knowing the resources of certain localities can co-operate by contributions to the general literature on this subject.

Do You Appreciate the

Value of the Scrap Heap?

DURING the war, mining and metallurgical managers operated their plants for the most part at maximum capacity. Considerable new equipment was installed, but in many cases repairs were deferred. To shut down a machine for the time which would be required for repairs was thought inadvisable, and then, too, the idea was current that prices were very high only temporarily, and that work not absolutely necessary could better be postponed until supplies were more plentiful.

The time of stress is passed. Most mining works are now operating at a fraction of their capacity, so that needed repairs and replacements can easily be made without sacrificing production. Economists believe that a new price level has been established, which will not be materially reduced for several years; in fact, in many cases, prices are still advancing, so that purchases should not be deferred in the belief that more advantageous terms may be made in the near future.

Soon, we hope, the treaty of peace will be signed, and credits will be established between nations. Mining, one of the most basic of all industries, may be expected to be one of the first to be called upon to rebuild Europe. The mining industry should be ready with its machinery in the most efficient condition. Too often, when business is good, the tendency is to say "We have no time for changes," and when business is bad, "Times are hard, and we cannot afford to spend the money."

The economy of labor, at its present high price, is something to which we must all give attention. Nothing is so wasteful in this respect as a decrepit machine, and it belongs on the scrap pile. Former well-reasoned decisions must be revised, for a machine which was economical five years ago may not be so today, though, in itself, it may be just as efficient.

Some years ago, when mottoes were more popular as an office decoration than they are today, the writer had one on his desk reading somewhat as follows: "The principal reason for the success of the American business man is that he appreciates the value of the scrap heap." The manager of the plant, which was in none too prosperous a condition, was a parsimonious individual, and, spying the motto one day, said "Yes, that is very true; lots of material is thrown on the scrap heap which might be made to serve a little longer." Thus we have the other point of view. But it is not the big way to look at things—what we like to think of as part of the American Idea. Pennies saved do not always grow to be dollars in the bank.

Too Much Regulation

SENATE Bill No. 2896, introduced by Senator Nelson on August 23, 1919, provides for Federal regulation of the manufacture, sale, purchase and use of explosives. It follows closely the line of the U. S. Explosives Act, the salient features of which were published in the Journal of February 22, 1918, p. 378. The Explosives Act was designed to cover the conditions growing out of the war. The proposed Federal regulation is objected to by mining and other interests in California for the following reasons:

First, it places an additional unnecessary burden upon mine operators.

Second, it will supersede an already workable and practicable State statute now in force in California, which, together with certain rules and regulations adopted by the Industrial Accident Commission of the State of California, provides for the manufacture, sale, use, and storage of explosives.

Third, the revenue provided for therein would be entirely inadequate to meet the cost of enforcement.

In an editorial appearing in the Journal on June 21, p. 1098, there was pointed out the need of close control upon the distribution and use of explosives, and the question was raised as to whether it would not be good public policy to have uniform state or Federal laws to cover this need. Under our system of government, the control of explosives used within a state is vested in the state government. It is a part of the state police powers, as well as a part of the activities of State Industrial Accident Commissions or other state organizations concerned with the safe operation of mines.

There are already adequate Federal laws regulative of the interstate transportation of explosives. We believe that a general Federal enactment of the kind proposed, however desirable it may appear to be from the standpoint of public safety, would lead to confusion, and that if it were not efficiently carried out it would be ineffective. Placing such an act in the hands of the Commissioner of Internal Revenue and his department does not denote a comprehensive understanding of the mining industry and the peculiar conditions which prevail in different states.

It is to the interests of the mining industry of the separate states to secure legislation through their respective state legislatures to cover the need for close control, without imposing excessive and irksome restrictions. It is probable that there are already state laws, as in the case of California, which meet the situation.

Wasting Heat on the Slag Dump

IN THESE days of conservation, the sight of hundreds of tons of red-hot slag being poured out on smeltery dumps arouses in the thoughtful observer a feeling of regret, the extent of which depends, to a considerable extent, on the amount of his domestic fuel bill. Great advances have been made in metallurgy, but too little attention appears to have been devoted to the heat balance of metallurgical furnaces, more particularly in the utilization of the heat

in the molten products. The heat in the gaseous products is in many cases partially turned to profitable account.

A ton of slag from a copper smelting-furnace contains roughly 1,400,000 B.t.u., which might be utilized. In coke at \$10 a ton one can buy 25,000 B.t.u. for one cent; or with coal at \$5 a ton, 50,000; or with oil at \$2.50 a barrel, 20,000. Each ton of slag poured on the dump thus represents a loss of 30 to 70 cents in its heat content alone; in a plant where 3,000 tons of slag is poured every day, the yearly loss is in the neighborhood of half a million dollars. The magnitude of the loss is appalling.

Metallurgists are inclined to confine research to those problems which apparently offer the greatest probabilities for a successful solution. Yet the work may result in a saving of only \$100 a day, whereas twice as much work on a harder problem may mean a reward of \$500 a day. Saving the heat from molten furnace products is one of those problems which we are likely to postpone until some less visionary ideas have been developed. Yet, we do not wish to give the impression that schemes have not been devised for this purpose. The proposal has been made to run the slag into molds placed on trucks, which are drawn through a tunnel. Air passing through the tunnel in the opposite direction becomes heated and may be used for various purposes, such as under boiler fireboxes, for heating blast, and similar operations. A patent has been used on a method of running the molten slag into vertical tubes, surrounded by water, the lower part being made larger to facilitate the removal of the solidified pillar of slag. Or the molten slag might be run into a closed vessel of water, the steam removed at atmospheric pressure and used in a low-pressure turbine, the granulated slag being removed from the bottom of the vessel by suitable means.

Sometime in this generation, we venture to predict, the current wasteful practice will become obsolete. With so many of our smelting plants working at reduced capacity, the time is ripe for doing some practical experimenting on the subject.

The enforcement of the Federal Explosive Act, repealed since the armistice, imposed restrictions which, though irksome, were faithfully observed by the mining industry. An important and perhaps unlooked-for result of these regulations was to diminish the liability to accident by carelessness in leaving powder lying loose along walls or upon timbers or by capped fuse left hanging on nails or on timbers. Surplus powder and supplies were returned to magazines, with the further result that a distinct economy in the use of explosives followed. Mine managers and superintendents should continue the close control of explosives in their mining operations, for, once a good practice has been started, it can be continued; but slackness and carelessness, if allowed to follow at the heels of a strict regime, inevitably result in danger to all underground men, as well as waste, both of which conditions add to the cost of operations.



FACE OF QUARRY AT PROPERTY OF NORTHWEST MAGNESITE CO., CHEWELAH, WASH.

Magnesite Mining in Washington

VIEW OF WORKINGS AND PLANT OF NORTHWEST MAGNESITE CO., CHEWELAH, WASH.



Ore Deposits of Utah*—Part I.

Principal Mining Districts of the State Are Associated With Occurrences of Intrusive Rocks, The Orebodies Occurring as Replacement Deposits in Fissures—Metal Production Shows Increasing Output From Lode Mines Since 1870

BY B. S. BUTLER

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THE object sought in this paper is the presentation in a summary form of some of the features of the ore deposits of Utah that are discussed in greater detail in a report now in press on the "Ore Deposits of Utah," U. S. Geological Survey Professional Paper 111, by B. S. Butler, G. F. Loughlin, V. C. Heikes, and others. For a more complete account of the geology, description of individual districts, for references to the extensive literature and other features, and for detailed evidence for the conclusions here advanced, those who are especially interested are referred to that report.

there was a general elevation of the entire region, and this was greatest along certain east-west belts forming the Uinta and Raft River ranges. Although other uplifts, such as those of Tintic-Deep Creek and of Beaver County, as shown in Fig. 1, are less prominent physiographically, they are equally important structurally.

Possibly the uplifts of the Plateau region, the Henry, Abajo, and La Salle mountains uplifts, the San Rafael Swell, and others (also shown in Fig. 1), were formed during the same post-Cretaceous period. Contemporaneous with or soon after the general uplift there was a great outpouring of lava and accompanying intrusion of igneous material over much of the Great Basin and part of the Plateau provinces, and this volcanic activity was followed by the subsidence of the Basin region below the Plateau region. At that time and later the Basin region was broken into blocks of general north-south trend, which were tilted at different angles and which form the Basin ranges. The effect of the same movement in the Plateau region was to throw the more pliable Mesozoic sediments into folds. Since these events occurred (if, indeed, they have entirely ceased), the processes most active in the Plateau provinces have been those of denudation and erosion, which have lowered the general surface and produced great canyons. As the Basin province has no outlet through which materials can be removed, debris resulting from a wearing down of the higher areas accumulates in the lower areas, and is gradually filling the intermountain lowlands. Lowering of the highlands and filling of the lowlands are both working to level the Basin area.

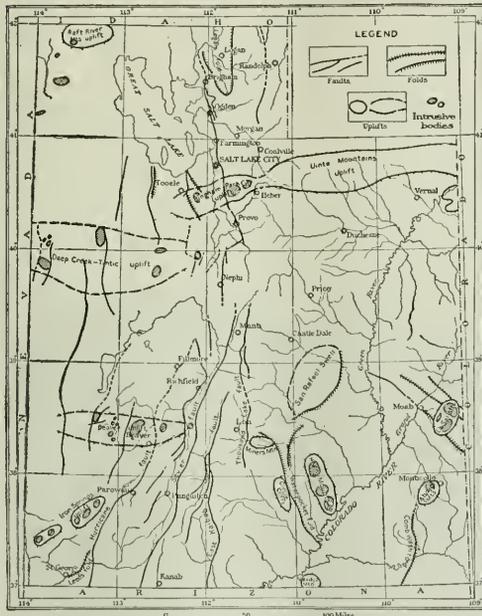


FIG. 1. OUTLINE OF THE LARGER STRUCTURAL FEATURES OF UTAH

The western part of Utah is in the Great Basin province; the southeastern part is in the Plateau province; and the northeastern part includes the Uinta Mountains. The Great Basin province is separated from areas to the east by a zone that may be designated the Wasatch belt. A large part of the Basin province in Utah was above sea level and was undergoing erosion throughout the Mesozoic era, the material removed being deposited in the area now occupied by the Plateau and Uinta provinces. In post-Cretaceous time

RELATIVE POSITION OF SEDIMENTARY ROCKS

The sedimentary rocks of Utah range in age from pre-Cambrian to Recent. Pre-Cambrian rocks, mainly schist, shale, and quartzite, are exposed along the great east-west uplifts—the Uinta Mountains, Raft River Mountains, the Tintic-Deep Creek uplift, and adjacent to the great northward-trending Wasatch fault. (See Fig. 1). Resting unconformably on the pre-Cambrian rocks is a great series of Paleozoic quartzites, shales, and limestones, ranging in age from Lower Cambrian to Permian. Within the Paleozoic system there are no marked angular unconformities, but there is abundant evidence of periods of non-deposition and of erosion. The Paleozoic rocks form most of the Basin ranges and much of the Wasatch belt, but they pass eastward beneath Mesozoic formations. Near the Colorado boundary, south of the Denver & Rio Grande R.R., where the pre-Cambrian rocks are exposed, the Paleozoic formations are absent, apparently having wedged out toward the east.

Upon the Paleozoic formations lies a thick series of Mesozoic rocks, consisting mainly of shales and sandstones but including some beds of limestone. These strata are exposed principally in the eastern part of the state, but they are found also at a few places in the

*Publication sanctioned by the Director of the U. S. Geological Survey.

Great Basin. They rest with little or no angular unconformity on the Paleozoic rocks; and within the Mesozoic strata there are no pronounced angular unconformities, though in the Mesozoic era, as in the Paleozoic, there were periods of non-deposition and of erosion.

Overlying the Mesozoic rocks in large areas south of the Uinta Mountains and in the Plateau region are

important being the Park City-Little Cottonwood-Bingham belt, the Tintic-Deep Creek belt, Beaver County belt, and the Iron Springs belt. In addition to these there are intrusions in the Grouse Creek, Raft River, and Pilot ranges and three centers of intrusion, the Henry, Abajo, and La Sal mountains, in the southeastern part of the state. (See Fig. 1.) The large intrusive bodies in the western part of Utah are charac-



MINE OF UTAH COPPER CO., BINGHAM CANYON, OQUIRRH RANGE

Tertiary formations which consist largely of sandstone and shale but include some limestone. At a few places in the Great Basin, Tertiary sediments lying unconformably on the older rocks are exposed. Quaternary sediments occupy large areas in the Great Basin between the ranges.

Extrusive rocks are of interest because of their extent, and intrusive rocks, which are not relatively abun-

teristically stocks; those exposed by erosion in the southeastern part are laccoliths.

The composition of the intrusive rocks, like that of the extrusives, is prevailing intermediate, approaching quartz monzonite and quartz diorite. In the stocks in the western part of the state the deeper exposed portions are the more siliceous, probably because of differentiation produced by the sinking of the ferro-magne-



LITTLE COTTONWOOD DISTRICT, SOUTH SIDE OF CANYON, SHOWING ALTA OVERTHRUST ZONE IN WHICH OCCUR OREBODIES OF THE WASATCH, COLUMBUS-REXALL, AND CARDIFF MINES

dant, because the ore deposits are commonly associated with them. Extrusive rocks are most abundant in southern Utah, where they form a broad belt extending from the Nevada line eastward to the High Plateau. They also occupy large areas farther north in the Great Basin. A large part of the lava is of intermediate composition, approaching latite, though rhyolites occur, and the latest flows are of basalt.

The intrusive rocks are confined largely to rather definite belts in the western part of the state, the more

sian minerals, which were the earliest to form, to still greater depth. In the laccoliths of the Plateau region there has been little differentiation.

The age of many of the igneous bodies is not known from direct evidence. Those that have been determined are of post-Cretaceous age. Probably most of them are of Tertiary age, though some may be earlier. Several, at least, of the intrusive bodies are later than the associated extrusive rocks.

The oldest large structural feature in the rocks is

Production of Utah Mining Districts, 1865 to 1917

District	Period	Ore (Short Tons)		Gold		Silver		Copper		Lead		Zinc Recoverable — Tons	Value —	Total Value (c)	Dividends Paid	Number of Shares
		Value	Value	Value	Value	Pounds	Pounds	Value	Value							
Bingham (West Mountain)...	1865-1917	1,515,018.90	\$31,318,190	48,415,824	\$35,665,120	1,658,636.86	\$296,608,196	1,058,092.538	\$52,429,453	40,052,718	\$3,678,727	\$419,699,686	\$88,501,870	9	8	
Park City.....	1870-1917	211,263.81	4,507,178	133,290,810	97,340,586	31,028,556	4,917,960	1,232,444,864	56,374,841	66,191,185	4,951,107	169,814,024	43,386,698	9	9	
Tintic.....	1869-1917	1,374,942.51	34,536,956	125,220,682	85,388,392	171,493,635	27,555,435	752,049,426	35,398,474	16,803,653	1,590,790	180,401,804	31,959,096	29	29	
Beaver County.....	1870-1917	787,079	21,159,286	11,818,088	8,588,392	49,638,983	8,478,593	411,404,954	17,980,774	33,507,519	2,577,029	49,392,527	7,747,704	4	4	
Opilar and Tush Valley.....	1870-1917	28,394.15	886,076	13,365,305	1,127,519	23,026,554	4,044,373	275,860,038	14,643,698	4,823,331	442,691	31,536,438	1,235,000	6	6	
Big and Little Cottonwood.....	1867-1917	24,213.55	55,529	13,215,139	57,512	9,859,917	1,741,962	180,616,765	10,225,640	320,934	39,283	25,222,552	2,474,060	8	8	
Camp Floyd.....	1871-1917	920,834.87	19,085,512	48,760	57,512	10,609,992	1,536,757	(c) 43,669	2,315	.....	.....	19,093,424	3,881,323	4	4
Washington County.....	1875-1917	64,217	13,127.80	7,356,657	8,079,416	159,091	30,077	28,586,796	1,574,129	46,911	4,824	9,631,616	(c) 900,000	4	4	
American Fork.....	1870-1917	48,740	1,000,000	1,887,596	2,044,647	159,091	30,077	(c) 847,883	61,006	.....	.....	3,895,050	8,000	1	1
Tuacahn.....	1868-1917	67,710	150,595.75	704,748	490,999	(c) 73,616	14,049	(c) 847,883	61,006	.....	.....	3,679,143	439,561	1	1
Utah.....	1870-1917	152,405	104.43	225,136	253,484	16,577,321	2,702,321	4,799,122	294,756	34,680	3,537	3,256,193	3,256,193	2	2	
Blair.....	1870-1917	18,459	409.40	6,926	1,627,832	4,315	681	16,069,128	678,655	.....	.....	2,316,464	363,720	2	2
Flint Springs.....	1902-1917	56,483	7,677	158	2,499,603	182	23	11,406,680	577,742	18,792,296	1,246,697	1,847,744	.....	.....	.....
North Tintic.....	1902-1917	4,377	912.21	18,857	102,747	63,496	75	1,932,683	90,780	788,679	75,096	478,122	.....	.....	.....
Caribou.....	1870-1917	4,065	15.29	317	37,226	24,295	1,526	2,589,245	274	114	.....	190,762	.....	.....	.....
Mount Neb..	1905-1917	1,682	8.46	1,037	6,037	494	75	803,005	43,525	.....	.....	49,812	.....	.....	.....
Albion.....	1899-1917	712	70.88	1,464	18,689	3,179	.....	284,557	12,731	.....	.....	20,153	.....	.....	.....
Blue Bell.....	1891-1917	249	5.14	105	3,179	.....	.....	7,097	496	.....	.....	16,015	.....	.....	.....
Box Elder.....	1908-1917	151	5.25	108	189	23,080	3,073	2,900,780	22,720	.....	.....	3,782	.....	.....	.....
Calaveras.....	1916-1917	684	2.00	41	78	21	290,780	520,721	44,622	.....	.....	23,423	.....	.....	.....
Clifton.....	1892-1917	71,576	12,109.06	252,177	163,301	1,911,840	320,791	4,622	.....	.....	.....	951,803	.....	.....	.....
Colorado River.....	1911-1916	100	47.51	982	11	6	782	1,265,974	71,670	41,500	4,262	83,132	.....	.....	.....
Columbia.....	1908-1917	3,262	18.76	388	9,552	4,907	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit (Gamb and Millard Counties).....	1904-1917	1,511	538.98	11,142	5,127	169,250	31,676	.....	.....	.....	.....	45,809	.....	.....	.....
Durway.....	1916-1917	167	1.36	28	906	630	9,067	2,428	114,773	8,479	.....	11,565	.....	.....	.....
Ericksen.....	1916-1917	264	37.82	782	50,344	33,634	364	92	29,646	2,549	.....	37,037	.....	.....	.....
Free Coinage.....	1917	54	17	3	362	298	.....	.....	28,765	2,474	.....	2,775	.....	.....	.....
Gold Springs.....	1902-1917	12,939	2,482.26	51,314	5,048	5,048	.....	.....	.....	.....	.....	56,362	.....	.....	.....
Imperial (Garfield County).....	1914-1917	1,607	416.96	8,619	28,332	16,104	.....	.....	752	96	7	2,587	.....	.....	.....
Lake Side.....	1903-1917	333	95	19	928	638	.....	.....	2,749	751	.....	6,908	.....	.....	.....
La Sal - Big Indian.....	1907-1917	166	21.04	435	5,393	7,569	.....	.....	22,963	236	.....	11,194	.....	.....	.....
Leamington.....	1903-1917	387	2.20	45	1,682	1,052	36	6	126,963	6,198	.....	7,301	.....	.....	.....
Lost Springs.....	1906-1917	42	6.33	131	233	159	.....	.....	6,744	1,788	.....	2,900	.....	.....	.....
Miners Basin.....	1903-1913	385	1,172.71	24,243	6,143	3,322	.....	.....	.....	.....	.....	27,565	.....	.....	.....
Paradise (Cachoe County).....	1914-1917	182	.....	188	129	10,762	2,741	15,277	776	17,883	2,227	5,873	.....	.....	.....
Park Valley.....	1902-1917	67,755	17,945.33	370,962	8,968	5,141	49,075	6,442	21,867	1,115	.....	383,660	40,000	1	1
Promontory.....	1907-1917	13,714	.....	378	248	1,078	215	1,256,021	91,220	5,725,336	723,990	81,673	109,000	1	1
Santaquin.....	1910-1917	470	47	10	3,492	2,019	.....	.....	208	34	.....	11,659	.....	.....	.....
Silver Lake.....	1908-1917	954	46.93	971	122,836	70,124	70,082	10,143	479,835	20,969	.....	102,207	7,500	1	1
Silver Lake.....	1902-1914	50	8.10	167	2,429	1,428	12	1	37,810	1,831	.....	3,427	.....	.....	.....
Smokey.....	1902-1915	80,623	812.40	16,793	110,315	80,042	753,925	131,445	2,218,632	166,368	4,751,909	896,937	.....	.....	.....
Spring Creek.....	1902-1915	6,992	2,048.05	42,337	5,587	2,951	1,327	232	5,609	263	.....	45,783	.....	.....	.....
Stetson.....	1901-1917	13,102	3,034.42	62,726	51,638	188	.....	.....	.....	.....	.....	117,451	.....	.....	.....
Summerville.....	1902-1915	169	.....	725	381	86	.....	.....	.....	.....	.....	8,075	.....	.....	.....
Third Term.....	1916-1917	317	1.17	4	1,086	2,623	661	77,951	8,262	340	59,075	7,325	.....	.....	.....
West Tintic.....	1902-1917	4,180	1,197.65	24,757	35,085	21,959	10,456	1,907	1,437,322	96,318	.....	83,669	.....	.....	.....
White Canyon (San Juan).....	1915-1917	96	6.06	126	384	49,889	12,676	.....	.....	.....	.....	13,073	.....	.....	.....
Wild Cat Range.....	1914-1917	182	85	17	2,340	2,241	648	11,791	554	.....	.....	2,466	.....	.....	.....

(c) Commercial value used for metals produced in each calendar year. (d) This yearly production of silver, between 1871 and 1881, was estimated to be 46,000 ounces. (See U. S. Geol. Survey Statistical Ann. Rept., pt. 2, p. 355, 1895). See also that period the gold was mined and very little silver, and only 2,760 ounces were reported by producers whose ore yielded a total of 920,741.10 ounces of gold from 1890 to 1913, inclusive. (e) No records were kept by producers of certain lots of lead ore shipped from the Black Warrior and Dixie mines in the Tussequito district. (f) Dividends paid by operators in the Silver Reef section are known to be incomplete. A fair estimate is given by competent authorities. (g) Between 1904 and 1911 the production was 44,244 pounds of copper and 134,361 pounds of lead, as reported by producers. Prior to this period no record of production was found.

folding. The age of much of the folding in the western part of the state has not been determined, and the folding may have occurred in two or more periods. The most pronounced folding, which was accompanied by overthrust faulting, took place in the Wasatch belt, near the boundary of the Basin and Plateau provinces. This folding occurred in post-Cretaceous time.

After the folding there were east-west uplifts, some of which were accompanied by intrusions. (See Fig. 1.) The Uinta and Raft River ranges represent such uplifts, and such structural features are associated with the intrusive belts farther south, as the Tintic-Deep Creek and the Beaver County uplifts. The domes or swells and the broad uplifts that characterize the

in 1865. Since 1870, as may be seen in Fig. 2, there has been a steady and increasing output from lode mines, which to the close of 1918 have yielded a total of over \$900,000,000, and the operating companies had paid dividends of more than \$170,000,000. An accompanying table shows the metal production and its value for the several districts of the state.

Placer Deposits—The largest placer deposits in Utah are those of Bingham Canyon, which have yielded about \$1,000,000 in gold, and there has been a small production of gold from the placers of Colorado, Green, Grand, and San Juan rivers.

Lode Deposits—The lode deposits, considered from the point of view of origin, may be separated into two

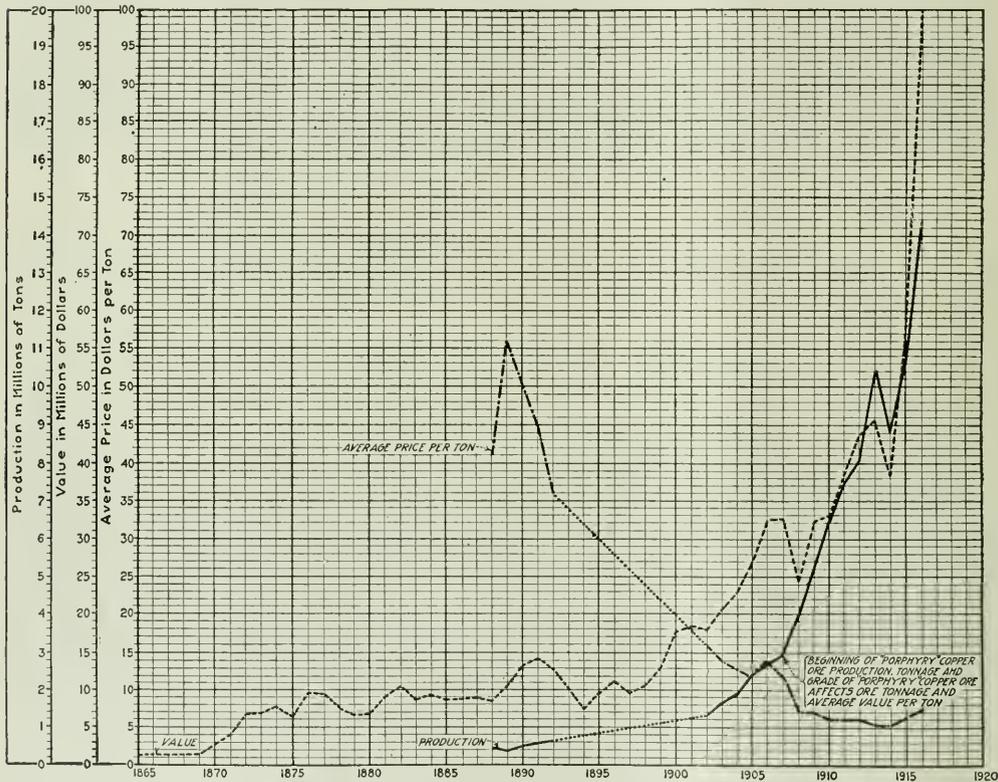


FIG. 2. CURVE SHOWING BY YEARS PRODUCTION OF ORE, VALUE OF ORE, AND AVERAGE VALUE OF ORE PER TON, 1865 TO 1916

Plateau region may have been formed at the same time. The youngest large structural features are north-south faults that outline the Basin ranges and that also occur in the Plateau area. (See Fig. 1).

INCREASE IN ORE OUTPUT FROM LODE MINES

The presence of metallic deposits in the mountains of Utah was known in the '50s of the last century, and a little lead ore was reduced to metal in a crude way by the Mormon settlers. Active prospecting began with the arrival of General Connor's California volunteers, in 1862, and the first claim was located in Bingham Canyon in 1863. The production of placer gold began

groups: (1) those that show no close relation to igneous rocks, and (2) those that are closely associated with igneous rocks and are believed to be genetically related to igneous intrusion.

Deposits Not Obviously Associated With Igneous Rocks—Of the deposits not obviously associated with igneous rocks, the Mesozoic "red bed" or sandstone deposits of silver, copper, and uranium-vanadium are the most abundant. The study of certain of these deposits has led to the belief that they were formed later, than most of the folds and faults which were important factors in controlling the movement of the solutions that deposited the ores. Most of the deposits are closely as-

sociated with fossil vegetation, which appears to have been a factor in precipitating the metals from solution.

The Silver Reef deposit of southern Utah, which has yielded more than \$8,000,000 in silver, is the most im-

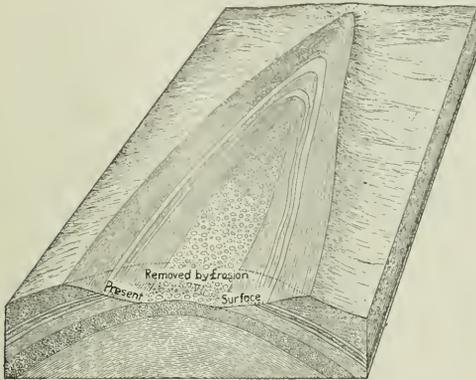


FIG. 3. GENERALIZED STEREOGRAM, SHOWING THE RELATION OF ORE DEPOSITS TO STRUCTURE IN THE SILVER REEF DISTRICT

Ores are principally in the sandstone strata

portant of this type. The orebodies are near the crest of an anticline, as shown in Fig. 3, which appears to have been a controlling factor in the circulation of solutions. The larger copper deposits of the Plateau

The Mesozoic rocks of the Plateau region contain small amounts of metals that seem to have been deposited with the sediments, and it is believed that the workable deposits have resulted from a concentration of this disseminated metal by circulating waters after the region was elevated, folded, and faulted.

Deposits Associated With Igneous Rocks—Most of the ore deposits are associated with the belts of intrusive rocks that coincide with the Park City-Little Cottonwood-Bingham, Tintic-Deep Creek, Beaver County, and Iron Springs uplifts in the western part of the state. The deposits occur in all classes of rock—intrusive, extrusive, and sedimentary. A comparison of the different deposits in any one of the three classes of rock, and of the deposits in one class of rock with those of the others, leads to the belief that the metals contained in the ore deposits came from the same general source as the material that forms the intrusive stocks.

DEPOSITS IN INTRUSIVE ROCKS

The deposits in the intrusive rocks consist of the following: Pegmatitic gold quartz veins, represented in the Deep Creek Mountains and in the Raft River Mountains; pegmatitic quartz tourmaline-scheelite veins of the Clifton district; quartz-tourmaline iron-copper veins of the Clifton and San Francisco district; quartz-copper veins and stockworks of the Bingham and Beaver Lake districts; quartz lead-silver-copper veins of the Bingham and Tintic districts; quartz-gold veins of the Clifton district; and magnetite-hematite veins of the Iron Springs district. The pegmatitic types are

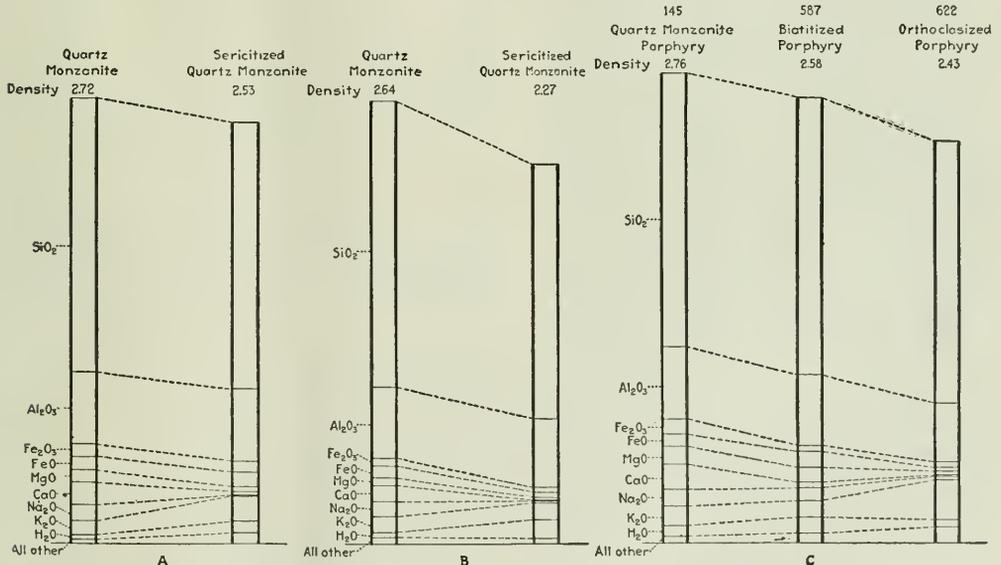


FIG. 4. DIAGRAMS SHOWING CHANGE FROM FRESH TO ALTERED QUARTZ MONZONITE, PRODUCED BY THE ACTION OF THE ORE SOLUTIONS IN THE WALL ROCK ADJACENT TO VEINS

A, Cactus mine; B, O K mine; C, Utah Copper mine

regions are clearly associated with folds, faults, and fissures. The relation of the vanadium-uranium deposits to structural features is not as clearly apparent, but their location near the domes and folds of the Plateau region seems more than accidental, and a detailed study may reveal a casual relation to these structures.

unmistakably differentiation products of a magma, and the other types show such an intergradation as to lead to the belief that they are all directly related to igneous activity.

The deposits in sedimentary rocks may be subdivided into contact deposits and replacement deposits as-

sociated with fissures. The contact deposits include copper deposits, which are present in many districts, but are particularly well developed in the Rocky, San Francisco, Little Cottonwood, and Clifton areas.

Several of the copper deposits are notably high in iron. Contact gold deposits have been worked in the Clifton district, and contact tungsten deposits are present in the Clifton region and in the Grouse Creek range. Iron deposits are important in the Iron Springs district, and many of the other deposits contain a large amount of iron. The contact deposits are characteristically replacements of limestone at or near the contact with intrusive rocks by silicates, oxides, and sulphides. All the deposits show large additions of silica and variable amounts of iron, sulphur, copper, boron, and some other metals.

REPLACEMENT DEPOSITS IN IMPORTANT DISTRICTS

The replacement deposits associated with fissures include copper deposits such as those of the Bingham, Star, Little Cottonwood, Lucin, and other districts;

of the replacement deposits in limestone, which are important in the Park City, Tintic, Bingham, and other districts. The deposits of the Cottonwood districts associated with thrust faults constitute a special type allied to the bed deposits.

The origin of the deposits in the sedimentary rocks can best be approached by considering their relation to the deposits in adjacent igneous rocks of the origin of which there seems little doubt. There is strong evidence that these classes of deposits were formed by similar solutions. The character of the solutions can be judged only by their action on the rocks, and it, of course, must be recognized that the same solution would act quite differently on rocks of different composition as monzonite and limestone. The similarity may be indicated by the change effected by the more abundant constituents, or it may be more strikingly evident by the presence of some of the rarer elements, but the agency of similar solutions is indicated when the proportion of the more abundant constituents is similarly shown by the action on igneous and sedimentary coun-

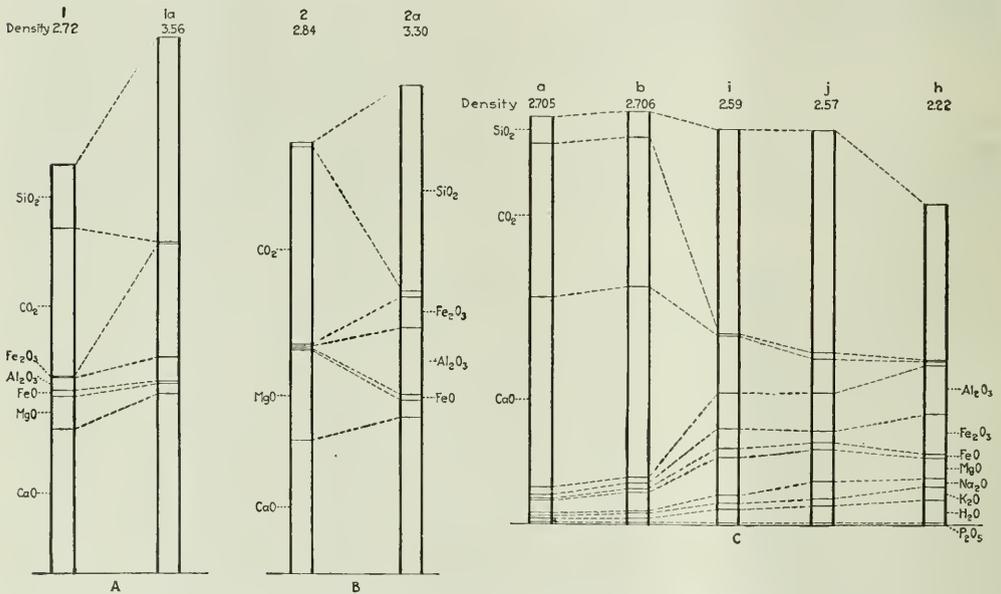


FIG. 5. CHANGES OF LIMESTONE IN CONTACT ALTERATION

A and B, San Francisco district; 1 and 2, fresh rock; 1a and 2a, altered rock; C, Iron Springs district; a and b, fresh rock; i, j, and h, altered rock

lead-silver and lead-silver-copper-zinc deposits in many areas, most productive in the Park City, Tintic, Bingham, Cottonwood, Ophir, and Stockton districts; silver deposits of the Park City, Ophir, and Mercur districts; gold deposits of the Mercur district; and quicksilver deposits of the Mercur and Marysvale districts.

The important deposits of this type may be separated into fissure replacement deposits in which the replacement has extended only a short distance from the fissure, and bed deposits in which the replacement is confined largely to certain beds or zones and may extend into them for a considerable distance from the fissure. The more important deposits of the former occupy fissures in quartzite, as in the Ontario fissure of the Park City district. The bed deposits include most

of the replacement deposits in limestone, which are important in the Park City, Tintic, Bingham, and other districts. The deposits of the Cottonwood districts associated with thrust faults constitute a special type allied to the bed deposits.

The origin of the deposits in the sedimentary rocks can best be approached by considering their relation to the deposits in adjacent igneous rocks of the origin of which there seems little doubt. There is strong evidence that these classes of deposits were formed by similar solutions. The character of the solutions can be judged only by their action on the rocks, and it, of course, must be recognized that the same solution would act quite differently on rocks of different composition as monzonite and limestone. The similarity may be indicated by the change effected by the more abundant constituents, or it may be more strikingly evident by the presence of some of the rarer elements, but the agency of similar solutions is indicated when the proportion of the more abundant constituents is similarly shown by the action on igneous and sedimentary coun-

The similarity of solutions is perhaps more strikingly

brought out where both types of deposits in the same district contain some of the rarer elements. Boron minerals abound, and tungsten minerals are also present in both types in the Clifton district. Abundant barite occurs in the deposits in both the intrusive and lution rich in barium, and the iron deposits of the Iron sedimentary rocks in the Tintic district, indicating so-Springs district occur both as veins in the intrusive rock and as replacement of the adjacent limestone. The location of the deposits and the composition of the solutions that formed them both point to a common origin for the deposits in the intrusive rocks and the contact deposits. Deposits in sedimentary rocks associated with fissures show all stages of mineralogical gradation from typical contact deposits, and there can be no reasonable doubt of their common origin.

DEPOSITS IN EXTRUSIVE ROCKS

The occurrences of mineralization in extrusive rocks consist of silver-lead-copper-zinc deposits of the San Francisco district; gold-silver deposits of the Gold Springs-Stateline districts and the Marysvale region; and the alunite deposits of the Marysvale region. The deposits occur as filling of fissures and replacement of the adjacent rock. The situation and character of the deposits and the alteration of the adjacent rocks indicate that the origin of the deposits is the same as that of those in the igneous and sedimentary rocks, but the mineralogy shows them to have formed near the surface. The alunite deposits perhaps may have reached to the original surface.

(To be Concluded)

The Larder Lake Gold Area

Recent Developments Show More Promise Than Early Results Indicated.—Electric Power Available Will Permit Systematic Sampling Over Large Area

TORONTO CORRESPONDENCE

THE twenty-eighth annual report of the Ontario Bureau of Mines, 1919, Part II, contains a paper by P. E. Hopkins on the Larder Lake gold area, situated fifty miles due north of the Cobalt silver district, near the Ontario-Quebec boundary. It is connected by a wagon road seventeen miles long to Dane station, on the Temiskaming & Northern Ontario Ry.

The finding of gold in August, 1906, was followed by a rush of prospectors during the ensuing winter, when a few thousand claims were staked. Development resulted in much disappointment, and most of the claims were abandoned. Desultory mining has since been carried on at two or three properties, the total gold production being about \$20,000, coming from the Associated Goldfields (Harris Maxwell) La Mine d'Or Huronia, and the Reddick property. In parts of the area, recent development work has made certain properties more promising than they formerly appeared.

The geology of the area is similar to the pre-Cambrian in many other parts of Ontario. The oldest rocks are dominantly volcanic, comprising greenstones and green schists. Associated with them are bands of ferruginous carbonate, iron formation, slate and conglomerate, which strike nearly east and west and dip vertically. The sediments have their greatest development along the north shore of Larder Lake, portions of which are traceable westerly to Kirkland Lake.

The rusty weathering carbonate is intersected by quartz and calcite stringers, which carry most of the gold. Cutting the above rocks are dikes of porphyry and aplite, and superimposed on them are erosion remnants of conglomerate, greywacke, and arkose of the Cobalt series. The diabase and gabbro dikes represent the latest igneous activity.

Rusty carbonate rocks are found in or near many of the Northern Ontario gold areas, but this type of material has been prospected to a considerable extent in various parts of the province without yielding any producing gold mines. These rocks are more widely distributed in the Larder Lake district than elsewhere, and are important, as they appear to contain a greater quantity of gold than the other rocks of the area. Gold occurs, however, in the aplite on the Gold King and in the porphyry and green schists of La Mine d'Or Huronia. It is believed that the gold is related to these aplite-porphyry intrusions and therefore indirectly to granite.

The rusty-weathering carbonates are dolomites in places which occur in bands up to 300 ft. or more in width; usually brown in color, but often large parts of them have been altered to green fuchsite or mariposite, serpentine, and talc. They are intersected by a network of quartz and calcite stringers, which carry low assays in gold over considerable widths, and frequently contain small oreshoots or spectacular gold showings. Although this association of rocks and mineral solutions is not known to form ore in many parts of the world, there is resemblance to the orebodies on the Rawhide mine, southeast of Angels Camp, Cal. Small, medium-grade oreshoots do occur, as on the 83-ft. level of the Reddick and 500-ft. level of the Associated Gold Fields, but they are isolated, with little to indicate where they will be found and what will be their extent.

The passing from ore into material altogether or nearly barren is indicated only by the disappearance of visible gold, or by low assays, and not by any change in the character of the deposit. As the known richer shoots are small and scattered, the success of mining will depend upon the working of extremely large bodies of low-grade ore, which will necessitate much capital and detailed mining. Electric power being available, a careful, systematic surface sampling of large areas of mineralized dolomite can be made at a reasonably small cost, with the purpose of finding low-grade ore over a considerable area.

The properties of the Associated Goldfields known as Block "B" and Block "D," formerly known as the Harris Maxwell and Reddick mines, respectively, are operated with electric power supplied from the company's own plant at Raven Falls, from which a transmission line was also constructed to La Mine d'Or Huronia. Mining operations have been of an intermittent character. Other gold prospects worthy of mention on which some work has been done are the Gold King, Chesterville, Kerr-Addison, and Larder Lake Proprietary. A promising pyrite prospect, which Mr. Hopkins regards as worthy of further development, occurs on Claim H. S. 904, half a mile from the southwest bay of Larder Lake, in Hearst Township. An 8-lb. sample yielded on analysis 43 per cent sulphur and 40c. of gold to the ton. Massive iron pyrites several feet wide was also seen on Claim H. S. 913, which is in the southeast part of Hearst Township.

What Mexico Needs

With Order, Fair Laws, and Honest Administration, the Latent Resources of the Country Would Be Developed Without Exploitation—A Properly Enforced Mandatory Under a League of Nations Is Proposed as a Possible Solution of Present Difficulties

BY AN AMERICAN CITIZEN RESIDING IN MEXICO*

THE editorial which appeared in the *Journal* of July 26, 1919, under the caption "Article 27" is far from accurate, and in the interest of fairness and accuracy should be corrected.

The new Mexican Constitution was signed in Queretaro, Jan. 31, 1917, and promulgated Feb. 5, 1917. Chapter I, including Articles 1 to 29, inclusive, is the Mexican Bill of Rights or, as they call it, Individual Guarantees.

"Article 14.—No law may be made retroactive to the prejudice of any person. No one may be deprived of life, liberty, property, possessions or rights, except by trial before courts, previously established, in which the essential formalities of legal procedure are complied with, in conformity with laws enacted prior to the act....."

The above is an accurate translation of part of Article 14 of the Constitution, which clearly makes any law or decree that tends to be retroactive, or any deprivation of acquired property, possessions or rights except after trial by a competent court, unconstitutional, and would undoubtedly be so construed by any just court or honest executive.

"Article 27.—Property to the lands and waters situated within the national territorial limits, corresponds originally to the Nation (has its origin in the Nation) which has had and has the right to transfer dominion to individuals, constituting (thereby) private property. This (private property) cannot be expropriated except for reasons of public utility and under indemnization.

"The Nation will have the right, at all times, to impose the regulations upon the use of private property which the public interest demands, such as regulating the use of the natural elements that may be produced; to make an equitable distribution of the public riches; and to guard their conservation. With this object the necessary measures will be taken for the division of the great estates; for the development of small properties; for the creation of new agricultural communities with the indispensable waters and lands; for the development of agriculture generally and to prevent destruction of the natural elements and the damages which property might suffer, to the prejudice of the public.

"Towns, villages and communities lacking lands and waters, or who do not have sufficient quantities to provide the necessities of the population, have the right that they be granted them, from the surrounding properties, always respecting the small property.

"In view of this, the grants of lands which have been made to date in conformity with the Decree of Jan. 6, 1915, are hereby confirmed.

"The acquirement of private properties necessary to carry out the objects expressed in the foregoing will be considered as of public utility.

"The Nation has direct dominion over the minerals and substances which in veins, masses or orebodies form deposits of a nature distinct from the earth itself, such as the minerals from which industrial metals and metalloids are extracted; deposits of precious stones; rock salt and the deposits of salt formed directly from sea waters; the products derived from the decomposition of rocks when

their exploitation requires underground workings; phosphates which can be utilized as fertilizers; solid mineral combustibles (coal); petroleum and all the solid, liquid or gaseous hydrocarbons.

"The Nation is also proprietor of the waters of the seas within the limits and terms fixed by International Law; of the waters of the lagoons and estuaries; or those of the interior natural lakes which are connected directly with constant flowing streams; those of the principal rivers and streams from their sources to their mouths, if they flow into the sea or cross two or more states; those of intermittent streams which cross two or more states; those of rivers, streams or canyons which form national or state boundary lines; the waters which are extracted from mines; and the beds and margins of the foregoing lakes, rivers and streams to the extent fixed by the law. Any other stream not included in the foregoing will be considered as an integral part of the private property it crosses; but the use of the waters, when such stream passes from one property to another, will be considered a public utility, and will be subject to the regulations which the States may dictate.

"In the cases to which the two preceding paragraphs refer, the dominion of the Nation is inalienable and imprescriptible, and the Federal government may only grant concessions to individuals or to civil or commercial companies organized in conformity with Mexican laws, under condition that regular works be established for the exploitation of the respective elements, and that all the requisites provided by law be complied with.

"The acquiring of dominion over lands and waters of the Nation will be governed by the following provisions:

"I.—Only Mexicans by birth or by naturalization, or Mexican corporations, have the right to acquire dominion over lands, waters and their dependencies, or to obtain concessions for the exploitation of mines, water power or mineral combustible (coal) in the Republic of Mexico. The State may concede the same right to foreigners, providing they agree before the Department of Foreign Affairs to consider themselves as Mexicans in matters relating to the property rights, and not to invoke for the same, or for that which relates to them, the protection of their Governments, under the penalty that in case they fail to keep the agreement they will lose their rights in the property acquired by virtue of the agreement, to the benefit of the Nation. Foreigners may not under any conditions acquire direct dominion over lands and waters within 100 kilometers (62.14 miles) of the frontiers nor within 50 kilometers (31.07 miles) of the coast."

"II.—Religious Societies" and "III.—Charitable Institutions" do not concern us here, and I omit the translation, as well as "V.—Bank." "VI.—Common Holdings" as of tribes, communities, etc., will also for the same reason be omitted, as well as "VII.—Other Civil Corporations."

"IV.—Commercial corporations, with stocks (or shares), may not acquire, possess or administer rural lands. Corporations of this class formed to exploit any industrial factory, mines, petroleum wells or for any other purpose not agricultural, may acquire, possess and administer lands, only to the extent that may be strictly necessary for the indicated objects of the establishments or services, which the Executive of the Union or of the States will fix in each case.

"All contracts and concessions granted by former governments since 1876 which have tended to segregate in the

*Neither the name nor the address of the writer of this article is published, for reasons which will be appreciated upon reading the translation of Art. 33.—Editor.

hands of any single individual or company lands, waters and natural riches are declared revisable and the Executive of the Nation is authorized to declare them null and void, if they imply serious detriment to the public interests.

"Chapter III., Article 33.—Foreigners are those who do not possess the qualities named in Article 30 (i.e. Mexicans by birth or naturalization). They have the same rights which the first section of Chapter I of the Constitution grants; but the Executive of the Union will have the exclusive power to force any foreigner whose presence he judges inconvenient to leave the national territory immediately and without the necessity of previous judgment.

"Foreigners may not mix in any manner in the political affairs of the country."

In making the foregoing translations, the chief concern has been to give the true meaning of the text rather than to make smooth English, and it is believed to be accurate.

It will be noted that there are direct clashes between Article 14 and Article 27, the last paragraph of the latter giving powers to the Executive which in the former are specifically delegated to competent courts.

Under the old laws gold, silver, platinum, copper, iron, cobalt, nickel, manganese, lead, mercury, tin, chromium, antimony, zinc, bismuth, sulphur, arsenic, tellurium, rock-salt and precious stones in ore veins or deposits are specifically mentioned and declared to be the property and under direct dominion of the Nation, as well as placers of gold and platinum.

The following were declared to be the exclusive property of the owner of the soil under the old law:

I.—Veins or deposits of mineral combustibles (coal) in all of their forms and varieties.

II.—Veins and deposits of bituminous matter.

III.—Veins and deposits of salts that appear on the surface.

IV.—Springs or underground flows of water, except that waters extracted from mines became the property of the mines.

V.—Surface rocks and materials of the soil and the earths, sands and clays.

VI.—Bog iron and iron float, stream tin and the ochres.

All of these, except surface rocks and the earths, sands and clays, would now appear to have been declared to be the property of or under the dominion of the Nation; and in addition the following materials that were not specifically mentioned in the law of 1909, although some of them were well known to exist in great quantities: petroleum; hydrocarbons, solid, liquid and gaseous; phosphates and salt deposited by the sea.

It appeared that while certain valuable minerals had been considered the property of or under the direct dominion of the Nation for many years and had paid extraordinary taxes both on the lands under which they lay, without acquiring any manner of title to the surface of the lands, and upon their products, other very valuable minerals of an organic base were treated in an entirely different manner. In fact, silver and gold in ores are paying nearly double the tax on their gross value that petroleum is paying at this date, according to the statements of Sub-Secretary of Industry and Commerce, Mr. Salinas; and if the miner has over 100 hectares of claims in one mining agency he pays just 3 and $\frac{6}{10}$ times as much property tax per hectare on the area in excess of one hundred hectares.

The translation of Article 27 shows that the editorial under that heading was inaccurate in the following particulars:

(a) A renouncing of citizenship is not required—

only an agreement to consider oneself as a Mexican in all that relates to the special property and only to that property, and the further agreement not to invoke the protection of one's government for that property; which is not a serious thing to agree to when it is remembered that we have had no protection from our Government nor any results from any complaints we have made to it for the last eight years.

(b) The statement regarding foreign or domestic corporation ownership of lands is fairly correct as stated, and probably a good and desirable thing to do if they can find the means to do it honestly and honorably.

(c) Leaving out the word "immediate" from the sentence regarding the holding of excess land requirements, the clause is correct and should work no hardship on any legitimate enterprise.

(d) Adding the word "direct" before "ownership" and changing the latter to "dominion" the clause would state the matter correctly, except for a slight error in the distance. Under the old law there was a zone of 80 kilometers on the frontiers in which foreigners could not take up or acquire mining properties without special permission from the Executive of the Nation and renouncing their rights as foreigners.

(e) If the writer of this clause had put a period after "nation" he would have been exact; but Article 14 of the Constitution, and possibly the indemnification clause in Article 27, cover the situation.

(f) "If they imply serious detriment to the public interest" added to the clause will make it fairly well in accord with the text of the Constitution; and again Article 14 may be called into play.

Really, there is nothing seriously wrong, radical or unusual in Article 27, except that for a legal document it is in some instances rather loosely worded and subject thereby to different interpretations. When carefully written Congressional laws are passed to regulate and enforce it, and an honest and conscientious judiciary and Executive carry the laws into effect, there should be no room for cavil.

In the United States foreigners are not allowed to take up mining claims, nor homesteads, nor pre-emptions, nor any public lands until they have declared their intentions of becoming American citizens, although they can acquire private lands by purchase. Our mining and petroleum laws are generally recognized as particularly bad, but they have been in effect so long and such immense rights have been acquired under them that it is most difficult if not quite impossible to change them to a more rational basis. The tendency of our own Government to recognize Government ownership of petroleum and coal as distinct from the soil is shown in the withdrawal of great tracts of potential oil and coal lands as naval reserves and of great tracts of oil shale from entry, by department order, although possibly under color of law, and the recent proposal to lease oil lands at not less than 5 per cent royalty, which strangely is the Mexican rate.

The taxes on oil lands, according to an interview with Mr. Salinas, sub-secretary of Industry and Commerce, published in the *Universal* of Aug. 6, 1919, is five pesos (\$2.50, U. S. currency) per pertenencia (2.47 acres) per annum. The tax on petroleum is 5 per cent of its value, as stated in the same interview.

The taxes on silver, gold, copper and lead in ores

there is no question that the latent resources of the country would be developed without exploitation, work for its idle hands would result, and it would take its proper place in the sun.

That there is no man, faction nor party within the country capable of rejuvenating it, is patent to any impartial observer.

The only salvation of the country is the establishment of a properly enforced mandatory under the League of Nations to give them order, fair laws and honest administration until such time as they learn the basic principles of democracy. Personal contact with the people, from the richest haciendas to the poorest and most ragged peon, leads me to believe that the great majority of the people, outside of the officials and military, would gladly welcome such a solution to their difficulties.

Chemical Compounds for the Detection of Overheated Machinery*

Their Use as a Varnish-Paint Serves as a Heat Detector For Distorted or Dirty Bearings, Giving Warnings Before Serious Damage Occurs

BY H. T. PINNOCK

INVESTIGATIONS have been made into the use of chemical compounds as a means of indicating the overheating of bearings and other parts of machinery. Double iodides of mercury with other metals possess the property of undergoing a reversible transition involving change of color when heated and subsequently cooled.

Two of these compounds showed superior qualities over a number of others which were comparatively slow to change and spread over so large a range of temperature as to be unsuitable for the purposes required, or the range of color was too slight to be of any practical value. The first of these was the double iodide of silver and mercury, Ag_2HgI_4 , which is a pale lemon yellow powder at ordinary temperatures, and changes to a vivid carmine color at about $90^\circ\text{--}100^\circ\text{C}$, the change in both directions being fairly sharp. The other was the copper mercuric iodide, $\text{Cu}_2\text{I}_2\text{HgI}_4$, which Tonner had previously described. This substance is a vivid scarlet vermillion at ordinary temperatures and at $60^\circ\text{--}70^\circ\text{C}$. it changes to a chocolate brown. Both these compounds are adapted for use under suitable conditions, but it was found that a mixture of the two, consisting of 85 per cent of the copper salt and 15 per cent of the silver salt, was more sensitive and gave a greater color range from vermillion to almost black, the transition being exceedingly sharp. (Other mixtures were prepared for special conditions, but the above was more generally applicable.)

The compounds may be prepared in a variety of ways; for instance, a simple method of preparing the copper salt is by well triturating in a mortar 380 grams of cuprous iodide with 910 grams of mercuric iodide, sufficient water being added to form a paste. When thoroughly mixed, the mass is dried in the water oven, and the dried mass ground to an impalpable powder. Another method is to dissolve the mercuric iodide in excess of potassium iodide solution and precipitate the

double salt by the addition of copper sulphate solution. The silver salt can be prepared in a similar manner by double precipitation. Whichever method is adopted, the product should be well washed to eliminate soluble impurities, as these appear to retard the color change, as well as to affect its character.

It has been found convenient to convert them into a varnish-paint or enamel, by incorporating the powder with a colorless varnish medium that will stand moderately high temperatures without softening. A good white shellac spirit varnish such as is used on electrical machinery has been found suitable for most occasions, as this will stand a low stoving temperature, but for more elevated temperatures, a medium such as is used in the high temperature aluminum paints used for steam pipes, and which will resist temperatures up to 200°C ., is excellent. About 100 grams of compound to 70 c.c. of medium will be found a mixture of suitable consistency.

A convenient method of applying this heat detector is first to paint a white circle or ring on the bearing or other place which it is desired to keep under observation, using a zinc white paint. This white circle is applied to the journal or housing of the bearing, and the detector paint is applied as a vivid red bull's-eye in the middle of this, thus forming a striking object which is visible from considerable distances. It must of course be applied to the block of metal as near as possible to the point at which the heat is likely to be generated. It is sometimes desirable to apply the paint to the shaft itself, just where it extends beyond the bearing metal, and in this case a convenient method is to apply a broad band of white paint with a narrower band of the red detector paint in the center. This red band in the center of the white one is then easily seen as the shaft rotates. In any case, after the paint is dry, it should be protected with a coat of colorless oilproof varnish, so that the surface may be occasionally wiped free from dust and dirt.

This detector has also been successfully used on a gas engine, one of the main bearings of which was frequently heating up, owing to a slightly distorted shaft, and it was possible to place good big bull's-eyes upon it, which on many occasions gave warning of impending trouble, enabling the load to be reduced before damage was done. It was also found of service on the water-jackets of large internal combustion engines to give warning of insufficient circulation of cooling water.

Many other instances occur in which this property of the double mercuric iodide compounds may be utilized to advantage; for instance, it may be used in the reverse way on air-heating towers and the like. A case in point is that of a producer-gas plant where the air supply is saturated with water vapor at about $70^\circ\text{--}75^\circ\text{C}$. If the outside of the tower has a white circle about 3 feet in diameter painted on it, with a center about 1 foot in diameter of the detector paint, the appearance of a red color, visible all over the plant, is a sign that the saturation temperature has fallen too low and requires attention. The same applies to feed-water heaters for boiler feed water.

Western Australia Gold Production continues to decline. According to a consular report, during the six months ended June 30, 1919, the total Australian production amounted to 573,279 fine oz., of which Western Australia furnished 410,428 oz. For the corresponding period of 1918 the Australian production was 641,911 oz., Western Australia furnishing 443,983 oz.

*Abstracted from the *Journal of the Society of Chemical Industry*, London, Mar. 15, 1919.

The Boarding House—an Institution

Contentment and Length of Service Often Depend
More on Good Food, Well Served, Than
on the Rate of Wage

BY RAY W. ARMS

SECRETARY BAKER of the War Department is quoted as saying that a five-cent street railway fare in cities is a psychological necessity. I wish respectfully to submit that within this category also falls the dollar-a-day board at mining-camp boarding houses. No matter what difficulty the cook may encounter in securing foodstuffs, or what prices he has to pay for them, their arrangement into three meals a day must be accomplished for a dollar, or trouble is inevitable. In these days of high costs it is becoming increasingly difficult to set a table with sufficiently wholesome and palatable food at that figure, and the price asked in a great many places exceeds it, but, in spite of this, the men will always feel that a dollar is "par," and that any more than a dollar is overcharge.

Of greater importance, perhaps, than the price is the quality of the food. In mining camps, competition is not especially keen, and the workman is forced to depend upon a few places at the most. He is at the mercy of individuals who, though they are not always profiteers, are frequently careless and seek to accomplish their task in the easiest way, instead of making some effort to procure the best available. This carelessness is always a prolific source of discontent among the men, and much of the roving tendency so evident among miners, especially in the West, can be attributed directly to a desire to change boarding places.

Men in authority whose duties include the establishment of eating places for the men all too often have the mistaken idea that those accustomed to rough work can eat and enjoy anything. Nothing could be farther from the truth. The prevalence and persistence of this erroneous opinion is the cause of much grumbling among the men.

Often there are separate boarding houses for the officials, technical men, and those in the so-called "white-collar" jobs, which receive special attention and enjoy the choice eatables, the culls being sent over to the men, to their intense disgust if they are aware of the practice.

In a few instances no provision whatever is made for the men. Even though their number may be sufficient to justify the establishment of some sort of an eating place, they are left to shift for themselves, violating their digestions with canned and cold foods.

To be wholly successful in pleasing its patrons, a boarding house must serve good, clean, wholesome, palatable foods. Fancy dishes are neither necessary nor desired, but a little care and skill in the preparation of the plain dishes make an enormous difference in the results. Cleanliness is always appreciated, even among men whose work is grimy. Linen is superfluous, but a clean oil cloth or a well-scrubbed table top will serve the purpose. Also, no matter how hardened a man may become to all kinds of fare, his aesthetic sense is always offended at the sight and the feel of a greasy plate. And, besides being clean, the food must be plentiful and varied, so that differing tastes may be satisfied.

In mining camps, where pleasures are always few, the boarding house is an institution. Beyond its

threshold occur a large proportion of the events which serve to break the monotony of the miner's humdrum, off-duty existence. During working hours a man's thoughts are frequently occupied with conjectures concerning the coming meal. If he is fortunate enough to have an excellent eating place his anticipation will be pleasant, and he will be serene in the thought that, however far off from the truth his guess may be, the forthcoming meal will be palatable and satisfying. If he is ill-fated in his boarding house, his guess as to the approaching meal will probably be more nearly correct, but his anticipations much less keen.

The transient miner is said by some to be the most efficient type. In his roving from Alaska to Mexico he has picked up tricks of the trade that are unknown to the locally trained. I have never seen estimates concerning the length of his stay in any one camp, but from personal experience would judge that it is about eight weeks. He may come to a certain place attracted by a minor feature of the camp life which appeals to his fancy at the time. He stays until some adverse detail, equally minute, begins to pall upon him, and finally becomes intolerable. A great many times the feature which sends him on his journey to new fields is the boarding house. He gets along fairly well for a while, but after a time the pleasure of eating is gone. Why? Well because there is too much sameness to the menu; because everything is too salty; because the cook serves prunes three times a day; because the beef is always tough; because the flies are allowed too many privileges; because of a thousand other reasons, either imagined or actually existing. In other words, carelessness with the boarding house will never hold this type of men over their allotted time.

The word luxury is purely comparative. In New York real cream in coffee is for many a necessity. In the hills it is a luxury. On the other hand, broiled lobster is considered by some New Yorkers to be a rather luxurious repast. To the miner in camp it would be a curiosity. All of which is introductory to the statement that a little care and effort on the part of the cook will enable the men to have dishes which they will consider luxuries and will relish as such. A good tender cut of meat, some fresh vegetables, even the old stuff prepared in a slightly different way, might easily take on the aspect of a banquet to the simple tastes of the boarder.

It is therefore suggested that for several reasons it would be good policy on the part of the management to improve this often neglected department and furnish the best food obtainable. This course will be a large factor in inducing men to stay longer, and it is common knowledge that good food will render a man more efficient. It is even conceivable that where men are hired by the day or hour this increased efficiency might constitute an appreciable, though subtle, item in the cost accounts.

I have in mind a certain camp where daily wages run consistently lower than elsewhere in the district, but where the board is excellent and reasonable in price. The company runs the boarding house and hires a competent cook, who is given instructions to feed the men with the best of everything. As a consequence the company sustains a slight loss at the boarding house, but this is more than balanced by the difference in wages between this particular camp and the rest of the district. The men feel they are getting the best of the bargain, and, as a rule, are content to stay.

The United Eastern Mill, at Oatman, Ariz.*

A Modern Plant for Treating Gold Ores by the Cyanide Process—Single-Stage Crushing, Followed by Two-Stage Grinding With Short Ball Mills in Cyanide Solution—Straight Counter-Current Decantation Used

BY WHEELER O. NORTH

THE United Eastern Mining Co.'s property is situated in the Oatman Gold Road mining district of Mohave County, Ariz. The mine and mill are about twenty-six miles southwest of Kingman, the nearest railway connection. The ore consists of a mixture of calcite and quartz, with some andesite. The mineral values, which are mainly gold, alloyed with approximately 34 per cent, by weight, of silver, are extremely fine, so that fine grinding is a most important factor in extraction. The milling process, briefly, consists of single-stage coarse crushing, two-stage ball milling in cyanide solution, followed by combined mechanical and air agitation, and by straight counter-current decantation. The Merrill zinc-dust precipitation method is used to recover the valuable constituents of the ore, and is preceded by the Crowe vacuum treatment of the solution.

The most notable features of the plant are the absence of filters, and the use of short ball mills for fine grinding. As originally designed, the capacity of the mill was to be 200 tons per day, although the grinding facilities were to be capable of handling double that amount. By adding extra agitators and thickeners and by some alterations to the grinding equipment, the daily capacity has been raised to 285 tons. This, it was hoped, might be increased to 300 tons during the warm months of the present year.

As this paper deals primarily with plant operations, those interested in the mechanical description are referred to the article by Otto Wartenweiler,¹ the designing engineer, which gives the details and costs of design and construction. The following changes have been made since that article was published:

Two special simplex Dorr classifiers have been substituted for the two duplex Callow screens and bucket elevators, which classified the Marcy discharge and returned the oversize for regrinding. Three Dorr agitators 14x24 ft. diameter, and two Dorr thickeners, one 40x12 ft. and one 30x8 ft., have been added to the cyanide plant. A 4-in. Krogh centrifugal solution pump and a second Ingersoll-Rand compressor, 9x8 in., were also necessary additions.

FACTORS IN OPERATING COSTS

Water.—Water costs 52c. per 1,000 gal., and 210 gal., at a cost of 11c., are used per ton of ore milled.

Power.—Power costs about 2½c. per kw.-hr., and 1.25 hp. is required per ton of ore milled, costing 52c., or 24 per cent of the total cost.

Labor.—Labor, which is 26 per cent of the total cost, is entirely American, the wage scale being \$5 for helpers, \$5.50 for millmen, and \$6 for solution shift foremen. The repair crew receive \$4.50 and up. The total mill crew (exclusive of repair gang) of three shifts is normally fifteen men. The total labor cost, including superintendence, operation, and repairs, amounts to 56c.

per ton; the average wage is \$5.17 per shift; the tons milled per man on shift, 14.27; per man on repairs, 22.79; average, 8.76.

Supplies.—Supplies, which are 48.3 per cent of the milling costs, amount to \$1.06 per ton milled. All supplies are hauled from Kingman over a good mountain road, at a cost of \$8.50 per ton.

TABLE I. CONSUMPTION OF CHIEF ITEMS OF SUPPLIES

	Lb. per Ton of Ore Milled	Lb. per Ton of Solution Precip'd.	Per Oz. Fine Gold Recovered
Sodium cyanide:			
1917.....	0.722	0.198	0.717
1918.....	0.747	0.216	0.709
Average.....	0.735	0.208	0.713
Zinc dust:			
1917.....	0.548	0.150	0.544
1918.....	0.388	0.113	0.368
Average.....	0.464	0.141	0.450
Lime:			
1917.....	4.150	1.140	4.121
1918.....	4.930	1.430	4.675
Average.....	4.550	1.290	4.417
5-in. chrome balls:			
1917.....	0.925	.....	.....
1918.....	0.929	.....	.....
Average.....	0.927	.....	.....
1½- and 2-in. chrome balls:			
1917.....	2.12	.....	.....
1918.....	2.14	.....	.....
Average.....	2.13	.....	.....

Table II shows the operating costs per ton of ore milled for the last two years:

TABLE II. COST OF OPERATIONS

	Operating Labor	Repair Labor	Supplies	Power	Miscellaneous	Total
1917.....	\$0.4738	\$0.0902	\$1.0675	\$0.4751	\$0.0448	\$2.1514
1918.....	.....	.....	.....	.....	.....	.....
Average.....	.....	.....	.....	.....	.....	.....

In the mine, all ore passes through grizzlies set at 10 in. The 2½-ton skips dump automatically into the 250-ton flat-bottomed coarse-ore bin, which will deliver by gravity about 180 tons. The feed is taken by a 42-in. maple-lined, link-belt pan conveyor, using 2 kw. average load, and operating at a speed of 3 ft. per min. Two per cent of waste is here picked out at a cost of 85c. per ton.

The coarse crusher, a Telsmith No. 6 primary breaker, delivers 35 tons per hour of a 2-in. product, using 10 kw. Lately, the crusher has been preceded by 1½-in. grizzlies, thus relieving the load and materially reducing crusher repairs.

The Telsmith product is delivered by an 18-in. belt set at 20° incline, over a Merrick weightometer, to the fine-ore bin. This belt, operating at a speed of 250 ft. per min., handles up to 50 tons per hour, taking 7.6 kw. The weightometer results have proved entirely satisfactory.

TABLE III. COARSE-CRUSHING COSTS PER TON OF ORE

	Operating Labor	Repair Labor	Supplies	Power	Total
1917.....	\$0.0211	\$0.0092	\$0.0170	\$0.0112	\$0.0585
1918.....	.....	.....	.....	.....	.....
Average.....	.....	.....	.....	.....	.....

In the analysis of crushing costs in Table III, the increase in the second year is due largely to repair or replacement items.

Two-stage crushing would be desirable to secure finer ball-mill feed and doubtless could be affected at an equal, or even lower, cost than here obtained.

*Excerpted from an article that was presented at the Chicago meeting of the A. I. M. E., Sept. 22-26, 1919.
¹Bull. A. I. M. E., November, 1917.

A nice point of design is the relation of ore storage, particularly mine run, to the daily output. A storage of several days' ore should be provided for, as it is an important factor in the continuous and even operation of both mine and mill. This point is too often overlooked in otherwise well-designed plants for smaller-sized mines.

The fine-ore bin is a 24x24 ft. flat-bottom wood tank furnished by the Pacific Tank Co., and made of 4-in. merchantable Oregon pine. Its capacity is 500 tons. A rack-and-pinion gate feeding an 18-in. link-belt pan conveyor running at 33 in. per min., using 2 kw., delivers up to 15 tons per hour to the ball mill. The amount of feed is controlled by the opening of the bin gate. A record is kept of this opening, as measured by the number of teeth or notches on the bin-gate operating rack shown above a stationary marker at one side. These notches multiplied by the time give notch-hours, from which a known factor gives a fairly accurate estimate of the tonnage milled for each shift or for any desired period.

COARSE GRINDING

The ore, with the addition of lime, is fed to a No. 64 1/2 Marcy mill, working in closed circuit with a simplex Dorr classifier, set on a 3-in. slope and making thirty-four strokes per minute. This mill operates at 26 r.p.m. and carries a load of 9,000 lb. of 5-in. forged chrome balls. It reduces 260 tons of -2-in. ore to -20 mesh, using 67 kw. The grinding is carried on in a 1.6-lb. per ton KCN solution containing 1 lb. per ton of protective alkali (lime). The accompanying tables IV and V give the details of the mill operations and supplies.

Control of the coarse grinding is maintained by varying the specific gravity of the pulp in the Dorr classifier, and by the bin gate.

TABLE IV. BALL-MILL DATA

No. 64 1/2 Marcy mill	Peri- pheral Speed of Mill, Ft. R.p.m.	Tons per Hour Original Feed	Average Power Kw.-Hr. Gr.-Hr.	Kw.-Hr. Per Ton, Gr.-Hr.	Ball Load, Lb.	
2-in. feed ground to pass 20 mesh.	26	490	11.00	67	6.09	9,000
Allis-Chalmers 5 x 6 peb. mills 20-mesh feed ground 82 per cent -200.	28	440	3.75	48	12.80	8,000

TABLE V. TOTAL STEEL CONSUMPTION

No. 64 1/2 Marcy Mill	Lb. per Hour, Including Scrap	Lb. per Ton, Including Scrap	Per cent of Metal Lost as Scrap	Cost per Ton, Milled Ore
5-in. chrome-steel balls.	10.58	0.925	None	\$0.554
Feed-end liners, manganese steel.	0.717	0.072	32.2	0.110
Shell liners, manganese steel, step type.	1.650	0.163	45.5	0.268
Discharge grates, chrome steel.	0.566	0.055	48.4	0.137
Bolts, clamp bars, center liners	0.214	0.022	63.8	0.068
Total liner consumption.	3.147	0.312	43.0	0.583

The discharge of the mill is maintained at about 30 per cent moisture. The normal return circuit from the classifier is about two to one of original feed.

TABLE VI. COARSE-GROUNDING COSTS PER TON OF ORE

	Operating Labor	Repair Labor	Supplies	Power	Miscel- laneous	Total
1917	\$0.0429	\$0.0140	\$0.1097	\$0.1183	\$0.0001	\$0.2850
1918	0.0387	0.1165	1.424	1.465	0.021	3.462
Average.	0.0407	0.153	1.267	1.550	0.014	3.171

Table VI shows the Marcy mill costs. As in coarse crushing, the second year's costs are increased by renewals and replacements not occurring in proportionate amount in the first year's operation. Other factors tending to increase the 1918 costs were increases in

wages of 28 per cent, power 15 per cent, and supplies in some cases over 100 per cent.

Fine grinding is done in two 5x6 ft. Allis-Chalmers ball granulators. These mills carry a ball load of 8,000 lb. of 2-in. chrome steel pebs and consume 48 kw. They grind about ninety tons each from -20 mesh to 82 per cent -200 mesh, working in closed circuit with standard Model C, duplex, 54-in. Dorr classifiers, set at 2 1/2-in. pitch and operating at eighteen strokes per rake per minute. As this size classifier was found to be greatly overloaded for such fine separation, an 8-ft. Callow cone was installed to take the overflow of each classifier. The spigot product is returned by a Frenier pump to the classifier feed boxes. The slime overflow of the classifier was raised 4 in., which also helped materially in the classification.

The moisture content of the mill discharge is maintained at about 30 per cent, and, as in the coarse grinding, the main control is by the specific gravity of the classifier overflow.

The cones are equipped with a 1 1/2-in. discharge pipe, 30 in. below the overflow of the cone. After considerable experimentation, this size of outlet and head for the discharge proved to be the most satisfactory. This arrangement also acts as a trap for any coarse gold, so that a considerable increase in value of mill heads can be accommodated without the necessity of cutting tonnage. The spigot product is returned to the Dorr classifier by No. 3 Abbe Frenier spiral sand pumps.

TABLE VII. FINE-GROUNDING COSTS PER TON OF ORE

	Operating Labor	Repair Labor	Supplies	Power	Total
1917	\$0.0553	\$0.0328	\$0.1862	\$0.1899	\$0.4642
1918	0.0678	0.171	2.393	2.055	5.297
Average.	0.0618	0.246	2.140	1.981	4.985

It is of interest to note that comparative data in the district show that two-stage ball milling is about 15 per cent cheaper than the same work accomplished with stamps and tube mills. At the same time, indications are that single-stage ball milling shows the same supply and labor costs, but about 20 per cent greater power consumption.

TABLE VIII. TOTAL STEEL CONSUMPTION, INCLUDING SCRAP

	Lb. per Hour	Lb. per Ton Milled	Lb. per Ton Re- ground	Per cent Lost as Scrap	Cost per Ton Ore Milled
Allis-Chalmers 5 x 6-ft. Ball Mills	11.90	2.120	3.180	None	\$0.1662
14-in. chrome balls.	11.25	2.000	3.000	None	1.568
2-in. chrome balls.	16.30	2.900	4.350	None	1.592
15-in. east-iron balls.	0.220	0.040	0.060	52	0.072
Feed-end chrome steel liners.	0.037	0.007	0.010	40	0.012
Throat chrome steel liners.	0.630	0.115	0.173	28	0.218
Shell chrome steel liners.	0.029	0.005	0.008	40	0.014
Discharge grates, tool steel.	0.093	0.017	0.026	41	0.031
Discharge wedges, chrome steel.	1.009	0.184	0.277	45	0.347
Total liner consumption.					

AGITATION

From the fine-grinding department, the pulp flows by gravity to No. 1 Dorr thickener, arriving with a gravity of 1.12 and a dilution of 1 part of ore to 4.5 parts of solution. The thickened underflow is pumped by a duplex, Campbell & Kelly No. 4 diaphragm pump to the first of a series of seven 14x24 ft. diameter Dorr agitators, which are arranged to handle the continuous flow of pulp by gravity. The flow of pulp is 280 tons per day with a specific gravity of 1.40. The period of agitation is about sixty-two hours, after which dissolving of values is almost negligible. Agitation is effected by air, compressed to 30 lb. by two belt-driven Ingersoll-Rand compressors, Class E. R. I., size 9x8 in., using 15 kw. for each.

From the agitators the pulp flows through five 40-ft. Dorr thickeners arranged for straight counter-current work. The barren solution, 3.76 tons per ton of ore, is introduced in No. 4 thickener, and the wash water, about 0.82 tons per ton of ore, is introduced in No. 6 thickener. The flow at No. 6 thickener is split, and about one-third is sent to No. 7 thickener, a 30x8-ft. tank. The discharges of No. 6 and No. 7 thickeners flow together to the tailing pond with a moisture content of 0.82 ton of solution to 1 ton of ore.

The seven agitators, seven thickeners, and six duplex diaphragm pumps are all driven by one line shaft and consume an average of 6 kw., or just over 8 hp. The solutions are handled by direct-connected centrifugal pumps controlled by automatic float switches.

The primary thickener taking the dilute overflow of the cones, 280 tons of ore to 1,768 tons of solution, has a settling area of 4.37 sq. ft. per ton of ore, and a settling ratio of 38 cu. ft. per ton of ore. It is necessary, however, to operate this thickener with a low mud line to prevent colloidal material being drawn over into the gold tanks. About 870 tons of solution are precipitated daily, and the remainder, about 600 tons, is returned to the mill storage.

The regulation of all thickeners is maintained by varying the speed or the length of stroke of the diaphragm pumps. The mud line is determined by use of a weighted bottle, which will sink in solution but float on the mud. The maximum gravity is obtained with the highest mud line consistent with a clear overflow, other factors of alkalinity, temperature, and density of feed remaining constant. All additions of cyanide are made to No. 1 agitator, where the cyanide is built up to 2.7 lb. KCN per ton of ore.

The cyaniding costs are given in Table IX. The reduction in price of cyanide during 1918 more than offsets the adverse factors of power and labor.

TABLE IX. CYANIDING COSTS PER TON OF ORE

	Operating Labor	Repair Labor	Supplies	Power	Miscellaneous	Total
1917.....	\$0.0972	\$0.0237	\$0.4575	\$0.0884	.....	\$0.6668
1918.....	0.0867	0.0257	3553	1153	0.0018	5848
Average.....	0.917	0.248	4042	1025	0.010	6242

PRECIPITATION

The pregnant solution from the primary thickener flows by gravity to the No. 1 gold tank, from which it is pumped by a 2½-in. Krogh centrifugal pump through a Merrill central-slucing clarifying filter consisting of 28 frames 3½ ft. square. This filter delivers the clear solution to the No. 2 gold tank, or steady-head tank of the Crowe vacuum-treatment system. Zinc dust is added to the solution as it leaves the vacuum-treatment system. Control of precipitation is largely mechanical and is based on experience. The shift foreman checks the rate of zinc feed by weighing a 5-min. run, which is normally about 110 gm. When a new press is cut in, 20 lb. of zinc dust is added at once and the rate of feed is increased for six hours to 220 gm. per 5 min. The solution discharged from the press during the first 15-min. run is returned to the gold tank. This is with a precipitation rate of about thirty-six tons of solution per hour.

TABLE X. PRECIPITATION COST PER TON OF ORE

	Operating Labor	Repair Labor	Supplies	Power	Total
917.....	\$0.0003	\$0.0032	\$0.1274	\$0.0243	\$0.1552
1918.....	0.002	0.024	0946	0178	1150
Average.....	0.002	0.028	1103	0209	1342

The cost of precipitation as given in Table X showed

a decided reduction in 1918, due partly to the lower price of zinc dust but mainly to the use of the Crowe vacuum treatment, which effected a saving of nearly 50 per cent in the amount of dust used.

Vacuum treatment is carried out in a 4x10 ft. vacuum receiver or drum set on end, the 6-in. inlet of which is in the center of the top and 23.4 ft. above the solution level in the steady-head tank. The solution is poured down over a series of perforated trays. During this process, the occluded air is liberated and removed by the vacuum pump. The solution level in the vacuum receiver is maintained at a height of about 30 in. by a float operating a butterfly valve in the intake pipe. This float rod is fitted with an electric contact, which sounds a "Klaxon" alarm if for any reason the solution level gets dangerously low. The discharge of the vacuum receiver is from the center of the bottom. It feeds by gravity to a 7x8-in. triplex pump set so that the pump glands are 32.8 ft. below the solution level in the receiver. This keeps a slight pressure on the pump glands and prevents intake of air at that point. The zinc dust is fed to this pump, where it is mixed with vacuum-treated solution. It is then pumped to the refinery and the 32-frame, 36-in., Merrill presses. The barren solution from the presses is returned to the No. 4 thickener, part of it being used as cooling water for the air compressors on the way back.

CLARIFICATION

The clarifying filter is dressed with No. 10 duck. One set of cloths lasts about six weeks. The feed pressure on this filter varies from 8 lb. with a clean press, up to 33 lb. just before sluicing. The press is normally sluiced every six hours, using barren solution under 50 lb. pressure. It is very essential that the sluicing bar and nozzles be maintained at a high state of efficiency; a spare bar is always kept in readiness. The cloths become coated with a lime and alumina deposit, so that acid treatment is necessary every three days.

A hot solution of 0.9 per cent HCl is used with a contact of 60 min., the acid being circulated through the press by a 1½-in. centrifugal pump. After treatment, the press and acid-circulating system are drained and washed out, and the acid solution is stored, for future use, in a redwood sump tank.

The sludge from the ordinary sluicing of the filter is returned to No. 3 thickener, as it always contains gold and cyanide. Ordinary sluicing takes 10 min. and the acid treatment about 90 min., so that the filter normally operates 96 per cent of the day. Redressing requires nearly five hours. This filter can clarify 1,000 tons of solution per day under these working conditions.

TABLE XI. CLARIFICATION COST PER TON OF ORE

	Operating Labor	Repair Labor	Supplies	Power	Total
1917.....	\$0.0010	\$0.0017	\$0.0197	\$0.0073	\$0.0297
1918.....	0.004	0.020	0337	0100	0461
Average.....	0.007	0.018	0270	0087	0382

In both precipitation and clarifying costs, the only operating labor charged is that of changing cloths.

CLEAN-UP

The precipitation presses are dressed with four thicknesses of sheeting. The outside cloth is removed at each clean-up and a new cloth is added on the bottom. By this method no duck or canvas is required and the condition of the cloths as regards "liming up" is maintained nearly constant. When it is desired to clean a

press, the solution is cut off and the press is drained and blown with compressed air from 60 to 90 min.; this dries the precipitate to about 45 per cent moisture. The press is then opened and the precipitate is scraped into the precipitate wagon. The outside cloths, with some adhering precipitate, are removed and burned in a special furnace, and the resulting ashes are returned to the undried precipitate.

After determining the moisture content, the undried raw precipitate is fluxed with 11 per cent borax glass, 11½ per cent sodium bicarbonate, 6 per cent manganese dioxide, 3.3 per cent ground bottle glass, and at least 10 per cent of old slag shells from former melts, the percentage being in terms of the calculated weight of the dry precipitate.

A precipitate press ordinarily runs from five to six days, and yields about 130 lb. dry precipitate. In re-summing precipitation after a final clean-up, one press is given the entire flow. When this builds up a pressure of 35 to 40 lb., the second press is opened just enough to maintain the pressure of the first press below 45 lb. When the second press reaches 20-lb. pressure, the entire flow is turned into it and the first press is cleaned. This method is carried on until the end of the month, when a final clean-up is made. The solution is metered by a revolution counter on the triplex pump, which is calibrated at intervals with a known tonnage of solution.

MELTING

The fluxed wet precipitate is placed in No. 5 paper bags and fed to an oil-fired No. 150 Case tilting furnace, using a No. 100 long-lipped, graphite crucible. When ready for pouring, the crucible contains fifteen sacks of precipitate and yields a 600- or 700-oz. button and from 40 to 50 lb. of slag. This charge is poured into a conical mold and allowed to set for a few minutes. The slag is then tapped through a hole about 2 in. above the gold button, and run into cold water for granulation. The granulated slag, which carries about 25 oz. of gold per ton and as much silver, is ground in a small mill and concentrated with a laboratory-size Deister table. The bullion buttons are remelted and cast into bars weighing about 150 lb. each.

TABLE XII. REFINING COST PER TON OF ORE

	Operating Labor	Repair Labor	Supplies	Power	Miscellaneous	Total
1917.....	\$0.0437	\$0.0051	\$0.0710	\$0.0004		\$0.1202
1918.....	.0444	.0026	.0366	.0008	\$0.0017	.0861
Average.....	.0441	.0038	.0530	.0006	.0009	.1024

For convenience of comparison, the costs of clarifying, precipitating and refining for 1918 are also given per oz. of gold and per ton of solution precipitated:

TABLE XIII. 1918 COSTS PER TON OF SOLUTION PRECIPITATED

	Operating Labor	Repair Labor	Supplies	Power	Miscellaneous	Total
Clarification.....	\$0.0001	\$0.0006	\$0.0098	\$0.0029		\$0.0134
Pre-precipitating.....	.0001	.0007	.0274	.0052		.0334
Refining.....	.0129	.0008	.0106	.0002	\$0.0005	.0250

TABLE XIV. 1918 COSTS PER OUNCE FINE GOLD RECOVERED

	Operating Labor	Repair Labor	Supplies	Power	Miscellaneous	Total
Clarification.....	\$0.0003	\$0.0019	\$0.0318	\$0.0095		\$0.0435
Pre-precipitating.....	.0002	.0023	.0892	.0168		.1085
Refining.....	.0419	.0025	.0345	.0007	\$0.0016	.0812

REFINING COSTS

The costs of clean-up and refinery, as is the case with those of precipitation, were materially reduced in 1918 by the use of the vacuum process. The zinc content of the crude precipitate was reduced from 30 to 35 per

cent to 6 or 7 per cent, and the bullion content was raised from 54½ to 71 per cent. This increase in metal content allowed the substitution of the No. 100 crucible for the No. 150, as the smaller size easily yielded a button from 600 to 700 oz., which is about as large as can be conveniently charged into a red-hot furnace without danger of cracking the crucible.

The cost of refining, averaging a little over 10c, is only about 4½ per cent of the total cost of operations.

The Metallurgy of Wulfenite*

Probably 90 per cent of the molybdenum produced in the United States during the war period was derived from molybdenite, according to J. P. Bonardi, of the U. S. Bureau of Mines, in spite of the fact that prior to 1915 the wulfenite ores of Arizona supplied the larger part of the molybdenum. This is attributable to the successful application of flotation to molybdenite and because the deposits of the latter are larger. The wet concentration of wulfenite ore offers little difficulty, but a number of associated minerals—vanadinite, cerussite, anglesite, galena, pyromorphite and mimetite—come out in the concentrate, rendering its subsequent treatment somewhat difficult. Usually, a concentrate of 15 to 20 per cent MoO₃ is the best that can be obtained, and buyers of concentrate frequently set the latter figure as their minimum content. Wulfenite has the advantage over molybdenite that it frequently has gold in association, and both this and the lead are recovered in the treatment of the concentrate.

Any of three methods of treatment may be used: (1) an acid leach; (2) an alkaline leach; (3) fusing with something that will reduce the lead to the metallic form and take the molybdenum into the slag. The first has so many disadvantages compared with the other two as not to merit much consideration. Of the various alkalies, sodium sulphide is, perhaps, the most satisfactory, as the molybdenum goes into solution as sodium molybdate, the lead and precious metals remaining in the residues. This process is used by at least one company in the United States at present. The high-grade calcium molybdate thus produced can be used for the production of ammonium molybdate, ferromolybdenum, or added directly to the steel in the manufacture of alloy steels. By fusing with soda ash, caustic soda, and coal, the lead is recovered in the form of bullion. The sodium molybdate thus formed can be leached from the slag and the metal precipitated in the form of calcium molybdate, which can be utilized as stated above.

In one of the experiments a recovery of 96.7 per cent was made on the molybdenum and of 98.5 per cent on the lead, and it is estimated that a 90 per cent extraction of both would represent commercial practice. At present prices there is a difference of \$270 between the value of the products and the cost of the chemicals in treating a ton of typical concentrate, so that the process would seem commercially feasible.

The Gold Mines of Ontario, chiefly in the Porcupine district, have so far yielded \$51,000,000 worth of the metal. The Cobalt camp has produced \$185,000,000 in silver, and the copper-nickel mines of the Sudbury district have produced \$138,000,000.

*From the *Journal of the Franklin Institute*, September, 1919.

DETAILS OF PRACTICAL MINING

Suggestions From Practice for the
Superintendent, Foreman,
and Miner

Rock Grizzly at the Franklin Mine

BY A. O. CHRISTENSEN

A grizzly used at Franklin, N. J., for handling rock filling for the mine is illustrated in the accompanying sketch. The rock arrives through mill-holes as broken by the blasting, with little or no blockholing. The object of the grizzly is to act as a screen and separate

The critical feature of the arrangement is the brow marked B. Most of the work of running the rock through the chute is done by means of a bar operated just below the brow. If the brow is higher than a man's shoulder, the work is hard, tiresome, and dangerous, and it has been found that the distance of 5 ft. above the grizzly is the best height for B. Directly in front of the grizzly, and rising from a level with it, is a pile of material which is never disturbed and slopes up at its angle of repose. If the brow is situated over this pile, a part of the opening available trouble free running of the rock is lost and considerable trouble is caused by hang-ups and the entrance of chunks that are too large to pass through the opening. If the brow is placed back from the front edge of the grizzly, no purpose is served by the latter and it is subjected to harder use, because the chunks drop directly on the front edge from above, instead of rolling on it.

The length of the grizzly as measured from below the brow depends on the height of B and the angle of repose of the rock. Assuming this angle as 45°, and the height of B as 5 ft., the grizzly should be 6 or 7 ft. long. To make it greater than this would involve needless expense and is dangerous for the men when the run of rock begins after having been hung up.

Practice with various forms of grizzlies, and the study of their operation, show that, for this type, the following dimensions and arrangements have been

found satisfactory: The grizzly itself is made of horizontal 9-in. x 12-in. timbers, fitted into hitches, strengthened, and protected from wear by angle irons and spaced 2 ft. between centers. Across these are laid heavy railroad rails, spaced 15 in. between centers, inverted, and overlaid with strips of 1-in. flat iron to take the wear. These may be bolted to the timbers in different ways, but provision should be made for effecting easy renewal.

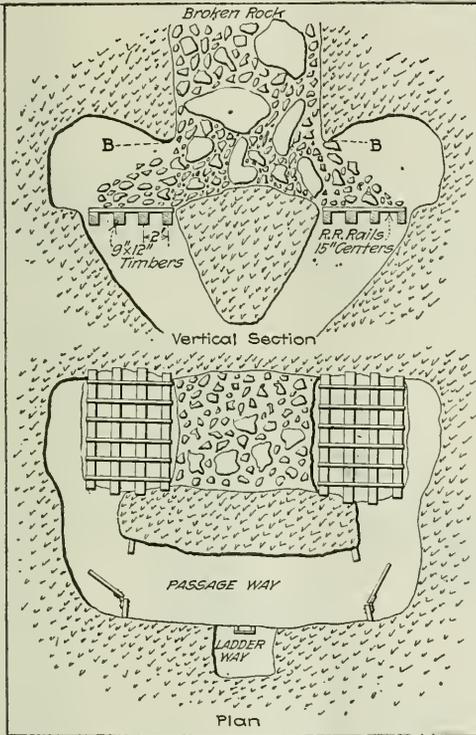
Two men can work on each grizzly, but it has been found more economical to have one helper on each grizzly and one man in charge. Chunks that are too large to pass the grizzly or to be broken with a hammer are rolled to one side and blockholed until so many have accumulated that they interfere with the work. In blasting, both sides are fired at the same time, the doors in the passageway are closed, and the men enter the ladder-way and close the door above, to protect themselves from the concussion.

Safety Device for Dumping Ore Into Skips

BY A. C. BIGLEY

Butte, Montana.

Station tenders dumping loaded ore cars directly into the skip from the station are in constant danger of being struck by rock falling down the shaft, and there is the possibility that the engineer may move the skip during the dumping operation and this often results in slight, serious, or fatal accidents. As a means of



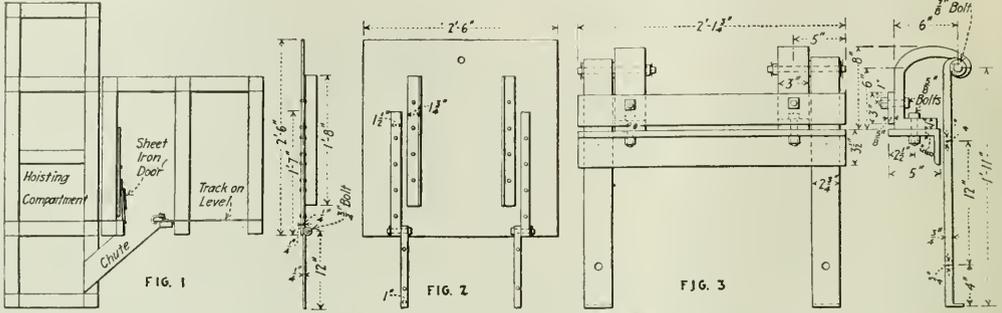
GRIZZLY FOR HANDLING ROCK FILLING

or classify the rock so that the proportion passing through will be of a size that may be delivered conveniently into tram cars by means of chutes.

The rough rock reaches the grizzly through the mill-hole, which is about 12 ft. in diameter. The capacity of the chute below the grizzly and above the haulage level is sufficient to hold whatever rock is produced during several shifts' work, so that failure to remove the rock from the chute may not immediately interfere with the running of the rock through the grizzly. Two separate grizzlies are employed, the capacity thus being doubled, one grizzly complementing the other in case of hang-up.

overcoming injury from these sources and at the same time increasing the efficiency in dumping directly into skips (in the absence of skip chutes or ore pockets) a scheme was devised at the Berkeley mine of the Anaconda Copper Mining Co., of Butte, Montana.

The ground in front of each hoisting compartment of the shaft was removed as shown in Fig. 1 and is lined on the sides and bottom with sheet iron, making a slide or chute with an opening into the shaft 20 in.



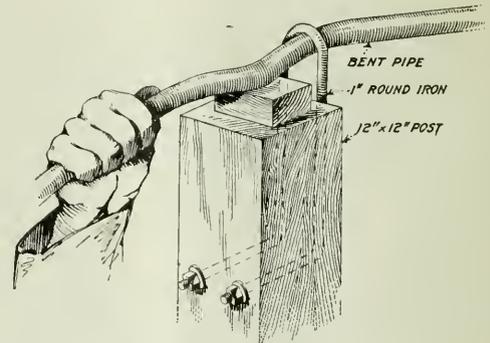
PLAN AND ARRANGEMENT OF SAFETY DEVICE FOR DUMPING ORE INTO SKIPS

deep and 19 in. wide. Sheet-iron doors, as shown in Fig. 2, cover the openings on the station floor when not in use. The doors when closed will not interfere with the caging of waste or handling of supplies on the station. In order to provide a dump or stop for the cars as they are being emptied, the device shown in Fig. 3 was made, and this prevents the car from pushing ahead and holds it stationary while it is being dumped. After the skip has been filled, the stop is turned over and folded into the slide or chute, a part of it serving as a support for the door when it is closed. This method protects the station tenders from danger, as their work is done at a safe distance from the shaft, and all station doors are closed. By the use of the old method it was necessary to "re-spot" the skip after three cars were dumped, on account of the stretching of the rope. The skip can now be filled without "re-spotting," and an easier method of dumping and handling of the cars is provided.

A Straightener or Bent Pipe

Pipes that have been laid through crooked drifts and up crooked raises are usually badly bent, and their much of the equipment is recovered from parts of the mine that have been worked out, an assortment of pipe removal requires further bending, and to this is added the falls of ground and shooting on the pipes. At most mines where development is progressing rapidly and

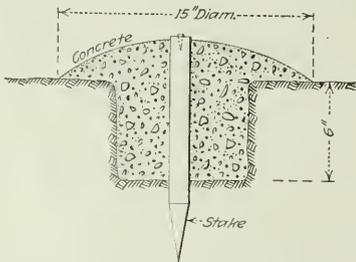
accumulates. The major part of this will be of 1-in. size, bent and twistest. Pipe of small diameter is readily straightened sufficiently to be used again. This straightening should be accomplished by rebending, and not by pounding, and, to do this, some means of holding the pipe is necessary.



DETAIL OF BENT-PIPE STRAIGHTENER

Concrete Collar for Survey Station

The sketch illustrates a method that may be used for the purpose of preserving reference stations in survey



METHOD OF CONCRETING SURVEY STATION

work, especially in the vicinity of an industrial plant or where construction operations are in progress.

The accompanying illustration shows a simple device which enables one man to straighten a large number of pieces of 1-in. pipe in a short time. It consists of a good-sized post, 8 x 8 in. to 12 x 12 in., set firmly in the ground, and about 4 ft. high. A piece of 1-in. round iron is bent into an elongated U-bolt, about 3 in. across the two arms, and the two ends are bent at right angle to the U-part, passed through the post, and fastened securely in place by nuts. In straightening a pipe, it is passed through the U and over a small block on top of the post. The post is at such a height that the pipe is easily manipulated, and the length of pipe offers sufficient leverage to enable the workman to bend it with little exertion.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War Minerals Relief

An important ruling, having to do with net losses, has been made by the War Materials Relief Board in connection with a claim by two partners, one of whom had a two-thirds interest in the property, and also had interest in other properties with the same product. His profits on the other properties more than covered his loss in the one covered by the claim. His partner, having no profits from similar operations, was awarded one-third of the amount allowed on the claim, it being specified that the other partner was not to share in the award. The exact wording of the ruling is: "Net losses must be individual and must reckon with all operations of any claimant for the production of the minerals specified in the act. No claimant can be permitted to ask for an award for net losses from unsuccessful enterprises alone. The term 'net losses' must be construed as such; that is, when the result of all operations of the claimant in the named minerals is unprofitable."

About 154 claims have been thrown out by the commission, as it was clearly shown no request or demand was made by the Government agencies named in the bill. Many protests are being received, but the commission is unable to act otherwise in view of the Attorney General's interpretation.

National Conference of Labor

National Industrial Conference was called to order on October 6 by Hon. William B. Wilson, Secretary of Labor, temporary chairman; Rowland B. Mahany acting as temporary secretary. John Barrett, Director General of the Pan-American Union, extended a cordial welcome to the conference on behalf of the governing board, and concluded a graceful and felicitous address by expressing the belief that all present were working for good will, particularly co-operation, and permanent peace in American industry.

Temporary Secretary Mahany read President Wilson's letter of September 3, 1919, calling the conference. A roll-call showed that all save three or four invited by the President were present. Secretary Wilson delivered an address, wherein he referred to the fundamental causes of industrial unrest, and called attention to the fact that permanent industrial peace must be based on industrial justice, and that it is not sufficient that either side to an industrial controversy should be the sole judge of what constitutes justice.

It was resolved that each of three groups of conferees, representing Employers, the Public and Labor, should appoint three members of a committee of nine on permanent organization of the conference;

and that, in like manner, a committee be appointed on rules and procedure. The conference, which promises to be of historical importance and great public service, opened auspiciously, an atmosphere of good feeling, public spirit, and desire to co-operate and to be mutually helpful, prevailing.

Exports of Mining Machinery

The exports of mining machinery from the United States during August, 1919, according to the figures of the Bureau of Foreign and Domestic Commerce, are as follows:

Countries	Oil Well	All Other
France	\$ 2,100	\$ 69,562
Italy		205
Netherlands		28,113
Norway		6,223
Roumania	41,331	
Spain		17,267
England		84
Canada	9,752	44,288
Costa Rica		263
Guatemala		1,150
Honduras		1,227
Nicaragua	1,304	3,323
Panama	1,268	
Mexico	106,565	53,090
Miquelon, Langley		2,165
Newfoundland and Labrador	200	
Barbados	866	
Trinidad and Tobago	4,428	
Cuba	4,421	9,098
Dominican Republic	153	
Argentina	33,933	
Bolivia		2,532
Brazil	1,742	4,000
Chile	230	87,597
Colombia		20,765
Ecuador	706	302
British Guiana	23	
Dutch Guiana		1,219
Peru	3,909	15,196
Venezuela		255
China		13,483
British India	31,183	3,359
Dutch East Indies	100,154	10,553
Japan	4,760	16,687
Russia in Asia	16,000	21,752
Siam		1,723
Australia	35	54,729
New Zealand		266
Philippine Islands	39,947	2,969
Belgian Congo		43,824
British South Africa		58,056
Morocco	183	
Portuguese Africa		38,207
Egypt		158
Total	\$411,276	\$733,703

Tariff on Potash

Germany is boasting that she will continue to control the potash output of Alsace, according to Representative Kinkaid, of Nebraska. Mr. Kinkaid urged that the bill providing duties on imported potash be reported promptly to the House and passed, and also called attention to the potash resources of the United States, urging their development. He cited the fact that the American producers proposed that the maximum price for next year shall not exceed \$2.50 per unit for their potash, in attempting to refute the claims that the potash bill will cause fertilizer prices to go to prohibitive levels.

Mine Taxation Discussed at Washington

Chicago Meeting Showed Need of Further Conference—
Many Prominent Mining Men Take Part—Committees Formed to Consider Interests of Special Mining Industry

AT THE meeting of the American Institute of Mining and Metallurgical Engineers in Chicago, the subject of mine taxation under the income-tax and excess-profit tax laws was discussed by L. C. Graton, of the Bureau of Internal Revenue, who is in charge of copper in the division of Natural Resources of the Income Tax Unit. Mr. Graton read a paper on the subject of administrating the tax, which was discussed with great interest at several sessions, under the chairmanship of R. C. Allen. The Chief of the Division of Natural Resources, Mr. Darnell, was also present at the meeting, and requested further assistance and co-operation by the Institute. Owing to the feeling that further conferences were necessary, H. V. Winchell, president of the Institute, appointed a committee of the Institute to meet in Washington in co-operation with the Internal Revenue Bureau. This committee assembled on October 6 at the Treasury Building and was welcomed in a cordial speech by Commissioner Daniel C. Roper, and in brief speeches by Mr. Darnell and Mr. Graton. The personnel of the executive committee selected by President Winchell is as follows: C. F. Kelley, chairman, S. J. Jennings, James R. Finlay, R. V. Norris, J. E. Spurr, W. G. Swart, and Paul Armitage, secretary.

The fact was emphasized by Mr. Kelley, in addressing the committee, that the function of the body was to formulate principles of taxation and interpret the law, rather than to criticize the existing legislation and its administration. He made it plain that, if the committee did not point out improvements and formulate correct and satisfactory principles, the metal industry would not be in a position to criticize Congress or the Revenue Bureau for any alleged shortcomings. For further action, it was decided to divide the committee into three sub-committees as follows: (1) Committee on invested capital—F. S. Peabody, chairman; Walter Douglas, Mr. Peterson, Mr. Schofield, J. F. Callbreath, C. F. Kelley, and W. G. Mather; (2) committee on valuation methods—J. P. Channing, chairman; R. C. Allen, J. R. Finlay, R. V. Norris, Arthur Thacher, J. E. Spurr, John P. Gray, and George F. Wolff; (3) committee on depreciation and depletion—W. G. Swart, chairman; R. M. Bennett, Paul Armitage, H. A. Guess, F. L. Garrison, W. A. Williams, J. L. Bruce, Walter Fitch, and Mr. Schree.

These three subcommittees held frequent meetings, and when the main committee of the whole was convened on the afternoon of October 9, each of the subcommittees presented resolutions and recommendations, which they had drawn up, and which were submitted to the committee of the whole for such action as was thought desirable. The matter was referred by this committee to the executive committee, which decided to go over these recommendations at

Atlantic City on October 20, and then formulate them definitely, so that they could be presented to the officials of the Bureau of Internal Revenue. The executive committee was enlarged so as to include W. G. Mather, Walter Fitch, John P. Gray, Arthur Thacher and Walter Douglas, Mr. Darnell was made an associate member.

In the meantime it was arranged that the resolutions decided upon should be considered by specially constituted committees representing the principal mining industries, which committees would be formed by the various members of the executive committee, who would act as chairmen. These committees are as follows: Copper, Walter Douglas; coal, R. V. Norris; metal, W. G. Swart; lead and zinc, J. R. Finlay, and precious metals, J. E. Spurr.

As seen from the list of members of the Institute, who make up the general committee, this series of meetings was successful in bringing together men of wide experience, and in affording opportunity for intensive discussion of the vital problems connected with the administration of the income-tax law and the excess-profits tax law in regard to mines. Moreover, the spirit of co-operation shown by Commissioner Roper and his staff promises well for the future.

Organization of the mining unit of the subdivision of natural resources in the Internal Revenue Bureau is relatively new, the present staff of mining engineers having but recently entered upon their duties. It is owing to the efforts of Mr. Darnell and Ralph Arnold that such an organization has come into existence.

Chronology of Mining, September, 1919

Sept. 1—Strike of miners ended at Virginia City, Nev.—Yellow Pine Mining Co., Goodsprings, Nev., voluntarily raised wages 25-50 cents.

Sept. 2—House passed zinc tariff bill.—Fire broke out in abandoned stopes of Hercules mine, Burke, Idaho.—Wellington Mines, Breckenridge, Col., resumed operations.

Sept. 3—Senate passed oil-land leasing bill.

Sept. 4—Mining companies at Colbalt, Ont., issued statement of their position as to labor strike existing.

Sept. 8—Strike at Cobalt, Ont., ended.

Sept. 9—Suit for infringement of flotation patents filed against Nevada Consolidated Copper Co. by Minerals Separation North American Corporation and Minerals Separation, Ltd.

Sept. 10—U. S. Supreme Court, at Boston, handed down decision in suit of Louis Ross against Albert C. Burrage to obtain part of profits from sale of mining properties in Chile to Guggenheims; court ruled Burrage was entitled to only \$100,000.

Sept. 14—Hurricane did much damage in various Texas oil fields.

Sept. 15—Public Lands Committee of House decided to expedite passage of general leasing bill.

Sept. 16—Herbert Hoover given dinner by A. I. M. E. in New York, upon arrival from Europe.

Sept. 18—Cloudburst put American Smelting and Refining Company's smeltery at Garfield, Utah, out of operation for several days.—First break occurred in Metal Crafts strike at Butte, Mont., when machinists voted to return to work.

Sept. 19—Governor of Minnesota vetoed Bendixen bill levying 5 per cent tax on iron ore.

Sept. 22—General strike of steel workers began.—School opened for teaching English to aliens in Utah mining camps, as required by state law.—Chicago meeting of A. I. M. E. and other societies opened.

Sept. 25—Fire broke out on 800 level of Homestake Mining Co., Lead, S. D., shutting down all mills.

Sept. 26—Arizona Commercial Mining Co. again filed suit against Iron Cap Mining Co., after former suits had been thrown out by Massachusetts court for lack of jurisdiction.

Sept. 27—Strike, which began August 19, settled at Chrome, N. J., plant of United States Metals Refining Co.

Sept. 29—Calumet & Hecla Mining Co. announced gift of life insurance policy to each of 10,000 employees.—New building dedicated at Pittsburgh, Pa., the U. S. Bureau of Mines experiment station.

New Process for Removing Sulphur Dioxide from Smeltery Smoke

A method for treating gases containing small amounts of sulphur dioxide, such as from 1 to 2 per cent, has been patented by E. V. Espenhahn, of the Broken Hill works, at Port Pirie, South Australia (U. S. Patent No. 1,315,183, Sept. 2, 1919). The gas is passed through a spray of sodium thiosulphate solution in washing towers or scrubbers, forming a solution of the polythionates. Part of this liquid is then heated to about 100 degree c., when decomposition takes place with the formation of sodium sulphate, sulphur dioxide, and free sulphur; the latter agglomerates into porous masses and is easily recovered.

The sodium sulphate solution is cooled, the salt precipitated out, filtered, mixed with coal or coke and heated to about 1,000 degree c., to form sodium sulphide. This is leached out of the fused mass and clarified. It is then brought into contact with a part of the polythionate solution, with which it reacts to form free sulphur and thiosulphate. The thiosulphate so formed is used to wash the incoming gases, making the process a cyclic one. Modifications of the process may be employed to produce concentrated sulphur dioxide, sulphuric acid, or thiosulphate.

September Pig-Iron Production

Pig-iron production in September, 2,441,554 tons, though 301,834 tons less than that of the 31-day month of August, was larger than July's output of 2,428,541 tons, according to Iron Age. The daily averages for September, August and July were 81,385, 88,496, and 78,340 tons respectively. The effect of the strike is shown in a net loss of 103 furnaces on the active list. Most of them were banked as October came in, but many are now in operation. Against a rated capacity of 93,360 tons daily for 265 furnaces active September 1, the rate of production

of the 162 furnaces in blast October 1 was only 50,-100 tons, indicating to how large an extent the larger furnaces were crippled.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for August, 1919, and the figures for August, 1918, as finally revised, are as follows:

IMPORTS, AUGUST, 1918 AND 1919		
(In pounds, unless otherwise stated)		
	August, 1918	August, 1919
Metals and ore:		
Antimony ore, contents	18,951	78,400
Antimony ore, contents	2,886,926	741,550
Antimony matte, regulus or metal.....		
Copper:		
Ore, contents	5,581,878	4,172,049
Concentrates, contents	5,629,619	3,262,921
Imported from (in part):		
Canada	3,981,670	2,870,938
Mexico	8,935,251	3,204,371
Cuba	2,127,800	2,143,507
Chile	1,213,378	169,385
Peru	2,288,016	54,633
Venezuela		720
Unrefined, black, blister, etc.	11,708,671	15,954,504
Refined, in bars, plates, etc.	168,027	439,151
Old, etc., for remanufacture	111,196	98,400
Composition metal, copper chief value.....		
Lead:		
Ore, contents	2,802,856	860,654
Billion, contents	12,397,866	4,959,021
Imported from (in part):		
Canada	2,678,977	300,765
Mexico	12,398,506	5,508,058
Pigs, bars and old		1,120,089
Pyrites, long tons	69,730	30,705
Imported from (in part):		
Spain, long tons	17,674	21,275
Canada, long tons	41,469	9,430
Tin ore, long tons	825	728
Tin bars, blocks, pigs, etc.	16,619,837	9,872,459
Imported from (in part):		
Straits Settlements	6,877,092	2,746,259
Dutch East Indies	5,481,194	
United Kingdom	1,901,348	
Australia	780,640	224,000
Hongkong	1,103,546	
Zinc:		
Ore, contents	3,412,338	1,606,497
Imported from:		
Canada	1,247,740	195,646
Mexico	2,164,598	1,402,151
Blocks or pigs, and old		11,545
Manganese ore, long tons	33,976	3,240
Imported from (in part):		
Cuba, long tons	972	193
Brazil, long tons	25,520	3,600
British India, long tons	1,650	
Tungsten ore, long tons	583	653

EXPORTS OF COPPER, LEAD AND ZINC		
(In pounds)		
	August, 1918	August, 1919
Copper:		
Ore, contents	107,120	
Concentrates, contents	34,000	10,500
Unrefined, black, blister, etc.	50,247	1,176,330
Refined, in ingots, bars, etc.	45,876,440	47,385,901
Exported to (in part):		
France	12,378,446	8,901,736
Italy	3,981,546	4,490,261
United Kingdom	22,393,051	11,355,619
Canada	4,688,948	1,211,643
Composition metal, copper chief value	29,477	
Old and scrap	5,531	20,223
Pipes and tubes	303,601	295,856
Plates and sheets	762,052	591,784
Wire, except insulated	1,837,989	3,203,901
Lead:		
Pigs, bars, etc., produced from domestic ore.....	15,194,602	2,653,083
Pigs, bars, etc., produced from foreign ore.....	3,141,888	6,602,822
Exported to (in part):		
Canada	3,061,859	230,023
United Kingdom	12,711,666	
Argentina	1,600	1,272,282
Japan	2,174,018	3,304,086
France		2,264,189
Brazil	268,987	768,719
Zinc:		
Dross	4,463,275	
Spelter:		
Produced from domestic ore	5,665,452	23,204,987
Produced from foreign ore	2,748,397	1,619,872
Exported to (in part):		
France	5,911,693	6,914,357
Italy	1,746,618	2,076,780
United Kingdom	156,718	11,390,236
Canada	487,273	230,642
Mexico	5,602	120
Japan		4,048,994
In sheets, strips, etc.	2,545,289	3,964,278

BY THE WAY

A Rare Find

"A new metal in the mining world of northern Ontario," says the Sudbury Star, "is to be developed by a syndicate of individual members of a well known firm of Sudbury, Ont., who have purchased a body of barytes north of the town along the line of the Canadian National Railways. The metal is high in chemical properties and is used extensively in the sugar, paint and rubber industries."—From a private source we are informed that this metal runs as high as 100 per cent in chemical properties, and is not considered unusual at that.

A Short Course in Timbering

Back in the days of the war, which is now so fortunately finished, it was the custom among some of the officer schools in France to send their young hopefuls out among the various engineer outfits for practical experience in technical work. A sergeant of the good old 27th relates one of his experiences with this type, showing vividly the importance usually attached to the intricacies of mining. It happened on one of the many cold, wet mornings that the sergeant had a detail busily at work timbering a dugout, when a natty young prospective shavetail breezed in with, "What's on today, sergeant, what are we doing?" "Timbering," "Timbering?" "Yup." "But I don't understand; there must be some mistake, I shouldn't have been sent here." "Why not?" "Why I took timbering yesterday."

Zinc in the Movies

Having seen several of the Ford Educational Weekly moving pictures during the summer, the secretary of the American Zinc Institute visited Detroit recently and called to the attention of the Ford Motor Company the educational possibilities of a film depicting the zinc industry, at the same time submitting a skeleton scenario, and that company at once agreed to make and distribute in connection with its Ford Educational Weekly service a moving picture showing the manufacture and uses of zinc. The photographs are now being taken, and when this work has been completed a committee from the Institute will assist in the editing of the film. The picture will be entitled "The Story of Zinc—the Everlasting Metal," and its sub-title, "An Exposition of Zinc from the Mine to the Roof of the American Home," indicates that it will include—beginning with the Missouri-Kansas-Oklahoma field—the mining, milling, loading, transporting, roasting and smelting of the ore, the casting and rolling of the metal, and the manufacture of sulphuric acid, zinc dust, zinc oxide and lithopone. Old and new uses of zinc will be particularly featured. It is planned to release the zinc film early in 1920.

Evils of Competition

The rivalry between shifts in getting out tonnage, though always encouraged by the superintendent, is nevertheless a frequent source of trouble to the latter. This is especially true on the iron ranges during the stock piling season, when tonnages are necessarily estimated and it is not easy to tell whether the various tricks resorted to are honest or otherwise. One of these subterfuges was accidentally brought to light by old Pierre, the stockpile roustabout at the Lake Angeline mine, in Michigan, back in the days when mines were operated on the unit system. Under this system a mine car filled a skip and a skip filled a stock-pile car.

The tally boy was also the skip tender, besides being related to anywhere from one to half a dozen of the men in the gangs at work. Old Pierre's understanding of the complexities of life was limited to the knowledge required to push the little car out on the pile and back to the skipway. Likewise he knew it was cold out on the dump. It was not in his mind either to hurt the plotters or help his employer when he hailed the captain one frosty morning and said: "Meestir captain, please to have de carpentair to put de leetle board on de side of de car. Now I can take two skip to one car; if I have de leetle board, I can take tree to one tam—and Cras, she's cold on de h'end of de dump."

The Popular Diamond

Some interesting facts about the market for diamonds were disclosed recently by an American importer just back from a diamond-buying visit to Europe, states the Financial Times, of London. Diamond sales in Amsterdam are cosmopolitan gatherings, for in the crowd one sees Japanese, Chinese, Hindus, Mexicans, Turks, Persians, Australians, South Americans, and men from every country in Europe. According to the expert, there was never such a demand for diamonds as there is today. Japan has become an enormous purchaser. There were many Hindus and Brazilians among the buyers, but of the South American countries Argentina is the heaviest purchaser. India was once the world's sole source of diamond supply, and when the Indian mines failed Brazil held that position. The Indian mines are exhausted, and the Brazilian mines are either nearly exhausted or inadequately worked, and are no longer an important factor in the world's diamond output. Germans, Austrians, and Russians at Amsterdam, apparently with plenty of money, are buying all the diamonds they can get. All the neutral countries were heavy diamond buyers during the war, and their market demands are still immense. But it is surprising to find that Germany, Austria, and Russia, which are supposed to be down and out financially, should now be cutting such an important figure in the world's diamond markets. It is more than probable that the present instability of less concrete forms of property is responsible for the popularity of the diamond. *Multum in parvo* is certainly a sound motto for the modern millionaire who wishes to hold on to his riches.

PERSONALS

J. M. Hill, the geologist of the U. S. Geological Survey, who is in charge of matters pertaining to platinum, has returned from a visit to the Colombian platinum deposits.

William W. Mein was recently in San Francisco, leaving on September 26.

C. G. Dainpre, manager of the Associated Gold Fields, Larder Lake, Ontario, has resigned.

J. B. Tyrrell, of Toronto, is examining properties in the Rice Lake district, in Eastern Manitoba.

R. H. Stewart has gone to Texas in the interests of the Gunn-Thompson syndicate, of New York.

Robert A. Kinzie, in charge of operations of the Engels Copper Co., was recently in San Francisco.

Edward Mosehauer, of the United Metals Selling Co., will go abroad to represent the Copper Export Association in Germany.

Sidney L. Shouts, of Wallace, Idaho, has gone to California, being engaged by the Government in the adjustment of war claims of chrome producers.

D. G. Kerr, vice-president of the United States Steel Corporation, and a party of friends spent several weeks' vacation in the woods near Watersmeet, Mich.

Willet G. Miller, who has been in England as Canadian representative of the Imperial Mineral Resources Bureau, is expected to return to Toronto in October.

Harry W. Darling, field engineer for the Crown Reserve Mining Co., Ltd., was in San Francisco during September and expected to leave for Porcupine, Ontario.

Carl A. Allen, Utah Inspector of Mines, attended the dedication of the Pittsburgh laboratory of the Bureau of Mines, and visited several Eastern cities before returning West.

M. D. Foster, formerly chairman of the House Committee on Mines and Mining, now a member of the War-Minerals Relief Commission, is seriously ill at his home at Olney, Ill.

John F. Bethune has been appointed secretary of the U. S. Tariff Commission. The position is of particular importance at this time, owing to forthcoming revision of tariff laws.

A. R. Montagu has been visiting **W. S. Boyd**, in Ray, Ariz., after two years spent in investigation of the mineral resources of the State of Bahia, Brazil, especially in connection with gems.

Frederick Burbidge, of Wallace, Idaho, manager of the Federal Mining & Smelting Co., was in New York, and will return by way of Oklahoma, where the company operates several zinc mines.

Major Julius M. Cohen returned from France in command of the 319th Engineers. Major Cohen was Chief Engineer of Construction during the last year at Camp Pontanezen, Brest, France.

Carl Tombo, of Philadelphia, Pa., was in Placerville, Cal., Sept. 8 and 9, examining, with **Burr Evans**, consulting engineer of Placerville, a free-gold mining property in El Dorado County, near Placerville.

L. Keith Ward has been appointed secretary to the South Australian Department of Mines, succeeding **F. C. Ward**. **L. Keith Ward** will still continue in his position of government geologist and director of mines.



Harris & Ewing
JAMES M. HILL

John A. Percival, of New York, president of the Consolidated Interstate-Callahan Mining Co., recently inspected the property near Wallace, Idaho. Mr. Percival is also interested in other mining operations in the Coeur d'Alene district.

Warren C. Prosser, who has been superintendent of the Red Mountain Mines Co. for the last two years, has resigned that position to return to professional work in mineral and oil-land investigation, with headquarters in Denver.

Rudolph A. McGovern, general manager of the Caloric Co., Brazil, a subsidiary of the Mexican Petroleum Co., sailed from New York on Oct. 2, on a business trip to England, Belgium, France, and Italy. After the tour Mr. McGovern expects to return to Brazil.

Frank N. Skeels, of Wallace, Idaho, mining engineer, is engaged in investigating the clay deposits of Idaho for the State Bureau of Mines and Geology, and in co-operation with the Federal Bureau of Mines. A bulletin will be issued covering the results of his work.

J. W. Bennie has transferred his headquarters to Gleeson, Cochise County, Ariz., in order to superintend the operation of one of the mining groups retained by the Shannon Copper Co., after the sale of its Clifton interests to the Arizona Copper Company, Ltd.

L. C. Graton has been employed by the Calumet and Hecla Mining Co. to make a complete geological survey of the entire territory owned, controlled, or managed by the interests in Northern Michigan, comprising 23,000 acres. It is expected the work will require two years.

J. Burns Read has been appointed assistant professor of mining engineering at the University of Illinois. Professor Read served as captain of ordnance in the Inspection Division of the U. S. Army during the war, and was in charge of the non-ferrous group of the metallurgical branch at Washington.

OBITUARY

H. P. Flint, superintendent of the Tom Reed mill, at Oatman, Ariz., was drowned recently while bathing in the Colorado River.

Frank Cochrane, chairman of the Canadian Government Railway Board and a former member of the Canadian Cabinet, died at Ottawa on September 22, after a protracted illness, at the age of 67. Mr. Cochrane was for some years Minister of Lands, Forests and Mines for Ontario.

John Trevarrow, Sr., aged seventy-six, died at his home at Mohawk, Mich., on September 21. He came from England in 1861, and worked at the old Central mine, and when the Mohawk mine opened he became head mining captain and directed the opening of this property, retiring in 1913.

Charles O'Connell, a prominent mining engineer of Northern Ontario, died at Haileybury, on September 20, from heart disease. Mr. O'Connell came from California, and was a pioneer of the Cobalt camp, being connected with the development of many valuable mines. He was several years manager of the Tough Oaks mine at Kirkland Lake, and until a short time before his death was manager of the Patricia property at Boston Creek.

Samuel Brady, agent of the Michigan Copper Mining Co. property, Ontonagon County, Mich., died on September 30, following an illness of two years, from cancer. Mr. Brady had been in charge of this property for thirty years, taking it over when it was known as the Minnesota. He was graduated from the Rensselaer Polytechnic Institute, of Troy, studied in Germany and England, and was experienced in gold mining in the Black Hills and in copper exploration on Isle Royale before his connection with the Michigan company.

Robert Neil Dickman, a mining engineer of Chicago, died at La Jolla, Cal., on September 14, following an operation. Mr. Dickman was formerly of the mining engineering firm of Dickman & MacKenzie. Mr. MacKenzie was killed in 1905 by Yaqui Indians while on business in Mexico. Mr. Dickman, at the time of his death, was on the staff of Robert W. Hunt & Co. He was born in Cleveland, Ohio, his father being Franklin Dickman, justice of the Supreme Court of the State. Mr. Dickman was graduated at the University of Michigan in 1886. He leaves a widow and one son, Franklin.

Henry B. Underhill, Jr., president of the Selby Smelting and Lead Co., and a resident of San Francisco, died on September 14. In 1866 Mr. Underhill went into the employ of Thomas Selby, who built the shot tower which was destroyed by the fire of 1906. The Selby Smelting Works was first established at North Beach, in San Francisco, and was subsequently moved to Vallejo Junction. In 1905 the business was sold to the American Smelters Securities Co., a subsidiary of the American Smelting and Refining Co. For over fifty-two years Mr. Underhill was associated with the smelting plant in the business and financial end, making a specialty of selling the silver produced by the plant. He finally became the president of the company, which position he held when he died.

SOCIETIES

American Society of Civil Engineers held a meeting on October 1 at which A. L. Sonderegger presented a paper on "Physiography of Watersheds and Channels, and Analysis of Stream Action of Southern California Rivers, With Reference to the Problems of Flood Control." The paper appeared in "Proceedings" for August, 1919.

The Institute of Metals held the Sheffield meeting on September 24 and 25, the program of which included a kine-

matograph film display of brass melting in an electric furnace, and a souvenir pamphlet containing a list of the members attending and illustrated descriptions of the University of Sheffield, works to be visited, and a specially drawn map of Sheffield.

Natural Gas and Petroleum Association of Canada held its first annual meeting at Hamilton, Ont., on September 19. C. E. Steel, president, was chairman. The following papers were presented: "Petroleum in Ontario, Reminiscence and Forecast," by A. M. McQueen; "Oxy-Acetylene Welding in an Isolated Plant," by J. H. Stoliker; "History of Natural Gas in Ontario," by D. A. Coste. M. Y. Williams, of the Geological Survey of Canada, outlined the findings of his recent survey trip to the prospective oil areas in the James Bay district, and G. R. Mickle, provincial mine assessor for Ontario, presented an interesting paper on some phases of the natural gas industry in the province.

American Institute of Mining and Metallurgical Engineers, Denver Chapter, held a banquet on September 19, at the Savoy Hotel. The institute met for the purpose of taking action to bring about the repeal of the Colorado Engineers' Licensing Act. J. R. Grant, chairman of the meeting, was empowered to select a committee of three to take action in the matter. Robert Hursh, manager of the Empire Zinc Co.; George Collins, manager of the Mary Murphy Mining Co., and J. C. Roberts, of the Colorado School of Mines, were appointed. Horace V. Winchell, of Minneapolis, Minn., president of the A. I. M. E., was the guest of the Golden Chapter at a banquet held on October 15.

INDUSTRIAL NEWS

International Trade Conference, called by the Chamber of Commerce of the United States at Atlantic City, N. J., has been postponed from the week of September 29 to the week of October 30, owing to delays incident to the departure of delegates from Italy, France and Belgium.

The Bucyrus Co. has removed the southern sales office from New Orleans, La., to room 2, 212 Jefferson County Bank Building, Birmingham, Ala. C. N. Ballentine will remain southern sales manager, and will be assisted by E. J. Wilkie, who has been connected with the sales department at South Milwaukee, Wis.

NEW PATENTS

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

Alloying—Admixture of Metals or Substances for Alloying. Edmund Godfrey Burr. (1,315,208; Sept. 9, 1919.)

Barium—Process for Preparing Barium Hydroxide from Barium Sulfide. Edward A. Barnes. (1,316,133; Sept. 16, 1919.)

Blast - Furnace-Stack Reinforcement. James P. Dovel. (1,316,085; Sept. 16, 1919.)

Blast Furnaces—Heat-Recuperating Process and Apparatus for Blast Furnaces. James P. Dovel. (1,316,086; Sept. 16, 1919.)

Briquetting Finely-Pulverized Iron Ore, Method Of—A. Lammerhirt. (1,315,315; Sept. 9, 1919.)

Casting Machine. Edward Harker Acton, Frank Evans Dickie and Thomas Pratt, assignors to Aluminum Co. of America. (1,316,471; Sept. 16, 1919.)

Classifier (Mechanical)—Frank E. Marcy. (1,316,911; Sept. 23, 1919.)

Crushing—Ball or Tube Mill. Newton L. Hall. (1,315,770; Sept. 9, 1919.)

Crushing—Centralized Ball Mill. Morrisson J. Barnett. (1,316,670; Sept. 23, 1919.)

Crushing—Hammer Mechanism for Rock-Crushing and Other Purposes. John R. Abbott. (1,316,406; Sept. 16, 1919.)

Crushing—Reducing Mill. Edward B. Campbell, assignor to Williams Patent Crusher and Pulverizer Co. (1,315,281; Sept. 9, 1919.)

Drill. Charles Erb Wuensch. (1,316,609; Sept. 23, 1919.)

Drill—Rotary Boring-Mill. Howard R. Hughes. (1,316,094; Sept. 16, 1919.)

Drill-Puller. William M. Williams. (1,316,753; Sept. 23, 1919.)

Electric Furnaces—Electric Transformer Especially Suitable for Use in Connection with Electric Furnaces. James Bibby. (1,315,359; Sept. 9, 1919.)

Electrical Treatment—Apparatus for Treating Ores. Carl Cornwell. (1,316,769; Sept. 23, 1919.)

Electrode for Electric Furnaces. Paul Sejourner, assignor to Societe Electro Metallurgique Francaise. (1,315,992; Sept. 16, 1919.)

Flotation—Process of Treating Copper Ores by Sulphatization and Flotation. Niels C. Christensen, assignor to Metallurgical Improvement Corporation. (1,316,352; Sept. 16, 1919.)

Furnace Roofs—Art of Repairing. Benjamin Gold. (1,316,297; Sept. 16, 1919.)

THE MINING NEWS

New York, October 11, 1919

Fire Breaks Out in Homestake Mine at Lead, S. D.

Company Preparing to Flood Workings—
No Men Laid Off—Mine Rescue

Fire broke out in a timbered stope between the 700 and 800 levels of the Homestake Mine at Lead, S. D., on September 25. Miners driving a drift for water lines on the 700 level ran into burning timbers on October 2. Efforts are being put forth to confine the fire to this area. Preparations have been made for flooding the mine, and during the interval the mills will be idle. All employees will be used on the surface until the fire is extinguished. In all probability the mine will be flooded to the 600 level within a month. During the fire of 1907 the workings were flooded to the 300 level in forty-seven days. The United States Bureau of Mines rescue car is on the ground from Livingston, Mont.

earnest effort is being made by these organizations to save the road from being taken up. The cost of the road was considerably over a million dollars. Permission has been given the owners by the Public Utilities Commission of Colorado to dismantle the road.

Texas Oil Companies Must Report to State Commission

New Law Imposes Fine For Failure, But Many Companies Have Not Complied

Under the new statute, passed last month, the Texas Railroad Commission has been given certain authority over the oil companies operating in the State. Carrying out the terms of this statute, the Commission called for reports from every oil company doing business in Texas, these to contain among other information the capitalization, amount of stock sold, price obtained, commission paid for selling, promotion costs, production, situation of

Assessed Valuations Lowered on Cuyuna Range Orebodies

The State Tax Commission, following hearings held in St. Paul, Minn., on August 8 and September 24, and which were generally attended by Cuyuna Range operators and fee-owners, and at which the past and present condition of the manganiferous ore situation was thoroughly gone into, ordered on Oct. 2 a substantial reduction in the 1917 and 1918 assessed valuations of the Clark and Cuyuna-Sultana orebodies. The Commission reduced the 1918 assessed valuation of the Clark from \$176,856 to \$21,737, and that of the Sultana from \$151,799 to \$33,309. Similar reductions in the assessed valuations of other manganiferous or low-grade bodies of the Cuyuna are expected to follow as a result of this ruling. The experimental nature of the manganifer-



VIEW OF LEAD, S. D., SHOWING PLANT OF HOMESTAKE MINING CO. B. & M. SHAFT IS SEEN ON HILLSIDE IN CENTER OF BACKGROUND

Boulder Railroad in Colorado May Be Scrapped

The Denver, Boulder & Western Railroad has been purchased by the Morse Bros. Machinery & Supply Company, of Denver. This road, 49 miles in length, in Boulder County, connects Ward and Eldora with Boulder, and is the outlet for practically all the mining towns and districts of Boulder County. It is a narrow-gauge line, laid with 56-lb. rail, and is completely equipped with eight locomotives, ninety freight cars and passenger coaches. The Morse Bros. company have offered this road to the mining men and commercial organizations of Boulder County, in order that the road may remain of service to the community. An

wells, amount of oil sold, to whom, and price obtained. Due publicity was given to the requirements of this statute through the press, and so far 1,080 reports of oil companies have been received properly executed. Blank forms for reports have been prepared, and are forwarded on request. Judging from letters of inquiry about various oil companies, directed to the Commission, it is believed there must be as many more companies operating that have not filed reports as there are that have reported. Because the law is a new one, the Commission has not yet taken action to penalize these companies, but may proceed to do so after October 1. The penalty for failure to make a report may be a fine of \$500.

ous ore market is given by the Commission as a reason for their ruling, Ruskard Hurd, secretary of the Commission, stating that "There never has been a normal demand, normal market, normal value or normal price for the manganiferous ores of the Cuyuna Range."

Insurance Gift Pleases Employees of Calumet & Hecla

The most important subject of discussion among mining men of the Michigan copper district during the last week was the blanket life-insurance policy put into operation by the Calumet & Hecla company for its 10,000 employees. The plan generally caused favorable comment among the workers. The insurance costs them nothing. No medical examination is to be required.

underground mining men have always found it difficult to secure life insurance owing to the hazard of their work. The Calumet & Hecla company is generally credited with the same forward-looking policy as it has showed in putting into effect the same compensation regulation that the State now requires of all corporations two years before there was agitation for such a compulsory regulation. The value of these policies ranges from \$1,000 to \$1,500.

standpoint will continue to be recorded. The only question is how long the Commonwealth Government will allow the permit to export gold to remain in force.

Birmingham Situation Improving Strikers Gradually Seeking Re-instatement and Conditions Approaching Normal

On Sept. 26 the Woodward Iron Co. blew in its No. 1 furnace which has been idle for several months, undergoing repairs. This was done in face

Scholarships at Sudbury

The International Nickel Co. of Canada has founded three scholarships to be awarded by competition to apprentices and minor sons of its employees. The scholarships cover the regular four years course at Queens', Toronto, or McGill Universities and are of sufficient value to meet entire cost of the course. First examinations for scholarships were held at Sudbury High School.

Hurricane Hits Somerset Oil Fields in Texas

Somerset Field, near San Antonio, Tex., was hard hit by the hurricane that swept the Gulf Coast country Sept. 14. The largest losses were sustained by the Gulf Production Co., ten of whose derricks were blown down, and Grayberg Oil Co., which lost eight derricks. Several other derricks were also destroyed. Nearly all wild cat derricks near San Antonio were blown down. Strangely, this territory was more damaged than other fields closer to the coast.

Kirkland Lake Strike Failing

Lake Shore and Teck-Hughes Companies Resume—Labor Scarce in Gold Camps

A short time ago a vote was taken in Kirkland Lake and the outlying camps to see whether or not the strike, which has stopped all production in Kirkland Lake for several months, should be called off. Although the majority voted against calling off the strike, the men at Kirkland Lake camp itself, which is the only one of importance, were in favor of returning to work. Several mines have therefore decided to resume operations. The Lake Shore has taken on a small force of men, as has also the Teck-Hughes. The forces will be gradually augmented as the different companies get into better positions. Apparently there is no attempt on the part of the union to prevent the men working. The men persisted in striking, despite orders from headquarters, and now after several months' idleness, are going back to work at practically the old scale of wages, some of the lower paid men receiving a small increase.

The gold mines of northern Ontario, and particularly Porcupine, are suffering from a shortage of labor. It is stated that the Hollinger could use another thousand men, while the Dome would be able to take from one to two hundred men. With the ending of the strike in Cobalt and the return of a large number of men to their old positions, the situation in Porcupine is still further aggravated. During the winter months numbers of men usually go into the bush to cut pulpwood, and were it not for the fact that there is likely to be a large number of unemployed in Canada during the coming winter, the situation in the mines might be serious.



GATES CRUSHER SECTION OF BROKEN HILL SOUTH MILL WAS DESTROYED TOGETHER WITH OTHER PARTS OF THE PLANT

Australian Gold Exports Bring High Premium

In Australia the Gold Producers' Association recently made a distribution of approximately £120,000, which had been realized on the disposal of gold in the East at a premium. That represented transactions by the organization to June last. Since then largely increased sales of the precious metal have been effected. Prices received in the early part of July were much lower than those obtained formerly, owing to the advent of the Americans as heavy sellers. This condition, however, was corrected subsequently as a result of the variation in the rate of exchange, and as a consequence gold, which is now being sold in the East, is again commanding fairly high premiums, as the demand is very extensive. Australia produces annually something like £3,500,000 to £4,000,000 in gold on the average in normal times. The premiums obtained by the Gold Producers' Association on sales effected down to the end of June last was 5s. 7d. per oz., and even if future negotiations should not yield quite as high a figure, it is hoped that by augmentation of production and consequently of sales, very satisfactory business from the sellers'

of the union threats to cripple the Woodward company by extending the strike in this district to include all plants of the company. No record is given of the actual number of men who went out on the strike order which followed the union threat but from unofficial sources it develops that a considerable number of skilled men walked out. The company succeeded in replacing these for the most part and by shifting from various plants kept going on full schedule. It is now reported that the majority of the strikers have returned to work.

At the various plants of the Tennessee Coal Iron & Ry. Co., men who struck are being rapidly reinstated or are asking for reinstatement. This company has put on a night shift of about 200 men at its No. 6 mine at Muscoda, the night shift having been abandoned several months ago. It is said that this night work will be permanent. The Bessemer Rolling Mills (Tennessee Coal Iron & Ry. Co.) apparently is not affected yet by the strike as practically all of the skilled men have remained at work and the plant continues to roll its regular output. Nos. 1 and 2 furnaces are running with full crews and Nos. 3 and 4 are idle but have been so for some time.

PROGRESS OF MINING OPERATIONS

Important Events of Interest
Condensed and Classified
for Easy Reference

ALASKA

Alaska Gold (Juneau)—Milled 176,870 tons ore in September, averaging 83.9c per ton; per cent extraction, 81.88; and tailings loss 15.2c.

ARIZONA

Cochise County

Blackhawk (Bisbee)—Full face of high-grade copper ore developed in drift on 650 level. Same ore body was cut at 450 ft. Nighthawk Leasing Co., operator; James Z. McKenna, superintendent.

Calumet & Arizona (Bisbee)—September production of copper was 4,494,000 lb., of which 3,318,000 lb. was available for company.

Shattuck-Arizona (Bisbee)—September production was 70,412 lb. copper, 690,222 lb. lead, 4,919 oz. silver, and 10.61 oz. gold.

Courtland District is renewing activity, with 60 men working on the Great Western and other properties.

Mascot (Dos Cabezas)—Test of new 150-ton mill reported satisfactory. Milling ore in sight and on dumps estimated at 1,000,000 tons. John W. Prout, Jr., in charge.

Tombstone lessees on the old bonanza mines now owned by Phelps-Dodge Co., are shipping 80 carloads of ore a month.

Gila County

Arizona Globe (Globe)—Ores will be treated in mill of Gibson company pending construction of own mill.

Castle Dome Development (Globe)—Drilling on 700 acres 12 miles from Globe. Reported to have cut 130 ft. of copper ore.

Iron Cap (Globe)—Concentrator to be constructed. David Cole, consulting engineer.

Graham County

Stargo (Morenci)—Shipments have begun from property, compressed air being furnished by Phelps-Dodge power plant quarter-mile away. Present shipments being made from old workings on 75-ft. level, but development is in progress at 185 level. David Fennesy, of El Paso, designing mill based on recent ore tests made by General Engineering Co., of Salt Lake City. Property owned and controlled by Stargo Syndicate composed of Arizona people and is not incorporated.

Greenlee County

Arizona Copper (Clifton)—September production of copper 2,900,000 lb.

CALIFORNIA

Amador County

Argonaut (Jackson)—Concrete foundations are being placed for new hoist. Stamp mill is operating to capacity.

Calaveras County

Lee Mine (Altaville)—Recent developments include unwatering of shaft, construction of gallows frame, and installation of hoist. Plans for near future consider sinking shaft 200 ft. below present depth.

Carson Hill Gold (Carson Hill)—Company has sold \$450,000 7 per cent 4-year convertible notes to private syndicate. Proceeds used to pay off the \$450,000 balance of \$600,000 loan from American Zinc, Lead & Smelting Co. Net profits earned in September, about \$75,000; total net since Jan. 1, when operation began, nearly \$500,000. Broad development campaign will begin soon.

Morgan Hill (Carson Hill)—Being operated by W. J. Loring. August cleanup, \$104,000.

Sierra County

Tightner (Alleghany)—Directors, on Sept. 29, gave bond and option over number of years to Fred Searles, Jr.; active operations to begin in 30 days and preparations about complete. Includes Tightner placer, Eclipse, Red Star, Arlene and West Extension.

COLORADO

Boulder County

Emmett (Jamestown)—Mining flusspar and delivering to Lehman mill at Jamestown and Pitchblende mill at Springdale. Green Transportation Co. has contract to deliver 300-500 tons per month to shipping bins at Boulder. Argo, Brownspar, Blue Jay and other properties (not Emmett Co.'s) to be reopened.

Interstate Metals (Salina)—New flotation plant almost ready. Arthur Buckbee, manager. Will do custom business though built primarily as experimental plant.

Victoria Group (Salina)—Owners will develop lower ore horizons by long tunnel. Mine has been steady though small producer of high-grade silver ore.

Ouray County

Guadalupe Group (Ironton)—Being worked by two lessees, namely, Guadalupe Leasing Co. and A. E. Ackerson. Former has built large boarding house and installed small gasoline power

plant; also driving 300-ft. drift and 90-ft. raise; 17 men employed. Ackerson lease building bunk house and working four men.

Camp Bird (Ouray)—Has completed transportation tunnel which connects with old mine workings. Work in progress several years. To complete work required 11,000 ft. of cross-cutting, 1,700 ft. of drifting, and 500 ft. of raising. Tunnel cut 15 new veins.

IDAHO

Boise County

Golden Age, Jr. (Pioneerville)—Preparing to drive development tunnel, and to install ball mill for regrinding concentrates tailings. Carload will be shipped early in October.

Bonner County

Idaho Continental (Port Hill)—Snow motors building in Spokane; will be used to haul ore to Port Hill, 26 miles distant from mines.

Shoshone County

Nabob (Beeler)—After completing 150-ton mill, financial troubles overtook company through inability to pay employees. Numerous liens filed and all operations suspended. Major Griggs now in New York to confer with officers of Stewart Mining Co., which controls Nabob. Understood to have much lead-silver and zinc ore available for mill.

Idaho-Carbonate Hill (Mullan)—Ore shoot averaging five ft. wide has been developed on 400 shaft level with drift still in ore. Work suspended temporarily while diamond-drill tests are being made to prove ore at further depth. Striking this ore is important on account of situation of property in section of district heretofore without proved mineral merit. Ore is lead-silver with a little zinc. Property controlled by W. D. Greenough.

Midnight (Mullan)—Lead-silver and zinc ore varying from a few inches to three feet developed for 250 ft. on north vein, reached by crosscut from Fanny Gremm tunnel level. Controlled by Jones & Baker, of New York.

Linfor (Wallace)—Linfor Copper Mining Co., successor to Empire Copper Mining Co., preparing to resume operations on Little North Fork. Property developed by 350-ft. shaft, with large block of medium-grade copper ore on lowest level. Has 150-ton mill. Under management of William Beaudry, formerly manager of Stewart.

MICHIGAN

Copper District

Calumet & Hecla (Calumet)—Continues to secure good results in reworking old sands which are now coming from depth of 100 ft. in lake and are running 18-lb. copper per ton. Cost under 8c. Production from sands this year will total 11,000,000 lbs., which will make total of 36,315,000 lbs. from lake. Estimated life of sandpile 35 years. Pebble importations from Denmark and France continue.

Seneca (Calumet)—Second level laterals opened this week, following suspension of hoisting for baling. Concreting in shaft and laying of rails necessary before sinking is resumed. No mill plans announced as yet.



INCENDIARY FIRE AT PLANT OF BROKEN HILL SOUTH SILVER MINING CO., BROKEN HILL, NEW SOUTH WALES, ON JULY 20, CAUSED \$500,000 LOSS.

Mayflower (Houghton)—Shaft down 1,520 ft. in trap. Identity of formation still undetermined. For 100 ft. there has been mixture of amygdaloidal matter (which alone carries some copper) and trap.

Victoria (Rockland)—Eight-ton skips will replace buckets for efficiency. Shaft at 2,700 ft. in mass copper and barrel rock. Four-ton mass taken out this week.

TEXAS

Brazoria County

Gulf Production (West Columbia)—Hogg No. 3 well pumping 150 barrels daily.

Statex Oil (West Columbia)—No. 1 Curson well came in September 23 at 3,000 ft., shooting oil over derrick, and gushing at rate estimated 5,000 barrels daily, with heavy gas pressure. Well is 1,100 ft. west of main field. New well, No. 1 Elman, started on adjoining lot.

Texas Co. (West Columbia)—Brought in Hogg No. 15 well September 18 at 3,100 ft., making 1,500 barrels daily at start. No. 19 Hogg well being tested below 3,000 ft.

Fort Bend County

Gulf Co. (Blue Ridge)—Derrick destroyed in recent hurricane being rebuilt, and work will be continued.

West Production (Blue Ridge)—Slight blowout occurred in setting screen in new well, and second and smaller screen must be set before well can be tested. Conditions good for producing well.

UTAH

Juab County

Tintic shipments week ended September 27 were 120 cars.

Chief Consolidated (Eureka)—New shaft down 735 ft., being drained by drift which is being driven toward shaft at 1,000-ft. depth. Pumps lifting 900 gallons per minute. Good produc-

Salt Lake County

Ohio Copper (Lark)—Experimental work at new flotation plant completed and mill shut down pending final report as to results. Several hundred tons of ore handled daily in making tests. West end of mill and part of crushing plant destroyed by fire in 1918 have been repaired. Bond issue and increase in capitalization ratified by stockholders. Plans for financing under way.

CANADA

Ontario

Cross Lake (Cobalt)—Shaft down 225 ft. Crosscutting on 210 level.

La Rose Consolidated (Cobalt)—Discovery of high-grade ore made at 100-ft. level. Will also drill on rich vein found on University property just before recent labor strike.

Paragon-Hitchcock (Elk Lake)—Shaft down 200 ft. Drifting on 24-ft. vein of calcite and aplite with some native silver.

Castle (Gowganda)—Good ore discovered on surface.

Teck-Hughes (Kirkland Lake)—Miners being engaged following recent shutdown owing to strike.

Wasapika (West Shining Tree)—Orebody reported to be 50 ft. wide. Crosscut at 100 level.

Murray-Mowgridge (Wolfe Lake)—Shareholders have ratified reorganization plan involving sale of assets to new company, known as Murray-Mowgridge Mines, Ltd.

Quebec

Bishop Claims (Lake Du Parquet)—Timmins interests of Hollinger Consolidated Gold Mines have secured option on this property, situated close to Quebec-Ontario boundary near Lake Abitibi. Geological conditions reported to resemble those of Porcupine field. Small rush to this section last year, but up to present nothing further has been done.

MEXICO

Chihuahua

American S. & R. (Chihuahua)—Erecting big machine shop at Avalos smelter, costing over 50,000 pesos.

Las Liones G. & S. (Ojo Caliente)—Operations are expected to be resumed at once. Ore shipped to smelter at El Paso, Tex., via Mexico Central R. R.

CHILE

Chile Copper (Chuquicamata)—August production of copper, 8,994,210 lb.; July, 7,161,444 lb.

PERU

Cerro de Pasco (La Fundicion)—September production, 5,266,000 lb. copper; August, 5,726,000.

tion coming from workings below water level. Shipments limited owing to present metal prices.

Godiva (Eureka)—Work suspended owing to price of lead. Winze sunk to 1,350 level to be continued to 1,500 or 1,600 level.

Iron King (Eureka)—Large blower installed and about 1,000 ft. of ventilating pipe now in place in 1,545-ft. shaft. Will continue sinking for short distance and then start drifting.

Pinion Queen (Eureka)—Power connections being made by Utah Power & Light Co. New connections being installed and building constructed. Knights interested.

Tintic Standard (Eureka)—Company experimenting on low-grade ores with view to building mill. Shipping good tonnage of high-grade ore.

Summit County

Silver King Cons. (Park City)—Has made first shipment of 106 tons from new strike on Electric Light claim. Net returns, \$61.15 per ton. Two lots ready for shipment.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
2	422 $\frac{1}{2}$	120 $\frac{3}{4}$	64 $\frac{1}{4}$	6	422 $\frac{1}{2}$	120 $\frac{3}{8}$	64
3	422 $\frac{1}{2}$	118 $\frac{3}{8}$	63	7	421 $\frac{1}{2}$	118 $\frac{3}{8}$	63
4	421 $\frac{1}{2}$	120	64	8	418	117 $\frac{1}{8}$	63 $\frac{3}{8}$

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

Daily Prices of Metals in New York

Oct.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
2	21 $\frac{1}{4}$ @21 $\frac{1}{2}$	53 $\frac{3}{4}$ @54	6 $\frac{1}{4}$	6	6.90 @7.10			
3	21 $\frac{1}{4}$ @21 $\frac{1}{2}$	53 $\frac{3}{4}$ @54	6 $\frac{1}{4}$	6	7.075@7.125			
4	21 $\frac{1}{4}$ @21 $\frac{1}{2}$	53 $\frac{3}{4}$ @54	6 $\frac{1}{4}$	6	7.10 @7.15			
6	21 $\frac{1}{4}$ @21 $\frac{1}{2}$	54 @54 $\frac{1}{8}$	6 $\frac{1}{4}$	6	7 $\frac{1}{4}$ @7.3 $\frac{3}{8}$			
7	21 $\frac{1}{2}$ @21 $\frac{3}{4}$	53 $\frac{3}{8}$ @53 $\frac{3}{8}$	6.25@6.30	6	7 $\frac{1}{4}$ @7 $\frac{1}{2}$			
8	21 $\frac{1}{2}$ @21 $\frac{3}{4}$	53 $\frac{3}{8}$ @53 $\frac{3}{8}$	6.25@6.30	6	7.40 @7.50			

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Oct.	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
2	103 $\frac{1}{4}$	101 $\frac{3}{4}$	112	277	275 $\frac{1}{4}$	25 $\frac{3}{4}$	26 $\frac{5}{8}$	41	41 $\frac{3}{4}$
3	103 $\frac{1}{4}$	101 $\frac{3}{4}$	112	278	276 $\frac{1}{4}$	25 $\frac{3}{4}$	26 $\frac{1}{2}$	41	41 $\frac{3}{4}$
4									
6	104	103	113	283	282	25 $\frac{7}{8}$	26 $\frac{3}{4}$	41 $\frac{1}{4}$	42
7	103 $\frac{3}{4}$	103	113	282	282 $\frac{1}{2}$	26	27	42	43
8	103 $\frac{3}{4}$	103	114	281	281 $\frac{1}{2}$	26 $\frac{3}{4}$	28	41 $\frac{3}{4}$	42 $\frac{3}{4}$

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

Metal Markets

New York, Oct. 8.

There was better sentiment in all of the markets this week, which was reflected by slightly higher quotations for copper, lead and zinc.

Our advices from Europe are to the effect that the stocks of metals, especially of lead and spelter, are being reduced both in Great Britain and on the Continent, and it is expected that before long Europe may be a buyer of zinc and lead.

Transatlantic freights are about the same. To British ports, \$15; to Havre, \$12; to Rotterdam, \$10; and to Hamburg, \$13. Transpacific freights, San Francisco to Hongkong and Kobe, declined to \$18.

Copper

A fair volume of business was done by agencies and by brokers, but the principal producers did nothing worth mentioning except through the Export Association. The latter did some business with several quarters, including Germany, and there were also some export sales made outside of the Association. Domestic consumers evinced some interest in buying copper, and it is not unreasonable to expect that some business with them will ensue ere long. In the meantime, it appears that the copper for sale by brokers has been cleaned up, and the smaller producers who have been selling have raised their prices a little.

Our latest advices from Japan, by mail, are to the effect that the copper

market there is very dull, with very little being done at present. It is generally believed that no recovery in the market can be expected until Japan has digested the larger part of the purchases that she made in America earlier in the year.

Tin

There was a better sentiment in the tin market, and prices were a little firmer until Oct. 7, when very heavy arrivals of Straits tin resulted in a general easing of prices.

Straits tin was quoted at 55c right through the week.

Singapore quoted £274 $\frac{1}{2}$, c. i. f., London, on Oct. 2; £276 on Oct. 3; £281 on Oct. 6; £284 on Oct. 7 and 8.

Lead

The statistical position is very strong. Only a few producers have any lead to offer. This week they realized an advance over the price asked by the A. S. & R. Co. At the same time there was still some business in small lots of lead done by second-hands at low prices, under conditions similar to what we reported last week.

The situation in the Coeur d'Alene remains unchanged. The St. Joseph Lead Co. started work at Herculanum on Oct. 4, but blast furnaces will not go into operation until Oct. 9. Labor troubles are now reported from Alton.

There were some sales of lead for export. For bonded lead, 5 $\frac{1}{2}$ c is asked.

Zinc

Zinc advanced sharply on rather large buying, which appeared to be mainly of speculative character.

High grade zinc was sold at 8c. Ordinary prolong zinc dust at 9 $\frac{1}{2}$ c.

Antimony—The market was unchanged at 8 $\frac{1}{2}$ c for spot. Futures were quoted at 9c.

Quicksilver—The price declined sharply, and the market closed unsettled at \$95. San Francisco telegraphed \$98, barely steady.

Silver—Silver is working on the level of 63d. to 64d. in London, but owing to the demand for the East, direct shipment from San Francisco commands a premium of 1c per oz., more or less. Otherwise, there are no developments in the silver situation.

Mexican dollars at New York; Oct. 2, 92 $\frac{1}{2}$; Oct. 3, 91; Oct. 4, 92; Oct. 6, 92 $\frac{1}{2}$; Oct. 7, 91 $\frac{1}{2}$; Oct. 8, 91 $\frac{1}{2}$.

Platinum—We quote refined ingot at \$130@135.

Palladium—Unchanged at \$120.

Monthly Average Prices for
September

Lead, New York	6.108c
Lead, St. Louis	5.853c
Lead, London	£25.330
Zinc, New York	7.510c
Zinc, St. Louis	7.160c
Zinc, London	£40.955
Silver, New York	114.540c
Silver, London	61.668d
Copper, electrolytic, N. Y.	21.755c
Copper, standard, London.....	£100.767
Tin, New York	54.482c
Tin, London	£280.102
Bessemer pig iron, Pittsburgh.....	\$29.35
Basic pig iron, Pittsburgh	27.15
No. 2 foundry, Pittsburgh	28.15
Copper Sheets—33½c per lb. Demand strong. Wire, 25½@26½c. Market weak.	

Zinc Sheets—\$10.50 per 100 lb.

Aluminum—33c per lb.

Bismuth—Unchanged at \$2.96.

Cadmium—Unchanged at \$1.40.

Nickel—Ingot, 42c; shot, 43c; electrolytic, 45c.

Pyrites—Spanish pyrites is quoted at 17½c per unit for furnace size ore, free from fines, c.i.f. New York or other Atlantic ports. Sulphur companies reported to be selling at prices as low as 14@15c. Market unsettled.

Tungsten Ore—A little business in Chinese ore was done at \$7. For high-grade wolframite, \$10.50 was still asked.

Molybdenum Ore—Considerable tonnage of molybdenite was sold at 75c per lb. of molybdenum sulphide.

Chrome Ore—Considerable business was done in ore for both the chemical trade and for metallurgical purposes. Ore of 40 to 45 per cent grade was quoted at 65c per unit, delivered in the East.

Manganese Ore—Market dull and no business reported.

Zinc and Lead Ore Markets.

Platteville, Wis., Oct. 4.—Blende, basis 60 per cent zinc, \$43.50 for premium grade and \$42.50 for Prime Western Grade. Lead ore, basis 80 per cent lead, \$72 per ton.

Joplin, Mo., Oct. 4.—Zinc blende, per ton, high, \$46.60; basis, 60 per cent zinc; premium, \$43.50; prime Western, \$45@43; fines and slimes, \$42@38; calamine, basis 40 per cent zinc, \$32@28. Average settling prices: Blende, \$43.48; calamine, \$33.28; all zinc ores, \$43.35.

Lead, high, \$76.50; basis 80 per cent lead, \$75; average settling price, all grades of lead, \$73.78 per ton.

Shipments the week: Blende, 8,721; calamine, 118; lead, 1,554 tons. Value, all ores the week, \$497,860.

The blende market was reported unchanged from last week until late this evening, when it was ascertained the higher prices above were being paid.

Receipt of more box cars and shipments by coal cars are helping move the ore stock toward the smelters. Buying continues around 8,000 to 9,000 tons per week, a little ahead of the shipments.

Added competition advanced calamine prices, and producers set a price at \$32 basis.

Iron Trade Review.

Pittsburgh—Oct. 7.

Though the outcome of the strike in the iron and steel industry was settled positively before the first week was out, even now, in the third week, the strike is receding slowly, and, indeed, it is receding at all only in districts or at plants where operations were already fairly heavy. Western Pennsylvania as a whole now shows about 85 per cent employment and 80 per cent production, or a few per cent more than a week ago. Eastern Pennsylvania and the South are running practically full. There remains a belt that is down tight, this beginning with the Wheeling district, extending north through the entire Mahoning Valley, and then running along the Lake front through Cleveland and on through Buffalo. Though Cleveland is down tight, Lorain, just a few miles west, is running practically normal. At Buffalo, Lackawanna and Donner are down tight, though Wickwire, farther to the east, is running in part.

The next chapter will open with breaks in the totally closed region, Youngstown being picked as the most likely place for a beginning. Wheeling, for years a hotbed of labor discontent, will probably be the last. Martial law has been declared in that part of the Calumet district that is in Indiana, and there will be martial law in the steel towns on the Illinois side the moment occasion arises. Thus the strikers in the closed belt are confronted with the spectacle of two-thirds of the men being out in the Calumet district without being able to do mischief to workers and the men in the Shenango Valley and western Pennsylvania generally being almost all at work, with the small minority unable to make trouble. Nevertheless, the manufacturers have no definite views as to when a break will occur, though it is considered improbable that it will be more than a few weeks. The strike is almost wholly

of common labor, chiefly unlettered foreigners, to whom idleness is necessarily very irksome; and, furthermore, the matter of money is important. Those who have no savings will find it difficult to live, and those who have saved will not want to dissipate their hoardings. The strike continues to show little real management by the leaders, who apparently had nothing in mind but to start trouble which would either cause the authorities to take a hand and bring about a compromise or would develop into some sort of revolution. Public opinion is wholly against the strikers, and the efforts of the strike leaders to bring about sympathetic strikes have been altogether futile.

Employment in the iron and steel industry as a whole is now at about 60 per cent of normal, and production, in tonnage, is at 50 per cent, or a trifle more of capacity. There are practically no market transactions, as the mills that are running are already sold up. Jobbers are under heavy demand, but are selling sparingly.

Pig Iron—Production by merchant furnaces is fairly large, but, as iron foundries are not affected by the strike, the requirements exceed the supply, and pig iron is scarce. As consumers were well covered when the strike started, there is little buying. The market is firm at former quotations: Bessemer, \$27.95; basic, \$25.75; malleable, \$26.25@27.25; foundry, \$26.75; forge, \$25.75, f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40.

Steel—A shortage of billets and sheet bars is likely to develop through the strike affecting steel-producing units more than steel-finishing units, but prices are unlikely to be affected, as we continue to quote: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; rods, \$52.

Ferromanganese—A quotation of \$95 c.i.f., could probably be obtained at any time on English. Domestic producers state their asking price is \$110, delivered, but consumers show no interest whatever in the market.

Coke—With sharp decreases in coke production in the Connellsville region since the strike started, and with the resumption of a few furnaces closed in the early days of the strike, there is a better balance between supplies and requirements, but coke is still plentiful, and furnace might be picked up at \$3.75, though some operators quote \$4.25 and do not expect to sell. Some of the byproduct ovens at Youngstown are operating slow, to keep warm, and the product is being sold at low prices. Foundry coke is little affected, good grades of Connellsville bringing \$6@6.25 per net ton at ovens.

CURRENT PRICES—MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

No.	Large Mills		Chi- cago	San Fran- cisco	—New York—	
	Pittsburgh	Louis			Cur- rent	Yr. Ago
No. 10.....	3.55	4.64	4.57	5.80	4.57	5.50
No. 12.....	3.60	4.69	4.62	5.75	4.62	5.55
No. 14.....	3.65	4.74	4.67	5.90	4.67	5.00
Black						
Nos. 18 and 20.....	4.15	5.24	5.42	6.75	5.30	6.30
Nos. 22 and 24.....	4.20	5.29	5.47	6.80	5.35	6.35
No. 26.....	4.25	5.34	5.52	6.95	5.40	6.40
No. 28.....	4.35	5.44	5.62	7.05	5.50	6.50
Galvanized						
No. 10.....	4.70	5.79	5.97	7.20	6.20	6.85
No. 12.....	4.80	5.89	6.07	7.30	6.25	6.95
No. 14.....	4.80	5.89	6.07	7.30	6.30	6.95
Nos. 18 and 20.....	5.10	6.19	6.37	7.60	6.60	7.25
Nos. 22 and 24.....	5.25	6.34	6.52	7.75	6.75	7.30
No. 26.....	5.40	6.49	6.67	7.90	6.90	7.45
No. 28.....	5.70	6.79	6.97	8.20	7.20	7.75

STEEL RAILS—The following quotations are per gross ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra.

	—Pittsburgh—		—Chicago—	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails.....	\$45.00	\$65.00	\$45.00	\$65.00
Standard openhearth rails.....	47.00	67.00	47.00	67.00
Light rails, 8 to 10 lb.....	2.58½*	3.36*	2.58½*	3.36½*
Light rails, 12 to 14 lb.....	2.54*	3.09*	2.54*	3.09*
Light rails, 25 to 45 lb.....	2.45*	3.00*	2.45*	3.00*

*Per 100 lbs.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named.

	—Pittsburgh—		Chicago	St. Louis	San Francisco
	Current	One Year Ago			
Standard railroad spikes.....	\$3.35	\$3.90	\$4.27	\$4.44	\$5.65
½ in. and larger.....	4.35	4.90	5.17	Premium	6.65
Track bolts.....	4.35	4.90	5.17	Premium	6.65
Standard section angle bars 3.00	3.00	3.25	4.22	Premium	4.60

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	—New York—			
		Cur- rent	1 Yr. Ago	St. Louis	Chi- cago
Beams, 3 to 15 in.....	\$2.45	\$3.47	\$4.245	\$3.54	\$3.47
Channels, 3 to 15 in.....	2.45	3.47	4.245	3.54	3.47
Angles, 3 to 6 in., ¾ in. thick.....	2.45	3.47	4.245	3.54	3.47
Tees, 3 in. and larger.....	2.45	3.52	4.245	3.54	3.47
Plates.....	2.66	3.67	4.495	3.54	3.67

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$2.55	\$2.55	\$4.5

RIVETS—The following quotations are per 100 lb.:

	—New York—		—Warehouse—			
	Cur- rent	1 Yr. Ago	Chi- cago	St. Louis	San Francisco	Dallas
¾-in. and larger.....	\$4.72	\$5.65	\$4.72	\$4.79	\$6.05	\$7.50
¾-in. and larger.....	4.82	5.75	4.82	4.89	6.15	7.20
¾ and ½.....	4.97	5.90	4.97	5.04	6.30	7.50
½ and ¼.....	5.22	6.25	5.32	5.29	6.65	7.75

Lengths shorter than 1 in. take an extra of 30c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging.....	+12½%
Galvanized cast steel rigging.....	7½%
Bright steel.....	22½%
Bright iron and iron tiller.....	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight.....	\$7.75	\$6.30	\$6.25	\$8.50	\$7.35
Assorted.....	7.50	6.50	6.40	8.75	7.60

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh:

Iron bars.....	2.75c.	Steel bars.....	2.35c.
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COAL BIT STEEL—Warehouse price per pound is as follows:

	New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
	\$0.12	\$0.16½	\$0.18	\$0.19	\$0.18½	\$0.14½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid.....	12c.	13c.	15c.	15c.
Hollow.....	18c.	19c.	21c.	20c.

STEEL AND IRON PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of National Tube Co. for steel pipe, Cardy A. M. Byer's for iron, both dated Mar. 21, 1919.

Inches	BUTT WELD		Iron Black		Galvanized Per Cent.
	Per Cent.	Galvanized Per Cent.	Per Cent.	Per Cent.	
¾ to 3.....	57½	44	¾ to 1.....	39½	23½
LAP WELD					
2.....	50½	38	1½.....	24½	9½
2½ to 6.....	53½	41	1½.....	31½	17½
7 to 12.....	50½	37	2.....	32½	18½
13 and 14.....	41	29	2½ to 6.....	34½	21½
15.....	38½	28	7 to 12.....	31½	18½
BUTT WELD, EXTRA STRONG PLAIN ENDS					
¾, ¾ and ¾.....	46½	29	¾, ¾ and ¾.....	28½	11½
¾.....	51½	39	¾.....	33½	20½
¾ to 1½.....	55½	43	¾ to 1½.....	39½	24½
2 to 3.....	56½	44			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2.....	48½	37	1½.....	25½	10½
2½ to 4.....	51½	40	1½.....	31½	17½
4½ to 6.....	50½	9	2.....	33½	20½
7 to 8.....	46½	33	2½ to 4.....	35½	23½
9 to 12.....	41½	28	4½ to 6.....	34½	22½
			7 to 8.....	26½	14½
			9 to 12.....	21½	9½

From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Cleveland	Chicago
¾ to 3 in. butt welded.....	47%	43½%	57½%
3½ to 6 in. lap welded.....	42%	45½%	53½%

	Galvanized		
	New York	Cleveland	Chicago
¾ to 3 in. butt welded.....	31%	34½%	44%
3½ to 6 in. lap welded.....	27%	30½%	41%

Malleable fittings, Class B and C, from New York stock sell at list plus 12½%, Cast iron, standard sizes, 10%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square.....	\$1.50	\$2.50	\$2.25	\$1.20	\$1.85	\$1.05
Hot pressed hexagon.....	1.50	2.50	2.25	1.00	1.85	.85
Cold punched square.....	1.50	2.50	2.25	.75	1.30	1.00
Cold punched hexagon.....	1.50	2.50	2.25	.75	1.30	1.00

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York.....	50-10%	50%
Chicago.....	50%	50%
Cleveland.....	60-10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller.....	50%	50%	50-5%
Larger and longer up to 1 in. by 30 in.....	40%	40%	40-5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:					
New York.....	\$1.25	Cleveland.....	\$3.75	Chicago.....	\$3.00
For cast-iron washers the base price per 100 lb. is as follows:					
New York.....	\$6.00	Cleveland.....	\$3.75	Chicago.....	\$4.25

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York and Chicago:

	Carload Lots		Less Than Carload Lots	
	N. Y.	Chicago	N. Y.	Chicago
Tar felt (14 lb. per square of 100 sq. ft.).....	\$70.00	\$70.00	\$71.00	\$71.00
Tar pitch (in 400-lb. bbl.).....	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels).....	34.00	34.00	37.50	37.50
Asphalt felt.....	68.00	63.00	72.50	72.50

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

No.	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.	c.l.	l.c.	c.l.	l.c.
No. 1 grade.....	\$1.50	\$1.75	\$1.90	\$2.15	\$2.30	\$2.55
No. 2 grade.....	1.35	1.60	1.70	1.95	2.05	2.30

Asbestos asphalt-saturated felt (14 lb. per roll) costs \$156 per ton. Slate-surfaced roofing (red and green) in rolls of 108 sq. ft. costs \$2.25 per roll in carload lots and \$2.50 for smaller quantities. Shingles, red and green slate finish, cost \$6.00 per square in carloads, \$6.25 in smaller quantities, in Philadelphia.

HOLLOW TILE—

Table with columns for city (St. Paul, Seattle, Los Angeles, New Orleans, Cincinnati, St. Louis) and tile sizes (4x12x12, 8x12x12, 12x12x12) with prices.

*F. o. b. factory, 4, 8 and 10 inch.

LUMBER—Price per M in carload lots:

Table with columns for city (Boston, Kansas City, Seattle, New Orleans, St. Paul, Atlanta) and lumber types (Fir, Hemlock, Spruce, Fir, Hemlock, Spruce) with prices.

Table for NAILS—The following quotations are per keg from warehouse: Wire, Cut, with columns for Mill, Pittsburgh, Dallas, Chicago, San Francisco.

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

Table with columns for city (New York, Jersey City, Boston, Chicago, Pittsburgh, Cleveland, Denver) and cement types (Current, One Month Ago, One Year Ago) with prices.

Note—Charge for bags is generally 15c. each, 60c. per barrel.

LIME—Warehouse prices:

Table with columns for city (New York, Kansas City, Chicago, St. Louis, Boston, Dallas, San Francisco, St. Paul, New Orleans, Atlanta, Denver) and lime types (Hydrated per Ton, Lump per 300-Lb. Barrel) with prices.

*200-lb. barrels. †Per 180-lb. bbl. Note—Refund of 10c. per barrel.

LINSEED OIL—These prices are per gallon:

Table with columns for city (New York, Chicago) and oil types (Current, One Year Ago) with prices.

WHITE AND RED LEADS—In 500-lb. lots sell as follows in cents per pound:

Table with columns for city (New York, Chicago) and lead types (Current, One Year Ago) with prices.

MINING AND MILLING SUPPLIES

Table for HOSE—Underwriters' 2 1/2-in., 3-in. per ft. with columns for Fire, Air, 50-Ft. Lengths and discounts.

Table for LEATHER BELTING—Present discounts from list in the following cities are as follows: New York, St. Louis, Chicago, Birmingham, Denver, Cincinnati.

RAWHIDE LACING—30% off for cut; 62c. per sq. ft. for side lacing.

Table for MANILA ROPE—For rope smaller than 3/4 in. the price is 1/2 to 2c. extra, while for quantities amounting to less than 600 ft. there is an extra charge of 1c.

PACKING—Prices per pound:

Table with columns for material (Rubber and duck for low-pressure steam, Asbestos for high-pressure steam, Duck and rubber for piston packing, Flax, regular, Flax, waterproofed, Compressed asbestos sheet, Wire insertion asbestos sheet, Rubber sheet, Rubber sheet, wire insertion, Rubber sheet, duck insertion, Rubber sheet, cloth insertion, Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes, Asbestos wax, 1/2- and 1-lb. balls) and prices.

REFRACTORIES—Following prices are f. o. b. works:

Table with columns for material (Chrome brick, Chrome cement, Clay brick, 1st quality fire clay, Clay brick, 2d quality, Magnesite, dead burned, Magnesite brick, Silica brick) and prices.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Table with columns for city (Chicago, San Francisco, St. Louis) and tie types (Plain, Douglas Fir—Green, Douglas Fir—Creosoted, Untreated A Grade Red Oak, Untreated B Grade Red Oak) with prices.

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels

Table with columns for city (New York, Chicago, Denver) and oil types (Pure steam-distilled pine oil, Pure destructively distilled pine oil, Pine tar oil, Crude turpentine, Hardwood creosote, 0.96-0.99) with prices.

COTTON WASTE—The following prices are in cents per pound:

Table with columns for city (New York, Cleveland, Chicago) and waste types (White, Colored mixed) with prices.

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

Table with columns for city (Cleveland, Chicago) and cloth types (13 1/2 x 13 1/2, 13 1/2 x 20 1/2) with prices.

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder.

Table with columns for city (New York, Boston, Cincinnati, Kansas City, Seattle, Chicago, St. Paul, St. Louis, Denver, Dallas) and explosive types (Low Freezing, Gelatin, Black Powder) with prices.

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Denver, 37c.; Chicago 31 1/2c.; St. Louis, 31c.

SODIUM SULPHIDE—In New York the price per pound is 5c. for concentrated, 3c. for crystals. The St. Louis price is 2c. for concentrated. The Denver price is 7 1/2c. for crystals. The Chicago price is 5c. for concentrated, 3c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 10c. per lb.; Chicago, 13c., Denver, 22c., St. Louis, 15c.

ALUMINUM DUST—Chicago price is 1.10 per lb.

Table for MINERS' LAMP CARBIDE—Prices net f. o. b. cars at warehouse points. Columns for Union, Cameo, Union and prices per 100-lb. Drums, 100-lb. Drums, 25-lb. Drums.

Engineering and Mining Journal

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Number 16

The Steel Strike—and Others

THE strike in the steel industry shows no signs of terminating; but at Gary, the nerve center of the situation, the theoretical passivity of the striker has threatened to turn into violence, and destruction has been held back only by Federal troops, machine guns, and artillery. The contest is a gigantic one, involving the most essential single industry of the country or the world—the United States iron and steel industry. It is not directed against any particular organization, the great corporations like the United States Steel Corporation and the Bethlehem Company standing on no better or worse a footing than smaller producers. It is a strategic campaign on the part of certain obscurely known organizations to control the steel industry.

That is the issue, plainly enough stated on both sides—the open shop: whether the employer shall employ whom he finds capable and desirable, and the employee shall work when he so elects and wherever he finds the best opportunity and conditions, or whether both capitulate to a subterranean and external control; whether a great technical and scientific industry shall be controlled by its stockholders, its engineers, its experts, its organizers and its skilled and unskilled workmen in a due and agreed proportion, or whether all shall become absolutely subject to orders issued from nowhere in particular and emanating from nobody knows whom.

It is clear that in many cases at least, the employees had no wish to strike and had nothing to gain thereby, but were coerced into so doing. It is equally clear that the willing forces of the strikers are mainly illiterate aliens, as stated by both sides at the Senate inquiry; and we have the testimony of the Mayor of Gary and General Leonard Wood that the dangerous element lies in anarchistic propaganda.

Signs are not wanting here as elsewhere that the American Federation of Labor is not heartily sympathetic with this particular campaign of domination, and that it is only withheld from active participation in the opposition by the fear of being classed as on the side of the "capitalist" and losing control of the labor situation.

Lesser strikes are in progress all over the country. The strike has become the holiday of the workman, his assertion of freedom, his magical Aladdin's lamp to rub and command. Originally a means to escape from distressing conditions, it is by no means always so at present; indeed, the opposite is sometimes the case—the striker goes out because he is

making so much money that he can afford to "lay off," and the sky is the limit of the game of poker he plays.

What of the ethics of this popular game? Undoubtedly, in most cases, a man has the right to quit work, as the labor leaders point out. This right is naturally paired off against the right of the employer to hire whom he pleases, which employers point out. Certain reservations, however, must be made to both these rights. The rights of an individual terminate when his freedom of action injures another individual or limits his liberty. There is the actual case of the newly arrived alien who killed his wife and was shocked and surprised at being arrested; he had understood that he had come to a free country. A watchman at a bank has not the right to quit work without notice—he can quit only when he has personally seen to it that his work is being carried on; nor can the keeper of the lighthouse, the hostman at the mine, nor many others. And the fundamental right of the employer to employ and to discharge has similar well-understood limitations.

Granted, in general, the individual right of the workmen to quit, however, what of the organized quitting called the strike? Quitting then becomes not an assertion of individual freedom but a force in strategic conflict; even if done quietly it is not passive but an active economic blockade of capital's ports, to obtain terms which theoretically cannot be obtained by peaceful negotiations. When employed as a counter-move against a similar economic blockade put down by the employers, singly or organized, it is the natural rejoinder of labor; it is indisputable that measures more active than talk have to be taken in the affairs of the world every now and then. When such a conflict begins to injure the public in general or an appreciable part of it outside the conflicting parties, one or both are overstepping their rights; and therefore widely organized labor and capital alike must be careful in their moves.

As an absolute rule, then, the right to strike cannot be granted. Could the American army have struck for \$50 per month and no trench work on the morning of Chateau Thierry? Lest you think this far-fetched, let it be added that we know a college graduate who claims that the army has the right to strike. Have the Federal troops at Gary the right to take the opportunity to strike? The policemen of Gary? The policemen of Boston? of New York? Have the postmen of the nation the right to strike? The telegraphers? The railroad men? The steel workers? The coal miners? Have

the doctors of the nation the right to organize and strike for double pay, cash or no service, time and a half for overtime and no night work? Have the Government clerks at Washington that right? The keepers of lighthouses? The judges?

Why not? Many of these things have happened; and the rest may happen. The Washington Government clerks and scientists are organized as a branch of the American Federation of Labor; the actors' strike shows the possibility of the professions; and the extreme advocates of labor organization are jubilantly looking forward to the time when all men receiving wages or salaries shall have been organized into one grand union.

The spectacle results of classes representing small minorities pressing alternately their advantage against all other classes by a system of force, passive or active, not consistent with the principles of equal justice toward all and the great balanced theory of the greatest good to the greatest number as the best possible condition. It is the system of the gentleman who boards a train at the opportune moment, and with the strategic advantage of being at the right end of a six-shooter, relieves the unwilling passengers of their cash. Organized capital is equipped also for just such undemocratic moves.

The ultimate objects of the steel strikers may be divined to be akin to the ingenuous Plumb plan for the railroads, whereby these arteries of the country are to be turned over to the engineers, firemen and conductors for the exploitation of the public. Soon, if the movement proceeds happily, we shall have the steel workers controlling the mines, furnaces and mills, the coal miners the fuel supply, the bank clerks the banking system, the counter-jumpers, floorwalkers and drivers of delivery wagons the department and chain stores, while to the policemen will fall the tribute or plunder of the cities.

This is sober truth, and not jest. The bituminous coal miners of the country are due to strike on Nov. 1, at the beginning of winter, to enforce by the freezing out of an unprepared people their plan for the nationalizing of the coal industry. The idea of the will of the majority and the test of the ballot is obsolete or not yet heard of by these ignorant and violent aliens.

What will be the result of all this state of destructive economic civil war which is upon us? As Hoover has pointed out, Bolshevism has succeeded in Europe in proportion to the illiteracy. In illiterate and ignorant Russia it has endured many months. In relatively well-educated Hungary it did not last many weeks. How long will America, foremost in education and intelligence of all nations, stand for the undemocratic domination by force of alien minorities; of cliques and conspiracies formed by the scum of the most backward European countries? In view of the principle above stated, the answer is reassuring.

Everywhere the strike situation has got beyond the control of organized American labor, as witness the open stand which the American Federation has found itself compelled to take against the printers' and longshoremen's strikes in New York, and others.

On Oct. 13, out of seventy recorded existing major strikes, only eight had the sanction of American Federation. The present crisis threatens organized labor as direfully as any other group.

When, then, are strikes justifiable and permissible, and when do they cease to be so? When the economic blockade or embargo which is thereby laid down is directed against the public or it is the public which primarily suffers under it, rather than the antagonized employers; when the strike organizers count on victory through the surrender, through starvation, cold, danger, hardship, or discomfort, of multitudes of men, women and children not parties to the specific differences between employer and employee which led to the strike, and through the inability of employers to withstand the pressure of such a defenseless multitude calling on the only responsible party to the strike to make peace at any price to them, then a strike becomes a conspiracy against the people, an act of civil war carried on by one of the best recognized and most efficient methods of modern warfare, and should be dealt with promptly by those civil and military organizations which the people has provided for its own protection, that it might go about unarmed and unafraid of foreign or domestic aggression.

We suggest the appointment of a Federal Strike Commission, composed of representatives of the Public, Labor and Capital, such a commission to license a strike of more than a certain number of employees before it would be legal; and strikes without the nation's approval to be punishable by the Federal authorities.

Institute Mine Taxation Committee in Washington

THE meeting of the specially appointed mine taxation committee of the American Institute of Mining and Metallurgical Engineers, at Washington on Oct. 6 and 7, in co-operation with the Bureau of Internal Revenue, was a most notable and significant event. The subject is not a minor one but of the greatest importance to the industry and to the nation, as mining is its second largest industry. Therefore the men summoned by President Winchell came from many States and formed an impressive gathering of what is best in mining engineering.

Delegations to Washington, representing special interests and seeking to obtain just recognition, or more, for the industries or groups they represent, are extremely common; but this visit did not partake of that character. Coming at the special request of the Internal Revenue Bureau, and representing the mining engineering profession, and not any special interests, there was no hint of any attempt or desire to "put something over," or to obtain any more favorable interpretation or application of the law than that desired in all fairness by those Government officials charged with its administration; nor were there clashes of interests intent on securing representation. Instead of "the discordant grinding of many axes," there was the quiet and impressiveness of a common practical and elevated purpose.

The engineers presented themselves as expert advisers, familiar with the facts and the equities of the income-tax and excess-profit laws as applied to the mining industry, and seeking intelligently the means for securing to the Government the payment of the necessarily heavy tax, without killing or even breaking the legs of the goose which lays the egg of gold, copper or steel. An unintelligent and arbitrary interpretation or administration of the situation would have exactly this suicidal or destructive effect, and the future of the mining industry, in so many branches of which the United States dominates the world, depends to a considerable extent upon the handling of this delicate situation.

The recommendations of the committee are not yet maturely formulated, although entirely satisfactory progress has been made, and the final presentation will probably be possible in a few weeks.

The first adventure of the Institute into public affairs under its new charter should be followed by others, wherever good may be accomplished. The precedent is an excellent one.

The Importance of Telling The Whole Story

IN GIVING treatment and operating costs, technical writers should be extremely careful to explain as completely as possible not only the prices and conditions obtaining at the time the given costs were entailed, but also exactly what the stated figures embrace. For example, some one might state the cost of reverberatory smelting to be \$2 a ton at a Tennessee smeltery, and the careful foreman in British Columbia might think that he was behind the times when his monthly reports averaged \$3.25. Yet if he thoroughly understood how each figure was determined he would possibly decide that a trip north would be of economic benefit to the Tennessee managers. He might find that labor and fuel were much cheaper at the other plant and that his own figure included interest and depreciation and half the superintendent's salary! (There being no reverberatory smelting in Tennessee, our readers must not enter these figures in their notebooks.)

Cost comparisons are even more odious than other kinds. They rarely mean anything without a complete study of the work covered. The more embracing they are, the less they can be understood. In the case mentioned it would be almost impossible completely to explain the \$2 figure, but a statement that the repair cost of a disk crusher was 5c. per ton of ore crushed would be fairly intelligible if accompanied by a description of the ore, size of feed and product, tonnage per day, size of crusher, facilities for repair work, cost of new steel and babbitt, character of the necessary repairs, price of labor, and a few minor enlightening details, such as the Bolshevistic tendencies of the repair crew.

Possibly the foregoing remarks may give a clue to the reason why some companies do not care to make public their costs. They may also explain, on the other hand, why other companies offer them freely to the metallurgical world.

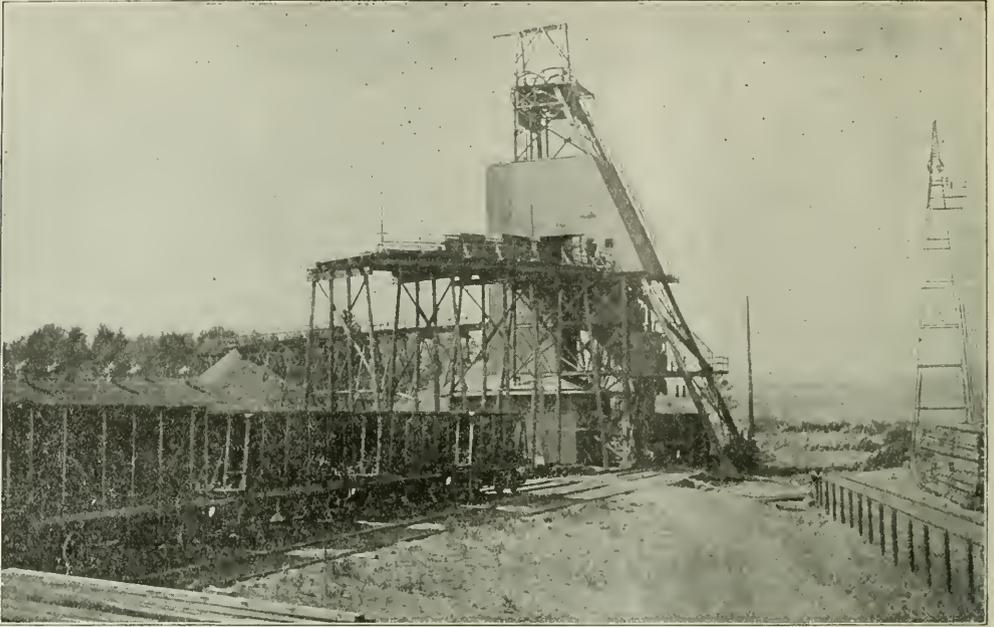
The Natural Trend

ANOTHER prominent mining company has joined the ranks of the oil producers. The United States Smelting, Refining & Mining Co. is reported to have secured a 50-per cent interest in the Wrightsman oil properties in the Bull Bayou oil field, in Louisiana. Except for a substantial interest in Ventura Consolidated, this is the first entrance into the oil business on an important scale by this company. Nipissing Mines Co., Helvetia Copper Co., Southwestern Miami Development Co., South Butte Mining Co. and East Butte Copper Mining Co. have all been reported as engaging in this popular activity. Many other and diverse interests, far removed from the environment which surrounds the development of oil lands, have made their advent in the field. Prominent among them have been railroads and the Cities Service Co. belonging to the Doherty interests, which organization has achieved a noteworthy success.

The transition from the development of mining claims to that of oil lands is a natural and logical one. The problems are quite similar. The science of geology has always been associated in the popular mind with mining, and so have the mechanical skill, and the hazard of prospecting, which constitute the two requisites in the bringing in of an oil well. The development of oil lands, however, is a comparatively simple operation and requires the solution of none of the intricate engineering problems involved in mining. Wealth flows to the surface in the form of oil much more easily than it is won from copper metal deep in the earth; and with the passing of the peak of opportunity for metal mining in the United States, the natural trend is for metal mining companies to invest a part of their accumulated surplus in the mineral industry of the hour.

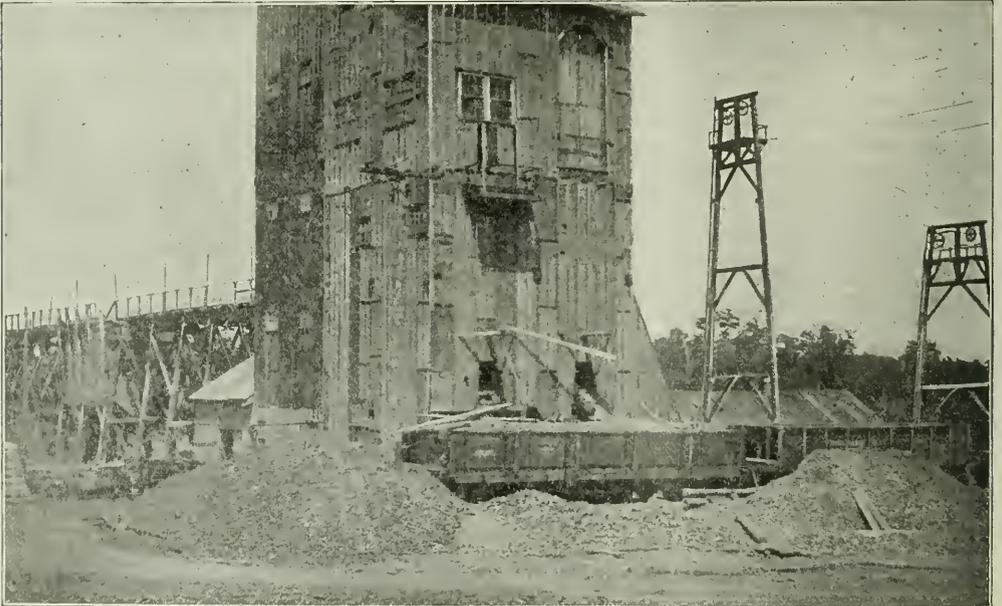
A New Department The Petroleum Section

The Journal has published in times past a number of articles dealing with the petroleum industry as well as with the subject of petroleum engineering. So important, however, has the industry become that we are starting in this issue a new department—The Petroleum Section. In this we will publish short articles on practical details, statistical material from various sources and information useful to engineers and others interested. Subjects of broader scope will be published as before among the leading articles of the various issues of the Journal. The establishment of the new department is another direction in which the Journal will increase its field of usefulness to its readers. It is hoped that engineers will not only contribute to this section but will also lend their aid to us in bringing the many important developments which are taking place in the comparatively new field of petroleum engineering to mining engineers, as well as to the industry. We feel that there has not been sufficient attention paid it but the Journal will now do its share.



MEACHAM MINE OF ROGERS BROWN ORE CO. AT CROSBY, MINN.

Photographs From the Field



SHAFT OF SENECA MINING CO. NEAR MOHAWK, MICH.

Ore Deposits of Utah*—Part II

Evidences Show the Formations of the Large Orebodies of Utah Were Influenced by a Relation Existing Between the Exterior and the Surface at the Period of Solidification—Brecciation of Rocks Favorable to Ore Deposition

BY B. S. BUTLER

U. S. Geological Survey, Washington, D. C.

IT HAS been pointed out that the exposed intrusive bodies in the eastern part of Utah are characteristically laccoliths, and that those in the western part are stocks. The present erosion surface has truncated the stocks at different distances below their tops, and, in

conditions of nearly uniform pressure, may have been a factor in preventing the segregation of such liquid and gaseous differentiates with their dissolved contents as they were formed. If the material forming a laccolith or sill was intruded into hot deep-seated rocks, and



FRONT OF WASATCH RANGE AT THE MOUTH OF LITTLE COTTONWOOD CANYON

fact, there is reason to believe that some stocks have not yet been exposed. Stocks that are truncated near their apices are designated apically truncated stocks; those that have been more deeply eroded are termed medially truncated stocks.

In studying the relation of ore deposits to the different types of intrusive bodies it was a matter of some surprise to find that more than 99 per cent of the metal production of the state derived from deposits associated with igneous rocks had been from those associated with apically truncated stocks. Prospecting of deposits associated with laccoliths and medially truncated stocks, though it has been carried on intermittently for more than forty years, has not developed a single mine of first- or second-class importance.

The scarcity and small size of ore deposits in association with the laccoliths of Utah is thought to be related to the slight degree of differentiation that is observed in these intrusive bodies. The material forming the laccoliths enters the chamber which it occupies through a comparatively small opening (see Fig. 6), and the material in the opening solidifies soon after active movement ceases, thus effectively shutting off connection with the deeper-seated source of supply.

The individual bodies of igneous materials in the laccoliths of Utah are relatively so small, and solidified so rapidly, that conditions for differentiation were not favorable. A large accumulation of differentiation products of which the ore solutions were one is therefore not to be expected. The fact that the laccoliths had no connection with the surface, and solidified under

solidified slowly, the conditions might be favorable to gravity differentiation such as has been called upon to explain deposits like those of Sudbury, Ont.

In the stocks differentiation was least active near the tops and on the margins where the solidification

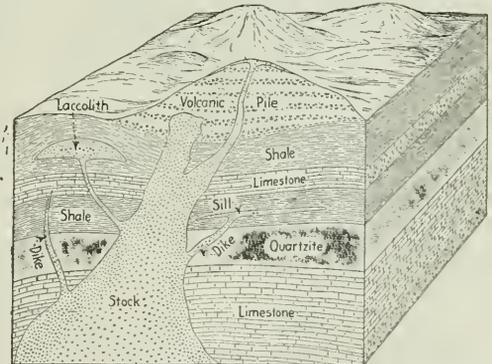


FIG. 6. GENERALIZED STEREOGRAM SHOWING DIFFERENT TYPES OF INTRUSIVE BODIES

was most rapid, and most active in the interior. The heavy products of differentiation, as the iron-magnesian silicate crystals that formed early, tended to settle, whereas the volatile constituents carrying metals in solution evinced a proclivity to rise. This differentiation by settling of crystals is believed to explain the more siliceous composition of the medially truncated stocks.

*Publication sanctioned by the Director of the U. S. Geological Survey.

As rapidly as a crust of solidified rock formed over and around the stocks it was fissured by the movements due to solidification and other causes, and the volatile materials rising through the still fluid mass, on reaching the fissured zone, were guided along these openings till physical and chemical conditions favorable to precipitation were reached in the solidified igneous rock or the adjacent sedimentary or eruptive rocks where minerals were deposited. (See Fig. 7.) The effect of this process was to concentrate the mineral constituents resulting from differentiation in and around the tops of the stocks. Where the stocks have been deeply eroded, this zone, and with it most of the valuable ore deposits, have been removed. (See Fig. 7.)

It is possible that the concentration of metals near the apex of a stock is influenced by the relation of the magma at the time of intrusion to the surface or to the zone of fracture. If a magma containing gases held

the stocks of Utah were so connected, notably those of the Tintic and Marysvale districts. Proof that an intrusive body now exposed had no connection with the surface before solidification is more difficult to demonstrate. There are, perhaps, criteria that would aid in such a determination, and their recognition will be valuable.

The deep-seated intrusive body of the Park Valley district contains abundant aplite and pegmatite, as does the Granite Mountain intrusive. Possibly the retention of these differentiation products means a lack of surface connection. Large ore deposits have not been found associated with these bodies. Whether aplites and pegmatites are significant or not, it may be noted that the intrusive rocks of all the districts containing large ore deposits are similar in character to those that are believed to have had a surface connection before solidification.

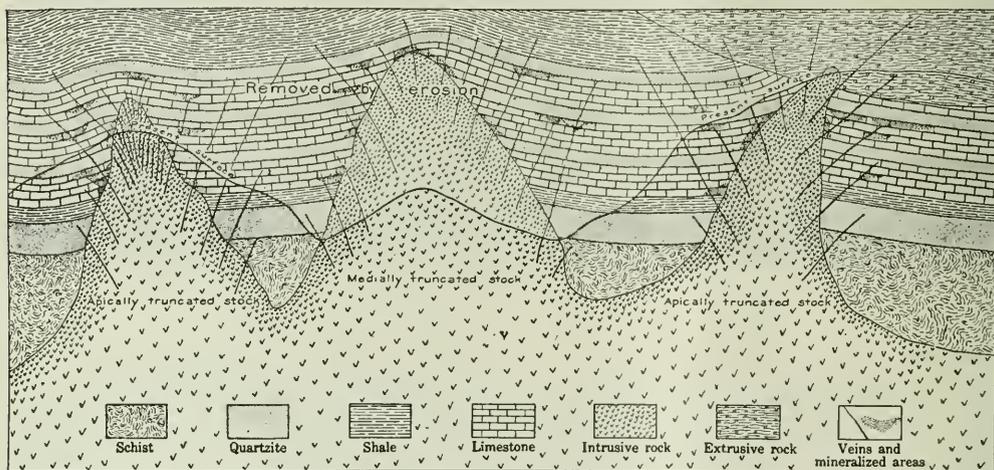


FIG. 7. GENERALIZED STEOGRAM SHOWING THE RELATION OF OREBODIES TO STOCKS.
The lighter portions of the stocks are more siliceous.

in solution under pressure is forced through the overlying rock until it connects with the surface or with the zone of fracture it is possible to imagine a condition similar to that produced by removing a cork from a bottle of champagne, when the dissolved gases move toward the region of lower pressure. In this manner there might be relatively rapid movement of previously dissolved gases into a restricted area from a large volume of magma.

The expansion of gases under decreased pressure and chemical reactions would effect temperature changes that may be factors in precipitating metallic and other substances. If the magma did not reach the surface, the influence of difference in pressure would not be effective or would be less effective. This may account for the conditions in the Park Valley district and in the Grouse Creek range where the tops of intrusive bodies (whether laccoliths or stocks is not apparent) are exposed by deep erosion, and do not appear to contain large deposits of ore.

It is not always possible to determine whether an intrusive body was connected with the surface before solidifying. There is, however, evidence that some of

Primary sulphates in igneous rocks and in ore deposits formed at high temperature are confined to a few complex silicate minerals containing the sulphate radical. In igneous rocks these minerals are characteristic of effusive rocks and dikes as constructed with deep-seated intrusive rocks. In deposits formed at intermediate temperature barite is common, and anhydrite is abundant in some deposits. Under favorable conditions, and probably at comparatively low temperature, alunite forms abundantly. It is believed that in many deposits the sulphate of the minerals has been derived from deep-seated solutions.

The study of volcanic emanations has shown that there is a change in their composition with change of temperature. At high temperature, sulphur or sulphur dioxide may be present, but no sulphuric compounds; whereas at moderate temperature, sulphurous and sulphuric compounds may be present. Sulphur trioxide is unstable at high temperatures (at atmospheric pressure it is practically dissociated at 1,000 deg.), and the temperature range in which it forms rapidly by combination of sulphur dioxide and oxygen is stable and narrow (approximately 250 to 600 deg. C. under at-

mospheric pressure). If free oxygen and sulphur or sulphur dioxide are present in igneous emanations, it would be expected that, in cooling, sulphur trioxide would form and that at suitable temperature the sulphates would also form.

Sulphuric acid can also be formed readily by the reduction of ferric solutions and sulphur dioxide. If emanations contain no free oxygen, that element may, combined with the metals or with hydrogen at high temperature, together with sulphur, form the oxides of sulphur and sulphuric compounds at lower temperatures.



HEAD OF LITTLE COTTONWOOD CANYON ALTA DISTRICT, WASATCH RANGE

That this reduction of metallic oxide and oxidation of sulphur compounds can take place is indicated not only by experimental data but by the abundance of ferric compounds in igneous rocks and mineral deposits formed at high temperature, though those ferric compounds are not only commonly absent in veins formed at moderate temperature, but in the adjacent wall rocks have been largely reduced. In contrast to this, sulphuric compounds are only sparsely represented in igneous rocks and mineral deposits formed at high temperature, but are frequently abundant in deposits formed at intermediate and low temperatures, and in many deposits are associated with abundant ferrous and manganous compounds. Such changes may be observed in a single deposit that has continued to form over a wide range of temperature, as that of the Cactus mine of the San Francisco district.

The alunite veins at Marysvale appear to have been deposited from deep-seated (hypogene) solutions, and it seems probable that in their formation the sulphur in the solutions was oxidized to sulphuric acid, which acted on the felspathic rocks adjacent to the fissures and formed the potassium and aluminum sulphates that entered into the alunite.

The interchange of oxygen between certain elements and sulphur, with varying physical conditions, is believed to be an important factor not only in the formation of sulphates in solutions of deep-seated origin but also in the precipitation of other primary (hypogene) ore minerals.

Before the main period of ore deposition, parts of the region had been deeply eroded, and rocks ranging from pre-Cambrian to Cretaceous age were exposed at the surface, so that the age of the rock is no trustworthy indication of its depth below the surface at the time

ores were deposited. Replacement deposits occur in rocks ranging in age from pre-Cambrian to Jurassic, and their relative importance seems to depend on chemical composition and physical character, and the relation to intrusive rocks rather than upon age.

The limestones were generally more readily replaced than the siliceous rocks, as is plainly evident in the Bingham, Park City, Tintic and other districts. In a series of limestone beds those composed essentially of calcium and magnesium carbonates were more readily replaced than the siliceous or shaly beds. This relation is illustrated in many of the districts of the state. Some particular feature may control in certain deposits; carbonaceous shale, for example, appears to have been most potent in precipitating gold from the solutions that traversed the rocks of the Mercur district.

IMPORTANCE OF PHYSICAL CONDITION OF ROCK

The importance of the physical condition of rocks as a factor in determining their susceptibility to replacement can hardly be overestimated. In many instances it appears to more than counterbalance unfavorable chemical composition, and where favorable chemical composition and physical character are combined in the same rock, bonanza deposits have resulted. Highly jointed brecciated or crushed rocks, where impervious gouge does not prevent access of metalliferous solutions, have uniformly proved favorable to ore deposition. Among the important deposits in such material are the great disseminated copper ores of the Bingham district, in highly jointed monzonite; the copper deposits of the San Francisco district, in brecciated quartz monzonite; the lead-silver-zinc-copper deposits of the same district, in brecciated latite; the deposits in crushed quartzite, in and adjacent to fissures in the Park City, Bingham, and other districts, and the deposits in brecciated limestone in the Cottonwood and other districts. In numerous instances a close inspec-

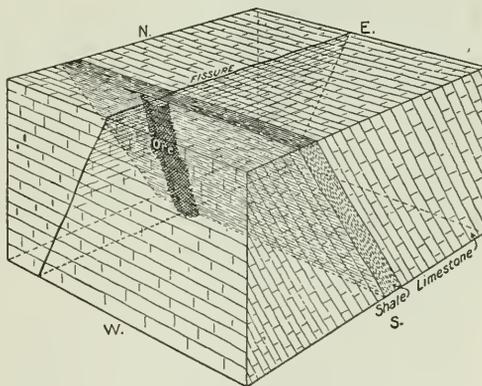


FIG 8. STEOGRAM ILLUSTRATING THE RELATION OF ORE SHOOT TO IMPERVIOUS ROCK

tion of an ore bed has shown that the selective replacement has been in part at least due to the fact that the replaced bed has experienced greater shattering adjacent to the fissure than the overlying or underlying beds.

The presence of impervious rocks may exert an important influence on the location of oreshoots. This is shown in the replacement of beds underlying shale, as in the Star district (see Fig. 8), or underlying a dike

or sill, as is shown in the Fish Springs, Ophir, and other districts.

The basin character of part of the area which has resulted in a greatly varying position of the water

however, affects very differently the various metals in the ores.

Under the conditions that have prevailed in the regions, gold has moved little during the process of

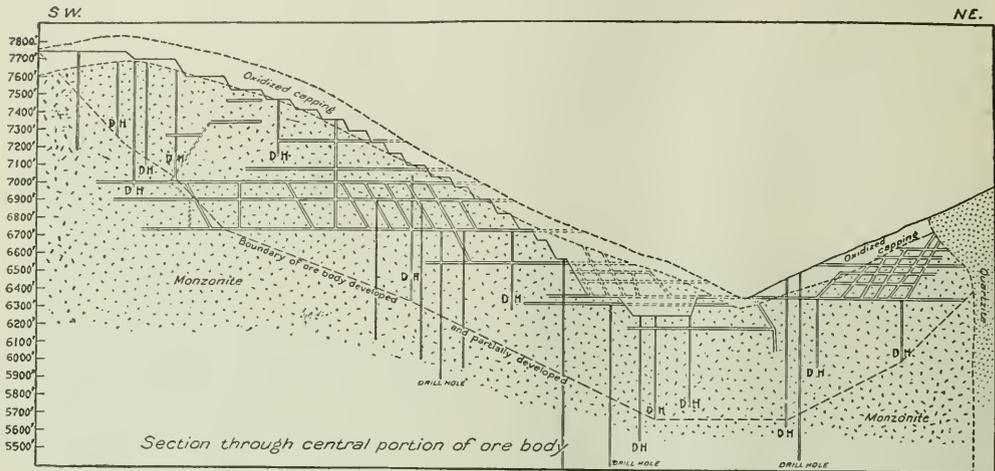


FIG. 9. SECTION THROUGH DISSEMINATED DEPOSITS OF BINGHAM DISTRICT SHOWING OXIDIZED CAPPING AND ENRICHED SULPHIDE ZONE
From Utah Copper Co. annual report

table has caused an unusual complex cycle of alteration by surface agencies in some of the deposits. Nearly all types of deposits have been both enriched and made

oxidation, but has undergone residual concentration in the gossans, as in the Bingham district, and the gold of the gossan may have been later concentrated in places. Moreover, the natural process of oxidation has eliminated one step in the metallurgical process. In the Mercur district the unoxidized ores required roasting before cyanidation, whereas the oxidized ores could be treated without roasting.

Silver, like gold, has apparently moved little under the prevailing conditions. This is probably due to the fact that chlorides are abundant in the region, and enough are present in the waters to convert all soluble silver salts that form to the slightly soluble silver chloride. As in the case of gold, there has been some residual enrichment, and the metallurgical treatment of the ores was much simplified.

Lead, upon oxidation, forms slightly soluble salts, mainly the sulphate or carbonate, and has migrated little. As with the metals previously mentioned, there has been residual enrichment, and the oxidized ores were amenable to the simple metallurgy that was possible in the early days of mining.

Copper, which forms readily soluble and also slightly soluble salts, shows much variation in movement. Where abundant limestone or calcite is present in the deposits, the copper resulting from the oxidation of the original minerals forms the slightly soluble carbonate, and there is comparatively little migration. Where the gangue is mainly silicate, the soluble salts migrate downward and are re-precipitated, forming a zone of sulphide enrichment, as in the disseminated deposits of the Bingham district and in the Horn Silver mine, as shown in Figs. 9 and 10 respectively. Much of the copper ore of the state has resulted from the enrichment of material originally too low in copper to be mined profitably.

Zinc, like copper, forms both soluble and insoluble

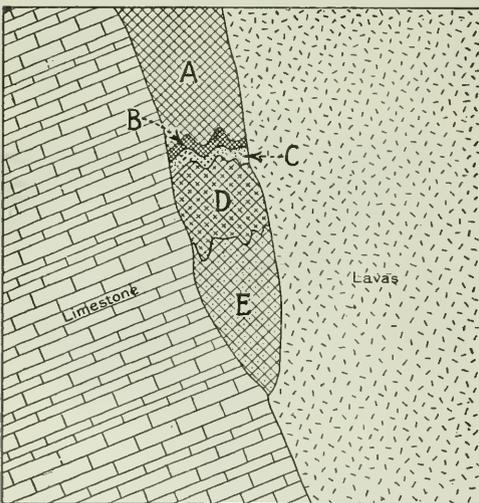


FIG. 10. GENERALIZED SECTION, SHOWING TYPES OF ORE IN THE HORN SILVER MINE

A. oxidized lead-silver ore; B. oxidized copper ore; C. secondary copper sulphide ore; D. Secondary zinc sulphide ore; E. primary sulphide ore

more amenable to metallurgical treatment by the natural process of concentration.

In nature, as in smelting, starting with a sulphide ore, the process is essentially one of oxidation. This,

salts. Under favorable conditions the zinc content of complex sulphide bodies has been concentrated into valuable deposits, but under unfavorable conditions it has apparently been disseminated and lost. The most favorable conditions appear to exist where the soluble

of tropical ulcers, which reduced the labor supply; to shortage of cars, and to the urgent Imperial demands at Beira for bunkering; also to the constantly increasing demand for coke for the Katanga copper mines and the need of the Rhodesian railways. Rhodesian mines de-

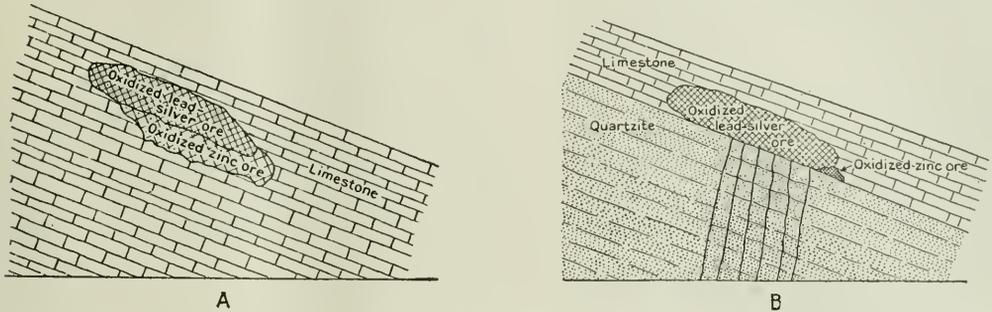


FIG. 11. A, CONDITIONS FAVORABLE TO THE FORMATION OF SECONDARY ZINC ORES; B, CONDITIONS UNFAVORABLE TO THE FORMATION OF A SECONDARY ZINC ORES

salts, in their migration, pass into readily replaceable limestone, by which the zinc is precipitated mainly as carbonate, as shown in Fig. 11-A. Where the solutions carrying the zinc pass into siliceous rocks (see Fig. 11-B) the zinc is too much disseminated to form ore. Under rather exceptional conditions, as in the Horn Silver mine, zinc is precipitated in the sulphide zone, as wurtzite, and thus forms a zone of enriched zinc-sulphide ore.

Mining in Rhodesia in 1918

Output and Dividends Decreased, Owing to War Conditions—Wankee Colliery Unable To Meet Demand for Coal—Influenza Made Heavy Inroads

THE mineral production of southern Rhodesia in 1918 was as follows, according to the report of the Secretary of Mines: Gold, 631,358 oz.; silver, 175,722 oz.; copper, 3,254 lb.; coal, 491,268 tons raised, 285,312 sold, 119,701 coked; chrome ore, 31,286 tons; asbestos, 8,574; ironstone, 6,355; wolframite, 11; scheelite, 26; arsenic, 114; antimony, 15; barytes, 54 tons, and diamonds, 449 carats. The value of the total mineral production in 1918 was £3,456,321, or £1,183,014 less than in 1917.

Ten mines produced over 10,000 oz. of gold in 1918, Shamva yielding 89,780; Globe & Phoenix, 82,283; Lonely, 49,561; Cam & Motor, 39,640; Falcon, 33,282; Rezende, 29,690; Eldorado, 29,348; Antelope, 18,405; Gaika, 15,645, and Fred, 14,129. Gold quartz crushed was 1,966,974 tons. Two large gold mines closed down late in 1917. Rising prices for stores and supplies and the absence of many claim-holders on active service also caused the closing down of many small mines.

A very rich shoot of gold ore was opened in the Rezende mine, at Umtali. The Globe & Phoenix mine continued its prosperous career, and the Lonely mine, at Bemberi, disclosed rich ore in the lower levels between 1,500 and 2,000 ft. vertical depth. It is rather amusing to note that not so very long ago this mine was cited as an example of "impoverishment in depth"!

The Wankee Colliery was seriously short in its coal output during most of the year, owing to an outbreak

pending on coal for fuel had often to go short and hang up stamps. "The strain on this colliery to meet increasing demands seems to be too great," runs the report. "The coal measures at Wankee are practically unlimited, and the coal is of excellent quality; but the necessity of opening up another colliery at Wankee with adequate equipment becomes more and more apparent."

The supply of wood and timber in the mining districts is causing anxiety, as no reforestation methods are practiced. During the last quarter of the year Spanish influenza paralyzed the industry. Natives died or deserted, and would not re-engage until they had visited their kraals to see how their relatives had suffered. In October and November, 1918, deaths in the mines amounted to 3,000 and desertions totaled 7,300. The loss to the mineral industry was about £400,000. The average number of native laborers employed was 32,766, and the death rate, which was greatly increased by influenza, was 110.76 per 1,000! The monthly average number of Europeans employed was 1,452.

The Odzi River bridge on the line to Beira, the shipping port, was carried away by flood, stopping exports of base metals for several months. Prospecting was at a standstill, and organized prospecting is required. A valuable area, however, containing vast deposits of chrome ore and some high-grade asbestos, was discovered in Lomagundi district forty miles from the railway. Scheelite was discovered in large quantities in and around the Golden Valley mine, in the Gatooma district, and also near Umtali.

The main copper producer was the Falcon mine, with 3,033 tons. The Lomagundi area shows promise as a copper producer. The Selukwe mines produced tin-chrome ore. Arsenic is now produced from a mine near Bulawayo and another near Umtali. The bulk of the production was sold in the Transvaal to the B. S. A. Explosives Co. which makes cattle dip. Platinum was discovered in the precious-stones wash of the Somebula district.

Dividends declared by mining companies in 1918 totaled £615,640, compared with £691,260 in 1917. These figures do not include profits made by small workers.

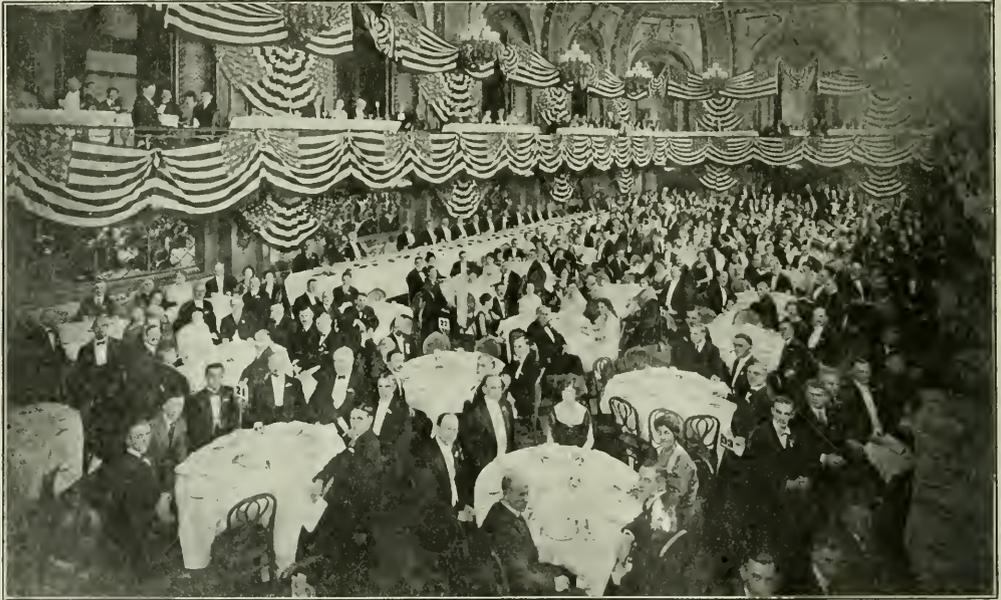
A. I. M. E. Banquet

THE banquet which is an annual feature of the meetings of the American Institute of Mining and Metallurgical Engineers was held this year in the Gold Room of the Congress Hotel, Chicago, on Sept. 24, 1919, and was attended by more than six hundred members and guests. Captain R. W. Hunt officiated as toastmaster, and introduced President Horace V. Winchell, who urged engineers to exert their influence toward the proper solution of public problems, and admonished them not to neglect their duties as citizens while engrossed in their professional activities. Mr. Winchell's address is published in full elsewhere in the Journal.

Captain Hunt discussed conservation, and pointed out that the conservation of mineral resources was

Commander Taublet, of the French Navy, delivered an address wherein he compared interesting mineral statistics of the United States and France, and pointed out France's great need for coal, and her willingness to exchange iron for coal.

Mayor Theodore W. Robinson welcomed the Institute on behalf of the city, and delivered an interesting eulogy on "Chicago the City of Destiny," in which he called it the world's larder and granary, and the greatest railroad center because of its twenty-seven trunk lines. In referring to the duties of the engineer, he urged the preaching of the gospel of hard work, thrift and loyalty. He advocated the open shop, and called the steel strike "foreign radicalism transplanted."



BANQUET A. I. M. E., CONGRESS HOTEL, CHICAGO, SEPT. 24, 1919.

more important than the conservation of our forests, because the forests could be replaced within a measurable period of years, whereas the minerals, once removed from earth, or wasted, represented a permanent loss. He advocated the conservation of human life first, natural resources second, and capital third, and expressed the opinion that if laws were enacted to take care of the first two, capital would take care of itself. He thought that the nationalization of coal mines would be the greatest hardship ever put upon the people of the United States, and that the most effective way to conserve coal would be to tax the coal left in the form of pillars in the ground in the process of mining.

Secretary Bradley Stoughton expressed, on behalf of the Institute, hearty thanks to Chicago for its cordial hospitality, and said that the meeting broke all records in point of attendance.

Charles M. Schwab delivered an entertaining address, in which he urged engineers to give more attention to the science of human engineering. He extolled the efficiency of American industry during the war, and referred to the so-called German efficiency as a great fallacy. He said that one way to reduce the high cost of living was to practice economy and efficiency, and that the surest cure for our industrial unrest was "an honest day's work for an honest day's pay."

Address of Horace V. Winchell at A. I. M. E. Chicago Meeting

AT THE BANQUET held on the evening of Sept. 24, at the Chicago meeting of the Institute, President Horace V. Winchell delivered the following address, which is here presented in full:

Ladies and Gentlemen: On behalf of the members and directors of the American Institute of Mining and Metallurgical Engineers, I desire to express our appreciation of the diligent labors and many thoughtful courtesies of the Chicago members which have culminated in this splendid gathering here tonight. We have enjoyed the cordial atmosphere of welcome by which we have been surrounded; we have profited by the interesting discussions of the past three days, and we shall long remember with gratitude the manifestations of friendship which have attended our brief sojourn in Chicago.

We look upon these, our annual mid-year gatherings in different sections of the country, as one of the most effective agencies in the forming of acquaintance with many whom we might otherwise never meet. In this way are brought together men of common aims and similar lines of investigation, and through the interchange of ideas and the friction of personalities are often developed a warmth of interest and a fruition of conception which lead not only to lifelong friendships but to results of importance in our social and economic development. Those of us who were here in 1893 and listened to the reading and discussion of Posepny's paper on the genesis of ores received an inspiration and a stimulus which perhaps have played no small part in the vastly greater study and the clearer understanding of that subject which in the past quarter of a century have been marked by a progress greater than that of all antecedent time. Nor is this the only epoch-making monograph which has first been promulgated at our meetings. I have no doubt whatever that some of the ideas advanced in our technical sessions this week contain germs of thought susceptible of great future elaboration, and that these germs, if not already fully developed, will bear rare fruit in succeeding years. May we not therefore congratulate ourselves and thank our hosts in this great metropolis because of this record-breaking attendance here this evening? Truly a high mark has been set in the history of Institute events.

In glancing backward over the last twenty-five years we become conscious of many changes, not alone in the scale of production and in methods of operation but also in the more intangible but none the less important conception of the relation of the engineer to society in general and more especially to his own particular community. Although it is to be feared that there is some foundation for the statement recently made to the chairman of the National Service Committee of the Engineering

Council¹ by "an acknowledged statesman and keen observer of events," that "Engineers are the most unresponsive citizens that we have. . . . Their aloofness and indifference in all matters outside of their own professional sphere are among the unexplained things in our political life," yet there are signs of an awakening, and the future is not without promise.

Our Institute itself, an organization which was for many years forbidden by the organic law from exerting any influence on law-making bodies, or even presenting its views as an organized unit of professional men regarding any movement which affected the general community, has recently removed these restrictions and is now able legally and with perfect propriety to appoint its committees and representatives to lend professional advice and assistance to any and all public and governmental agencies which may in any way shape and control legislation and national activities.

Recent events have shown us that the fabric of human relationship is each year more closely interwoven. The strands are ever closer and more firmly drawn, and each separate thread is a sensitized nerve alive with electricity and communicating instant warning of danger and news of damage to every other vital part. The development and perfecting of means of communication and transportation, and the arrival of an industrial age, have made all the world neighbors; and just as a fire in your neighbor's house is always a matter of concern to you, so an incipient conflagration of social or economic unrest or disorder in any part of the civilized world has now come to have its effect upon every other part.

I have said before, and it cannot be too often repeated, that from the historic moment when Admiral Dewey sailed into Manila Bay and upset the coffee cups of the Spanish Navy, we, the United States of America, are by force of natural law, and whether we wish it or not, partners in the commonwealth of nations. We may legislate against it; we may make treaties with reservations, or no treaties at all; we may set up barriers and lock the doors against all foreigners, black, white or yellow; but if because of our acts, or for any other reason, these excluded and distant peoples engage in conflict among themselves, we shall again, in spite of our wishes, our barriers and our padlocks, be drawn into the fray.

Nor is it in time of war alone that we find ourselves indissolubly harnessed up with the rest of mankind. Each smallest fluctuation in the annual production of the farms of Europe or of Argentine is reflected in our markets. Each drouth or famine, each outburst of Bolshevism, each overthrow of a tyrannical government in any part of the globe, affects each and every one of us, down to the youngest babe in its cradle or the poorest-paid worker in a sweatshop. Social diseases of the body politic are like the influenza: they are pandemic,

¹Engineering and Mining Journal, Sept. 13, 1919, p. 459.

they are in the air, and are not excluded by bolts nor barred gateways, by statutes or standing armies.

Nor may we blind our eyes to the fact that at the present time, under the order of divine providence, the United States is the only great nation whose resources are not only unimpaired but incomparably greater than ever before; that the nations of Europe are exhausted and almost bankrupt; that it is our privilege and our duty to them as well as to ourselves to go to their rescue. This was made so clear by our illustrious member, Herbert Hoover, in his address at New York last week, that it requires no emphasis from me. I presume each of you will soon receive that address in printed form. I advise you to learn it by heart and to lend it to all your friends. I wish that it could be read by every intelligent person between the Atlantic and Pacific; that it could be used as a text by every minister, and as a reading lesson for a week in every highschool. It emanated from a heart wrung by the woes of suffering millions and from a brain clear enough and broad enough to analyze the causes for Europe's condition and to perceive clearly the only remedy.

It is a source of inspiration to us, and one of supreme gratification to all engineers, that in a time of crisis, in a period that tried men's souls, at a moment when the real man comes to the front and assumes that position of leadership to which, by his mental attributes and moral courage he is naturally entitled, it should have been a mining engineer to whom the world turned for relief, and that for his trusted and most effective coadjutors he chose many other engineers. Does this not suggest to us that engineers are needed in the settlement of the world's affairs? Do we not realize that there is prevalent, as an aftermath of war and the artificial conditions created by it, a widespread feeling of discontent? Are we not still, and more than ever, ready to apply to the solutions of post-war problems the mental poise and balanced judgment which are a part of the equipment of the trained engineer? Shall we be so modest and retiring or so engrossed in our technical duties as to forget or neglect our duties as citizens?

Just at this point my subliminal ear detects a murmur. What do you say? "We cannot all be Hoovers or presidents or Members of Congress"? No, of course not! But you can help to make or unmake them, to influence them, and to shape the policies of government and the destinies of nations. Why is President Wilson touring the country today? Is it not to shape public opinion? He knows that the world is ruled by ideas, and that there is no greater force than public opinion. Suppose all the engineers of this broad Republic should unite and devote all of their spare time and energy for six months in advocating some change in our statutes which clearly appealed to their sense of equity as promoting the public welfare: do you not suppose they could speedily overcome the apathy and selfish inertia of our chief law-making body? Of course, they could. Well, it would not be you or I, but all of us, who would have done it. It would be the result of co-operation and organized effort, in which

each individual pulled in the same direction and not at cross-purposes with the rest.

Now, this is all trite; and in one form or another has been said many times. You want perhaps to know just what particular move to make next, and just how and where to begin. And these questions I cannot answer; but I may, with your permission, make a few suggestions.

There are problems of public character constantly before us, and yet of direct and vital importance to each one of us engineers. Some of these problems are comparatively local in their sphere of bearing and application; some are nation-wide, and some of them are international in scope. We have, for example, in each state and county, local taxation questions. As applied to mines and quarries, to mills and smelters, and to many other industrial plants, the valuation of properties for taxation involves questions which require engineering ability of high order, and keen analysis by the best brains of the country. The same problems are now presented in connection with the Federal Income Tax Law. Indeed, there are few subjects of wider general bearing and importance, nor any which make more pressing demand upon the engineering talent of the land. That we were not consulted in the framing of the law is perhaps due largely to our lethargy and apparent indifference. We are now confronted with its interpretation and proper application, and should not fail to give to the governmental authorities the benefit of our most serious consideration and competent advice. We are glad to be called into conference, and must willingly embrace the opportunity to aid in placing all interests involved on the most nearly equitable basis.

Then there is the ever-present and just now unusually inflamed antagonistic struggle between the employee and the employer. I know of no more promising work for engineers, with their peculiar adaption for studying the elements of a complicated situation, for determining the relative importance of its factors, for picking out the particular operating defects, and for suggesting solutions to difficulties. Conflicts generally arise through lack of mutual understanding and consequent lack of confidence. Where there is perfect understanding among fair-minded men there will be confidence, and where there is confidence, difficulties can be adjusted without strife. It seems to me that engineers may be of inestimable service to all classes by exerting the influence, which they undoubtedly possess, toward the education of the hostile elements as to the real necessities and actuating motives of the other. We are consumers; we are a portion of the public which always suffers in these industrial conflicts. We are coming to believe that no element in the community should be permitted to throw our entire industrial machine out of operation; that some control should and must be exercised to prevent these recurring disasters to the peace and prosperity of the country. The subject is one which demands the attention of all thoughtful and intelligent citizens, and is to be settled, if at all, only by concerted effort.

In broader fields we see the need of engineering brains and attention in the world-wide control and distribution of mineral resources. Recent thoughtful discussions by Messrs. Leith and Spurr have shown us that the United States has important duties to its own people and to the people of other countries in connection with the commercial control of minerals. It will be generally admitted that, until very recently, our people have been so busy in developing our own resources that we have paid little attention to those of other countries. It is also a fact that our policy of insularity has tended to discourage investments abroad. The studies of world conditions which we have been forced to make within the past few years have made it clearly evident that we must wake up and protect ourselves and our industries in their relation to the raw materials for manufacture and world-wide distribution. Our resources must not be dominated by foreign capital, and we must acquire our necessary share of those which can be controlled by us abroad. As Spurr¹ wisely says:

"Such mineral wealth as we possess in an exportable surplus must be managed for our best advantage. Such minerals as we do not possess in quantities sufficient for our own needs, must be secured to us so far as possible by a definite and intelligent governmental policy."

Other governments have already passed laws debarring us from owning or operating oil-producing properties and mines of various sorts within their territories. We have done little or nothing along these important lines of security and protection for the future.

Finally, it is for us to remember that we are not only engineers but Americans; that "America is worth saving not only as a land in which men and women may be free and increasingly prosperous, but as a land and a government under which character can be built, individual capacity given opportunity for free exercise, and co-operation on the widest scale promoted not only for private advantage but for the public good."²

Let us not forget that "socialism is the twin brother of autocracy, and, like autocracy, it is the deadly enemy of republicanism and of individual liberty." Let us stand firmly for the principles of equal rights and justice for all, and have full confidence in the destiny of our country. Thus alone shall we come up to the full measure of the possibilities of our profession and our duties as American citizens.

Special Meeting of Denver Members of A. I. M. E. at Chicago

One of the pleasant features of the A. I. M. E. meeting in Chicago was the reunion luncheon of the Denver and ex-Denver members of the Institute at the Congress Hotel, on Sept. 23, attended by twenty-two engineers, many of whom are now active members of the Denver Section. The meeting was called by H. B. Lowden, of the Colorado Iron Works Co.,

Denver, and Secretary of the Teknik Club, of Denver. H. C. Parmelee, editor of Chemical and Metallurgical Engineering, and formerly secretary of the Teknik Club, presided. Other members in attendance were John V. N. Dorr, the Dorr Co., New York; Walter G. Swart, Duluth, Minn.; A. M. Plumb, manager Wisconsin Zinc Co., Patteville, Wis.; Chester H. Jones, Chicago editor Chemical and Metallurgical Engineering; E. R. Ramsey, The Dorr Co., Denver; R. B. Moore, U. S. Bureau of Mines, Golden, Col.; D. J. Roach, Great Western Sugar Co., Denver; L. F. Miller, University of Minnesota, Minneapolis, Minn.; Will H. Coghill, U. S. Bureau of Mines, Seattle, Wash.; S. J. Osborn, Great Western Sugar Co., Denver; S. C. Lind, U. S. Bureau of Mines, Denver; W. A. Mitchell, assistant chief engineer Great Western Sugar Co., Denver; P. M. McHugh, Western sales manager The Dorr Co., Denver; S. A. Ionides, Denver; Arthur G. Dwight, New York; H. N. Stronck, Chicago; and John L. Malm, W. E. Malm, R. A. Malm and Harry J. Wolf, the Malm-Wolf Co., Denver.

The chairman referred to the meeting as one of the numerous reunions of engineers that contribute toward the success of the A. I. M. E. meetings. A renewal of old friendships was followed by a discussion of industrial relations, in the course of which there was a general expression of progressive sentiment. It was agreed that every important industrial contract of the future would be drawn with due consideration for (a) labor, (b) capital, (c) management, and (d) the community.

Chile Copper Co.

The tenth quarterly report of the Chile Copper Co., covering the second quarter of 1919, states that on account of the condition of the copper market the company's operations remained curtailed to approximately a 50-per cent basis. The production of copper for the quarter averaged 5,030,951 lb. per month, as compared with 5,169,641 lb. per month during the first quarter of 1919.

During the quarter ended June 30 there was treated 511,502 tons of ore, averaging 1.69 per cent copper; in the preceding quarter there was treated 648,203 tons, averaging 1.57 per cent copper. During the quarter 10,533,846 lb. of copper was sold and delivered out of a production of 15,092,852 lb. In the preceding quarter the copper sold and delivered totaled 3,971,849 lb., out of a production of 15,508,924 lb.

The average price realized for copper during the quarter ended June 30 was 15.933c per lb., as compared with 13.724c per lb. for the preceding quarter. For the quarter ended June 30, the cost of copper produced, including depreciation and all general expense, but excluding delivery and selling expense, excess-profits tax, obsolescence and depletion, was 12.69c per lb., as compared with 15.25c per lb. for the first quarter of 1919. Including all excluded items except excess-profits tax and obsolescence, the cost figured on copper sold was 21.520c for this quarter, against 30.355c for the first quarter of 1919.

¹The Scientific Monthly, July, 1919, p. 80.

²Nicholas Murray Butler, in an address before Cincinnati Commercial Club, April 19, 1919.

The Gold Situation*

Present Juncture of Financial Affairs Compared With Conditions Succeeding Civil War Period—
Importance of Stimulating and Encouraging Production of Gold—Effect
Of Present Expansion of Credits

BY JOHN CLAUSEN

A GREAT MAN once said, "Necessity opens our eyes to the advantage of fresh principles," and as I see it this is now the position in which we, as other nations, find ourselves. The greatest war the world has ever seen has so altered conditions that methods and customs different from those heretofore known or used must necessarily take the place of the old in order to keep abreast of the new order of things. In reality, a very important issue is presented as to whether the standard of value of the world will in future be gold or become a combination of silver and gold, and if so, what effect such changes would have on the trading powers of nations. It is obvious that if a bi-metallic standard were adopted as media, the question of the value between the metals themselves would become one of vital concern. Then again, for the actual needs of people there may be a scarcity of gold circulating as money for trading purposes, or as affecting the position of governments and banks and the availability of the precious metal in proportion to liabilities.

GREENBACK CURRENCY OF 1862

There are many interesting angles from which to view this important subject, but it may be of general benefit to here recount what happened in this country during and after our Civil War.

As an inevitable result of the Government policy which had placed upon the banks a burden too heavy for them to carry, the financial institutions in New York and other sections were, during the Civil War, forced to discontinue specie payments, which subsequently brought about the suspension of the National Treasury. At the beginning of 1862 a bill was introduced which had for its purpose the making of Government notes legal tender, and although that measure was considered unconstitutional it became law in February of the same year. The issue of greenbacks payable to bearer, after several amendments of the bill, was authorized up to a maximum of \$400,000,000. When the greenbacks were put out, it was expected that they would circulate at par with the gold dollar, containing 23.2 grains of pure metal, but a year after the first Legal Tender Act had been passed paper money had an exchange value equal to only 14.5 grains of gold. Its value rose in August, 1863, to 18.4 grains, but fell in July, 1864, to 9 grains, which appears to have been its lowest point. The premium on gold was then such that a dollar in paper money was not worth more than 36 cents in gold coin.

The most striking example of profiteering during that period was the Black Friday Conspiracy of September 24, 1869, when a group of speculators bought up large quantities of gold—creating an artificial scarcity—and as a result that commodity could be obtained only from this clique at ruinous terms. This brought

about many failures, and to check gambling in gold and reduce the premium on it, the Anti-Gold Law was passed; but as it did not materially bring the premium on gold to a lower level, it was very soon repealed.

In June, 1862, Congress authorized the use of "Postage and other stamps of the United States" as money because of the demand for small currency, notwithstanding the circulation of the so-called "shinplasters," which were issued in denominations of 5, 10, 20, 25, and 50 cents.

CALIFORNIA ALONE MAINTAINED SPECIE PAYMENTS IN CIVIL WAR

In some of the Western states attempts were made to maintain specie payments—after they had in the main been given up in the Eastern states—but California alone has the distinction of remaining on a sound metallic basis during the Civil War. In New York some of the banks felt confident of ability to continue paying cash, but none did—if the records are complete—with the exception of the Chemical National Bank. It was not until 1876 that gold again sold at par throughout the United States.

THE CRISIS OF 1893

Since that period the more notable event was the panic of 1893, which was followed by a depression throughout the nation, with the result that a large amount of gold was drained from this country to Europe. The Treasury's reserve became so low in November, 1894, that a sale of Government bonds was resorted to; in fact, the stock of coin was reduced to such an extent that there were outstanding more gold notes than coin, leaving a part of the certificates represented by bullion in the form of bars. Again, during February, 1895, and also in July of the following year, strong syndicates headed by leading bankers in New York accomplished the difficult task of bolstering up the finances of the United States Government, and it was largely due to their activities that the United States remained on a gold basis. The success of these combinations had a far-reaching influence on business, and as soon as it was seen that the gold obtained from abroad was not going to be lost at once, as in previous bond sales, confidence was again revived, and the financial position of the United States improved so favorably in the eyes of Europe that it was possible to float large holdings of American securities abroad.

THE GOLD POOL OF 1914

In August of 1914 foreign exchange became demoralized, and to remedy that situation a gold pool was created, when influential banks and bankers throughout the country joined in an agreement to provide mail and telegraphic transfers to Europe in lieu of gold for export, which proved a helpful factor in restoring order and confidence.

*From the *Chemical Bulletin* of the Chemical National Bank, Aug. 16, 1919.

For several years prior to the declaration of war in Europe, France, Russia, and Germany especially had been engaged in an eager competitive scramble for gold, which resulted in the holdings of their great state institutions increasing rapidly. On this account, at the outbreak of hostilities, we found them with what was up to that time the peak of their gold reserves.

The embargo which was universally adopted clearly demonstrated the desire of every commercial nation to control and retain its supply of gold. As far as the United States was concerned, other than the necessity of obtaining Government permission to export gold in coin or bars, its circulation in this country has not been restricted—although the efforts of banks and individuals alike have been directed toward harmoniously cooperating with the Government in concentrating the nation's supply with the Federal Reserve banks.

WHERE GOLD IS NOT ACCEPTABLE

One of the most curious economic features of the present situation is the strong light which it has thrown on the fact that it is possible to have too much of a good thing, even when that thing is gold. This is forcefully demonstrated if we glance at the financial position of the Scandinavian countries, where the law has been carried so far as to relieve the government banks of the statutory obligation to buy gold and coin from all those who bring it in. This naturally prevented other countries dealing with Scandinavia from paying for purchases in gold, and the barter of commodities was the only means open for concluding commercial transactions.

It has lately been said that the world is divided into two classes of countries: those which decline to accept gold and those which refuse to part with it. Sometimes it is asked how anyone can possibly refuse to take gold in payment, but this is explained by the statement that gold in bars or foreign coins is not legal tender anywhere. No person in Scandinavia, for example, could be made to take gold bars or American eagles in reimbursement for goods to meet a required payment in legal tender currency of Denmark, Norway, or Sweden.

THE PRESENT CREDIT INFLATION

The issue and circulation of paper credits throughout the leading nations of the world has been proportionately far greater than their holdings of gold, and this state of affairs has naturally resulted in inflation on an alarming scale. The thought, however, that European nations may possibly repudiate part of their war debts for the sake of reducing the amount of currency outstanding against government bonds or notes, is obviously superficial. Finance has become an international rather than a national question, and the monetary history of any country tends to become more and more merged with that of the whole civilized world.

International credit is firmly established on a gold basis, and no country has any interest in upsetting the present standard, although it is contended that, notwithstanding a great production of new gold, it may not necessarily assure universal gold standardism, as it would be a mere drop in the bucket of our future needs. If the world's credit, therefore, is to be carried on with gold, every ounce that can possibly be produced will be required as a basic foundation upon which international and national finance has been reared.

The production of gold is a vitally essential industry, which, for obvious reasons, should be promoted to the fullest extent. It is very apparent, however, that with a fixed value for the yellow metal, together with the rapidly increasing cost of material, labor and transportation, this particular industry as now developed is seriously affected, and it would seem inevitable that unless some form of Government relief is given to the producing mines, many of them will be compelled to discontinue operations.

In a letter addressed to Charles A. Sulser relating to the present conditions concerning the production of gold in Alaska, the Secretary of the Treasury clearly voiced the attitude of our Government when he stated: "I fully appreciate that with the rising cost of raw material and labor and with a fixed value for their output, the gold miners are facing difficult conditions. I should be sorry, however, if for this reason there were any relaxations in the effort to produce gold. At no time has this country so much required the largest possible production of gold as at present. . . . In order to place the the enormous amount of Government bonds required to finance our war expenditures, a large credit structure will inevitably be erected in our gold reserves, and it is necessary that these reserves—which are the foundation of the structure—shall be maintained on the broadest possible basis."

EFFECT OF INCREASING PRICE OF GOLD

There are people who argue that if the Government would agree upon a plan to increase the value of gold from \$20.67 to say, \$30 or \$40 a fine ounce, it would make a settlement of obligations possible with only half the metallic requirement otherwise necessary to redeem outstanding paper credits. This course, radical to say the least, would have a disastrous effect upon all credits and especially reflect upon the cost of living, which, in all probability, would climb to limits beyond the reach of the average citizen. Increasing the value of gold or giving it at premium does not necessarily give it a higher purchasing power, but, on the other hand, in the final adjustment seriously disrupts the basis of international credit.

When peace is finally restored all the world will be faced with a period of great financial and industrial uncertainty, and to pass through it successfully will be a task that will need all the statesmanship civilization can muster. To increase this uncertainty by tampering with the standard of international payment would be an extraordinary futile means of handling the situation, and only make the confusion worse confounded.

The principal nations of the world have adopted gold as the basis of their currency systems. The market price for it is everywhere the same and equally certain at the standard price of \$20.67 a fine ounce. It may be an anomaly that economic civilization should depend for means of payment on the supply of a particular metal, but it will take much ingenuity to find a practical substitute for gold and secure for it the popularity and confidence that this precious metal commands. The mere fact that it has been chosen by the most enlightened commercial nations is strong proof that it is the best single commodity for practical use as a standard.

The disproportionate distribution of gold among world nations attracts attention to the study of the part that this metal plays and is to play in future in the world's economic affairs. It is apparent to the careful observer that the pace at which the production of gold

increases is not as fast as the rise in value of the world's wealth.

The vast obligations piled up by nations, the huge issues of paper currency, the refunding of debts and resumption of specie payments are among the most urgent and difficult problems with which the world is now confronted. This makes it only too apparent that gold is a necessity for the credit and financial unity of nations, and it is essential that an adequate foundation of gold be created to uphold that system.

One of the first acts of the British government after England was plunged into war was to insure that the gold turned out of her mines should be safeguarded, and steps were taken for the deposit of new holdings in Canada, South Africa and Australia to the credit of the Bank of England. This arrangement had many advantages and tended greatly to facilitate the concentration of the metal where it was needed for the settlement of liabilities, and Great Britain has in this way used her gold unsparingly to meet immediate obligations.

The enormous increase in credits and paper money circulating in every country of the globe is reacting very materially on the present and prospective supply of gold, and it would seem timely to briefly review its relative influence on prices in general, which in normal times zig-zag to meet the demand for and the supply of credit and gold. If, for instance, prices and wages are increased, so far as they are paid in gold, it will require a proportionate amount of money to meet the higher costs. It follows as a matter of course that a larger circulation of money is required to meet the demand. While the quantity of gold available as money is seen to exert an influence in the direction of raising or lowering prices, it would seem equally certain that as international commerce progresses, and the system of credit expands, an increased world's supply of gold is a matter of vital importance.

It is true that, in practice, many transactions of buying and selling are set off one against another, but there can never be a system of finance carried on in any country, operating under a gold standard, without a basis of money somewhere.

HIGH PRICES LIKELY TO CONTINUE

The tendency to a further rise in prices is likely to continue for several years; the increase in the cost of living, and the importance of adjusting wages to prices; the increasing obligations of nations extending over long periods; the problem of a universal standard of value; the development of commerce and banking; the growth of population and wealth—these are questions which are becoming of increasing importance. With the falling off in the production of gold and a material rise in gold prices, a very serious state of affairs is presented, which is likely to affect the international economic position of all peoples.

We are at the dawn of a bigger financial and commercial tomorrow, and while the situation is fraught with a great many difficulties, we must face conditions as they exist and through frank and free discussion arrive at a practical and sound solution. Let us hope that our united efforts will crystallize into a practical plan for the alleviation of the present critical situation, and that in the process of correction we may establish those principles which lie at the base of national progress and human welfare.

Baffles Should Be Tight*

BY W. F. SCHAPHORST

One subject that is seldom touched upon in connection with boiler operation is the baffle wall. A baffle seems to be a simple part of a boiler setting, and therefore worthy of little thought, but that is not the case. Baffles should be correctly designed, correctly placed in the boiler tubes, and they should be leakless. Tests have proved that they cannot be placed haphazard, here and there. The volume of the hottest gases usually determines the position of the first baffle encountered. Then, as the gases reduce in volume, due to coming in contact with the tubes and giving off heat, it is clear that the second baffle must be so placed that there will be no reduction in gas velocity. And so on. As the gas moves from pass to pass the baffles are placed closer and closer together.

If the baffles leak because of loose or careless construction, the hot gases will "short-cut" through the baffle and escape up the chimney without giving off the full amount of heat. The chimney gases will be too hot. Holes in baffles should be stopped up with plastic fire brick. Or, when the baffle is in a badly damaged condition, it might be well to replace the entire baffle with a new leakless monolithic baffle of this plastic composition.

Determining the Amount of Dust in the Air of Miami Copper Mines

The U. S. Bureau of Mines, in co-operation with the U. S. Public Health Service, has begun a study of dusts from the Miami, Arizona, copper mines, according to the *Journal of the Franklin Institute*. To determine the dust content a volume of 19 cu.ft. of mine air is filtered through a glass tube containing 100 gm. of sugar, the tube being of such dimensions as to give a filtering column 1½ in. high. The sugar is then dissolved in water and the recovered dust screened through a 230-mesh screen, which removes all particles larger than 50 microns in diameter. These are rejected, as particles of wet dust larger than 10 microns in diameter are considered harmless, as they do not lodge in the lungs. The dust is then graded into two portions, a non-injurious, consisting of particles between 12 and 50 microns in diameter, and an injurious, made up of particles smaller than 10 microns. The total dust is determined in milligrams per cubic meter of air, the number of particles per cubic meter, the number of injurious particles per cubic meter, their weight in milligrams per cubic meter, and the weight of the dust over 10 microns diameter in milligrams per cubic meter. Photomicrographs are made of characteristic dusts.

Manganese Production Is Decreasing, according to the U. S. Geological Survey. Reports sent by operators of manganese mines to the Survey covering the first three months of 1919 show that the shipments of manganese ore during that quarter were much smaller than during any other quarter since 1917. The shipments of high-grade ore were 23,937 tons, against 75,465 tons during the last quarter of 1918 and 305,869 tons during the entire year. The number of shippers was only 24, against 247 during the year 1918. The shipments of low-grade ore, containing 10 to 35 per cent manganese, were 35,516 tons, against 320,455 tons during the last quarter of 1918 and 916,163 tons during the year.

*Copyrighted, 1918.

PETROLEUM SECTION

Engineering Notes and Equipment Details
Production Statistics---Progress
in Important Fields

Mexican Senate Introduces New Oil Bill Legislation Providing for Nationalization of Oil Lands Results in Sharp Conflict—Foreign Oil Com- panies Appeal to Supreme Court

ACCORDING to reports reaching New York from Mexico, the inactivity of the Chamber of Deputies, which has failed to take action on the nationalization of oil lands, has resulted in the Senate initiating new measures based on those of the President, but differing therefrom in that the retroactive feature is absent. Therefore, if these measures are enacted into law, the oil lands to which title was obtained before the present Constitution became operative, on May 21, 1917, would not be affected.

President Carranza's decrees, which were for the purpose of making Article 27 of the Mexican Constitution apply to foreign-owned oil lands, have been the subject of bitter attack by the foreign interests, which declare that the decrees as well as the article are confiscatory.

In the course of the debate, efforts were made to include in the measure a complete redrafting of the Article 27, which caused considerable discussion. The government's side, supporting the nationalization program, was presented by Luis Cabrera, Secretary of the Treasury, and Leon Salinas, Secretary of Industry and Commerce. Secretary Cabrera has been quoted to the effect that the foreign oil interests would not be satisfied with the decision of the Senate, and therefore it was only a waste of time to discuss the oil question.

The suits brought in the Mexican courts by the foreign oil companies have been appealed to the Supreme Court. Apparently, to delay any action of this court, Secretary Cabrera has opposed the action in order that the Executive Department of the Mexican government and the oil interests may reach an understanding. So far, no information is available as regards an understanding between the respective parties in interest.

Investigation of Oil Resources in Utah

Geologists of the U. S. Geological Survey are in the southern part of Utah, according to a report of Director George Otis Smith, to Congressman Meton H. Welling, making a reconnaissance investigation of the possibilities of finding oil in the Virgin River section. After making an examination of the geological conditions, Messrs. Reeside and Bassler, who have the work in charge, will move eastward and northward, extending the scope of the work as their judgment concludes that conditions warrant.

The proposed survey of a large area including much of the San Rafael Swell has been deferred through lack of funds. It has also been found necessary to eliminate field work on oil shales in Utah, although a general report on the oil shales of north-eastern Colorado and southwestern Wyoming is approaching completion.

In view of the threatened oil shortage, companies are prospecting for oil in portions of New Mexico and Arizona, and, in the judgment of the Federal geologists, Utah has better prospects than many other areas in which no commercial production of petroleum has yet been assured.

The study of the geology and ore deposits of the Cottonwood and American Fork districts—interrupted during the war—has been resumed. It is expected that the field examination will be completed this fall, and that Messrs. Calkin and Butler will submit their report before the field session of 1920. A similar report on the geology and deposits of the Oquirrh Range, that had been recommended and planned, was abandoned because of lack of funds. The general report by Mr. Butler on the ore deposits of Utah is now in preparation for publication.

World Petroleum Investigation

According to reports from Washington, an investigation of world petroleum conditions has been initiated by the Administration, particularly with regard to discrimination that may be exercised against American enterprise obtaining control of foreign properties. It is understood that this move was instigated by the Shipping Board and also through suggestion from Congress.

The remarkable statements made by Senator Phelan, of California, in a discussion in the Senate, to the effect that foreign capital was given free rein in the exploitation of oil land in the United States, whereas, with the exception of Mexico, Americans are almost entirely excluded from all foreign fields, lent an impetus to such an investigation. Realization of this condition is reported to have caused the Shipping Board to urge President Wilson to undertake such an inquiry for the purpose of developing a national policy to assure an adequate fuel-oil supply for the United States Navy and for merchant ships.

The first step, it is understood, has been to obtain reports from consuls in every country where oil is produced, which will cover the mining laws and any legal restrictions imposed on foreigners in obtaining concessions. When all the details have been obtained a complete report will be made, and used as a basis in determining whether domestic measures of exclusion are necessary.

Natural Gas in Elk Hills, Kern County, Cal.*

R. P. McLaughlin, State Oil and Gas Supervisor of California, Describes Recent Activities of His Department in New Oil and Gas District—Further Tests Necessary To Determine the Possibilities of the Field

AN IMPORTANT addition to the available supply of natural gas was the most striking oil-field development during the month of May. It is possible that one of the largest gas fields in California has been tapped by this work in the Elk Hills, in Kern County.

The discovery was made by the Standard Oil Co. at its well No. 5, Sec. 36, T. 30 S., R. 23 E., M. D. B. & M. Through its co-operative attitude, the company afforded the State Mining Bureau an opportunity to demonstrate the economic value of scientific and technical work in the exploitation of natural deposits of oil and gas. The discovery is the outcome of recommendations made by the engineering staff of the Bureau. Successful demonstration of the recommendations could not have taken place had the company not followed the policy of acting upon suggestions which to it at first appeared of doubtful value.

The recent development gives another clear demonstration of the fact that rotary tools may easily and effectually conceal valuable deposits of oil or gas. Such a condition must not be confused with the unsettled question of protection of deposits by mud fluid. An adequate test of the value and productiveness of certain strata requires that water be "shut off," and then the well must be bailed or pumped.

The first investigations and recommendations by the State Mining Bureau in the Elk Hills were made by Deputy Supervisor R. N. Ferguson. His account is as follows:

Prior to the development of oil by the Standard Oil Co. on its "Hay" property, in Section 36, T. 30 S., R. 23 E., M. D. B. & M., in the Elk Hills, the field had been inactive for several years. The only matter coming before the department concerning the field was the waste of gas from the Hillcrest well, on Section 28, T. 30 S., R. 23 E., M. D. B. & M. This waste is reported to have started when the casing was pulled from the well. It was not brought to the attention of the department until the escaping gas took fire early in 1918. At that time it was investigated, and from unofficial sources it was determined that the gas was coming from formations a little over 600 ft. below the surface. No log of the well was or is as yet available. At the time of the receipt of "Notice of Intention to Drill" Hay No. 1 (Sept. 20, 1918), in this field, the department was in possession of the above information relative to Hillcrest Well No. 1 and of logs of the following Associated Oil Co.'s wells:

Section 22, T. 30 S., R. 23 E., M. D. B. & M.—Well No. 3, which reported a 1,900-bbl. flow of hot salt water from 2,690 ft. to 2,710 ft. and gas, but no oil. Well No. 4, N.E. ¼, which reported showings of gas from 610 to 828 ft., but no oil. Well No. 4, S.E. ¼, which reported a depth of 1,185 ft., but no oil, gas or water.

Section 21, T. 30 S., R. 23 E., M. D. B. & M.—Well No. 2, which reported a depth of 1,291 ft., but no gas, oil or water. Well No. 2, which reported gas at 2,415 ft., showing of oil at 2,500 ft., gas between 2,800 and 2,900 ft. Well No. 4, which reported a depth of 1,187 ft., but no gas, oil or water.

Section 26, T. 30 S., R. 23 E., M. D. B. & M.—Well No. 1, which reported gas at 1,090 ft. oil of 35 degree gravity from 3,067 to 3,410 ft., heavy oil at 3,580 ft., and oil and gas at various points between depths of 3,724 and 4,030 ft.

Section 36, T. 30 S., R. 23 E., M. D. B. & M.—Well No. 1, which reported gas between depths of 410 and 520 ft., and oil and gas from 2,470 ft. to 3,058 ft. Logs of several other wells, less than 500 ft. in depth, were also available.

*Excerpt from advance chapter of Fourth Annual Report of the State Oil and Gas Supervisor, California State Mining Bureau, May, 1919.

From this information, and a general knowledge of the structure of the region, it was assumed that the following series of formation existed throughout the Elk Hills. This assumption was arrived at by roughly contouring the exposed formations as shown by geological maps, and comparing the well logs, using a correlation line based on the contour map:

First—500 to 1,000 ft. of formation likely to carry upper water.
Second—At least 1,000 ft. of formation likely to carry gas in commercial quantities. The upper portion of this gas zone to correspond stratigraphically with that found in Hillcrest well, section 28, T. 30 S., R. 23 E., M. D. B. & M., and in Associated Well No. 4, N.E. ¼, Section 22, T. 30 S., R. 23 E., M. D. B. & M., and Well No. 1, Section 26, T. 30 S., R. 23 E., M. D. B. & M., and Well No. 1, Section 30, T. 30 S., R. 24 E., M. D. B. & M.

Third—Either (A) or (B):
(A) The above gas zone to continue to a thickness of 2,000 ft., and to be underlain by the flowing salt water reported in the log of the Associated Oil Co.'s Well No. 3, Section 22, T. 30 S., R. 23 E., M. D. B. & M., at 2,690 ft., and this in turn to be underlain by a productive oil zone.

(B) The gas zone to give way to an upper oil zone, the two to have a thickness of about 2,400 ft., and to be underlain by the hot flowing salt water, and this in turn to be underlain by a second oil zone.

In starting Well No. 1, the company essayed "to drill until we encounter a productive oil or gas formation and then cement a string of casing above such formation, the size and weight of casing used to depend on the depth at which we encounter productive oil or gas." The reply to the proposal was so written as to specify a manner of drilling which would properly protect the gas and oil from damage in either of the above cases. It was recommended:

First—That conductor pipe be securely cemented in the first blue clay below the yellow surface gravel (not deeper than 500 ft.). This casing was specified to serve the double purpose of excluding possible upper water and of making it possible to hold pressure on the mud, with which underlying gas formations were to be sealed.

Second—It was recommended that in drilling ahead the size of the hole be reduced at a depth of 1,500 ft., so that, after determining the full thickness of the gas zone, the hole could later be reamed to a point below the gas, leaving a shoulder at that point. It was expected that this shoulder would be used as a landing point for the casing with which the gas was to be cased off. It was thought that one of two things would develop during this drilling to determine the point of landing: (a) Water sand would be encountered; and in this case it was expected that the company would be required to cement casing above the water and below the gas; or (b) oil would be encountered below the gas, in which case the company would desire to case off the gas before trying to produce the oil.

Third—The recommendation was so worded that in case water was encountered above the productive oil, or in case the company desired to drill to the deeper zone (below the water), a string of casing should be cemented below this water in such a manner that no oil- or gas-bearing formations would be cased off with the water behind this casing.

Well No. 1 was drilled to a depth of 2,532 ft., and produced oil in January, 1919. Neither the company proposal nor the department recommendations, as set forth in the letter quoted, were followed by the company. Eighteen-inch stovepipe casing was cemented at 495 ft. and 12½-in. casing at 2,480 ft. No test was made to determine the value of the upper gas zone. It was, therefore, necessary to devise plans which would not unduly hinder the company in its search for oil, but would still insure that valuable gas deposits were not being overlooked, with the attendant possibility of waste. This part of the work was carried on by Deputy supervisor R. D. Bush and the State Oil and Gas Supervisor.

Proposal to drill wells Nos. 2 and 3 followed soon after the demonstration that No. 1 was a satisfactory producer of oil. The proposals were that the wells should be drilled in about the same manner as No. 1 had been drilled; that is, in a manner which would not permit test for supposed upper gas. The Bureau was reluctant to see a further precedent established of passing through

the upper gas zones without testing their value and, if necessary, providing against waste by dissipation or flooding. The company, on the other hand, maintained that a single oil well in this locality did not adequately prove the value of the property and that its proposals should be followed. It was decided that wells Nos. 2 and 3 should be drilled approximately as proposed, with the added proviso that special attention should be given, during drilling operations, to observing gas indications in the upper formations. It was further agreed that, should these two wells fail to prove definitely the existence or non-existence of upper gas zones, another well would be drilled for that specific purpose. The company acceded to the proposed expenditure, notwithstanding its expressed doubt as to the commercial value of the gas zones. The test well was designated as No. 5.

In Well No. 2, at a depth of 1,537 ft., the driller in charge reported that mud in the circulating ditch showed considerable gas for about two hours. Owing to misunderstanding as to what was required in observing or testing this gas showing, the well was not "shut down" until it reached a depth of 1,630 ft. At the last-mentioned depth an inspection showed no evidence of gas. It was later reported that some gas was noted at a depth of 1,835 ft.

During the drilling of Well No. 3 a showing of gas was reported at a depth of 1,652 ft., and inspection showed only a few bubbles in the circulating mud. At a depth of 1,850 ft., gas was again reported, and inspection was made by a representative of the Bureau. Heavy mud was circulating, and where it discharged into the ditch the odor of gas was noticeable. The gas bubbles confined in the mud broke upon rising to its surface, and gave the appearance of boiling. Such an appearance extended throughout the length of the ditch and into the suction tank. The drilling foreman stated that he had seen much weaker showings at wells which had later developed into good gas producers. The showing also appeared to him similar to those observed at wells Nos. 1 and 2 at depths of 1,825 ft. and 1,865 ft., respectively.

Drilling continued, and 12- $\frac{1}{2}$ in. casing was cemented at a depth of 2,455 ft. Gas flowed from the well at the rate of over two million cubic feet per day through a two-inch "bean" under pressure of 26 lb. per square inch, when the well was open to a depth of 2,465 ft. The well was completed as an oil producer at a depth of 2,683 ft.

Notice of intention to drill Well No. 5 was filed on Mar. 28, 1919, proposing to cement 12 $\frac{1}{2}$ -in. 50-lb. casing at a depth of 1,800 ft., drill to 2,000 ft., and test out gas. The casing was cemented as proposed, and it is of particular interest to note that at the test of shut-off, on May 24 and 25, with five feet of open hole below the casing shoe, the well was bailed to a depth of 1,300 ft. and stood twenty-five hours with a rise of only five feet in the fluid level. This feature is of particular importance, as indicating that there is but slight danger of a well in the vicinity blowing out prematurely, although Well No. 4 did blow out from a deeper zone. Drilling continued, and 6 $\frac{3}{4}$ -in. casing, with 100 ft. of perforated pipe on the bottom, was landed at 1,895 ft. and the well bailed. Gas began to flow uncontrolled on May 28, at the rate of thirty-three million cubic feet per day. The flow was later placed under control, and, so far as pipe-line facilities permit, is being delivered to consumers

Well No. 4 was begun about the same time as No. 5, and was drilled in similar manner to wells Nos. 1, 2 and 3. It therefore does not necessarily appear in the chronological statement of events previously set forth. It is of interest to state that it encountered a large flow of gas lower than that in No. 5. The gas ignited, burned the rig, and at the time of writing the fire can be seen for many miles.

From the foregoing description it will be noted that the extent of gas resources of the Elk Hills has not yet been thoroughly tested. The necessity for a careful drilling program, insuring adequate protection, is self-evident.

August Production of California Oil Fields

August production of the California oil fields is given by the *Standard Oil Bulletin* in the following table:

Field	New Rigs	Drilling	Wells		Producing	Production per Day, Bbl.
			Completed During Month	Abandoned During Month		
Kern River	14	19	9		2,017	20,700
Mckittick	2	3			346	7,236
Midway-Sunco	16	83	18	2	2,301	86,516
Lost Hills-Beridge	3	19	5	1	552	12,247
Coalinga	5	38	7	3	1,197	44,715
Lonpoc and Santa Maria Ventura County and Newhall	6	21			369	15,265
	10	37	4		503	4,871
Los Angeles and Salt Lake		3			666	3,887
Whittier-Fullerton	22	121	8		850	83,090
Summerland					142	147
Watsonville					5	75
Totals	78	344	51	6	8,948	278,749

Total crude-oil stocks, Aug. 31, 1919, were 33,705,383 bbl. Total shipments from fields in August, 1919, 8,786,695 bbl.

The British-Mexican Petroleum Co.

Final arrangements are now being completed for the factors entering into such a change are the high the establishment of a working basis of a new oil company to be known as the British-Mexican Petroleum Co., Ltd., which will control the products of the Pan-American Petroleum & Transport Co. and its subsidiaries. Negotiations with this end in view were started in 1915, but were not concluded at that time, because of war conditions.

It is the intention of the new company, it is understood, to gradually replace coal-driven by oil-driven liners, and to build storage oil tanks in various parts of the world. The new organization has already agreed to purchase from the Mexican Petroleum Co., Ltd., a minimum quantity of 7,00,000 bbl. of oil annually for a period of years.

Herbert G. Wylie will be the active manager of the new company, with offices in London, according to information obtained at the Washington office of the Mexican Petroleum Co.

The British-Mexican Petroleum Co. is capitalized at \$9,733,000, equally divided between British and American interests. It is reported that Sir Thomas Royden, deputy chairman of the Cunard Steamship Co., is a director of the new company, which fact, it is believed, indicates that British steamship companies are probably taking definite steps to adopt oil as fuel instead of coal. Reports coming from England to the Bureau of Foreign and Domestic Commerce point out that two of the factors entering into such a change are the high price of coal and the ease and rapidity with which a vessel can be "oiled."

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical
Industry Dealing With Pertinent
Subjects of Interest

Early Developments in Flotation at the Kylee Copper Mine, New South Wales

The Journal for July 5 contains a paragraph, on p. 21, concerning an improvement in flotation practice at Anaconda,¹ which is interesting to me because the improvement mentioned therein is one of several that were made at the Kylee Copper Mine, New South Wales, Australia, in 1910, in an M. S. machine, adapted from the existing zinc-lead practice at Broken Hill.

The Kylee plant is worthy of mention, as it was the first plant to make a commercial success of the froth-flotation of copper ores, and the one in which most of the present-day commonly accepted principles of copper froth-flotation were firmly established. Among them were: (1) the feasibility of using a cold non-acid circuit; (2) the practicability of treating ores containing a small amount of sulphide minerals (only 6 per cent instead of the 30 per cent or more contained in Broken Hill ores); (3) the production of high-grade concentrate by refloating low-grade froth; (4) the necessity for grinding finer than in zinc-lead practice where dense hot acid solutions were the order of the day; and (5) the importance of low and fairly constant pulp dilution in the machine. In fact, feeding reagents at the grinding plant instead of at the head of the flotation machine was the only important principle of present-day practice which was not developed at this plant.

Later, on the advice of A. R. Weigall, the consulting engineer, the Kylee system of copper flotation was adopted by the Seoul Mining Co. at its Suan plant in Korea, to treat tailings from the gold mill, containing as little as 2 per cent of sulphides, mostly in the form of chalcopyrite. The results were satisfactory until ore was encountered containing secondary bornite, which proved to be difficult to recover. The problem was investigated and solved, quite independently of the excellent work done in America about the same time by G. A. Chapman, by feeding a collecting oil to the tube mills.

At the Suan plant, not only are all middlings returned to the head of the machine by the suction of the stirrer in the first mixing box, but also the transference of the rougher concentrate to the cleaner cell is accomplished in the same manner.

By properly adjusting the mixing box and the stirrer a head of 5 ft. can be negotiated without difficulty, and there is no necessity for pumps or elevators around the plant, except in the case where the

cleaner tailing is returned to the regrinding circuit instead of directly back to the head of the rougher.

H. Hardy Smith,
Huchang Mining Co., Kokai, Heianhokudo, Chosen,
Aug. 20, 1919.

Foreign Trade and Government Protection

Although I am interested in an entirely different line from that of the manufacturers, would it be possible that a few remarks on foreign conditions might be of interest to them? One of the questions now confronting us as a nation is that of foreign trade. Our Government seems to be intensely interested in the building up of a merchant marine to further this trade, to be offering all sorts of advice, largely through the Department of Commerce, and to be urging the industries of the country to expand, particularly in Latin America.

Beautiful, is it not?

Take the case of one American who has seen considerable foreign experience. Our Government suggests "Go after the business and bring the money home." But if you get into any trouble outside of our boundaries, it also says, "Why did you leave the United States? You had no business out of the country, and as you went to further your own interests, you cannot expect any consideration from this Government, and you will have to stand your losses." (This may mean your life as well as your property.) "Bring home the money, but don't ask us to do anything for you except to receive your Income Tax."

What real American in Latin America does not send orders home for home-made goods? How many Americans in Latin America are not like the Chinese in this country, striving to make their pile and then get back home? And what a time some of us have had to get back, particularly if we left before passports were required?

Our Consular Service is 99 per cent inefficient. If you doubt this, go abroad and see some of our "representatives;" or, worse yet, try to get one to fulfill his obligations to you as an American citizen, and see what results you can obtain.

This is a part of my own personal experience:

After having been ordered out of Mexico by a paternal State Department, which stated that I had no business to be out of the States, and had no recourse to the department for losses incurred in a foreign country, I took another chance, and went to Australia. Armed with letters to both the Consul and the Vice-Consul (two out of three good men I have encountered in the service), I immediately became identified as an American. After the war broke out, I desired to return to the States, and I applied for

¹The feature at Anaconda to which Mr. Smith refers is the return of middling to a box in front of and slightly below the first M. S. cell, the middling pulp being drawn up into this cell by the suction created by the impeller.—Editor.]

passports for myself and family to the successors of the men to whom I had taken letters, one of which, by the way, was from a former Consul to South Africa, the third good man in the service.

Would the Consular Department look up my letters? "No. They were filed in the basement and were unavailable." I would "have to secure a birth certificate. American citizens in Sydney cannot identify you unless they were present at the time you were born."

I was therefore compelled to write to the Mayor of Canton, Ohio, which place I had left thirty years before, requiring a loss of three and a half months' time waiting for a reply, and upon the receipt of the necessary papers, duly certified by the Mayor and with a certificate from the State Board of Elections stating that he was the duly elected and qualified Mayor, was met by the true statement of the Consul, "You were never the Mayor of Canton."

Ye Gods! and ten thousand miles from home!

After getting photographs, and duly presenting my wife for identification, the next brilliant remark was, "Who is this woman?"

I got the passports, and the Consul got my personal opinion of his ancestry and his intellectual rating.

Now, after having been ordered out of Mexico by our State Department, and after having had such a hard time to get home from Australia, my advice would be to stay at home, all ye Americans. Let the foreigners come here to buy your goods, or hire an Englishman, a Frenchman, or even a German as a traveling man or agent to represent your firm and thereby avoid having a widow and perhaps some orphans on your hands should your agent be killed, for if you don't provide for her after her husband has been robbed and murdered, she will have to provide for herself.

The season is open for Americans the year round, and though our Government may protect—yes, does protect ducks and geese—it does not protect its citizens.

Some of us remember the Mafia. We many of us remember the Maine. We settled. We were settled with. How about the Cumbre Tunnel, Santa Ysabel, and even on our own territory, Columbus?

By all manner of means, get the trade. When you send out an agent, if he be an American, better send a death certificate and a coffin along, so as not to bother our Consular Service or our State Department with any such trifling matters as a murdered citizen.

G. L. Ashmun.

Bowling Green, Ky., Sept. 22, 1919.

Herbert Hoover's New York Address

The issue of the Journal of Sept. 27 is the most valuable publication that has ever come into my office, in that it contains the address in full of Herbert C. Hoover to the American Institute of Mining and Metallurgical Engineers. In common, I imagine, with the whole body of American engineers, I have been waiting for the calm, clear, dispassionate and

dependable statement of the only living man today who can define and set forth existing world issues from accurate personal knowledge.

Through all the mass of conflicting, political, and otherwise biased statements which have issued from time to time through the medium of the press since the war ended, none have previously seemed to bear the impress of absolute sincerity or of even scant knowledge of facts, saving only the public speeches of the President himself, which speeches, unfortunately, only a few people comparatively have personally heard or have read through the limited press reports.

I have read and studied Mr. Hoover's statement until I almost know it by heart. It is the masterly statement of America's greatest living engineer today, the only man who is capable of speaking with authority, from absolute and exhaustive personal knowledge, without bias, of the vital issues confronting this nation. As such it should receive worldwide publicity. It may well be studied in the public schools, because the issues involved are, and will be perforce, largely the heritage of the men and women of tomorrow.

Education, in these matters plainly differentiated, are clearly and forcefully separated from the biased statements and interested attitude of political influences, seeking to make these issues party capital, one way or another, is an absolute requisite for correct final judgment and action, which judgment and action will be continuously needed at least over the next decade and possibly longer. Yet, so far as I have observed, Mr. Hoover's masterly and official statement is not receiving any part of the publicity which it imperatively demands, and I am hopeful that in your wisdom and judgment, you may find it advisable and possible to issue this speech in pamphlet form for general distribution. I am convinced that American engineers at least will warmly welcome such a publication (which manifestly should be made by the United States Government itself), in the event it is not to be so officially published, which I surmise might be politically an impossibility.

Geo. H. Clark,

Consulting Engineer,

Member Yale Engineering Association.

Birmingham, Ala., Oct. 10, 1919.

The Diesel Engine in the Southwest

Referring to my article which appeared in your issue of Sept. 20, entitled "The Diesel Engine in the Southwest," please refer to a description of a compressor in connection with the Diesel engine where I made use of the expression "feather valve" in describing the valves of this compressor. I now learn that the word "Feather," in connection with a valve, is a registered trade name which was in this case misused, as the valves referred to in my article are of an entirely different construction than those to which the above mentioned trade name refers.

B. V. E. Nordberg.

Milwaukee, Wis., Oct. 20, 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Magnesite Tariff Bill

By vote of 154 to 112 the House of Representatives on Oct. 7 passed the magnesite tariff bill (H. R. 5218). As passed, the bill provides a duty of $\frac{1}{2}c$ per lb. on magnesite ore; $\frac{3}{4}c$ per lb. on calcined, dead-burned and grain magnesite; and $\frac{3}{4}c$ per lb. and 10 per cent ad valorem on magnesite brick. The bill as originally introduced provided $\frac{3}{4}c$ per lb. on ore; $\frac{1}{4}c$ on calcined, dead-burned and grain magnesite, and 25 per cent ad valorem on magnesite brick.

A sharp difference of opinion as to the duty which should be imposed on imported magnesite developed during the discussion of the bill. Representative Moore of Pennsylvania, one of the high-protection leaders of the House, opposed the rates as too high and suggested their amendment. Mr. Moore insisted that a duty of $\frac{1}{2}c$ a lb. is the very highest rate which should be allowed on calcined, dead-burned and grain magnesite. Mr. Moore's contention was largely in the interest of American investors who, he said, prior to the knowledge that any important deposits of magnesite existed in this country, developed mines in Austria representing an investment of \$2,000,000 of American money, and in addition, invested a half million more in plants for the treatment of the imported ore, after its arrival here. Mr. Moore pointed out that no tariff duty would be needed so far as Western magnesite is concerned, if it were manufactured in the West, instead of in the East. As a result, under the proposed tariff, only one series of mines in one state would have to furnish the product for states three thousand miles away, who would be obliged to pay excessive freight charges and would be prohibited from getting their raw material in competition. Representative Hadley of Washington, who has been most prominent in urging the tariff on magnesite, in an extended speech pointed out that our deposits of magnesite are very extensive, there being 8,000,000 tons blocked out and in sight, according to the Geological Survey. He said that he had evidence from consumers that domestic magnesite is superior to the Austrian product, and that magnesite mining here has reached the point where all the requirements of the country can be filled. In connection with the claim that the bills would play into the hands of an American monopoly, Mr. Hadley pointed out that this was not true, inasmuch as the largest producer owns only one-eighth of the total known deposits in the country, and has never produced more than one-third of the country's output. He referred to the Geological Survey's report showing that magnesite was produced in ten counties in California in 1918, and that in 1917 there were 65 separate producing companies in that state.

Mr. Hadley reviewed the situation which confronted the steel industry of the United States when war was declared on Austria, and argued against allowing the country to drift back into the same position. Mr. Hadley had figures purporting to show that \$2,000,000 has been invested in the magnesite industry in the State of Washington and \$1,500,000 in California, which were contested by Representative Moore, who called attention to some estimates that such investments in the West do not exceed \$500,000.

It is evident, from the discussion on the rate of pay in Austrian mines, that no reliable information is at hand as to the wage rate there.

Figures submitted to the Ways and Means Committee show that the price of magnesite at Eastern ports, under the operation of the proposed tariff, would be \$50 a ton as compared with the pre-war price of \$16 laid down at Eastern ports. The freight rates from the State of Washington to Eastern ports is \$16 a ton.

Representative Kitchin, the ranking democratic member of the Committee on Ways and Means, attempted to amend the bill by proposing lower rates of duty in each case, but each of his amendments was defeated.

The sensation of the debate, however, came when Mr. Kitchin proposed to add the following provision to the bill: "That the duties provided for shall not apply unless it be shown to the satisfaction of the Secretary of the Treasury that the industry producing magnesite is paying for the labor, in the production of such magnesite, as much as \$12.50 a ton." After a long parliamentary wrangle, the proviso went out on a point of order. Mr. Kitchin forced a record vote which, with one exception, was along party lines.

The main arguments for the rates of duty as carried by the bill were that the tariff would add only $3\frac{3}{4}c$ a ton to the price of finished steel, and that it is necessary to maintain the war-born magnesite industry which produced 316,000 tons of magnesite in 1917 despite the non-existence of the industry prior to the war.

Civil Service Positions Open

The U. S. Civil Service Commission announces open competitive examinations for the following: Chief metallurgical chemist (male), \$3,000 per year; assistant chief metallurgical chemist (male), \$8.80 per day; metallurgical chemist (male and female), \$6.88 per day; assistant metallurgical chemist (male and female), \$5.12 per day. Applications must be filed with the commission on or before Nov. 25, 1919.

Also a position as transitman for men only at \$900 to \$1,200 a year, or at higher or lower entrance sal-

aries, depending upon the qualifications and duties of the appointee, who may be allowed the temporary increase of \$20 per month allowed by Congress. Applications will be received until further notice.

Applicants should apply for Form 1312 to the Civil Service Commission, Washington, D. C., stating the exact title of the examination desired.

Protective Tariff Legislation

A general anti-dumping bill, intended to protect American industry from the unloading of foreign products in American markets pending the passage of new protective tariff legislation, was introduced by Senator Smoot on Oct. 7. It is stated that this bill has the support of the Republican leaders and is designed to take the place of the pending bills for a protective tariff on dyestuffs and other "infant industries."

Canadian Reciprocity Bill

The House of Representatives on Oct. 9 voted to repeal the Canadian Reciprocity Act, without opposition. It was declared that there was no intention to act in hostile fashion toward Canada, but that all nations should be treated equally in such matters. Under the Reciprocity Act a number of products were duty free, including unmanufactured asbestos, gypsum, talc, mica, feldspar and fluorspar.

Iron Imports and Exports*

During August, 1919, there was imported to the United States 32,117 tons of iron ore, 21,991 tons of scrap iron, and 2,902 tons of pig iron; these commodities coming from Spain, Sweden, Canada, and Cuba. Pig-iron exports totaled 38,373 tons during July and 35,764 in August. Iron ore exported was 182,066 tons in July and 44,915 tons in August, the entire amounts going to Canada.

The decrease in the amount of exports during August from those in July may be attributed in part to abnormally high exchange rates now in force, which have advanced the export cost of foreign countries from 15 to 50 per cent.

Some Manganese Producers Are Still Active

The signing of the armistice resulted in a considerable decrease in the activity of manganese producers, but despite present conditions, several properties have been developed during 1919, according to W. R. Crane in a Bureau of Mines bulletin. The Superior Manganese Company reports an exceptionally promising discovery of high-grade ore at Neva, Tenn. A ten-ton electric furnace for treating this and a carbonate ore from the East Fork Mine, near Sevierville, Tenn, is being built by the Tennessee Manganese Co., of Knoxville.

Considerable activity in manganese development work is also reported in the Cuyuna range in Minnesota. Fairly large bodies of manganiferous iron ore have been developed in Eagle County, Col., and the Philipsburg district in Montana is still active.

American Mining Congress to Meet at St. Louis

Annual Convention To Be Held in November Will Consider Important Readjustment Problems—Nation-Wide Participation Desired

FOLLOWING close upon the Industrial Conference recently held in Washington, another event of national importance is approaching in the annual convention of the American Mining Congress, that is to be held at the Planter's Hotel, in St. Louis, Mo., Nov. 17-21. At this convention the officers of the congress hope to bring together all conflicting interests that enter into the nation's business, and by discussion of the various readjustment problems to determine what policies will best serve the country at this critical time.

Participation in the convention, it is announced, will be upon the following basis: The President of the United States may appoint ten delegates at large; governors of states and territories, ten delegates; state mining departments, five; county commissioners, two; mayors of cities, one for each 100,000 population, except that where the population is 100,000 or less two may be appointed; mayors and presidents of towns, two delegates; national bodies organized in behalf of commerce, mining, and oil, ten delegates, and similar state bodies, five. Presidents of state schools of mines or universities where mining is included in the curriculum may be members of the convention. Members of the American Mining Congress are likewise members of the convention. In addition to this representation, members of both houses of Congress have been invited to participate.

The subjects that are upon the general program for discussion include the proposed nationalization of industry, industrial relations, the international petroleum situation as relating to the United States and Mexico, and national "blue-sky" laws. Other subjects are those of public lands and water power, freight rates in relation to industry, and national co-operation among industries. The relation of mining to national finance, and to state and Federal governments, as well as to labor, will also be discussed. Conservation and protection of the wasting industries will be another topic to receive attention.

Problems directly relating to each division of mining will be given full discussion in divisional conferences. Separate meetings will be arranged, for which programs are being prepared, covering such subjects as pertain directly to metal mining, coal mining, petroleum, non-metalliferous substances, gold, silver, and precious metals, and oil shale. As to each of these subjects there will be discussions upon production, transportation, and exchange. The recommendations of each sectional meeting will be referred to the general committee on resolutions for final action by the whole convention.

Appointments of delegates and inquiry regarding convention plans and other matters may be addressed, it is stated, to John T. Burns, assistant secretary of American Mining Congress, Planter's

*Excerpted from "Monthly Reports on Minerals Investigations of the Bureau of Mines," September, 1919.

Hotel, St. Louis, Mo. The annual members' meeting of the congress will be held at the Planter's Hotel on Nov. 20, for the purpose of electing four directors and for transacting other business.

In conjunction with the convention will be a National Exposition of Mines and Mining, a feature of which will be an historical and educational exhibit by the U. S. Bureau of Mines, showing the history, development, and possibilities of mining in the United States. District and state exhibits will also be displayed.

American Mining Congress and the National Exposition of Mines and Mining

Sessions To Be Held in Conjunction With Machinery Exhibit in St. Louis, Nov. 15 — National Gold Conference and Meeting of War-Mineral Producers

THE National Exposition of Mines and Mining, embracing every phase of mining, including coal, metal, chemical, non-metalliferous and petroleum machinery and labor-saving appliances, will be held in the old Southern Hotel Building, St. Louis, Mo., during the week of Nov. 17, in conjunction with the American Mining Congress. The St. Louis Chamber of Commerce, the St. Louis Convention and Publicity Bureau, the Associated Industries of Missouri and the Mining Associations of Illinois and Missouri are co-operating to make the exposition one of the largest exhibits of the industry ever held in the United States. This will be the first time the American Mining Congress has attempted a comprehensive exposition in connection with the educational program of the annual convention.

Applications for exhibit space at the exposition have been received from numerous concerns situated in all parts of the country. The old Southern Hotel Building contains more than 50,000 ft. of floor space available on two floors. There will be no charge for space for actual exhibitors of any of the lines connected with the mining industry.

General sessions of the congress will be held in the Planter's Hotel. The program includes discussions by prominent statesmen and business men on the proposed nationalization of industry, industrial relations, the international petroleum situation as it relates to the United States and Mexico, national "blue-sky" laws, public lands and water power, relation of the mining industry to national finance and to labor, and other topics of interest to the industry.

Problems directly relating to each division of mining will be given full discussion in divisional conferences. Separate meetings will be held, for which programs covering such subjects as pertain to metal mining, coal mining, petroleum, non-metalliferous substances, gold, silver and precious metals and oil shale are being arranged. In the sections there will be discussions upon production, transportation and

exchange, and the recommendations of each sectional meeting will be referred to the general committee on resolutions for final action by the whole convention.

The National Gold Conference and National Conference of War-Minerals Producers will also be held during the same week.

A special program in charge of Dr. Harold N. Lawrie, gold economist of the American Mining Congress, is being arranged, but in addition to the selected speakers there will be an open forum for the presentation of all resolutions and practical suggestions which may be offered by those present.

The circular calling upon the representatives of the industry to attend the convention emphasizes the necessity of maintaining an adequate gold reserve and at the same time meeting the demands of the trade, which is apparent to both producers and financiers, but says that the impracticability of changing the present price of gold without overturning the present monetary system and affecting international relations is also apparent. The call states, further:

"The trade demands for gold in the United States during the present year, according to the best obtainable statistics, will exceed the total production of gold in this country by \$15,000,000, and next year, if the present ratio of decrease in production and increase in demand is maintained, the trade shortage will be \$20,000,000.

"The distress of the producers is reflected in all mining communities, and this unsatisfactory condition pertains not only to the United States but to all other gold-producing sections of the world."

Request for information regarding the appointment of delegates, inquiries regarding convention plans, and similar communications should be addressed to John T. Burns, assistant secretary, American Mining Congress, Planters' Hotel.

New Zinc Oxide Plant at Columbus, Ohio

The American Zinc, Lead & Smelting Co. will build this fall an extensive plant at Columbus, Ohio, for the manufacture of zinc oxide from lead-free ores shipped from the company's mines at Mascot, Tenn. Production will probably begin early in 1920. Zinc oxide is used largely in the rubber and paint industry, and the fact that Columbus is a center of these industries led to the decision to establish the plant there. Besides the mine at Mascot, the company has zinc mines at Joplin and Platteville; zinc smelters at Hillsboro and East St. Louis, Ill., and Caney, Kan., and a lead smeltery at Granby, Mo.

West African Gold Output

The gold output of Western Africa during the first six months of 1919, and for the corresponding period of 1918 and 1917, according to The Economist, was as follows:

	—Fine ounces—		
	1917	1918	1919
January	31,756	25,407	24,509
February	25,334	25,346	26,068
March	38,126	25,524	25,509
April	29,827	27,682	25,810
May	29,160	29,747	23,748
June	27,517	28,308	25,114

BY THE WAY

Lake County, Col., Wins Boundary Suit

Judge Henry J. Hersey, of the District Court of Denver, recently presided at a suit between Lake and Summit counties, Colorado, which was begun on September 23. The controversy, which was over the boundary line between the two counties, was finally decided in favor of Lake County. The Climax Molybdenum Co., owned by the American Metal Co., happens to be situated approximately on the boundary line in dispute. Lake County, by reason of the decision in its favor, is now entitled to the taxes accruing from this valuable molybdenum property.

Freedom in the Mountain Heights.

The principle of self determination has strong backing in some circles in Telluride. At least one gathers this impression as he reads the interesting columns of the San Miguel Examiner. A recent item reads: "Jack McEchern promised to beat it if he was let out of jail yesterday, so the authorities let him out, and the chances are that he will go." Another item hints that there may be some slight restriction on individual liberty at times when it says, "Kid McGovern drifted back here this week. He is under a six-months jail sentence and upon being told that it was either go back to jail or get out of town for him, he left for the Alta."—Such is life in the mining camps, or is it?

A Great Opal

If opals are unlucky, a certain one that is now being displayed in Washington must be good for a disaster. It weighs 16.95 ounces Troy, and was discovered during the war in a mine in a western state. It has been weighed by the Bureau of the Mint and displayed among other places in the private office of the Secretary of the Interior. The owners of the stone are keeping secret the place of its discovery, but advanced the opinion that the geological formation in which this gem was found occurs in Idaho, Montana and Nevada. The stone was found two years ago but has been kept in a safe deposit vault to await the return of peace and a better market for gems. Although the opal is uncut, the beauty and fire of the stone are striking. It is absolutely free from matrix and its weight expressed into carats is 2,572.

Look Before You Leap

In spite of safety-first precautions and the inculcation of principles that tend to prevent accidents, some individuals seem predestined to casualties of definite types. A group of college sophomores, putting in their first summer of actual underground experience, visited the old iron mines at Mount Hope, N. J. One task was to run a survey line through

some irregular stopes from a gloryhole to a shallow hoisting shaft. In their great zeal to display traditional sophomoric erudition some members of the party started in to cover a little extra territory. Investigation disclosed the existence of a winze, whereupon a learned discussion ensued as to the probable history and purpose of the working. Since an upward current of air persisted, it was conceded that there was a communication with some shaft or adit opening at a lower level. The Solomon of the squad offered to prove his contention that it connected with the Taylor mine by going down forthwith and meeting any or all doubters at the entrance to the Taylor. He actually had one foot poised to descend when a pessimist of Scotch ancestry restrained him by force, suggesting that some test be applied to the ladder.

A slight shaking of that relic demonstrated that dry rot may leave but little outward signs of decay, for the ladder at once crumbled to dust and was not. By all the rules of experience, the embryonic engineer had a lesson fit to last a lifetime. Either in spite of it, or through excessive caution, or else due to what a theologian might call the law of foreordination, the same engineer had his bad fall in an old mine shaft about twenty years later. Happily, though, the accident involved nothing worse than the loss of a leg.

Native Labor on the Rand

It is cheering to note that somewhere still on this globe of ours there are those that are proud to work and who by their daily toil gain social distinction. The attention of Mr. Gompers (and, incidentally, Mr. Vardaman, of Mississippi, may be interested) is directed to this Elysium. In darkest Africa these people live, as any paid agitator will tell you. For years, work on the Rand mines has been a tradition with the East Coast native, who obtains in the mines wages and conditions of employment far superior to those in his own country. A member of the Witwatersrand Native Labor Association, in testifying recently before a government commission, according to the correspondent of the Financial Times (London), said that the native is eager to come to the Rand, and the young native who has not worked on the Rand is rather looked down upon. It was, therefore, unnecessary for the association to do much toward actually inducing natives to come and work, and it rather concentrated its energies on transit facilities and good conditions of employment.

Details were given of the recruiting system by the member. Normally the association obtains 40,000 to 45,000 recruits yearly from East Coast territories, and the number employed in gold and coal mines was about 78,750. As only about 170,000 are available for work outside the territories, and the period of work is intermittent, about half the native's time being on the Rand and half at his kraal, there is little scope for appreciable increase in number of recruits. The Portuguese African, who usually works underground, constitutes 38 per cent of the underground native strength, thus forming the backbone of the industry's native labor force.

NEW PUBLICATIONS

- Salt Resources of the United States.** By W. C. Phalen. Paper, 6 x 9; pp. 284, illus. Bull. 669, U. S. Geological Survey, Washington, D. C., 1919.
- Bibliography of Petroleum and Allied Substances in 1916.** By E. H. Burroughs. Paper, 6 x 9; pp. 159. Bull. 165, Bureau of Mines, Washington, D. C., 1919.
- The Anvik-Andreafski Region of Alaska (including the Marshall District).** By George L. Harrington. Paper, 6 x 9; pp. 70, illus. Bull. 683, U. S. Geological Survey, Washington, D. C., 1918.
- Recent Developments in the Absorption Process for Recovering Gasolene From Natural Gas.** By W. P. Dykema. Paper, 6 x 9; pp. 90, illus. Bull. 176, Bureau of Mines, Washington, D. C., 1919.
- Ground Water in the San Jacinto and Temecula Basins, California.** By Gerald A. Waring. Paper, 6 x 9; pp. 113, illus. Water Supply Paper No. 429, U. S. Geological Survey, Washington, D. C., 1919.
- Pulverized Coal Systems in America.** By Leonard C. Harvey. Paper, 7 x 10; pp. 65, illus. Special Report No. 1. Fuel Research Board, Department of Scientific and Industrial Research, London, England, 1919.
- Report on Mining Operations in the Province of Quebec during the Year 1918.** Paper, 6½ x 9½; pp. 158, illus. Department of Colonization, Mines, and Fisheries, Bureau of Mines, Quebec, Canada, 1919.
- A Bibliography on the Roasting, Smelting, and Electrometallurgy of Zinc.** Revised to June, 1919. Paper, 6 x 9; pp. 386, illus. Bulletin, School of Mines and Metallurgy, University of Missouri, Rolla, Mo., 1918.
- Petroleum in 1917.** By John D. Northrup. Advance chapter, "Mineral Resources of the United States, 1917"—Part II. (Pages 683-901). Paper, 6 x 9; pp. 219, illus. U. S. Geological Survey, Washington, D. C., 1919.
- The Silurian Geology and Faunas of Ontario Peninsula and Manitoulin and Adjacent Islands.** By M. Y. Williams. Paper, 6½ x 9½; pp. 195, illus. Memoir 111, No. 91, Geological Series, Ottawa, Canada, 1919.
- Mineral Resources of the United States, 1916. Part II—Non-metals.** E. F. Burchard and G. F. Loughlin, Geologists in charge. Cloth, 6 x 9; pp. 1105, illus. U. S. Geological Survey, Washington, D. C., 1919.
- Electrolysis in Concrete.** By E. B. Rosa, Burton McCollum, and O. S. Peters. Technologic Papers of the Bureau of Standards, No. 18. Second edition. Paper, 7 x 10; pp. 142, illus. Department of Commerce, Washington, D. C., 1919.
- A Bibliography of Indian Geology and Physical Geography, with an Annotated Index of Minerals of Economic Value.** Compiled by T. H. D. La Touche. Paper, 7 x 10; pp. 571. Geological Survey of India, Calcutta, India, 1917.
- The Oil Fields of Allen County, Kentucky, with Notes on the Oil Geology of Adjoining Counties.** By Eugene Wesley Shaw and Kirtley F. Mather. Paper, 6 x 9; pp. 126, illus. Bull. 688, U. S. Geological Survey, Washington, D. C., 1919.
- Upper Cretaceous Floras of the Eastern Gulf Region in Tennessee, Mississippi, Alabama and Georgia.** By Edward Wilber Berry. Paper, 9 x 12; pp. 177, illus. Professional Paper 112. U. S. Geological Survey, Washington, D. C., 1919.
- Among Industrial Workers.** A handbook for Young Men's Christian Associations in Industrial Fields. Revised Edition. Paper, 6 x 9; pp. 154, illus. International

Committee, Young Men's Christian Associations, New York, 1919.

A Bibliography on the Roasting, Leaching, Smelting, and Electrometallurgy of Zinc. Revised to June, 1919. Compiled by Harold L. Wheeler. Paper, 6 x 9; pp. 388, illus. Vol. IV, No. 3, Bulletin, School of Mines and Metallurgy, University of Missouri, Rolla, Mo., 1918.

Contributions to Economic Geology (Short Papers and Preliminary Reports) 1918. Part II—Mineral Fuels. David White, G. H. Ashley, and M. R. Campbell, Geologists in charge. Paper, 6 x 9; pp. 355, illus. Bulletin 691, U. S. Geological Survey, Washington, D. C., 1919.

Western Canada Mining Directory and Year Book, 1919. Cloth, 6 x 9; pp. 114. Progress Publishing Co., Ltd., Vancouver, B. C., 1919.

This book is divided in sections as follows: Directory of Officials of the Canadian Department of Mines, etc.; Directory of Mines in British Columbia, Alberta (coal), Saskatchewan (coal), and Yukon, arranged alphabetically, giving names of owners, locations, etc.; Laws Affecting Mining in Western Canada; Statistics of Dividends and Stock Market; Statistics of Production; List of Mining Publications and Bibliography; Directory of Machinery and Mine-Supply Houses. The value of a directory is determined only by use; therefore, it is too early to say anything about the merits of this one, except that it appears to be well arranged, and is probably a valuable addition to the published information on western Canada.

ABSTRACTS

Oxidized Zinc Ores of Leadville, Col. By G. F. Loughlin. Pp. 91, pls. 8, figs. 7. Bull. 681, U. S. Geological Survey, Washington, D. C., 1918.

Although deposits of oxidized zinc ores at Leadville, Col., had been exposed in mine workings for many years previously, it was not until 1910 that their character and extent began to be realized. Since that year large quantities have been mined annually. Bulletin 681 begins with a review of early accounts of zinc carbonate and silicate and of the recent discovery of the orebodies. It then describes in detail the oxidized zinc ore minerals and minerals associated with them, the varieties of ore, their range in metal content, their distribution and extent, and their genesis. G. F. L.

Geology and Ore Deposits of the Yerington District, Nevada. By Adolph Knopf. Professional Paper 114. Pp. 68, pls. 5, figs. 12. U. S. Geological Survey, Washington, D. C., 1918.

The Yerington district in western Nevada is, next to Ely, the most productive copper district in the state. The oldest rocks of the district consist of andesites, keratophyres, and limestone, with subordinate shale, quartzite, and gypsum, all of Triassic age. They were intruded in post-Triassic time, probably early in the Cretaceous, by granodiorite, which was followed by quartz monzonite. These intrusions intensely metamorphosed the rocks they invaded and converted large areas into lime-silicate rock. After this metamorphism the region was cut by numerous dikes of quartz monzonite porphyry. Faulting then ensued, and along the faults ore-forming solutions arose and produced the copper deposits to which the district owes its economic importance. The Tertiary rocks, resting with marked unconformity on the Mesozoic group, are chiefly volcanic and are at least 7,000 ft. thick. They fall into three major groups, which are separated by two well-marked unconformities. The lowest subdivision consists of quartz latite, rhyolite, and andesite breccia; and it is probably the correlative of the Esmeralda formation of Upper Miocene age. The middle subdivision consists of andesite flows resting in places on the eroded edges of the rhyolites. The uppermost subdivision consists of subangular conglomerate overlain by basalt. The principal ore bodies consist of pyrite and chalcocypite in a gangue of pyroxene, garnet, and epidote. They are replacement deposits of limestone developed along fault zones and are of the contact-metamorphic type. The primary ore is essentially unenriched by later sulphides. The average tenor of the ore mined has ranged from 2.75 to 6 per cent of copper. A. K.

PERSONALS

Herbert C. Hoover is in California. Charles S. Haley is now at Farmingdale, N. J.

Jay A. Carpenter was recently in Randsburg, Cal., on mine examination work.

S. J. Speak, of Hooper, Speak & Co., London, has been in San Francisco and is now at Trail, B. C.

G. L. Sheldon is returning to Denver from a month's professional work in Nevada, California and Montana.

H. D. Budelman, superintendent of the West End Consolidated, has returned to Tonopah from a trip through Siskiyou County, California.

F. M. Van Tuyl of the Malm-Wolf Co., made an examination of oil properties near Douglas, Wyo., for Wyoming interests during October.

W. J. Johnson, of New York, is at the New King of Arizona mine, seventy miles northeast of Yuma, Ariz., where he is developing water for milling needs.

W. P. Harlow, of Boulder, Col., accompanied by George Teal, consulting engineer, was recently in Jerome, Ariz., where he is interested in a number of properties.

Lyman F. Barber, until recently mill superintendent for the Black Diamond Co., at Walker, Ariz., has taken charge of the mill of the Swansea Lease, Inc., at Swansea, Ariz.

Robert E. Vinson, of the University of Arizona, has been making an investigation of the effects of the smoke of the United Verde smeltery on the surrounding vegetation.

Major Paul B. Davis, of New York, formerly of Organ, N. M., lately in France with the engineers, will open offices in El Paso, Texas, for the practice of mining engineering.

Dudley Dean, secretary and treasurer of Keweenaw Association, spent several days during the week of October 13 on the Gogebic Range, inspecting the mines owned by the association.

Sydney H. Ball, of the firm of Rogers, Mayer & Ball, has been made a chevalier of the Belgian Order of the Lion, in recognition of his work in developing the mining industry of the Belgian Congo.

H. H. Bellamy, a representative of the Sandavol Zinc Co., of Chicago, has been in the North Arkansas zinc field for several days, investigating the ore deposits of the field and buying carbonate concentrates.

Edward W. Berry and Joseph T. Singlewald, Jr., of the Department of

Geology, Johns Hopkins University, have returned from a trip of six months to Peru, Bolivia and Chile, made through the George Huntington Williams Memorial fund.

Charles Eugene Schneider, head of Schneider & Co., Creuzot, France, is a member of the French economic mission, which, along with similar missions from Great Britain, Belgium and Italy, will visit New York to inform the American public of the economic situation of Europe and advocate financial co-operation between the powers during the period of reconstruction.

G. H. Clevenger, vice-chairman and acting officer of the Engineering Division of the National Research Council, with office in New York, has given up his active supervision of the work of the council and will leave soon to fulfill a professional engagement in Mexico. Upon his return, some months hence, he will open an office in New York as consulting engineer, specializing in metallurgical lines.

R. B. Moore has been designated to succeed Charles L. Parsons as chief chemist of the Bureau of Mines. For several years Mr. Moore has been in charge of the Mining Experiment Station of the Bureau at Golden, Col., and he also was in direct charge of the radium work done by the Bureau. Mr. Moore will be succeeded at Golden by S. C. Lind, who has been serving at that station as physical chemist.

OBITUARY

James H. Conrad died at his home in Oakland, Cal., in the early part of October. Mr. Conrad was at the head of the famous Malakoff property at North Bloomfield, where he made his home for many years. He came to California from Pennsylvania in 1858 and served in the army during the Civil War. Following the decline of hydraulic mining, he was employed by an English syndicate to direct hydraulic operations in various parts of the world, but returned at intervals to North Bloomfield.

MINING SCHOOLS

Camborne School of Metalliferous Mining has secured the services of J. G. Lawn as acting principal and to conduct the mining classes until the governors find an engineer who can accept a permanent position. H. W. Hutchin has been appointed lecturer on assay-

ing, taking the position formerly occupied by the late J. J. Beringer. Mr. Hutchin will continue some portion of his private practice, particularly his work for South Crofty.

INDUSTRIAL NEWS

Arthur M. Loeb & Co., Lima, Peru, desire to communicate with manufacturers of all kinds of mining and railroad equipment for the purpose of securing their exclusive agencies in Peru.

The Merchants' Association of New York has issued its year book for 1919, containing reports of the president and various bureaus, list of members and the rules and regulations governing the members' council.

Stewart & Holmes Drug Co., Seattle, Wash., will move about Jan. 1, 1920, to their new building, corner Occidental Ave. and King St. The assay and chemical supply department which has heretofore been in a separate building, will occupy the fourth floor.

E. V. Peters, general sales manager of the New Jersey Zinc Co., New York, left on October 10 for the West, to be gone a month on a business survey. Mr. Peters is accompanied by R. M. Neumann, manager of Western sales, with headquarters in Chicago. During their trip they will inspect various distributing warehouses which the company has established. Messrs. Peters and Neumann will visit, among other cities, Denver, San Francisco, Los Angeles, Portland, Ore., and Seattle.

National Foreign Trade Convention will be held at San Francisco, Cal., May 15-20, 1920. American firms represented at previous conventions have been requested to have their representatives, living or traveling abroad, time their visits to this country so as to take advantage of the opportunities afforded by this convention. Three special steamers, chartered for the accommodation of delegates from abroad, will be provided for the ports on the Pacific Ocean. Another steamer starting from New York, will go by way of the Panama Canal. Information regarding details of sailing and the program will be furnished by O. K. Davis, secretary, No. 1 Hanover Square, New York.

The Morse Bros. Machinery and Supply Co., of Denver, Col., is dismantling the Argentine and Grays Peak R. R. This road runs from Silver Plume, Col., to the summit of Mount McClellan, 14,000 feet elevation. It was equipped with 40-pound steel rails and

gasoline Shay locomotives. All of the material is being brought to Denver for resale. This company is also dismantling the Jerry Johnson 100-ton cyanide mill at Cripple Creek, erected in 1914. It was equipped with Dorr thickeners, agitators, classifiers and Olive filters. The material is also being shipped to Denver for resale. The 500-ton concentrator and 250-ton copper smeltery of the Penn-Wyoming Co. at Encampment, Wyo., is also being dismantled by the Morse Company. The 1½-mile Leschen tramway is also being prepared for shipment. This tramway was built in four sections of four miles each, and is available for immediate use. Over 96 miles of wire rope, 925 buckets, 196 towers, and tension stations, with complete terminal irons, make up the equipment. This was said to be the longest successful tramway in the world.

SOCIETIES

The Teknik Club, Denver, Col., held a dinner on October 13, which was followed by a program with addresses by Albert C. Crehore, on "Constants of the Ether," and Jay Lonergan on "Selling in China."

Canadian Mining Institute will hold the annual meeting in Vancouver on November 26, 27 and 28. E. T. Hodge, professor of geology at the British Columbia University, has been appointed general secretary.

Colorado Scientific Society held its regular meeting on Oct. 11, 1919, in Denver, Col. Captain Harry G. Burrows, Engineers Corps, addressed the meeting on "Engineering Construction in France During the War."

American Institute of Electrical Engineers and the American Physical Society held a meeting October 10 and 11, 1919, in Philadelphia. The present status of theories of atomic structure was one of the subjects discussed.

California Metal Producers' Association will change its name at the annual meeting of the Association, Oct. 22, 1919, to "California Metal and Mineral Producers' Association." The offices of this association are at 625 Market St., San Francisco, Cal.

American Welding Society, 33 West 39th St., will hold a meeting on Oct. 24 at the Engineering Societies Building. The program is as follows: Address, by C. A. Adams; "A Theory of Metallic Arc Welding," R. G. Hudson; "Repairing a Lighthouse," J. H. Deppler; "Gas Welding During the War," H. S. Smith; "Gas Cutting," F. E. Rogers; "Electric Resistance Welding,"

P. T. Van Bibber. A moving picture, "Repairing the Northern Pacific," will conclude the meeting. J. H. Deppler of the Metal & Thermit Corporation has been elected a vice president of the American Welding Society, and P. F. Willis, president of the Henderson-Willis Welding & Cutting Co., has been elected a director of the society.

TRADE CATALOGS

Electric Hoists. Victor R. Browning and Co., Cleveland, Ohio. Pamphlet; 8½x11; 8 pp.; illus. Describes electric hoists built for general purposes, with details of various parts.

Suspension Baffle Walls. Kefauver and Kenney, Baltimore, Md. Pamphlet, 8½x11; 4 pp.; illus. Describes the application of suspension baffle walls for steam locomotives, with advantages claimed for this type.

Lea-Courtenay Co. of Newark, N. J., has recently issued two bulletins, Nos. H 4 and S 5. The first is a treatise on centrifugal pumps as well as a catalog of the company's most complete line, and the other is a synopsis of typical centrifugal pumps installed in various industries.

The Stowe Stoker. Laclede-Christy, St. Louis. Catalog, 7x10; 16 pp.; illus. Describes the Stowe Stoker, a new automatic type, for which is claimed an increased capacity and economy. A discussion of combustion problems with the effects of various factors is included.

C-H Rectangular Magnets. The Cutler Hammer Manufacturing Co., Milwaukee and New York. Pamphlet; 8½x11; 8pp.; illus. Descriptive of magnets adapted for handling regular shapes in steel and iron, including billets, slabs, round and square bars, pipe, and steel plate.

Stamp Mills. Allis Chalmers Manufacturing Co., Milwaukee, Wis. Bulletin No. 1432 C; 8x10½; 52 pp.; illus. Describes stamp mills and accessory machinery for free-milling gold ores. A set of specifications for a ten-stamp mill with estimates of materials and supplies for one month's run, is included.

Material-Handling Machinery. The Osgood Co., Marion, Ohio; 8½x11; 32 pp.; illustrated. Describes steam shovels, cranes, clamshell outfits, and dredges manufactured by the company. The shovels are built in two types, the revolving, Nos. 18 and 29, carrying a ¾-yard and 1-yard dipper, respectively, and the Standard Railroad, Nos. 43 and 120, carrying a 1½-yard and a 6-yard dipper.

NEW PATENTS

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

Gases—Treatment of Gases Containing Sulphur Dioxide. Edward Victor Espenhahn. (1,315,183; Sept. 2, 1919.)

Gold-Washing Apparatus. John H. Fellows. (1,316,835; Sept. 23, 1919.)

Grizzly—Roller Grizzly. Leo Finger. (1,313,011; Aug. 12, 1919.)

Ingot Molds, Antipinging, Means For. John Brunner. (1,315,944; Sept. 16, 1919.)

Jigging Apparatus and Process. William C. Prickett. (1,315,407; Sept. 9, 1919.)

Leaching—Process of Treating Copper Ores by Lixivation with an SO₂ Solution. Niels C. Christensen, assignor to Metallurgic Improvement Corporation. (1,316,351; Sept. 16, 1919.)

Lime—Method of Producing Lime. Arthur S. Dwight and Richard Lewis Lloyd, assignors to Dwight & Lloyd Metallurgical Co. (1,315,952; Sept. 16, 1919.)

Magnesium—Process of Producing Alkali-Earth Metals. Warren F. Bleecker and Walter L. Morrison, assignors to Electric Reduction Co. (1,311,378; 1,311,379; and 1,311,380; July 29, 1919.)

Melting Metals, Art Of. William H. Bristol, assignor to The Bristol Co. (1,315,206; Sept. 9, 1919.)

Mine Water—Process of Treating Mine Water and Product Thereof. Addison F. Hoffman. (1,315,836; Sept. 9, 1919.)

Nitrogen—Apparatus for Fixation of Atmospheric Nitrogen. James Simpson Island. (1,316,445; Sept. 16, 1919.)

Platinum Metals—Process of Recovering. William C. Furguson, assignor to Nichols Copper Co. (1,315,660; Sept. 9, 1919.)

Powdered Coal—Apparatus for Burning. Aubrey J. Grindle, assignor to Combustion Economy Corp. (1,315,719; Sept. 9, 1919.)

Pulverized Coal—Combustion Process and Apparatus for Practicing the Same. Ulisses A. Garred, assignor to Garred-Cavers Corporation. (1,311,807; July 29, 1919.)

Roasting—Method of and Apparatus for the Heat Treatment of Finely-Divided Materials. Francis O. Blackwell and Nathaniel H. Emmons, 2d. (1,315,460; Sept. 9, 1919.)

Screen. Frank E. Johnson, assignor to American Manganese Steel Co. (1,312,545; Aug. 12, 1919.)

THE MINING NEWS

New York, October 18, 1919

Comstock Lode to be Diamond Drilled

Diamond drilling is to be employed on the Comstock lode at Virginia City, Nev., to prospect the ground below the Sutro tunnel, which is 1,640 ft. below the surface. The work will be done by the Middle Mines Association, together with various Eastern interests. H. L. Slosson, Jr., president of the Association, is quoted as saying, "People in the East have taken control of the Savage, Chollar and Gould & Curry mines, which mines have produced above the Sutro tunnel (1,640 level) over \$55,000,000. The Best & Belcher is to co-operate with them in the plan and the Potosi company has agreed to exploration proposed. No work of any

of C. H. Hitchcock. The option on this tract has recently been extended and drilling will be continued. The work is said to have disclosed bodies of hematite ore. The Little Long Lake iron lands on the same range have recently been examined by J. C. Murray. These lands are owned principally by H. E. Knobel and John W. Wolvin, of Port Arthur.

Conditions Good in Grass Valley District, California

Labor disturbances in the Grass Valley district of California are believed to be over. The conservative element among the miners is in control and any further difficulty is confidently expected to be improbable or, if it arises, to per-

as low as \$35 per month and a single miner can save \$50 per month from his wage of from \$100 to \$120 per month. With this surplus they are inclined to lay-off when they have accumulated a small stake. The result of this tendency is to bring the requirement for the number of miners of this class up to double the normal number.

There is encouraging activity in the district. Both the Empire and the North Star mines are recovering rapidly from the effects of the unfortunate strike. At the Idaho-Maryland unwatering operations are proceeding rapidly and a second air compressor is being installed. Other properties are also operating. The Banner properties on Banner Mountain are reported to have been purchased and added to the holdings of the Central Consolidated Mining Co.

Gold Rush to Hampton Plains

Recent Discovery in Western Australia Drawing Many Present Indications Promising

The facts relating to important gold finds in Western Australia during the last summer are given by the following dispatch from the Premier at Perth, W. A., to J. D. Connolly, Agent General for Western Australia:

"In June this year party prospectors found large ore formation on Block 50, freehold property, held by Hampton Properties, Ltd., situated 22 miles south of Kalgoorlie. Shaft sinking disclosed lode formation 25 ft. wide and ore channel can be traced north and south for considerable distance. Country rock is similar to the Boulder belt. Formation is oxidized to depth of 60 ft., composed of ferruginous quartz and soft lode formation and assays high values. If developments continue as at present, it is one of the most important auriferous developments found for many years.

"About half-mile eastward another ore formation has been disclosed showing visible gold. Surface indications of ore are good, but developments are necessary before anything definite can be said. A considerable number of leases have been taken up."

During September the Hampton Properties issued 268 mining licenses and received application for 170 leases. Little is being done, it is said, pending completion of the survey.



VIEW SHOWING SURFACE PLANT OF THE UNION MINE, COMSTOCK LODGE, VIRGINIA CITY, NEVADA

character has been done between the Sutro tunnel level and the 2,300 level. The combination shaft controlled by these companies is now open to the Sutro tunnel level and for some distance below. We have during the last 90 days equipped it with electric hoist and air compressor, new cables, etc., and are now carrying down air pipe to operate the diamond drill at the tunnel level."

Drilling in Northern Ontario for Iron Ore

The Leitch iron ore lands east of Lake Nipigon in northern Ontario are being diamond drilled by Smith & Travers, of Sudbury, Ont., for American interests. This work is in charge

of settlement without a strike. A secret ballot has been inaugurated in the unions and as a consequence the vote on questions affecting the welfare of the men more adequately represents the thought of the workers. A careful observer familiar with the facts said that the strike would not have occurred if the secret ballot had been in use. More than half of the miners employed are men of family who have worked for the companies under favorable wage and living conditions for a long time. The unmarried miners and the drifters who are necessary to complete the complement of workers at the various properties constitute the real problem. The high cost of living has not affected them since board and lodging is

Strike Settled at Tonopah and Divide

After considerable delay and much uncertainty the labor difficulties of the Tonopah and Divide districts have been settled and work has been resumed at a number of properties. It will take some time before operations become normal, for many of the best miners and skilled mechanics have gone to other localities and some will remain away permanently. It is largely due to the efforts of Governor Boyle that the difficulty was finally adjusted. To prevent further interference with the workmen who are returning to their work an injunction has been issued by Judge Averill of the local Nevada court restraining certain persons connected with the I. W. W. and such other persons who may be associated with them from interfering with miners or from claiming that any authorized strike is in course at Tonopah and Divide. The order prevents any interference of whatever nature with the workmen.

Globe-Miami District to Have "Safety First Week"

The Mine Rescue and First Aid Association of the Globe-Miami district, in Arizona, has undertaken a crusade to promote the safety of the community. To this end the week of Oct. 19 to 25 has been set aside as "Safety First Week" and the aid of all civil and industrial departments in the district has been asked in making the thing a success. It is planned to carry out the Association's program by means of proclamations by the Mayors of Globe and Miami, by four-minute talks to school pupils by their teachers, and by similar talks in theatres and to men as they go on shift in the various plants. The district has been placarded with "safety-first" mottoes and the support of newspapers and local merchants obtained.

New Cornelia Plans Future Construction

The plans of the New Cornelia Copper Co. have been definitely outlined by J. C. Greenway, general manager. The 500-ton mill is working well, but the experimental work may have to be continued for about ten months, which is considered sufficiently long to determine the best methods to adopt for concentrating the local ore. A 5,000-ton concentrator will then be built and may be in operation within three years. It is estimated that with a daily demand for 5,000 tons of ore, the surface carbonates and oxides will last from six to eight years. They will be taken out by steam shovels and reduced in the leach-

ing pits. By the end of this period a second 5,000-ton flotation unit will probably be in operation, thus continuing a daily draft on the mines for 10,000 tons of ore. Much of the sulphide for the mill yet is to be uncovered by the shovels working on the carbonates, though even now a large sulphide supply is available through development in nearby ground acquired by the company. The sulphides are richer than the surface ores, so concentration will give much larger bullion returns.

It is planned also to establish a smeltery, probably of reverberatory type. It is possible that the bullion also will be



MAIN SHAFT, TONOPAH-BELMONT DEVELOPMENT CO., TONOPAH, NEV.

refined at Ajo, to save transportation costs. The necessary sulphuric acid can be obtained, as it is now, from the Calumet & Arizona acid works at Douglas.

Homestake Fire Still Burning

The fire in the Homestake mine, at Lead, S. D., which started on Sept. 25, as reported in the last issue, broke out when miners blasted down a timbered raise on the 800 level. Water was turned in from the 600 and 700 levels and for a week the blaze was confined to the stope where it began. Openings were driven on the upper levels for water lines. The fire could not be reached from the 800 level and all openings leading from the burning stope were bratticed off to confine the gas. On Oct. 2 the fire reached the 700 level and on Oct. 4 it was decided to flood the workings to the 600 level. All machinery from lower levels was hoisted and all mine work suspended. All mills were also shut down owing to the need of all available water. Flooding to the 600 level will probably take about five weeks. Suitable work will be found by the company for all

employees during the temporary shut down of mine and mills. The fire continues to burn between the 700 and 600 levels.

During the fire in the same mine in April, 1907, it required 47 days to fill from the 1,550 level to the 200 level, and took 622,257,232 gals. of water. Today the mine is over 2,000 ft. deep, but the lower levels have not been opened to any great extent. If the fire can be held below the 600 level it should not take as long to fill the mine as it did in 1907. The 600 level and those above are larger than those below. Another advantage of keeping the fire below the 600 is that work can be resumed immediately after the fire is extinguished.

Labor Quiet on Mesabi Range

Steel Strike Fails to Close Down Mines—Some Men Out at Ely From Other Causes

The steel strike has thus far been absolutely devoid of direct results in closing down even one iron ore mine on any of the Minnesota ranges. Because of vessel congestion at lower lake ports many operators have been forced to mark time for two or three shifts out of each week since the strike was called, while others have been able to revise their schedules and put excess steam shovels to work stripping and doing other dead work around the pits while awaiting the return to normal conditions. A small strike of purely local nature has interfered with the operation of Chandler mine at Ely on the Vermilion Range, two foreign elements disagreeing on the desirability of a certain boss and leaving the operator in the position of facing a strike regardless of the course he might choose. Though short handed the mine has continued to operate. The striking element have continued to strike in spite of efforts toward conciliation by townspeople and officials, and have now increased the demands to include those championed by the I. W. W. in 1916; namely, the abolition of the contract system with a minimum of \$6 per eight-hour day. The trouble has also spread and the Sibley, Zenith and Pioneer mines are now closed down. Radical agitators are infesting all mining camps on the Mesabi Range, but are making no headway.

New Baltic and New Arcadian Companies Consolidate

A merger of the New Baltic and New Arcadian Copper companies has been effected. Shareholders unanimously approved the plan at a meeting held in Houghton, Mich., on Oct. 7. The new company will be known as the Arcadian Consolidated. Assessment will be avoided by leaving 43,000 shares in

the treasury to be marketed. Exploration results in the Baltic shaft were said to be promising at the time operations were suspended.

Seneca Buys Mill Site

The Seneca Mining Co. has purchased a mill site from Calumet & Hecla on the shore of Lake Superior. The site consists of 340 acres just west of the town of Eagle River, in Keweenaw County, Mich. This road will be down grade practically all the way to the mill. Underground, the showing continues good. Shaft sinking has been resumed. The lateral work on the first level, comprising 450 ft., has been completed to the boundaries. Second level lateral work has been under way since Oct. 1.

Representatives of Arizona at St. Louis Convention

The following named have been appointed by Governor Campbell to represent Arizona at the session of the American Mining Congress at St. Louis Nov. 17 to 21: A. T. Thomson, Douglas; F. W. MacLennan, Globe; Norman Carmichael, Clifton; M. Curley, Ajo; J. Kruttschnitt, Jr., Tucson; W. C. Browning, Superior; G. M. Colvocoreses, Humboldt; J. A. Burgess, Oatman; Ezra W. Thayer, Phoenix, and W. B. Marvin, Yuma.

Boulder, Colo., Association Formed To Help Prospectors

Grubstaking of prospectors is the object of the Gold Mining & Improvement Association recently organized at

Boulder, Col. The officers of the Association are James M. Platt, president; C. M. Pruden, vice president; Moses Hoover, treasurer, and Delia Mulford, secretary. The other directors are W. G. Houston, Charles M. Keith, John H. Du Bois and Mary N. Morehouse.

Canadian Geological Research

Dominion Geological Survey Work In British Columbia Covers Extensive Territory

In the course of its work during the last summer the Dominion Geological Survey had several parties at work in various districts of British Columbia. One party, in charge of J. J. O'Neill, who was geologist with the Stefansson Arctic expedition, covered the Salmon River district at the head of Portland Canal. In this district is the Premier mine as well as the Big Missouri group and other prospects of promise. The Cariboo country was covered by the party of B. R. McKay, who is making a geological survey of the placer gold deposits. A party in charge of L. Reinecke worked the section lying along the Pacific Great Eastern Ry. between Clinton and Quesnel. The soda lakes of this area will be made the subject of a special examination by Mr. Reinecke. The Slocan district was covered by M. F. Bancroft, who is completing a geological survey of the district which was begun years ago and was almost completed by the late O. E. Le Roy.

V. Dolmage with his party was engaged in surveying the west coast of Vancouver Island. The Britannia area

along Howe Sound was covered by S. J. Scholfield, who is making a detailed examination of the district. In the Bridge River country, S. C. McCann is preparing a geological map and is comparing the geology of the district with that of the Grass Valley district of California. Charles Camsell, who is in general charge of the Survey's work in British Columbia, spent a few weeks in the Coquihalla River section examining the district.

Concentrator for Rossland, B. C.

Consolidated Company Decides to Erect Plant—May Also Build Mill At Kimberley

At a joint meeting between the officials of the Consolidated Mining & Smelting Co. of Canada and those of the city of Rossland, B. C., on Sept. 27, arrangements were practically concluded by which the company will build a 5,000-ton concentrator in Rossland city. Sufficient water has been assured, and the company has placed its engineering staff at the city's disposal in order to expedite the preliminary work. S. G. Blaylock, general manager of the company, announced that, now that a water supply was assured, he was anxious to get the building roofed before the snow came. Construction is to be of reinforced concrete, and the roof will be of sheet zinc supported on steel rafters. It is expected that the plant will be in operation within a year. There is also a persistent rumor that the same company will build a 10,000-ton concentrator at Kimberley, where the Sullivan mine, its largest producer, is situated.

PROGRESS OF MINING OPERATIONS

Important Events of Interest
Condensed and Classified
for Easy Reference

ARIZONA

Graham County

Arizona Leasing (Klondyke)—Company organized to take over Grand Reef and some other groups in Klondyke district. Active development soon will be under way on principal properties.

Mohave County

Cerbat Tunnel surveyed into mountain three miles. Geological and mineralogical survey of district now in progress.

Placer Ground near Colorado River to be handled by dry washing plant which is to be installed by H. L. Harris.

Chloride Queen (Chloride)—Working steadily on Silver Mountain and Sun-

day School groups. Double-compartment shaft sunk to 256 ft., with 320-ft. drift on 200 level. Ore generally is high-grade silver.

Golconda (Chloride)—New mechanical equipment being installed by Highland Mining Co.

Hidden Treasure (Chloride)—Chloride Mining Co. is clearing out old workings.

Memphis (Chloride)—Taken over by Dardanelles Mining Co. from Miss Anna Durkee, of New York.

Schenectady (Chloride)—Sold to J. McMillan and associates; will unwater and start development at once.

Steffy (Chloride)—Foreclosed to Thompson-Dudley Machinery Co. Machinery, including mill, will be sold.

Arizona Butte (Kingman)—Starting work on big tunnel at Stockton Hill, with full equipment necessary.

Bunker Hill (Kingman)—Property, east of Cerbat, taken over from John Mulligan by H. E. Smith. Vein, cropping for 700 ft., runs high in silver.

Cleopatra (Kingman)—Property near Bill Williams Fork reported to have developed 200,000 tons of copper ore of good grade. Inspection lately made by representative of Humboldt Smelter.

McKesson (Kingman)—Machinery from Tipperary mine at Oatman being transferred to its property near Wallapai.

Pawva (Kingman)—Purchased and will operate Last Chance mill on ore from 180 level. G. W. Gibson in charge.

Senate Silver (Hackberry)—Sinking inclined shaft and drifting from 200 level.

United American (Kingman)—Work resumed with full crew. Shaft to be sunk within 90 days to 500 ft., where drifting will be started. W. K. Ridenour, president, at the camp.

Pima County

New Cornelia (Ajo)—September production of copper 3,898,000 lb., comprising 3,092,000 lb. cathodes, 334,000 lb. smelting ore, and 472,000 lb. cement copper.

El Tiro (Silver Bell)—Fair grade copper ore shipped regularly to Hayden smeltery. Produced 500,000 lbs. since July 1, repaid all development and rehabilitation costs and has treasury balance. Has exceptional railway facilities and good electric equipment. Percy Williams, manager.

Arizona-Tucson (Tucson)—Sinking 2-compartment shaft on the property, in Amole district, 8 miles south of Tucson.

Dawson Metallurgical (Tucson)—Has completed 85-ton Dawson-type furnace near Narragansett mine, in Rosemont district, 42 miles southwest of Tucson. W. A. Doyle, president, in charge.

Mina Mexicana (Tucson)—Taken over by the Suffern Company, of New York, which has started development.

Yavapai County

Jerome Superior (Jerome)—Below 700 ft., shaft cut 4-in. streak of brown hematite, considered encouraging sign. Hoisting 140,000 gals. a day. George Mitchell, general manager.

Tuscumbia (Jerome)—Old Tuscumbia mine in northern slope of Bradshaws about 4 miles from famous Peck mine, taken over under lease and bond by George Kingdon and others. About one month was spent in sampling. Large force has been employed and new camp built. In early days Tuscumbia had remarkable record of production and its bullion output exceeded that of its neighbor, the Peck.

Copper Queen Gold (Mayer)—Will build 100-ton flotation mill; contract let to Kennard & Bierce, of Los Angeles.

Henrietta (Mayer)—Installing electric hoist for sinking from main tunnel.

Silver Belt (Prescott)—First carload shipped to El Paso from 250 level, netted \$5,000. Company will sink from old workings on 3-ft. vein of high-grade ore. Ben Rybon in charge.

CALIFORNIA

El Dorado County

Pacific Deep Gravel (Placerville)—Six hundred acres seventeen miles east on Lincoln Highway, sold by J. H. Zimmerman of Placerville, to J. E. Sexton, Eugene Davis and others, of Eureka and New York. Development includes old 400-ft. cross-cut tunnel and air-shaft; will drive new cross-cut at deeper level. Fifteen men at work. Will Christian in charge.

Placerville seriously threatened by encircling forest fires on Sept. 24. Buildings on Poverty Point and Baring Gould properties were burned down.

Kern County

California Rand Silver (Randsburg)—Dividend of \$96,000 declared. Former sheriff J. W. Kelly, president.

Nevada County

Allison Ranch (Grass Valley)—Mill being operated eight hours per day only, on account of scarcity of profitable ore. Consolidated Mines Co. driving development drifts east and west of shaft and hope to cut Hartery and Omaha ledges.

COLORADO

Boulder County

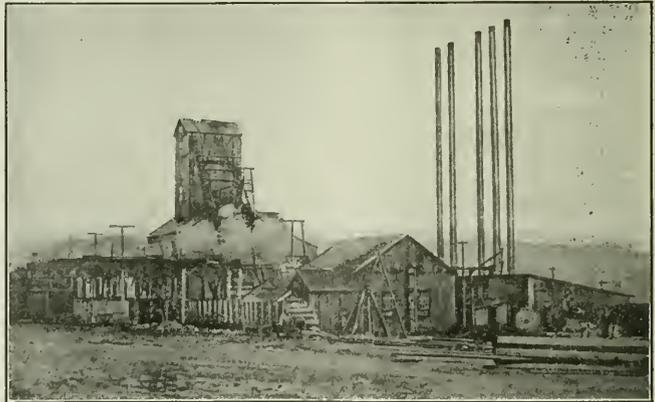
Golden Eagle (Boulder)—Property in Argo tunnel bonded to Eastern interests. Much work done in retimbering, catching up caved ground and driving raises and skipways. Large tonnage expected from tunnel and upper levels. Al Weinberger, general manager, and T. D. McGuire, superintendent.

Eagle County

Horse Mountain M. & M. (Eagle)—Company in Fulford Mining District, 70 miles from Eagle, operating Lady Bell group. About 175 cars of high-grade gold-silver ore was shipped, in removing of which a large body of low-grade ore was developed. Now planned to build mill. J. O. Kempf, president; John Welsh, vice president; S. A. Mock, secretary-treasurer.

Gilpin County

Ottawa Group (Alice)—Property 10 miles north of Idaho Springs, consisting of 8 lode claims and mill-site, purchased for \$50,000 from John F. Kaminky, by newly organized Roosevelt Mining & Milling Co., composed of five business men of Newark, N. J.



SURFACE PLANT OF WOLFTONE MINE, LEADVILLE, COL.

Idaho-Maryland (Grass Valley)—Test run made for unwatering 1,000-ft. vertical shaft. Pumping will be done with old electric-driven Cornish pump formerly used.

Cold Springs and Buckeye group of claims in Willow Valley sold by W. G. Motley of San Francisco to Mrs. L. M. Hoge of Nevada City. Buckeye hoisting plant and Cold Spring mill included. Hoge interests driving long tunnel to tap quartz veins and gravel, and erecting 15-stamp mill near tunnel mouth.

Plumas County

Engels Copper (Engelmine)—Company's Superior mine showing high-grade average ore.

Developed by 2,200-ft. tunnel; 20 men employed. Nathan Shapiro in charge.

Gunnison County

Ruby Consolidated Silver (Irwin)—Company with property two miles off Crested Butte Branch Railroad has set aside \$30,000 for development.

Pitkin County

Ethiopian (Quartz)—Operations suspended owing to poor market. Has 4-ft. vein of high-grade amorphous-graphite.

San Juan County

Valley View Leasing (Telluride)—Constructing mill to treat ores from San Bernardino group which it is operating under lease.

MICHIGAN Copper District

Champion (Painesdale)—Maintaining tonnage of ore running 40 lb. per ton refined copper. Baltic and Trimountain mines of same group making better than 32 lb. average.

Mass Cons. (Rockland)—Now shipping 500 tons daily and plans further increase in output. September ore shipments totaled 14,000 tons.

Gogebic Range

Norrie-Aurora (Ironwood)—New locomotive crane with long boom and clamshell in use on coal docks to spread coal away from dock. Former practice of Lake Superior mines of storing part of winter coal supply in railroad ore cars is no longer permitted by R. R. Administration.

Pabst (Ironwood)—"H" shaft crosscut on 24th level cut through footwall into ore 966 ft. north of shaft on Oct. 1. In last two months crosscut was driven 441 ft. in slates; 8x15-ft. heading, three shifts, six men each, with mucking machine and five drills. Considerable time lost because of powder gas, no ventilating system used.

Puritan (Puritan)—Miner buried and suffocated Oct. 11 on 70 ft. sub. of 14th level. Piece of capping rock fell in stope and caused run of ore.

Morgan (Wakefield)—Being developed with force of 25 or 30 men. Railroad not yet in, and all ore hoisted has to be stocked. Property farthest east of operating mines of the range. Ore-body tested by extensive drilling before development was begun. Operated by Thomas Furnace Co., of Milwaukee, who can handle siliceous ores found on this property.

Marquette Range

Barnes-Hecker (Ishpeming)—Armstrong loader installed underground; first on Marquette range.

South Jackson (Negaunee)—Pit loading suspended for season. Never operates during winter.

Menominee Range

Oliver Iron (Stambaugh)—Dober mine ceased shipping for season.

Pickands, Mather (Iron River)—Shipments stopped from James, Balkan, James, Caspian, Bengal, Fogarty and Baltic mines. Balkan only property to reduce force. Stocking room scarce at Balkan.

McKinney Steel (Crystal Falls)—Dunn, Tobin and Odgers mines are idle. Probably will not resume until spring.

Amasa-Porter (Amasa)—Ore now being hoisted and stocked.

MINNESOTA

Cuyuna Range

Northland (Cuyuna)—Developing and stockpiling manganiferous ore.

Mahnomen (Ironton)—Has been shipping special manganiferous ore all rail to an interior furnace. Ore assayed high 28 per cent manganese and 29 per cent iron, or a combined content of 57 per cent dried.

Thompson (Ironton)—Inland Steel Co. is relinquishing Haley-Keating lease, operated since 1913, as property is exhausted. Equipment and plant will be used in mining the SW. ¼ of SE. ¼ of Section 2-46-29, a State lease known as the North Thompson, which was stripped two years ago and has been operated as an open pit.

Whitmarsh Mining Co. (Ironton)—Closed down both its mines, Martin and Huntington. About 25,000 tons in stockpile at each property. Will allow mines to fill with water.

Sagamore (Riverton)—Stripping contract completed. Winston-Dear Co. loading ore in pit. Will ship 100,000 tons manganiferous ore this season. Experimental washing in Rowe washing plant is giving excellent results in eliminating excess fines and moisture.

Huntington (Sec. 9-46-29)—Reduces force temporarily awaiting more favorable turn of market. Whitmarsh Mining Co., operators.

Joan No. 4 (Trommald)—Shaft of this manganiferous property of Marcus L. Fay, which has been closed down since December, 1918, mysteriously caved and disappeared from view on night of September 30.

Omaha (Woodrow)—Miners' strike adjusted; underground operation resumed. Drying plant shut down for repairs. Eighteen gangs one shift in straight shipping ore. Installing auxiliary electric hoist. Omaha Iron Co., Chicago, operators.

Mesabi Range

Wisconsin Steel (Chisholm)—Subsidiary of International Harvester Co. has begun developing underground mine, including three forties in NW. ¼ of Section 27-58-20. Property leased from Great Northern, reported to contain 10,000,000 deposit. C. R. Emerson, local superintendent.

Jean (Eveleth)—Small underground mine of Kingston Mining Co. worked out. Total shipment, 109,139 tons since opening in 1916.

Oliver Iron (Eveleth)—Will build 100 residences and one modern flat building; at Hibbing, 19 residences and one flat building; Coleraine, 32 residences; Eveleth, 25 residences; Ely, 24 residences. Call for bids on 140-room hotel to be erected in new addition to Hibbing.

West Adams (Eveleth)—Fault Mining Co. operating small revolving shovel stripping old caves. Expect to recover large tonnage of high-grade lost through earlier careless methods.

MISSOURI

Newton County

Heaton-Hodges (Granby)—First of two shafts started in 1918 now 17 ft. into ore revealed at 230 to 250 ft. by diamond drilling of Trentland. Runs better in lead and zinc than drillings indicated. Charles O. Hodges, of Dallas, Tex., president. This will be the first producer in new district. Several other companies have started shafts.

MONTANA

Beaverhead County

Boston and Montana Development (Wise River)—Line of Montana Southern Ry., proposed as outlet for ores of Elkhorn mines, will be completed to these properties about the middle or latter part of this month, according to local office of Boston & Montana.

Silver Bow County

Butte-Bullwhacker (Butte)—Tonnage shipped to Anaconda's leaching plant being increased to more than 100 daily.

Butte-Duluth Copper (Butte)—Grade of about 2 per cent copper being maintained in shipments to the Washoe reduction works.

Butte and Superior (Butte)—Development program for Butte-New York territory adjoining Black Rock mine, controlled by Butte & Superior, includes crosscut from 1,800 of Black Rock. Butte-New York ground cut on 1,200 level said to be promising.

Crystal Copper (Butte)—Showing in "B" vein continues good, more than 2½ ft. of ore being in sight with grade high in silver and gold values.

East Butte Copper (Butte)—Showing on 1,800 level is reported to be improving. Tonnage grade running well.

North Butte (Butte)—Ore reserves of Granite Mountain and Speculator mines standing at high point in number of years, according to unofficial reports. Output being increased.

NEVADA

Mineral County

Simon Silver Lead (Mina)—Burch, Hershey & White appointed engineers.

Pershing County

Loring (Lovelock)—Excavating for 30-ton Gibson mill of Jose-Davis company finished and concrete foundation will be put in at once. Tunnel on company's lease on Sheepherder still shows full face of good ore.

Nevada Honey Bee (Lovelock)—William J. Loring, manager, has started systematic prospecting of service, without interfering with regular development. Malley shaft down 125 ft. and Benedetti tunnel in 262 ft.

Storey County

Consolidated Virginia (Virginia City)—For week ended September 26 Consolidated Virginia extracted 137 tons of good-grade ore from point 60 ft. east

in new vein on 2,150 level and 88 tons from point 30 ft. southwest in same vein.

Mexican Gold and Silver (Virginia City)—Opening new level at 1,900-ft. point of 2,000 raise and crosscutting east and west. Enlargement of cyanide plant continues.

Ophir Silver (Virginia City)—From 1,900 level there were extracted 41 tons of good-grade ore in week ended September 26. Prospecting continues on 1,465, 1,600, 1,800, 1,900 and 2,000 levels.

SOUTH DAKOTA

Custer County

At Fairburn, first rig to be used in drilling for oil in this new field has arrived, and will be set up at once. Structure said to be good, and all land within area leased. Although no oil has ever been developed in vicinity, oil men claim indications are satisfactory.

Lawrence County

Gold Stone (Deadwood)—Articles of incorporation filed. Capital \$125,000. Company has leased Rainbow mine in Maitland district, and will also work adjoining properties which they own. Incorporators—Solomon Burns and N. T. Mason, Deadwood, and Mark J. Little, Pittsburgh, Pa.

Echo (Maitland)—Sinking of shaft approaching 200 level. Good grade of lead-silver ore cut in sinking.

Mogul (Terry) — Operations suspended owing to labor shortage and increased cost of production. Mill in continuous operation since completion of new plant in 1914.

UTAH

Juab County

Tintic shipments week ended Oct. 4 totaled 120 cars.

Electric power has been installed recently by over 12 companies of East Tintic district.

Goshen Valley R. R. is rapidly completing a spur to Iron King and Tintic Standard properties.

Apex Standard (Eureka)—Small bunch of promising ore opened on 900 level 100 ft. from shaft. L. W. Merriam, president.

Lehi-Tintic (Eureka)—Developing ore opened on 900 level through lower tunnel. Shaft sinking deferred. Will build tramway. Working on surface plant.

North Standard (Eureka)—Sinking suspended while drifting for ore on 500 level.

Sioux Consolidated (Eureka)—Damages of \$7,500 for failure to buy and hold block of stock of this company awarded to James Morgan, of Nephi, against W. H. Child & Co., brokers of Salt Lake City. Suit was brought for

value of stock dividends paid while company was making payments and interest which amounted in all to \$17,000.

Tintic Standard (Eureka)—Producing 100 tons silver-lead ore daily from 1,000 level. Hauling by truck to Denver & Rio Grande main line.

WASHINGTON

Kittitas County

Great Western Silica (Roza)—Building 25-ton mill for pulverizing crude diatomaceous earth. Extensive deposits opened on Squaw Creek, nine miles from Roza.

F. M. Handy & Keller (Valley)—Hauling magnesite from Double Eagle quarry by motor truck.

Majestic Diatomaceous Earth (Wymer)—Producing about 10 tons of finished material daily.

Lincoln County

Drum Lummon (Miles)—Producing good grade of silver ore from property south of Crystal Buttes. Will truck to Davenport for shipment. M. H. O'Connell in charge.

Okanogan County

Copper World Gold (Loomis) — Leased for five years to E. Dempster, of New York, who expects to expend \$25,000 to \$30,000 in next year in equipment and development. Dempster also has lease with eight years to run on Copper World Extension adjoining, from which he shipped 4,000 tons last year and where 35,000 tons are said to be blocked out. Copper World, said to have mineral zone 100 ft. wide within which is 17 feet of sulphide ore. Tramway 2½ miles long has been built to Copper World Extension, at cost of \$45,000, and will be extended a few hundred feet to Copper World.

Kaaba Mines (Oroville)—Installing mine plant with 600-cu. ft. compressor 4,000-lb. hoist and electrical equipment. J. W. Douglas, president.

Stevens County

Gladstone Mountain (Boundary)—Chimney of lead ore struck within short distance of Electric Point line. Ore is of similar grade to that found in chimneys on Electric Point ground. Body 26 ft. wide and of unknown length. Shaft will be sunk 100 ft. and at same time crosscut will be run into chimney from 260-ft. level in main shaft. Holdings surround Electric Point on three sides.

Electric Point (Northport)—Ore accumulated in bunkers before temporary suspension is being shipped. Ore chimney recently opened being developed. Mine now developed to 800 level. Aerial tramway to Leadpoint successful and 7-mile extension to Woodspur being surveyed.

CANADA

British Columbia

Cork-Province (Ainsworth)—Shipments suspended since August. Considerable ore and several carloads of concentrates on hand.

Snowstorm Group (Ashcroft)—Diamond-drill exploration by the Provincial Government in Highland Valley disclosed high-grade copper, and will be resumed after further surface work on Iona claims of this group. W. S. Drury will survey the property.

Lenora (Cowichan, Vancouver I.)—Being opened up by G. D. B. Turner, who is now on the ground. A. Meagher in charge.

North Star Mine (Kimberley)—Operations affected by strike of metal miners. Was expected to regain a shipping basis shortly, as damage from recent fire has been repaired. O. C. Thompson and J. L. McKinney, owners.

Gold Plate-Humming Bird (Nelson)—Group of claims at head of Roaring and Five Mile creeks being reopened and developed by owners.

Ontario

La Rose (Cobalt)—Has unwatered and started to work No. 3 shaft of University Mine, which has been under water for ten years.

Mining Corporation (Cobalt)—Shipped 100,000 oz. of silver bullion.

Nipissing Extension (Cobalt)—Has arranged to start development of its properties.

Hunton-Kirkland (Kirkland Lake)—Shareholders have rejected offer of H. Cecil to take option on property.

Lake Shore (Kirkland Lake)—Has resumed operations. Property has been closed for several months on account of strike.

Argonaut (Larder Lake)—Former Mine d'Or Huronia, has completed changes and extensions to mill, and is now ready to operate. Main shaft will be sunk to 200 level.

La Mine d'Or Huronia (Larder Lake)—Taken over by Argonaut Gold Mines, Ltd., as close corporation organized in Montreal. J. E. Hardman is consulting engineer, and John W. Morrison, formerly manager of Lake Shore Mine, Kirkland Lake, is general superintendent. Much exploration work already done. Property close to Beaverhouse Lake.

Clifton (Porcupine)—Has cut main vein on 100-ft. level, where it shows much free gold. In 1913 open cut on this vein shipped 80 tons to smeltery, average \$155 per ton.

Davidson (Porcupine)—Will do large amount of diamond drilling to explore vein on 1,200 level.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices
 Metal Market Conditions, Average
 Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
9	417 ³ / ₄	117 ¹ / ₈	63	13	Holiday	Holiday	62 ³ / ₄
10	418 ¹ / ₄	117	62 ⁷ / ₈	14	417 ³ / ₄	117 ¹ / ₄	63 ¹ / ₈
11	418 ³ / ₄	117 ³ / ₈	62 ⁷ / ₈	15	417	118 ¹ / ₄	63 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.

Daily Prices of Metals in New York

Oct.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
9	21 ³ / ₄	54 ¹ / ₂		6.25@6.30	6.00@6.10		7.40@7.50	
10	21 ³ / ₄	54 ¹ / ₂ @55		6.25@6.30	6.05@6.10		7.40@7.50	
11	21 ³ / ₄	54 ¹ / ₂		6.25@6.30	6.05@6.10		7.40@7.45	
13	Holiday	Holiday		Holiday	6.10@6 ¹ / ₄		7 ³ / ₈ @7.40	
14	21 ³ / ₄	54 ¹ / ₂ @54 ³ / ₄		6 ¹ / ₄ @6 ¹ / ₂	6.10@6.15		7.37 ¹ / ₂ @7 ¹ / ₂	
15	21 ³ / ₄	54 ¹ / ₂		6 ¹ / ₄ @6 ¹ / ₂	6.15@6.20		7.40@7.50	

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Oct.	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
9	104	103 ³ / ₄	113	281	282	27 ⁵ / ₈	28 ¹ / ₂	43 ¹ / ₂	43 ¹ / ₂
10	104 ³ / ₄	104 ¹ / ₂	114	283	284	27 ⁵ / ₈	28 ³ / ₈	42 ³ / ₄	43 ¹ / ₂
11									
13	106 ¹ / ₂	106 ¹ / ₂	114	283	284 ¹ / ₂	27 ³ / ₄	29	43 ¹ / ₂	44 ¹ / ₂
14	106	106 ¹ / ₂	115	281 ¹ / ₂	282 ¹ / ₂	28 ¹ / ₂	29 ¹ / ₄	43 ³ / ₄	44 ¹ / ₂
15	105 ³ / ₄	106 ¹ / ₄	115	278 ³ / ₄	280	28 ⁵ / ₈	29 ¹ / ₄	44	44 ³ / ₄

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

Metal Markets

New York—Oct. 15, 1919

The markets for copper and lead were in great confusion this week. Producers and consumers were equally uncertain in determining the real positions. In some quarters copper was viewed as being stronger, while in other quarters it was held to be weaker. With respect to lead, however, there was no doubt as to the strength.

Transatlantic freight rates were about the same as in the previous week, but with a leaning toward easier tendency. The rates from San Francisco to Hongkong and Kobe remained unchanged at \$18.

Copper

A larger business was done by producers this week than for a long time

previously, and a good many producers figured in the market. The buying was mainly by wire-drawers, but some business in cakes was done. There was also some small export business, both through the Association and outside of it. Japan bought early for delivery and Germany bought several lots, and probably would buy more at 21³/₄.

The prices realized this week varied widely, some business being done as high as 23c, but a great deal larger business at lower figures. The old asking price of 23¹/₂c, delivered, has now been forgotten. Producers were trying to find a market, and each one being ignorant of the actions of others, and buyers being completely in the dark, all

kinds of prices were asked and were realized. This condition prevailed right through the week and as late as this afternoon had not cleared up. Taking into account the volume of transactions at different prices, we average the market throughout the week at 21³/₄c.

Copper Sheets—33¹/₂c per lb. Demand is strong. Wire, 25@26c.

Tin

This market was erratic, under the influence of the longshoremen's strike. It rose sharply and then declined with the probability of termination of the strike. The amount of business transacted was light.

Lead

There was a very large inquiry for consumption, especially at interior points, which caused a sharp advance in the St. Louis market, which at present is the market most truly indicative. The satistical position is very strong, and lead is wanted in large quantities by corrodors, the manufacturers of blue-lead products, and by the makers of storage batteries. There are only a few producers who have any lead to sell, and they apparently are not anxious to dispose of it. The A. S. & R. Co. maintains its price at 6¹/₄c, New York, but yesterday and today it seemed to be impossible to buy any lead under 6¹/₂c. The quotation for lead in the New York market this week is more nominal than anything else, scarcely any business having been transacted here.

For bonded lead for export 5¹/₂c is asked.

The St. Joseph Lead Co. began producing lead at Herculanum on Oct. 9. The labor troubles in the Coeur d'Alene are reported settled. At Alton, Ill., however, there is still trouble and that plant is producing at only partial capacity.

Zinc

In rising to the neighborhood of 7.50c, such free selling was encountered that the buyers withdrew, and consequently prices eased off a little, but toward the close sales were made again at 7.40c for October and 7.50c for November-December. There was only a little inquiry by domestic consumers. The outstanding feature of the week was widespread inquiry from foreign countries, which resulted in the

sale of several thousand tons to Great Britain. Large inquiry from Great Britain, Belgium and France is still pending. At present export business can be done only via Galveston, which confines it to smelters in Arkansas and Oklahoma, smelters east of the Mississippi being unable to pay the freight rates from New York or Baltimore and meet the European market.

The zinc smelting works at Donora and Terre Haute are idle owing to strikes.

Zinc Sheets—\$10.50 per 100 lb.

Other Metals

Aluminum—33c per lb.

Antimony—Unchanged at 8½c for spot. Futures were quoted at 8½c. In some quarters 9c for futures was asked, but no business was reported done at that price.

Bismuth—Unchanged at \$2.96.

Cadmium—Unchanged at \$1.40.

Nickel—Ingot, 42c; shot, 43c; electrolytic, 45c.

Quicksilver—Following very heavy reduction in the price for quicksilver in the London market, our own market declined sharply. On Tuesday afternoon sales were made at \$85. This morning the price dropped to \$75. San Francisco telegraphs \$80, soft.

Silver—Market showed some decline until Oct. 14. Orders from China in London found supplies very scant, and accounted for the advance on the 15th to 63¼d. Exports of bar silver to London and the Continent, week ending Oct. 11, 287,000 oz.

The general stock of money in the United States on Oct. 1, 1919, totaled \$7,662,898,238; of this, \$2,905,726,555 was in gold coin and bullion, \$308,145,759 in standard silver dollars, and \$243,380,383 in subsidiary silver. The money in circulation on Oct. 1 was \$5,806,571,880, or \$54.58 per-capita circulation.

Mexican dollars at New York: Oct. 9, 90¾; Oct. 10, 91; Oct. 11, 91¼; Oct. 13, holiday; Oct. 14, 91¾; Oct. 15, 92¾.

Platinum—Unchanged at \$130@135 for refined ingot. The demand from jewelers is active.

Palladium—Unchanged at \$120.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 11.—Zinc blende, per ton, high, \$46.80; basis 60 per cent zinc, premium, \$45; prime Western, \$45; fines and slimes, \$42.50@40; calamine, basis 40 per cent zinc, \$32@33. Average selling prices: Blende, \$43.93; calamine, \$34.13; all zinc ores, \$42.59.

Lead, high, \$78.70; basis 80 per cent lead, \$77.50@75; average settling prices, all grades of lead, \$76 per ton.

Shipments the week: Blende, 8,089; calamine, 107; lead, 1,480 tons. Value all ores the week, \$471,410.

Sellers tried to set the price at \$47.50 to \$50 basis, but buyers "sit tight" on \$45 basis, some sellers coming across late today with offers to accept \$45. A report of \$46 basis for some ore high in iron is circulated without verification. Buyers of premium ore were limited to a \$45 basis, and their buying was light. In fact, at noon today all buying was light, but the offers of sellers to accept the basis may sell a large tonnage tonight.

Platteville, Wis., Oct. 11.—Blende, basis 60 per cent zinc, \$46@47 base, both for premium grade and prime Western grade. A temporary shortage of blende, particularly prime Western grade, caused sharper competition among buyers wanting the ore. Lead ore, basis 80 per cent lead, \$72 per ton. Shipments reported for the week are 2,059 tons blende, 199 tons galena, and 349 tons sulphur ore. For the year to date the totals are 78,066 tons blende, 5,017 tons galena, and 13,232 tons sulphur ore. Shipped during the week to separating plants, 2,273 tons blende.

Other Ores

Tungsten Ore—But very little business was done, and there seem to be no very good prospects. Chinese ore was quoted at \$7.25, with intimations that concessions might be obtained.

Molybdenum Ore—Quoted nominally at 75c.

Chrome Ore—Rhodesian ore, basis 45 per cent, was reported offered at \$7 per long ton, c.i.f., Eastern ports.

Manganese Ore—Quoted nominally at 50c per unit.

Pyrites—Spanish pyrites is quoted at 17½c per unit for furnace size ore, free from fines, c.i.f. New York or other Atlantic ports.

Average Prices for September

Lead, New York.....	6.108c
Lead, St. Louis.....	5.853c
Lead, London.....	£25.330
Zinc, New York.....	7.510c
Zinc, St. Louis.....	7.160c
Zinc, London.....	£40.955
Silver, New York.....	114.540c
Silver, London.....	61.668d
Copper, electrolytic, N. Y.....	21.755c
Copper, standard, London.....	£100.757
Tin, New York.....	54.482c
Tin, London.....	£280.102
Bessemer pig iron, Pittsburgh.....	\$29.35
Basic pig iron, Pittsburgh.....	27.15
No. 2 foundry, Pittsburgh.....	28.15

Iron Trade Review

Pittsburgh—Oct. 14

The steel strike, now in its fourth week, is losing ground, but only slowly. Production, taking the industry as a whole, is still not up

to 60 per cent of normal, although employment is perhaps at a trifle over that figure.

Working forces are commonly inefficient, so many new men having been taken on, and at a number of works men are employed at odd jobs without there being regular production. Employment in Western Pennsylvania has continued to increase, whereby the Shenango Valley is operating almost full, and municipal Pittsburgh is operating nearly full, but mills in the lower Monongahela Valley are still somewhat shorthanded, and at Monessen, the head of the valley, the men have not stampeded to work, as was expected when the return began last week.

Both in Youngstown and Cleveland, however, which were closed tight, the beginnings of resumption have just occurred. One blast furnace is operating in Cleveland, and at Youngstown about four furnaces are operating, with a few openhearth steel furnaces and one bessemer converter. The Wheeling district remains tightly closed.

Steel consumers are not importuning mills for deliveries, but, instead, are expressing their sympathy and anxiety to co-operate. Jobbers are parceling out their stocks to regular customers.

Pig Iron—Several merchant furnaces closed by the strike have resumed, and production of merchant iron is not nearly as much under normal as is the case with steel. Bessemer and basic are fairly plentiful, though foundry iron is somewhat scarce. Prices are unchanged: Bessemer, \$27.95; basic, \$25.75; malleable, \$26.25@27.25; foundry, \$26.75; forge, \$25.75, f. o. b. Valley furnaces, \$1.40 freight to Pittsburgh.

Steel—Billets and sheet bars have grown extremely scarce, as steel-producing mills are more affected by the strike than are finishing mills. Prices are largely nominal, and no attempts are made to secure premiums. Regular prices, now largely nominal, are: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; rods, \$52.

Ferromanganese—There is practically no inquiry. One or two of the English producers are quoting \$95, c.i.f. Nominal quotation of domestic producers is \$110, delivered.

Coke—Coke is weak, but not much is being dumped on the market. Consumption of merchant coke is somewhat heavier than it was a fortnight ago. Production in the Connellsville region is sharply curtailed in an effort to meet condition. Foundry coke consumption is as heavy as formerly, but offerings are larger. We quote furnace coke at \$4 and foundry at \$5.50@ \$6.25 per net ton at Connellsville ovens.

Engineering and Mining Journal

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New York and San Francisco, October 25, 1919

Number 17

Our Invisible Government

THE steel strike continues to dwarf in interest various other strikes in the mining and metal industries, being, indeed, of such national importance that much of the future history of the country depends on its outcome. We are heartily in sympathy with the attitude of Judge Gary and the principles of local and individual freedom for which he is holding out. Nothing could be fairer and more patriotic than the final manifesto to the Employers' Group before they left the Industrial Conference in Washington, out of which they were forced by the quitting of the Labor Group. On the other hand, the stand of the latter group, not for collective bargaining but for Union rule, is not calculated to win public sympathy. More than that, their action in bolting the conference rather than submit to an adverse vote does not augur well for their ability to bargain fairly and moderately. The action smacks of the Mexican idea of elections, where the candidate who is defeated at the polls takes to the hills with his riflemen and harries the successful administration till another election gives him a new opportunity. No system can cure social and industrial disorders unless the right kind of manhood is behind it. Witness the failure of collective bargaining system in the case of the coal strike. This system has obtained, we are informed, between coal operators and miners since 1878; and now it takes the form, on the part of the miner, that he makes his demands for acceptance without change, discussion, or delay, and with the alternative of disaster to the whole United States.

Surely the organization of labor for mutual protection and improvement is a desirable thing; and during the war our labor organizations were loyal and helpful. That steel workers should not be allowed to adjust conditions by local "works" committees, and local collective bargaining with their employers, but must walk out to allow some higher council, composed of men perhaps unfamiliar with their conditions, to dictate to the industry, is not, in our opinion, fair; as a matter of fact, it is not even collective bargaining, but the principle of surrendering local and individual rights to the manipulation of labor bosses.

It is increasingly certain that the steel strike is being engineered by the Bolshevik organization, as testified by a member of General Wood's staff before a Senate committee; and that the coal strike and others are part of a widespread revolutionary program. The exponents of the Plumb plan of buying the railroads, the common carriers for a hundred-

odd million Americans, and turning them over to 300,000 brakemen and conductors, announced darkly to a Congressional Committee that if the plan was not accepted it would mean revolution. They should have said that if the plan were accepted it would mean revolution. The fear of a revolution initiated by labor if its demands are not granted in the case of strikes like those covering steel and coal is not a factor to be considered; for if their present methods succeed, it means an overthrow of constitutional government. It would mean the triumph of one of the great parties in what we may call the invisible government, which has grown up gradually, side by side with our regular political system.

It must seem strange to thoughtful members of Congress to be bereft of all power but that of despairing speech-making, while the real issues and future government of the country are debated upon by a conference of private chieftains, acknowledged by Washington as the real powers; and to have these powers threaten and defy Congress as the American Federation of Labor is doing in regard to the possibility of including anti-strike provisions in the pending railroad legislation. Modern methods of organization have led to the growth of these powerful leagues, while the Constitutional government that was ideal for the newly liberated thirteen colonies has become more and more inadequate. Like the Western judge who could find in his printed code nothing that covered the killing of a Chinaman, and so freed the accused, Congress finds no precedent that covers interfering with the assassination of the prosperity and liberty of the country by a conspiracy of strikes and the substitution for the American government of the dictation of an increasingly effective and arrogant labor faction, directed by its own secret system.

The fair American way to such power as its numbers and rights merit is open to Labor. Let Labor, if it will, elect its own delegates to Congress, and so secure fair representation commensurate with that of the rest of the population of the United States. It is a fact that our legislators are representatives of sections rather than groups, classes, or principles; that they consist in undue proportion of lawyers and professional politicians; and this defect is doubtless due to machine politics in the case of both great political parties. These parties will do well if they value representative government and wish to defeat the seizing of power by a minority faction, to see that their candidates represent the majority group or class in each section, and that labor, the professions, business and agriculture are fully represented.

The Mining Bureaus at Washington

CONDITIONS in those government bureaus in Washington which have to do with the mining industry are not highly satisfactory in the present stage. Not only does Congress go through the annual allotment of appropriations to the Geological Survey and the Bureau of Mines without careful, intelligent, and sympathetic consideration, but it fails to provide properly for the housing of the geologists and engineers who are the life of these organizations. Evil days have come upon us. Formerly, learning and technical skill were most highly esteemed popularly, and the man of attainments enjoyed distinct rewards of many kinds in comparison with others. Our progress in the direction of materialism has changed this. No class is relatively so poorly paid, whether in Washington or elsewhere, as the scientific or learned class; and pure learning, or research for Truth's sake, is no longer really respectable. The geologists and engineers have in desperation joined the Federation of Labor, an act at once poetic and sad—poetic because it emphasizes the brotherhood and equality of all men; sad because it expresses their vain hope of thriving and benefiting therefrom as the carpenter and the barber have done.

The modern tendency of Congress and the higher government officials, political appointees, is to classify these professional workers on the same basis with clerks, and to crowd them together so that efficient research, study, comparison, and the preparation of results are greatly impaired. The organizations in question, especially the older one, the Geological Survey, have a wonderful record and a traditional esprit de corps. The dignity of the position of the government geologist, his love and enthusiasm for his work, and fairly pleasant working conditions, formerly kept him contented with a relatively small wage. Today, with his still hardly larger wage halved as to its purchasing power by the depreciation of the dollar, his working comfort destroyed by close crowding by a Congressional committee, and his dignity attacked by the tendency of those government officials who owe their positions to politics to regard him as a kind of clerk, it is not surprising if, at some time, the final straw falls, and he leaves for some more profitable and less irksome private position.

Many of the best men in the Survey and the Bureau have left this fall. The Survey averages a loss of 20 per cent per year, or, theoretically, a complete renewal in five years. Is it not possible to have a campaign of education among the political throng in Washington, to teach them the great importance of this handful of trained and efficient scientific experts, and the basic distinction between them and the multitude of careless clerks who pack the rooms of the departments and furnish so convincing an example of the inefficiency of a bureaucracy? These two organizations represent, in the government, the greatest basic industry of the country, and the great influence of that industry should be applied toward securing them more intelligently dispensed appropriations, appropriate quarters, and a comprehending

and sympathetic direction. A separate government building for mining and geology should be provided for at once; and a separate entity within the executive organization.

Dedication of the Bureau of Mines Pittsburgh Station

THE recent dedication of the Bureau of Mines Building in Pittsburgh brings to mind the purpose and accomplishments of this useful institution, which was organized in 1910 and which since its inception has become recognized as a valuable and necessary complement to the industries of the United States. It is a trait of human nature that, when enterprises have passed the experimental stage and have proved successful, they are too often accepted as facts, and due consideration is not accorded to the efforts that called them into being, and the benefits derived from them are too often accepted in a "taken for granted" spirit.

Much of the good feeling that the Bureau has created is based upon service rendered in conserving human life and in developing natural resources. Those spectators at the first-aid and mine rescue contests conducted during the three days of the exercises at Pittsburgh were much impressed by the skill and enthusiasm of the members of the 101 teams which participated. The teams came from many sections of the country, one team journeying from the State of Washington and two teams from Colorado. Montana sent the Butte district team, the membership representing six different mining companies, and that team captured the second prize in the first-aid contest.

The pageant, "The Hidden Treasures of Earth," presented on the night of the second day of the meeting, deserves especial commendation, and the author, Thomas Wood Stevens, is to be congratulated. Any agency which directs attention to the romance in the every-day work of mining and preparing the products of that industry for consumption makes the worker's world a more pleasant place in which to live. The interest in the pageant, and the artistic excellence that marked its presentation, suggest that similar entertainment features would contribute highly to the enjoyment of dedicatory and convention ceremonies in general.

Wartime Manufacture of Refractories in Britain

Soon after the outbreak of hostilities in 1914, many British industries found themselves deprived of essential raw or semi-manufactured materials of mineral origin. Great impetus was given to the working of home supplies of metallic minerals, such as the ores of iron, lead, zinc, tin, and tungsten and of deposits of barytes, fluorspar, and quartz.

In discussing the subject in an article prepared for the Journal of the Society of Chemical Industry, P. G. H. Boswell mentions particularly the dearth of refractory materials and describes some of the work accomplished in efforts to add to the supply. In consequence of the cutting off of supplies of

Austrian and Greek magnesite, the home resources of dolomite were successfully developed. Mention is made of a similar impure artificial product of dolomite, silica, and iron oxide prepared in American cement kilns and sold under such trade names as cinderlag and magdalite.

Geo-chemical research on silica bricks showed that the quality of those burned at over 1,300 degrees C., the temperature commonly employed, could be materially improved by longer burning at a higher temperature. Greater inversion of the quartz to other low-density forms of silica known as tridymite and cristobalite was thus insured, with the consequence that less expansion of the brick occurred when it was set in the furnace. To quote further:

"The investigation by the geologists and mining engineers of home supplies of potash-bearing minerals, such as feldspar, and the recovery by the chemist, in co-operation with the geologist, of potash from blast-furnace flues in Britain and cement-kiln flues in America, temporarily overcame the difficulties produced by the absence of German salts. The coprolite-bearing deposits of the Cambridge greensand were, after some delay, opened up for the purpose of obtaining the contained phosphate of lime, and at the date of the armistice were yielding helpful supplies."

The Lure of Gold

SINCE days of old the lure of gold has excited men to pioneer in far-distant lands. Be it a sunken treasure ship or the vague rumor of a gold discovery, there will be some one, or there may be many, who will gladly exchange their sure-thing, humdrum occupation for the shoestring of a chance in the bleak stretches of the Arctic or the humid, parboiled tropics. A quick but seldom an easy path to fortune is ostensibly the motive, but we believe that this apparent motive is merely an accessory. It is primarily the love of adventure that impels men to venture forth on this quest for gold. It is the same spirit that drove the old vikings away from their home shores to distant, unknown lands.

The latest expedition of the kind is the cruise of the "Casco." This small schooner, once used by Robert Louis Stevenson, has finished its romantic career by being pounded to pieces in Bering Strait, north of Nome. It was outfitted and started on a gold-seeking expedition to the Kolyma River, in Siberia. The party of adventurers, under Captain C. L. Oliver, left San Francisco in June. North Cape, 400 miles west of Bering Strait, was reached. Ice floes and an early winter stopped further progress, and the return ended in disaster. Twelve of the party were left in Arctic Siberia, where they will prospect for gold. The remainder returned to outfit another vessel.

There are now fewer places for the adventurous gold seeker. Both the North and South poles have been discovered. The in-between places remain to be explored in detail. The problems of arctic travel have been successfully solved, and the tropics do not

present the extreme difficulties they once did. But in both the tropics and the arctic there will be for a long time to come open places for the adventurer and the gold seeker.

Time in Engineering Calculations

TIME is a flow. Matter cannot be destroyed, but time flows by ceaselessly, never to return. The time element enters into the calculations of the engineer as it does into practically all affairs of human life. An expenditure of 100,000 ft. lb. of work is a definite quantity, a 100-lb. weight lifted 1,000 ft. or a 1,000-lb. weight lifted 100 ft. The time within which this work is done determines intensity, and the rate, or the number of foot-pounds of work per minute, is power.

A hundred horsepower motor will give forth 3,200,000 ft. lb. of work per minute at the pulley. The present value of an ore deposit containing \$1,000,000 worth of recoverable metal is dependent upon the time element. If it were mined in an extremely short time it would command a value closely approximating \$1,000,000. If it required ten years to mine it, its present value would be materially less. Labor is bought at a given price per hour or per day. For the use of capital a given rate of interest per unit of time, six months or a year, is paid.

In selecting materials for underground structures, the time element is often a determining factor. How long is the working to remain open? How long is the structure to be used? Innumerable examples might be given, but enough has been said to emphasize the prominence of the time element in engineering. The clock should be placed alongside of the engineer's scale, and he should think in terms of this as well as other dimensional units.

Work and Play

HOW easy it is to please some men. One man will indulge in an automobile. He will pick it from among the multitude of designs. It will be of a certain style and kind which bears about the same relation to the personality of the owner as does his hat, or his necktie, or even his clothes. He takes a great pleasure in operating it. He cleans and fixes it with much the same solicitude that a mother takes with her child. It becomes a hobby with him.

In sharp contrast, another man makes his work his hobby. If he be the manager of a mine, he takes delight in all the many activities above and below ground. A thousand men may be under him. He feels a certain responsibility for them. Their welfare appeals to him. If one becomes sick or meets with an accident, he is among the first to concern himself with the affair. He goes among his men imparting enthusiasm. His interest becomes theirs, and the whole project keys into harmony with the spirit he brings to his trust. It is all worth while, whether it be a play or a work hobby. It is this spirit that leavens the day and smooths out the inequalities. All men ought to make their work as well as their play a hobby.



SMOKER GIVEN BY THE AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS IN THE GOLD ROOM OF THE CONGRESS HOTEL, CHICAGO, MONDAY EVENING, SEPT. 22, 1919.

Recent Social Gatherings of Engineers

SMOKER OF THE AMERICAN ELECTROCHEMICAL SOCIETY IN THE FLORENTINE ROOM OF THE CONGRESS HOTEL, CHICAGO, THURSDAY EVENING, SEPT. 25, 1919.



Development of the Rock Drill in America

Progress in Invention and Manufacture of Rock Drills Has Been Rapid Since the Inception of the First Machine, and Today a Number of Types Are Suitable to the Requirements Demanded by Various Operations

BY CHARLES AUSTIN HIRSCHBERG

COLORADO, known to many as the land of scenic beauty and mountain grandeur, is not only the playground of the tourist and the Mecca for the followers of Izaak Walton, but also the school of the inventor, brought about perhaps by the great industry of mining gold, silver, platinum, radium, zinc, lead, and many other minerals employed by man in the useful arts. What better

In 1871 another power rock drill was invented by Simon Ingersoll, and other similar drills, such as those of Wood, Sergeant, Waring, Halsey and Githens, made their appearance. From this time on, man's primitive hand methods of mining faded rapidly, giving away to the so-called reciprocating piston rock drill, which comprised a cylinder carrying a piston with a projecting end, to which was rigidly fastened a drill steel.

The year 1894 ushered in another period in the history of the State of Colorado, with silver mining predominant. It was about this date that J. George Leyner, a native of Colorado, born in Boulder County, opened the shop shown in Fig. 5, in the City of Denver, for the repair of mining machinery. This enterprise led him into numerous experiments with the power rock drill, finally culminating in the invention, about 1897, of the first hammer drill, a type in which the piston moves freely in the cylinder and strikes upon the drill steel instead of being attached fixedly to it, and pushing it as in the reciprocating type of drill, a direct reversion to the principle



FIG. 1. SKETCH OF PROSPECTOR AND BURRO

incentive could man want to spur him on to the ultimate goal of success than the knowledge of that state's vast stores of wealth, and sunshine glowing from the heavens upon him like a benediction throughout 365 days of the year?

Cunning nature, running true to form, hid her treasures deep amid the hills, so that man must seek and toil to realize his desires, and so, from the green valley to timber line and over the snow-capped range, tawny men beat trails to Colorado's treasure store in the '50s of the last century, bringing with them the pick and the shovel and the single-jack and steel. This was the start of the gold fever in the State of Colorado.

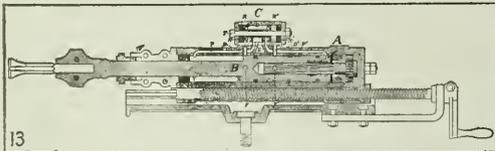
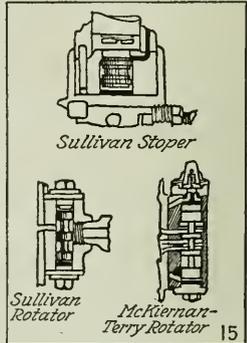
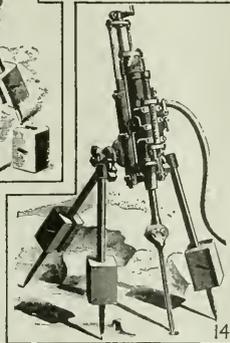
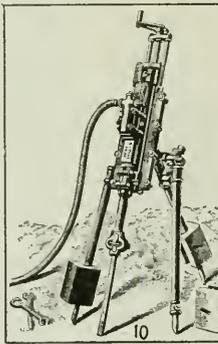
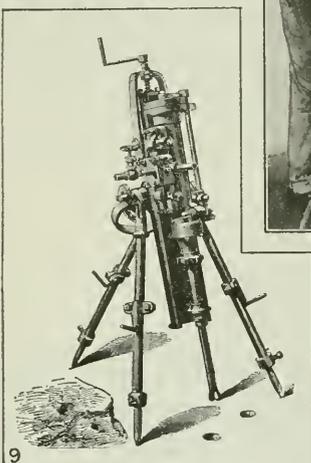
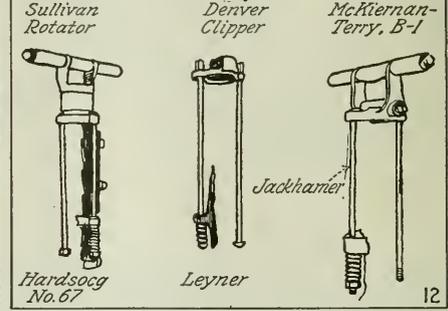
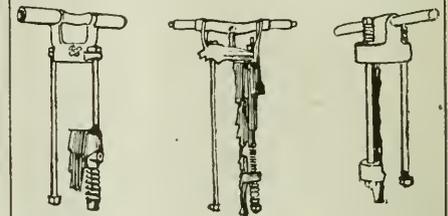
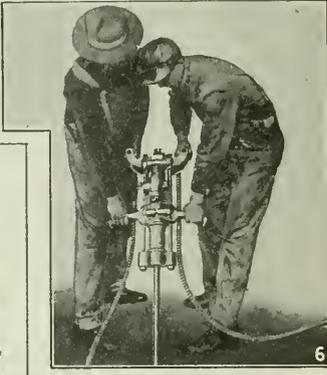
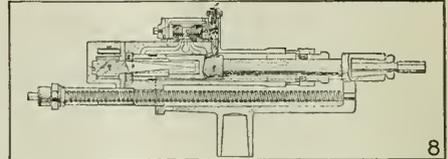
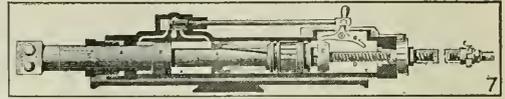
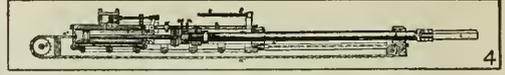
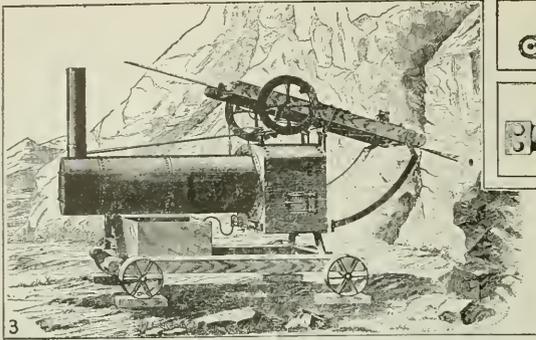
Event succeeded event rapidly until 1879, when a new period set in with the discovery of the lead-carbonate silver ores of Leadville. It was about this time that man put aside his single-jack and steel in favor of the power rock drill, invented by J. J. Couch, of Philadelphia, in 1849, and perfected during the intervening years by Couch and J. W. Fowle, of Boston, patent rights finally being purchased by Charles Burleigh, about 1866. The Burleigh drill was used in driving the Hoosac Tunnel in 1867. Fig. 3 shows Couch's first rock-drilling machine, and Fowle's first rock-drilling machine is shown in Fig. 4.



FIG. 2. MINER WITH SINGLE-JACK AND STEEL

involved in the primitive method of single-jack and steel.

There is no questioning the debt which the mining industry owes to the invention of the reciprocating type of rock drill, but it remained for a Western man, Mr. Leyner, born and raised amidst the hustle and bustle of the mining camps of Colorado, to take a real scientific step forward in the art of drilling



GENERAL TYPES OF POWER ROCK DRILLS AND PARTS—I

Fig. 3—The Couch Rock Drill, the first power rock drill. Fig. 4—Fowles First Rock Drill. Fig. 5—Leyner's First Shop. Fig. 6—The First Self-Rotating Hand Hammer Drill. Fig. 7—The Burrell Drill. Fig. 8—The First Wood Drill. Fig. 9—The Ingersoll Drill. Fig. 10—The Rand Little Giant. Fig. 11—Cross Section Rand Little Giant. Fig. 12—Side Rod Construction of Modern Drills. Fig. 13—Ingersoll Eclipse Drill, with Air-thrown Valve. Fig. 14—The Rand Slugger Rock Drill. Fig. 15—Modern Valve Actions of the Piston or Spool Type.

rock. It is not necessary to dilate at length upon the things he accomplished in the invention and development of the hammer drill—the introduction of water and air through hollow drill steel for cleaning the hole, automatic lubrication, enclosed-in-the-machine throttle control, mechanical rifle-bar-rotating drill steel chuck—in fact all hammer drills of the present day, irrespective of maker, have borrowed their most important features from the Leyner hammer drill.

In testimony of the value and correctness of Leyner's theories, his business grew to a point at which, in 1905, he was forced to build a modern manufacturing plant at Littleton, Col., to take care of a rapidly growing enterprise, finally ending in the purchase of license rights by the Ingersoll-Rand Co. of New York, since which time many modifications and refinements have been made, as typified in the Leyner-Ingersoll drill.

Still another product of Colorado's inventive genius is the creation of the stoper drill, which depends for its success upon an air-feed attachment to a drill cylinder, first experimented with by C. H. Shaw, of the C. H. Shaw Pneumatic Tool Co., Denver, Col., about 1906, followed rapidly by the Waugh slugger, also an air-feed type of machine; then the Crown air-feed drill of the Ingersoll-Rand, the Hardscog Wonder rock drill, the Sullivan, the Cleveland, the Leyner Stoper, and the Chicago.

The inventions chronicled proved the precursors of other styles of hammer drills; and the latter may fairly be termed modifications of design of these first types. For instance, the majority of the early hand hammer drills (excepting plug drills, employed for drilling shallow holes in granite and stone) were patterned largely after the air-feed stoper, the air feed being eliminated and a spade handle substituted; in fact, the manufacturers of these early stopers advertised the interchangeability of handle and air feed as a feature.

This early practice of interchangeability was, however, soon abandoned, for, though good in theory, it proved impracticable, and there is to be noted the appearance of the Little Jap drill, an Ingersoll-Rand product, followed rapidly by such machines as the Sullivan hand hammer drill, the Hardscog Little Wonder, Cleveland hand drill, Leyner Brownie, and numerous others.

In 1909 the first real self-rotated hand hammer drill made its appearance. Following the practice of making hand drills out of stopers, Mr. Leyner conducted extensive experiments with a Leyner drill cylinder removed from its shell. As will be seen from the illustration, Fig. 6, he placed a T-handle at the back, with additional handles part way down the cylinder. He built several of these machines, more particularly for shaft sinking. However, before he had gone very far the Ingersoll-Rand Co. obtained a license to manufacture and sell under the Leyner patents, and as early as 1912 the Jackhammer, the first self-rotating hand hammer drill employing Leyner rifle bar and sleeve chuck rotation, was placed

on the market. It proved such a success, that other manufacturers brought out modified designs.

It is often said that there is nothing new under the sun. To some extent this saying may be applied to present-day drill designs. Things which had been tried and tested in the early struggle with reciprocating drills, and later with the first Leyner drills, but abandoned because of their failure to perform as expected, and again in the latter case, because of the impossibility of securing suitable materials and a lack of knowledge in those days of refined methods of heat treating to enable materials to stand up under the particular work they were to perform, are today making their appearance in the designs of many drills and exploited as new.

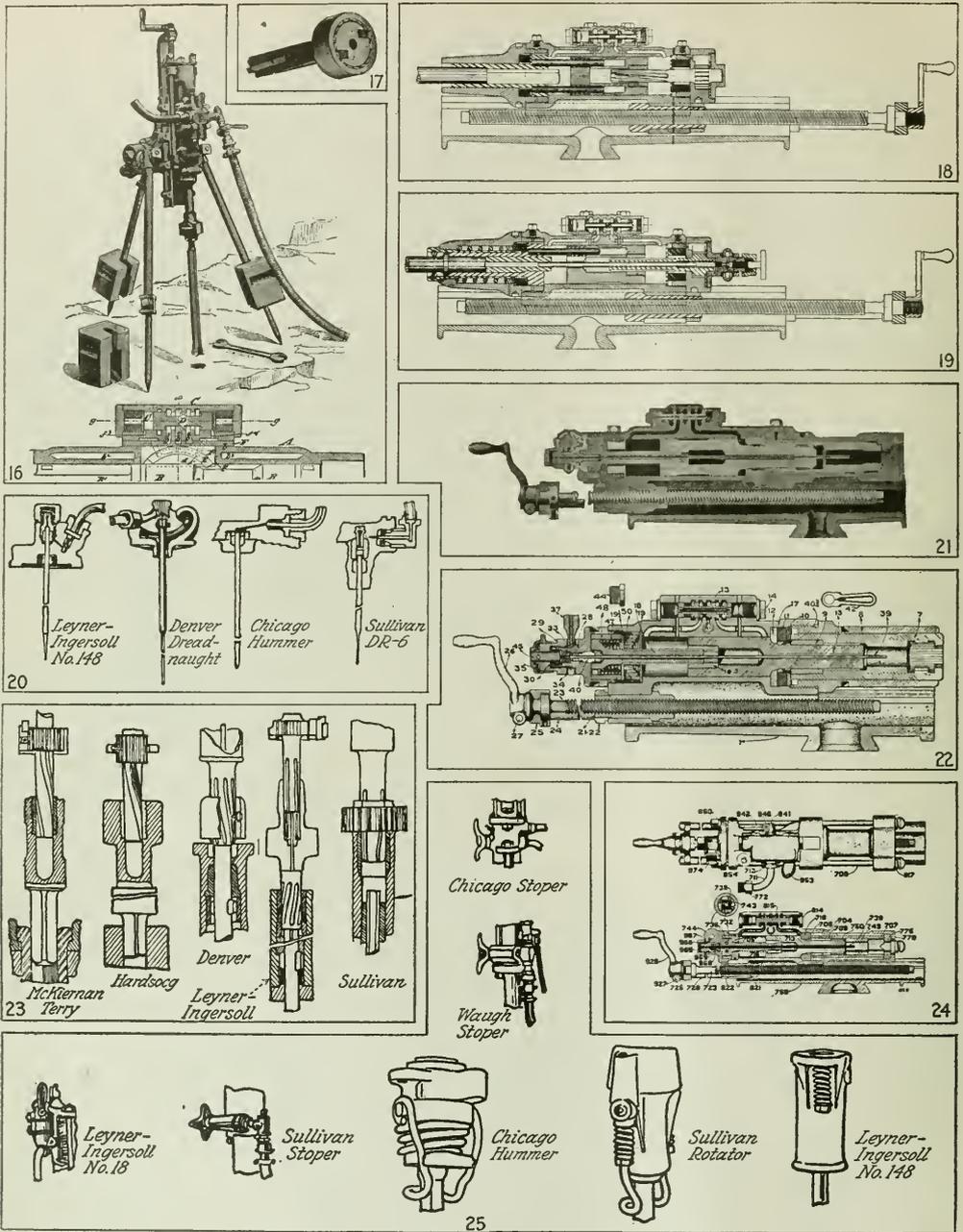
Fig. 7 shows the first reciprocating rock drill, as used by Burleigh in driving the Hoosac Tunnel in 1867, a project of construction fathered by the State of Massachusetts. The tunnel was five miles long, and was driven through hard rock. It was an ambitious scheme for those days, involving at its start the employment of hand drilling. That the work in driving this tunnel was carried to a successful conclusion was due largely to the efforts of J. W. Fowle, of Boston, who invented the Burleigh rock drill. Burleigh's part in the development of this first rock drill rested with certain improvements which he made as a mechanic in the shops of the Fitchburg Machine Works, where the machine was built.

The Wood drill shown in Fig. 8 was brought out soon after the Burleigh drill had made its appearance on the Hoosac Tunnel. In the testimony before the Massachusetts Legislature appears the following statement: "We were satisfied that this drill was an entire infringement on Mr. Burleigh's patents, and that our obligations to Mr. Burleigh ought not allow us to suffer the Michigan drill (Wood) to be used by our contractors."

The Ingersoll drill as shown in Fig. 9, which employed a tappet valve action and followed somewhat new lines of design in that it utilized a guide shell with feed screw for feeding the machine forward, making it much lighter and, therefore, possible to mount on a so-called bar mounting in place of a carriage mounting, came next. It was employed in the Musconetcong Tunnel of the Lehigh Valley R. R. This was about the year 1871.

Fig. 10 shows the Rand Little Giant drill as developed by A. C. Rand and George Githens in 1875. This drill also employed a tappet valve action controlled by the motion of the piston to operate a flat slide valve, as shown by the cross-sectional view Fig. 11. It was with this type of machine that the side-rod construction made its appearance, which is found even today in later drills, such as the present day Leyner-Ingersoll, the Sullivan Water drill, the Sullivan Piston drill, the Denver Dreadnaught, and many others. (See Fig. 12.)

The Rand Little Giant drill was adopted largely throughout the Lake Superior iron country, as well as in certain sections of the copper region. Some of



GENERAL TYPES OF POWER ROCK DRILLS AND PARTS—II.

Fig. 16—The Sergeant Rock Drill. Fig. 17—Sergeant Release Rotation. Fig. 18—Leyner's First Hammer Drill. Fig. 19—Leyner's Drill, the first hammer drill with the water feature. Fig. 20—Water Features of Modern Drills. Fig. 21—No. 5 Water Leyner Drill. Fig. 22—Cross Section of Model 5, Water Leyner Drill. Fig. 23—Hammer Drill Rotations, Modern Drills. Fig. 24—Cross Section No. 7 Water Leyner Drill. Fig. 25—Throttles and Front Heads, Modern Hammer Drills.

its notable work is the Hell Gate Channel excavation and the Weehawken Tunnels.

Fig. 13 shows the Ingersoll Eclipse air-thrown valve drill, which was an improvement over the Ingersoll drill invented by Henry C. Sergeant in 1873 and brought to its final state of development in 1878. This was the first independent valve motion control. The Ingersoll Eclipse drill was employed in driving such tunnels as the Cascade, Bozeman, Silverbow, Siskiyou, Snow Shoe, Vosburg, Coosa Mountain, Wickee, and Croton Aqueduct.

Fig. 14 shows the Slugger rock drill invented by Halsey and introduced by the Rand Drill Co., now the Ingersoll-Rand company, in 1883. This machine, it will be noted, is equipped with side rods and a flat-back head-spring to absorb shocks. The valve is of the piston or spool type. Though having an independent valve action, it was without variable stroke. It was used largely in mine work and in some of the big aqueduct tunnels.

Many modern day drills employ independent air-thrown valve actions patterned largely after these first two types. Even the first Leyner hammer drill borrowed the spool valve from these early constructions. Fig. 15 shows the valve action of a number of drills of today which fall under the same classification.

In 1884 the Sergeant auxiliary-valve drill came to the front, bringing with it the release rotation and a spool-valve motion controlled by a crescent-shaped piece in contact with the main piston, as shown in Fig. 16. This type of drill replaced to a considerable extent the Little Giant in the Lake Superior mines and drove the Catskill Aqueduct tunnels and many others, among them the Pennsylvania Tunnel under the East River, New York. The release rotation feature of this type of drill, shown in Fig. 17, gradually found its way into other makes of drill, including the No. 6 Water Leyner drill, brought out by Leyner in 1906.

From 1898 up to the present time many revolutionary changes in the mechanics of the rock drill are to be noted. This is the period of hammer drills, and during these years there was a gradual passing of the piston drill. Leyner's drill as shown in Fig. 18 made its appearance in 1897, followed by the type of drill shown in Fig. 19, in 1898, it being the first of his or any other drill to employ water and air through the drill steel.

Referring to Fig. 20 it will be observed that present day builders of hammer drills borrowed in its essential details the water-and-air principle of the Leyner drill. Fig. 21 illustrates the No. 5 Leyner drill, brought out about 1903, showing substantially the same type of rotation first employed in the later models of Leyner drills, except that it had a locking key for holding the steel in the chuck, which feature was abandoned in the Model 6, Fig. 22, already referred to, and later types.

Fig. 23 shows the rotations of various makes of hammer drills, which it will be noted correspond in main essentials to the Leyner type. In Fig. 24 is

shown the No. 7 Leyner drill, which may be said to be the real father of all present-day hammer drills. It includes in its design the Sergeant release rotation feature, the rifle-bar rotating-sleeve chuck feature, the water-and-air feature, and the first automatic lubricator, as well as inclosed machine throttle construction, and one piece solid front head, and, finally, split front head with through bolt retained by the front head cap. It is interesting to note the variations of features of these designs as found in other makes of machines, as shown in Fig. 25, including the mounted hammer drills, self-rotating hand-hammer drills, and stoper drills, with their air-feed attachments as well.

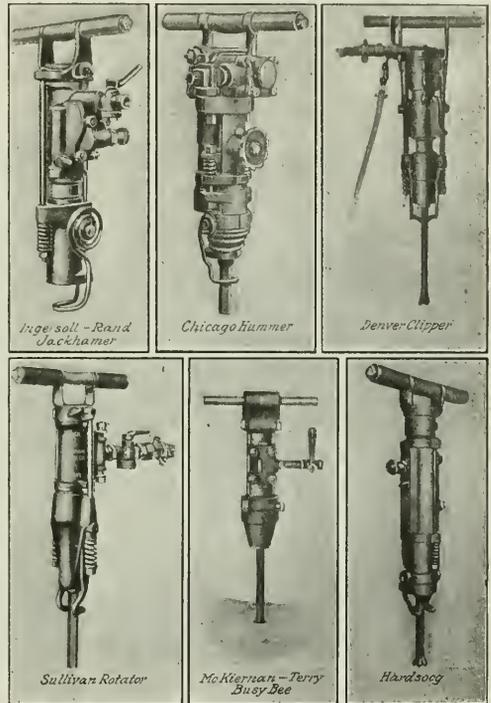


FIG. 25. MODERN SELF-ROTATING HAMMER DRILLS

The Leyner drill has been used in such notable work as the Newhouse tunnels, the Lucania Tunnel, the Los Angeles Aqueduct tunnels, the Laramie Poudrie Tunnel, as well as in some of the biggest mines of the country, numbering among others the Calumet & Hecla, Anaconda, Homestake, as well as many other large mines abroad.

It is interesting to compare the advance which has been made in the self-rotating hand-hammer drill, starting with Leyner's first experiment in 1909, shown in Fig. 6, on through to the Ingersoll-Rand Co.'s various Jackhammer types, Sullivan Rotator, Denver Rock Drill Co.'s Clipper drill, Chicago Pneumatic Co.'s Hammer, McKiernan-Terry Busy Bee, and many others, as shown in Fig. 26.

Dedication of Pittsburgh Bureau of Mines Building

Exercises on September 29, 30 and October 1, Largely Attended. Speakers Praise Work of Bureau. Interesting Demonstrations at Experimental Mine and Explosives Testing Station at Bruceton, Pa.

BY EUGENE P. McCORKEN

THE new Bureau of Mines Building in Pittsburgh, Pa., was dedicated on Sept. 29, the ceremonies being attended by a large number of engineers and mining men from all parts of the United States. Representatives of Federal and state departments, of the engineering profession, and of labor delivered addresses, the tenor of which attested the great importance of the work of the Bureau in the conservation of human life and natural resources. These ceremonies were followed by an

exhibition of explosions of coal dust and black powder, demonstrating in a realistic manner the ever-present danger and the imminence of such occurrences in practical operations. The utility of liquid oxygen as an explosive was also demonstrated. Of especial interest was the presentation of the pageant, "The Hidden Treasures of Earth," by Thomas Wood Stevens.

burgh Chamber of Commerce, Sept. 29, 30, and Oct. 1, and the various events were of the highest technical and dramatic interest to the attending delegates. The dedicatory exercises were held at 10:30 a. m. in the rear of the Bureau of Mines Building. After the invocation by Chancellor McCormick of the University of Pittsburgh, Chairman Gillespie introduced E. V. Babcock, Mayor of Pittsburgh, who made the address of welcome, extending the hospitality of the city to the visitors. Mr. Babcock



PANORAMIC VIEW OF FORBES FIELD, SHOWING FIRST AID TEAMS ON FIELD

referred to the efforts of the civic authorities, beginning ten years ago, to secure the new building for Pittsburgh, which is a strategic center of the great mining and manufacturing industries. Alexander T. Vogelsang, First Assistant Secretary of the Interior, representing Secretary Franklin K. Lane, responded. Mr. Vogelsang read a message from the Chief Executive, dated Sept. 23, from Ogden, Utah, as follows: "Will you not be kind enough to convey my most hearty greetings to the assemblage at Pittsburgh next Monday? I wish that I might be present to express my very deep interest in the work being done by such instrumentalities for the increase of production, the safeguarding of life, and the raising of the standard of labor and scientific endeavor. It is a very happy circumstance that with this

exhibition of explosions of coal dust and black powder, demonstrating in a realistic manner the ever-present danger and the imminence of such occurrences in practical operations. The utility of liquid oxygen as an explosive was also demonstrated. Of especial interest was the presentation of the pageant, "The Hidden Treasures of Earth," by Thomas Wood Stevens.

The fourth national First Aid and Mine Rescue Contest was held on Sept. 30 and Oct. 1, and was the largest safety meet so far held in the United States, the teams coming from every section of the country and representing the coal and metal-mining and metallurgical industries.

The celebration of the dedication and the safety contest were held in co-operation with the Pitts-

burgh Chamber of Commerce, Sept. 29, 30, and Oct. 1, and the various events were of the highest technical and dramatic interest to the attending delegates. The dedicatory exercises were held at 10:30 a. m. in the rear of the Bureau of Mines Building. After the invocation by Chancellor McCormick of the University of Pittsburgh, Chairman Gillespie introduced E. V. Babcock, Mayor of Pittsburgh, who made the address of welcome, extending the hospitality of the city to the visitors. Mr. Babcock

meeting should be associated the ceremonies connected with the dedication of the new building in Pittsburgh of the Bureau of Mines."

In his address, Mr. Voglesang said that the work of the Bureau was greatest in times of peace, but that during the war the Bureau "gave the country a service that was excelled by no mechanical or scientific association to any other country at war in any part of the world." In referring to the work of the Bureau, the speaker said, "If an industry does not elevate labor and prevent waste, it alone is responsible if the Government takes over and operates that industry." Mr. Voglesang also urged that all industrial differences be settled, and expressed the hope that this country might have a year of industrial peace.

Following Mr. Voglesang, William C. Sproul, Governor of Pennsylvania, spoke on the necessity of the Government teaching safety and rendering assistance in development of mechanical devices in the arduous labor of mining. The Governor said the question of housing was of much importance and that he was prepared to make recommendations at the next legislative session, which might be considered radical, but which would bring about better home conditions.

J. Parke Channing, representing Horace V. Winchell, president of the American Institute of Mining and Metallurgical Engineers, was then introduced. Mr. Channing chose for his topic "The Engineer in Industry," and in his address discussed the distribution of wealth, presenting statistics from an investigation made by W. R. Ingalls. Mr. Channing's speech will be published in a succeeding issue of the Journal.

John L. Lewis, president of the United Mine Workers of America, was represented by the next speaker, Van A. Bittner, who delivered an address, making a strong plea for improvement in certain sections of the country where loss of life and wastage of coal in mining were comparatively high. He referred to the work of the late Joseph A. Holmes, the first Director of the Bureau of Mines, which was received with applause. The record of the Bureau of Mines since its organization in 1910 was truly remarkable, the speaker said, in the saving of life. In 1909, there were killed in the coal mines of the United States 3.96 men per 1,000 employed, or one death per 174,416 tons produced. In 1918, the death rate was 3.39 per 1,000 men, or one death per 266,000 tons.

At the conclusion of the addresses, the key of the building was turned over to Director Van. H. Manning by Assistant Secretary Voglesang. Mr. Manning in receiving the key said: "It is indeed to me a very high privilege to accept from you this key to this magnificent structure which has been contributed to the cause of humanity by our Government. It is an honor to be the representative who has been selected to accept this emblem which stands for safety and efficiency in the universal industry, and I hereby pledge to you, Mr. Secretary, and to you who represent capital and labor, employer

and employee, in the mining and allied industries, my allegiance to the cause we represent."

Experimental Mine and Explosive-Testing Station

After the conclusion of the dedicatory exercises, the delegates were taken on two special trains to Bruceton, Pa., to the experimental mine and explosives-testing station, where actual demonstrations of various explosions and causes in connection with mining work were made. Also, a rockdust barrier for flame and the use of the "geophone" were shown. The program, which gives in detail the various events, follows:

(a) Explosion in experimental mine.

Pulverized Pittsburgh coal dust was used, placed on cross shelves overhead and on the floor and side shelves. Two pounds per foot of entry was applied from the mouth of entry to station 450, and one pound from 450 to 650, a total of 1,100 pounds.

The cannon loaded with three pounds of FFF black blasting powder was situated on the floor of the entry, 225 feet from drift mouth, pointing outby.



VAN H. MANNING RECEIVING THE KEY OF THE BUILDING FROM ALEXANDER T. VOGLESANG, FIRST ASSISTANT SECRETARY OF THE INTERIOR

Pressure manometers (gages) were situated 550 and 750 feet respectively from the mouth of the drift; flame recorders were placed near the dust barrier and matches were used throughout the test zone to indicate the presence of flame.

- (b) Inspection of and demonstration of rockdust barriers on outside of the mine.
- (c) Inspection of the interior of the experimental mine. Demonstration of the "geophone," an instrument used for locating imprisoned miners.
- (d) Demonstration of the use of liquid oxygen explosives (blasting stump).
- (e) Demonstrating the danger of an electric current making a circuit through metal powder containers.
- (f) Demonstrating the danger from the flame of miners' open-flame lamps coming in contact with kegs containing black blasting powder.

Fourth National First Aid and Mine Rescue Meet

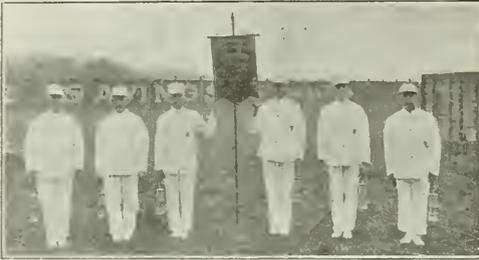
The fourth National First Aid and Mine Rescue meeting, in connection with the dedication, was the largest gathering of its kind ever held. Eighty-one teams, from fifteen different states, competed

for first place in First Aid, and twenty teams entered the Mine Rescue contest. The events, both in the eliminations and finals, were close, and a number of ties resulted, which were worked off in special events.

A feature of the events was a contest in artificial resuscitation, in which ten teams entered in the First Aid finals took part. It was won by the United States Coal & Coke Co., Inc., Gary, W. Va., of which F. S. Hock was captain. The team was awarded a large silver loving cup, to be held until the next national contest. The judges of this contest were Captain C. C. Gans, Medical Corps, U. S. Army; Dr. S. L. Underwood, and Dr. A. E. Torrence. The practical nature of the events is shown by the two problems given the Mine Rescue teams. The first was the recovery of a worker from under a fall of slate following a mine explosion, the teams being required to rescue the man and treat his injuries. The other

and Edward H. Cox, general manager of the Snowden Coke Co., Braznell, Pa., chief judge of the Mine Rescue events. D. J. Parker, chief safety engineer, Bureau of Mines, headed the committee on grounds. E. E. Bach, director of the State Americanization Bureau, was chief recorder.

A smoker in the Chamber of Commerce rooms was the closing event of the meet, and here the winners were announced and the prizes awarded. The winning team in the First Aid contest received the Colliery Engineer cup, to be held till the next meet, and the National Safety Council cup, which becomes its permanent property. Each member of the winning team received a bronze medal from the American Red Cross and a gold medal from the National Safety Council, and the members of the second and third teams silver and bronze medals, respectively. The winner in the Mine Rescue contest received the Colliery Engineer cup and the gold cup



FIRST AID TEAM NO. 51, STANDARD MINE, H. C. FRICK CO., MOUNT PLEASANT, PA. WINNER OF FIRST PRIZE

problem dealt with the rescue of two men from a tunnel in which dynamite was burning. These problems were prepared by the Bureau of Mines.

The First Aid problems, five in all, were chosen by Major M. J. Shields, of the American Red Cross. These problems were also as practical as possible and covered treatment of a number of injuries frequently met in mine and mill accidents. The Standard Mine team of the H. C. Frick Co., of Mount Pleasant, Pa., won the First Aid contest in competition with twenty teams which survived the eliminations. J. C. Spence was captain of the team, which won with an average of more than 99 per cent in the five problems given. Second place was won by the Butte District team, of Butte, Mont., of which Joseph E. Watson was captain. A team representing the Roslyn Fuel Co., Seattle, Wash., was third. W. J. Evans was captain.

Unusually high percentages were made by the winning teams in the Mine Rescue contest. First place was captured by the Acme Mine No. 2, Union Coal & Coke Co., Bentleyville, Pa., headed by Mark Jones, with 99 per cent. The team representing Leisenring No. 1 Rescue Station, H. C. Frick Co., won second, with 98 per cent. The captain was Patrick Bradley. Buffington Rescue Station, H. C. Frick Co., led by Frank Hyde, won third. Major Shields was chief judge of the First Aid contests,



EXPLOSION OF 25-LB. KEG OF F.F.F. BLACK BLASTING POWDER PRODUCED BY OPEN FLAME LAMP

presented by Coal Industry. The members of the winning team received gold medals from the National Safety Council and the members of the second and third teams silver and bronze medals, respectively. The teams winning the championship of their respective states, as determined by their rating in the first day's contest, received state championship pennants and merchandise prizes contributed by firms in Pittsburgh and elsewhere. The list of state champions among metal-mining companies is as follows: Mine Rescue—Alabama, first prize, Republic Iron & Steel Co., Birmingham; Montana—first prize, Butte district. First Aid—Colorado, first prize, Primos Chemical Co., Vanadium; New Jersey—first prize, Raritan Copper Works, Perth Amboy;

second prize, New Jersey Zinc Co., Franklin; Montana—first prize, Butte district; Tennessee—first prize, American Zinc Co., Mascot.

Man's Conquest of Nature's Forces Shown Dramatically in Pageant at Forbes Field

The romance of the mining industry was portrayed on the night of Sept. 30 in the pageant "The Hidden Treasures of Earth," which was presented at Forbes Field under the auspices of the Pittsburgh Chamber of Commerce. It was written and directed by Thomas Wood Stevens, and some of the

Emperor, who places it in the lap of the idol of the country. As the bystanders and the emperor kneel with bowed heads, the slave stabs the ruler and escapes with the nugget.

The third scene represented the development of iron. King Edward III visits the furnaces in Sussex, England, and is incensed at the cutting of his forests for fuel, but is so impressed by the development in the production of iron that he forgives the people and grants them the freedom of the forests.

The fourth scene portrays moments in the progress towards the safety of life in coal mining, begin-



SPECTATORS VIEWING MINE RESCUE TEAM LEAVING THE GAS GALLERY

actors of the company were employees of the Bureau of Mines, students of the Carnegie Institute of Technology and University of Pittsburgh, and members of the United Mine Workers of America. The pageant was composed of four episodes, depicting figuratively the discovery by man of the treasures of the earth.

The scene of the first episode was in the bronze mines of Tarshish, Spain, at the time of Solomon. The second episode was laid in India, where a Greek slave finds a gold nugget by mining, instead of washing the sand for gold, as his comrades were doing. The nugget is taken from him, finally reaching the

mine with the invention of the safety lamp and finally the modern methods of First Aid and Mine Rescue.

Two of the Old Mill Sites of the East Rand Proprietary Mines are being cleaned up to recover the gold and amalgam, which, in the course of many years' working, have escaped recovery and accumulated. Colonel Bottomley described the process in his last annual report, which was abstracted in the South African Mining and Engineering Journal. The location of the deposits is determined by panning promising waste material. The rubbish is burned and sluiced, the sluices being about 100 ft. long, set at an angle of 15 degrees.

E. and M. J. Quotations Recognized by Court

Price Disturbances Due to Government Control Did Not Render Contract Void—How Market Price of Copper During War Was Determined—The Question of Embargo

A CASE arising out of the disturbances of war upon the market price of ore was recently decided in the Appellate Division of the Supreme Court of New York. Incidentally, the decision handed down shows the regard in which the Engineering and Mining Journal is held in the metal trades and industries (Boret et al vs. L. Vogelstein & Co., Inc., 177 N. Y. S., 402).

In this issue plaintiffs were doing business in London, England, and made contracts with the defendants, doing business in New York City, whereby the defendant agreed to purchase from the plaintiffs the total production of copper ore, or copper matte, in seller's option, produced by the South American Copper Syndicate, Ltd., from its Aroa mines, or other mines in Venezuela, for a period of eight years beginning Jan. 1, 1918. Also, contracts were made regarding the freights, which provided for the transportation of the ore or matte from Tucacas, Venezuela, to New York at a specified freight charge, payable on delivery at Chrome, N. J., or at any port other than New York, as ordered by defendant. The contracts were entered into on March 20, 1916. The controversy arose over that provision relating to the fixing of the price to be paid for the ore. No price was named, but it was "to be paid for at the average price of electrolytic wire bars as published in the Engineering and Mining Journal of New York. . . ."

Referring to the agency named in the contract through which the price was to be established, the court said: "The Engineering and Mining Journal, which was and is recognized by the metal trades and industries as a standard and reliable source of information, published the daily current market price of metals, including refined copper (electrolytic wire bars) as bought and sold and dealt with in the open market, and based said quotations on information obtained from the trade and sales reported by producers, agencies, and dealers in the open market, and correctly stated how quotations were obtained as follows: 'The above quotations are our appraisal of the average of the major markets. . . .'"

After making of the above contracts, war was declared between the United States and Germany, and in the statement of facts as agreed upon between the parties it is said that in September, 1917, the President and Government of the United States established, fixed, and prescribed the amount of 23½¢. per lb. at which refined copper should be bought and sold in the United States, which sum was less than the market price prevailing before that time; and, says the decision, "Since that time the Engineering and Mining Journal of New York has quoted from day to day the sum thus fixed by the Government as the quotation on copper."

Now, the plaintiffs notified the defendant that they accepted all the modifications introduced by Government regulation of copper prices, and insisted that the written agreements between them were valid and enforceable. This was before any copper ore or matte had been shipped to the defendant. Prior to plaintiff's notice, however, the defendant had notified plaintiffs it regarded the contracts null and void by reason of the conditions created by the action of the United States Government, and it thereupon declined and refused to accept or transport any ore under the contracts. However, in June, 1918, a shipment of copper ore and matte made by the plaintiffs arrived in the United States, and by mutual consent of the parties, and without prejudice to the rights of either of them, and without recognizing any contract as existing, the defendant consented to receive this shipment, pay the freight and dispose of the ore "for the account of whom it may concern," and in accordance with this agreement defendant handled this shipment, remitting the net remaining proceeds to the plaintiffs in London.

During all of 1918 and later, the Federal Government refused to allow shipments of copper from South America to this country, except by special permit obtained from the War Trade Board. During this time plaintiffs, and defendant on plaintiff's behalf, made numerous requests for permits to import copper from South America, all of which were refused, except for the importation of the shipment the payment for which is the subject of this action, and one later shipment.

There was no controversy, said the court, as to the disposition of this shipment of ore, but the controversy submitted for the decision was whether or not, upon the foregoing facts, the plaintiffs were entitled to judgment against the defendant in the sum of \$9,996.80, being in addition to the amount remitted before to plaintiffs on account of the one shipment of ore dealt with as above stated; and the further deciding whether the agreements entered into in 1916 between the parties, relating to the sale of copper ore or matte, were valid and enforceable contracts under all the conditions, provisions, and circumstances specified above. If no such valid and enforceable contracts existed by virtue of the agreements as originally entered into, due to the intervention of governmental power and authority regulating the importation and price of copper, then the plaintiffs, the court held, were not entitled to recover.

The claim of the plaintiffs was that their acceptance of the lower price, as fixed by governmental orders, precluded said acts of the United States Government affecting the validity of the contracts, and also that any restriction imposed as to importation of copper was immaterial for the purposes of the cause, for the reason that the particular shipment which was the subject of this action reached the United States, as before stated.

In opposition, the defendant claims that under all the conditions, provisions, and circumstances, including the acts of the President of the United States and the Federal Government, these agreements had

been rendered void, the voiding of the smelting contract necessarily voiding the freight contract, without which there was no material to be transported.

The case was submitted to the court upon an agreed statement of the facts. Regarding the fixing of the price of copper at $23\frac{1}{2}c.$ per lb., in one place it was stated that the President and Government of the United States fixed and established the price; then again it was stated the price was fixed by agreement between American copper producers and the United States Government. However, the court held that from the stipulated facts the parties agreed that the conditions and regulations existing fixed and determined their rights to the same extent as if the price had been fixed by the Congressional action and Presidential proclamation; and the court stated that a careful search failed to reveal any act of Congress that either fixed the price of copper, or authorized the President or any executive department or commission to do so.

Further in its opinion, the court said that the establishment of $23\frac{1}{2}c.$ per lb. for copper was a fact, and this price was quoted in the Engineering and Mining Journal as the prevailing market price at the time of the delivery of the copper in question. The plaintiffs had accepted this and notified defendant. The contract had provided for a contingency of the price dropping as low as $16c.$ per lb. The contract did not fix the price. It clearly expressed the intention of the parties that the copper was to be paid for at the prevailing market price at the time of the various deliveries. The contract was to extend eight years, and was entered into after most of the great powers were at war with Germany. The parties may have contemplated that unusual and abnormal market conditions would be occasioned by the war, that the United States might become involved, and that the performance of the contract might become both difficult and burdensome. But, said the court, parties cannot be relieved from the performance of their contracts for those reasons, but only where, by acts of law, the performance therefore has become impossible or illegal.

If the contract had fixed the price of copper at a figure higher than $23\frac{1}{2}c.$, and the Government of the United States had thereafter legally fixed the price at $23\frac{1}{2}c.$, and forbidden sales at any other price, the contract would have been rendered illegal and unenforceable, said the court. But that was not the case.

The defendant contended that the parties had designated the Engineering and Mining Journal as a valuer to fix the price, and also argued that the price was to be fixed by the prices established in an open and competitive market. Neither contention was correct, said the court. The Engineering and Mining Journal was not to value and fix the price of this copper. Its statement of the prevailing market price was recognized and adopted by the parties as a correct statement, and payments were to be made on the basis of the market price as stated therein. Whether there was competition or agreement among the sellers of copper was immaterial. The price that other purchasers paid at the time of the various de-

liveries, as ascertained and published in the said Journal, was the price defendant agreed to pay, held the court.

As the shipment sued on was delivered despite the restrictions against importation, the effects of the embargo need not be determined, said the court, it merely holding that in so far as the contract was executed by the plaintiffs the defendant on his part was bound to pay. The final contention of defendant was that the freight contract was void, as the plaintiffs were not bound to furnish any specified quantity of copper for shipment; that is, this contract was void for the lack of definiteness. But it was held that the freight and ore agreements were so mutually interdependent as to constitute a single contract. In the ore contract the plaintiffs agreed to sell the entire production of the mines, and therefore the court held it was the entire production of the mines that the defendants were to transport. Said the court: "It is well settled that, where a party agrees to purchase the entire production of a plant, the seller impliedly agrees to deliver the entire production, and that the contract is not unilateral."

Judgment was accordingly rendered for plaintiff.

The Vapor Pressure of Lead Chloride

During the past few years interest has been revived in the possibility of treating certain complex ores, especially those of lead, zinc, silver, and copper, by a process involving a chloridizing roast, and subsequent volatilization of part or all of the valuable metallic constituents. In order to make a technical study of this process, a knowledge of certain fundamental data, such as the vapor pressures of the chlorides of the metals involved, is essential. There is a decided lack of such information in the literature. The Bureau of Mines has been making an experimental study of the volatilization process to determine its possibilities and limitations, and has also undertaken to determine the vapor pressures of the important metallic compounds concerned in the process. The vapor pressure of lead chloride was the first to be investigated.

The results of the work have been published by the Bureau of Mines as Technical Paper No. 225, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for five cents. The vapor pressures for lead chloride at temperatures from 500 to 850 degrees c. are given, together with the weights of lead chloride in unit volumes of saturated vapor between 500 and 950 degrees, and the vapor pressures of the solid salt down to 400 degrees. The melting point was found to be 498 degrees, and the heat of vaporization at that point 40,600 calories.

During the Daylight-Saving Season last year, according to the Compressed Air Magazine, the Edison Electric Illuminating Co., of Boston, saved 4,420 long tons of coal because of the extra hour of daylight utilized by turning the clock one hour forward. The decrease in kilowatt-hours from this cause was 5,000,000, representing a loss of revenue of about \$350,000.

Plans for the Fourteenth Census of Mines and Quarries

Census Bureau, Geological Survey, and Bureau of Mines
to Co-operate—State Surveys Also to Assist in
Collating Statistics

FOR some months negotiations have been in progress between the Bureau of the Census, the U. S. Geological Survey, and the U. S. Bureau of Mines, looking toward a fuller utilization of the technical experience and facilities of the two mineral bureaus of the Government in the coming Fourteenth Census than in previous censuses. An agreement covering this co-operation has finally been perfected. The co-operative arrangements are based upon the recognition of the necessity for eliminating duplicate work, the need of uniformity in the compilation of statistics, and the desirability of focusing upon this difficult task all the technical experience already available in the Government service.



Harris and Ewing

F. J. KATZ

Under the co-operative arrangements as finally perfected a considerable number of the technical specialists and statistical clerks of the Division of Mineral Resources of the Geological Survey, together with some trained specialists and clerks in the Bureau of Mines, will be assigned to duty with the Division of Mines and Quarries of the Census, although probably retained upon the payroll of the first-mentioned bureaus. This staff will be fused with the existing staff of the Division of Mines and Quarries of the Census, the entire organization, augmented by the addition of new members, to constitute the fusion statistical organization.

F. J. Katz, who for a number of years has been one of the specialists of the Division of Mineral Resources of the Geological Survey, and who re-

cently has been associated with the administrative work of that division, has been appointed chief of the Division of Mines and Quarries of the Census, effective Oct. 1, and will have immediate charge of the fusion statistical organization. Mr. Katz, in his new capacity, will be entirely a census official, but his long experience in the mineral statistical work of the Federal Survey will insure a sympathetic utilization of the organized experience of the Survey in the forthcoming mineral census.

The joint supplemental schedules relating primarily to the mineral production will receive the benefit of the technical knowledge of the Survey specialists in their preparation, and after they have been filled in they will be edited and criticised by the same technical specialists and statistical clerks of the Survey who for years have been intimately familiar with the particular subjects involved. The general schedules which will accompany the supplemental schedules will cover some of the broader features of the mineral industry, such as capitalization, and will be edited and tabulated by the Bureau of the Census in co-operation with the technical specialists of the Bureau of Mines and, in some cases, the Geological Survey. The technical talent of the two mineral bureaus will also be used in the preparation of the final report of the census dealing with the mineral industry during 1919. Though the Geological Survey will thus contribute heavily of the time and knowledge of its technical staff to the census work, the regular Survey reports dealing with various phases of the mineral industry will be continued and published in the usual form.

A significant feature of the Fourteenth Census is the fact that it will be conducted so far as possible by mail, and the field agents will be used only in the collection of delinquent schedules. In previous censuses virtually all of the census information was obtained through field agents. It is believed that the use of the mails will not only facilitate the co-operation between the census and the Survey, which has for years obtained its statistical returns largely by mail, but that this arrangement will also expedite the work.

For many years the statistics of the production of gold, silver, copper, lead and zinc in the Western states have been obtained by the Survey through branch offices at Denver, Salt Lake City, and San Francisco. During the census year the statisticians in charge of these offices will be designated as census agents, and the joint schedule covering the mineral production of the Western states will be sent out from and returned to these cities, thus insuring the full utilization of the intimate relationships between the statisticians in charge of these offices and the mining industries of the states which they serve.

That the delinquent mineral schedules shall be handled as intelligently as possible, it has been arranged that the field agents operating in states where mining is the predominant industry shall, as far as practicable, be men of some experience in mineral matters.

The Geological Survey has co-operative arrangements with a considerable number of state surveys, to insure complete co-ordination between the mineral statistical work of these state organizations and the Federal organization. Though it will be impossible during the census year for any of the mineral schedules to be returned to state organizations before they are sent to the Census Bureau, authorization has been secured whereby the Geological Survey may continue to furnish state surveys tabulations of the mineral production to such states as desire to continue such co-operation. In such cases the joint Census-Survey or Census-Bureau of Mines schedules will be rubber stamped to indicate co-operation with the state.

San Francisco Engineers Hear Hoover

At a Recent Dinner He Renews Acquaintances With Pacific Coast Colleagues—Discusses European Economic Conditions—Favors League of Nations

BY LEROY A. PALMER

THE engineering organizations of San Francisco gave a dinner to Herbert Hoover at the Commercial Club on Oct. 7. It was the first time that I had seen Mr. Hoover, and it may be that the impressions that he made on a fellow-member of his profession will be of interest.

As our guest passed through the gathering of 300 representatives of the engineering professions, who rose and applauded enthusiastically, my first thought was: In this the man who has done all of those wonderful things of which we have read, even to taking liberties with our menus, which no one, at the outset, supposed he or any one else could get away with? The man who passed my table was not of great stature, or of stern face and dominating appearance, but of average height, with a rather serious and almost quizzical expression of countenance that seemed to betray embarrassment, or perhaps a wish that the walk to the speaker's table was over and that we would let him move about without so much fuss.

After the dinner, T. A. Rickard made an address in which he referred to Hoover as "the most useful man in the world, whose name is known wherever civilization has spread. . . . The man with a million children who pray for him every night and whom a million mothers bless every day."

During this address Mr. Hoover studied the table cloth directly in front of him and toyed with a lead pencil. He smiled in rather an embarrassed manner at an occasional personal sally, such as the reference to "this shy, stubborn fellow," and I could feel that under any turning over in his mind of what he was to say himself was an undercurrent of thought to the effect, "What does he want to spill all of that stuff about me for? Why doesn't he cut it short?"

I had heard that Mr. Hoover is not an especially brilliant speaker. I do not agree entirely. He is not an orator, but speaks in a low-pitched conversational

tone, with clear enunciation and without hesitation. The first person singular is noticeably inconspicuous. A sense of humor crops out, more in manner perhaps than in speech, and he impresses one as being thoroughly human.

In his address he paid tribute to engineers as a class as men of "quantitative" rather than "qualitative" minds, and stated that for this reason he had found them particularly helpful in carrying on the work he had been called on to do in Europe. He spoke briefly of what had been accomplished by the Commission for Relief in Belgium and by other relief organizations with which he has been connected since the armistice.

The burden of Mr. Hoover's address was the necessity for greatly increased productivity to meet the present unstable economic conditions. To this end we must set aside sentiment and revenge and re-establish trade relations with the Central Powers, assisting them to rehabilitate themselves so that they may discharge their obligations to the rest of the world. He favors the Peace Treaty and the League of Nations as they stand. Not that they are perfect, but that until peace is a definitely accomplished fact no one will extend to the Central Powers the financial assistance without which they cannot get into the producing class. Hence we should overlook the imperfections of the treaty and accept such risk as may be involved in order that we may effect a stabilization of economic conditions as soon as possible.

After the address, Mr. Rickard stated that Mr. Hoover would be willing to answer questions. It was here that we obtained an insight into his quick mind and extraordinary range of information. Without hesitation, he skipped from Russia to the famous telegram consigning the obnoxious German officials to "that place paved with good intentions"—to quote the questioner—from Silesia to prices of foodstuffs at home.

I think most of us were somewhat amused at one question as to the source of the power by which he had accomplished his ends, particularly when, as chairman of Allied Relief, he had had to deal with certain recalcitrant states. Mr. Hoover modestly assured us that he had found almost every one willing to co-operate; but when not, he had been in a position, through his control of foodstuffs, to apply pressure. I am sure that most of the audience would have answered that question with one word—"Hoover."

With respect to Russia, he expressed the opinion that Bolshevism is tottering, that Lenine has confessed its failure in certain vital respects, and that it will be better to let it fall of its own weight than to give any occasion for holding its leaders up as martyrs.

Doubtless the questioning would have continued indefinitely had Mr. Rickard not suggested that Mr. Hoover had been very generous in the matter, so what every one felt to have been an unusually interesting and satisfactory meeting broke up with "He's a Jolly Good Fellow."

Bankers and Mining

Successful Mining Investment Requires Discrimination Between Prospects and Mines—Meritorious Mining Enterprises Compared to Other Commercial Ventures—Basis for Bank Loans—Mining Risks are Reduced to a Minimum by Able Management

By H. A. WHEELER
St. Louis, Mo.

THE average business man may be forgiven for his frequent inability to distinguish between a prospect and a mine, or between "wild-cat" drilling and developing a proven oil field. His knowledge of such matters is usually so superficial that he fails to recognize the great intervening gulf until after he has lost his money in trying to bridge over from the prospecting to producing stage. But a mining engineer is trained to discriminate clearly between *hunting* the game and *eating* the game, and he is not accustomed to regard a meritorious mining enterprise as being too hazardous for bank loans.

By the term prospecting, or "wild-cattng," I mean the searching or hunting for ores, minerals, or oil, which must always precede mining, or the *winning* or *production* of ores, minerals, or oils.

All mines were once prospects and all oil wells were originally "wild-cats," and the searching for properties that can subsequently be developed into paying mines or profitable wells is a hazardous venture. Time and money, no matter how liberally spent, cannot make a mine out of a prospect, or a well out of a "wild-cat," if the mineral or oil is not there in sufficient amount and under such economic conditions as to make it a profitable producer. Patience, persistence, and ample capital may finally succeed in discovering a prospect that can be developed into a mine, but the percentage of such successes is so small, and the risk is so hazardous, that only those who can afford thus to gamble the time and money should undertake it. It is a game for optimistic, red-blooded, strong men, who can afford to speculate with more or less of their capital and continue smiling if it results in total loss. However, the stakes are usually so large, if crowned with success, that, most fortunately for the progress of the human race, there are plenty of men who have the requisite nerve and backbone to "buck the tiger."

Prospecting, or "wild-cattng," is a genuine gamble, and although with good judgment and the accumulation of a ripe experience the chances of success can be greatly improved, it is hazardous to expect banking aid. But this applies exclusively to prospecting or "wild-cattng," or the searching for profitable deposits or pools.

After a deposit has been proven up by a prospector, or a pool of oil has been located by a "wild-catter," it becomes as legitimate a field for the consideration of the banker as any new enterprise. By proving up a prospect I mean the requisites of good modern mining practice that demand sufficient development work in shafts, drifts, and crosscuts, or ample drill holes, to demonstrate an orebody of sufficient size, richness, and character to make a paying mine—not an over-grown, excessively worked prospect that may count drifts by the mile, as the famous Sierra Nevada mine, on the Comstock lode. For the latter has never been more than a huge prospect, although more or less continu-

ously worked for fifty years through incessant assessments. It is extremely unfortunate that the term mine, without any qualification, is so loosely applied by the market to all underground workings, whether mere prospects or developed producers.

It is not surprising that the layman, who accepts the term mine without investigating whether it is a prospect or a producer, has been so frequently misled into a prospecting proposition under the supposition that it was a producing mine.

When the tonnage actually demonstrated by developments, whether by drifts or drilling; when the grade of the ore and working conditions show that it can be profitably operated—then, indeed, is the banker leaning backward if he is too conservative to advance the funds to assist in producing plant equipment or working capital.

With all precautions, there are still uncertain factors—risks that do not render the enterprise as safe as a Government bond, some of which are more or less inherent to mining, whereas others are due to changes in markets and local conditions that affect all mercantile business. But if those behind the enterprise have good judgment, ample experience, and integrity, without which any enterprise is a dangerous hazard, whether mining, manufacturing, merchandising, or banking, mining loans should be as favorably considered by the banker as those in any other mercantile calling.

The conservative investor is likely to be more familiar with the financial failures of mining enterprises than with those in general business. For the mortality record of the mercantile world, according to Dun and Bradstreet, shows that it is only a question of years when over 90 per cent fail or go out of business, and this merely means that the retiring party foresees the impending bankruptcy and quits before it overtakes him.

Every new business enterprise is a speculation as to its ultimate success, yet most banks are willing to grant more or less credit to the young merchant or manufacturer, who often struggles for several years before he has built up an organization and a sales record that assures success and independence of banking assistance. In fact, few mercantile houses, especially the growing ones, ever reach the stage where their working capital is sufficiently large that they can successfully carry on their business without substantial aid from the banker, and the larger the firm the larger the bank loans usually are to tide it over its lean and stocking-up periods.

In many lines of mercantile life there is nothing tangible, beyond goodwill and reputation, on which to make bank loans; whereas, in most mining enterprises, there are also real estate and plant investments, besides reputation, to furnish security for a bank loan. The vicissitudes and constantly changing factors in mercantile life make all mercantile paper more or less speculative, and the watchful banker is never free from

anxiety as to whether some of his best customers will be able to take up their notes promptly when they become due.

To say that no mining proposition can be called an investment—that money put into mining should only be for the purpose of reselling at a profit—is ultra conservatism. About fifty years ago, when producing mines were few, and legions of prospects were being floated as mines, there would have been a better foundation for an over-cautious attitude toward mining. But with the great strides that have been made toward putting mining on a healthy plane—with the large outlays in development work to prove up the magnitude and profitable character of ore-bodies before attempting to put them on a producing basis—such excessive conservatism is unwarranted.

A timid investor or speculator would have sold Calumet & Hecla stock, bought as a speculation for \$12 in 1872, for \$25 a share, and thus doubled his money. But the Boston investors who put it in their safes have seen it advance to \$1,000 a share, and have taken out over \$1,550 per share in dividends (\$10 to \$100 a year), besides being able to sell it today for over \$400 a share in the present depressed condition of the copper industry. Yet few mines have been more unfavorably received by the market than was the stock named when it was floated, and few mines have been more conservatively managed in carrying large ore reserves and in frequently re-equipping the property with improved plants at the expense of junking earlier machinery.

The stock of the Homestake mine could have been sold at a profit in 1885, but those who locked up their stock have drawn about \$6 a year in dividends since then, and it is selling around \$80 a share today (the par value being \$100).

Quincy copper stock could have been sold at a profit in 1862, when it paid its first dividend after organizing in 1848, but those who held their stock have drawn dividends of \$2 to \$18 a year (par value \$25) since then that total over \$250 per share, and today can realize over \$70 a share.

The St. Joe lead stockholder who in 1876 had held his stock for about ten years while the property was slowly being converted from a prospect into a mine could have sold at an attractive profit, but those who held their stock have received 60c. to \$40 annually in dividends that aggregate over \$21,000,000, and today can get about \$14 for the stock (par value \$10).

Though the number of mining stocks that could be held for years for their dividend return—held as investments for their income returns—is large, I emphatically disagree with those who assume that any investment—of whatever nature—“can be locked up in a safe for five years.” No investments—no matter how seemingly safe and secure—can be ignored and forgotten for even a year, much less five years. New conditions are constantly arising in the life of all enterprises that are likely to affect their value greatly, and he who thinks that any investment is absolutely safe is woefully ignorant, and will probably receive severe jolts and losses. Perpetual vigilance is the price of success in any investment, no matter on what industry it is based.

The New England families who put all their savings into the New Haven railroad stock, as a life-long investment based on a dividend record of 10 to 8 per cent per annum from 1887 to 1912, have received no dividends

for the last five years. Stock for which they paid \$150 to \$255 a share is selling around \$30. St. Paul railroad stock that paid continuous dividends from 1895 to 1917, and cost the “sleeping investors” \$80 to \$199 per share, is no longer paying dividends and is selling around \$45, although it was recently enlarged into a trans-continental system in order to protect its traffic.

British consols—the staunchest, safest bond known to the investment world—were selling a 113 in 1897, and today they are below 50. They sold as low as 54 in 1815 and were up to 102 in 1852. Absolute safety is unknown in any investment, as the only two sure things in this world are death and taxes, and even the former cannot be dated. Everything is speculative to a greater or less degree. We are always surrounded by risks and changing conditions—the latter sometimes moving very slowly and sometimes abruptly—and the successful investor is he who is constantly on the alert to foresee impending changes, and who buys or sells accordingly.

Anticipate—anticipate—anticipate—is the keynote of successful investment, whether it is in mining, manufacturing, railroading, merchandising, or banking, and the mining world, including oil, has as many opportunities for reasonably safe investment as any other industry, if intelligence and good judgment are exercised. Hence it is in equity as much entitled to receive intelligent banking support as any other line of business.

Discrimination must be shown by the banker in making any loan in any line of business, and all his loans are more or less speculative. When the mining business is conducted on conservative lines, with its normal risks reduced to a minimum by able management, efficient plants, large reserves, and ample working capital, it is fully as worthy of the confidence of the banker as any other industry.

Metal Production in Ontario In First Half of 1919

Returns received by the Ontario Bureau of Mines from the mines and metallurgical works of the province for the first six months of 1919 are as follows: Gold, \$4,666,759, an increase of only \$18,595 as compared with the corresponding period of 1918; silver, 5,744,172 oz., compared with 8,736,002 oz.; metallic cobalt, 59,337 lb., a decrease of 59,552 lb.; metallic nickel, 5,147,745 lb., an increase of 4,938,943 lb.; nickel oxide, 5,503 lb., a decrease of 16,265 lb.; cobalt oxide, 202,912 lb., a decrease of 56,459 lb.; other cobalt and nickel salts, 160,021 lb., compared with 222,039 lb.; pig lead, 1,481,204 lb., an increase of practically 100 per cent in quantity; blister copper, 3,080,491 lb., against no production in the corresponding period of 1918; nickel in matte, 7,072 short tons, as compared with 21,393 tons for the same six months in 1918; copper in matte, 4,341 tons, as compared with 10,708 tons; pig iron, 24,095 tons, compared with 38,130 tons.

The figures throughout show a serious decrease, owing to after-war conditions. The drop in silver is due to Cobalt being a declining camp. The decrease in nickel and copper is also serious, as it runs into such large figures. It is altogether likely that the next six months will show further decreases in copper and nickel, as production fell as low as 2,000 tons of matte a month. From that figure it is showing a slow increase, and at the present time is up to about 2,500 tons a month. The consumption is altogether domestic, however, and there have been no foreign orders.

Colorado Section; A. I. M. E.

National Department of Public Works and the Engineers' Licensing Bill Impel Action by Local Members—Co-operation of Other State and National Bodies Solicited

A MEETING of the Colorado Section of the American Institute of Mining and Metallurgical Engineers was held at 6:30 p. m., Sept. 19, 1919, at the Savoy Hotel, Denver. Thirty-three members and guests were present at the dinner, which was followed by a business session. U. S. Senate bill 2232, creating a department of public works, was discussed and explained in detail, and a motion in support of the bill creating such a department, now before Congress, was passed.

A motion instructing the secretary to write a letter to all members of the Colorado Section, explaining the purpose for which subscriptions from the members are asked, in connection with securing the passage of Senate bill 2232, was also passed.

Colorado Senate bill No. 339, creating a state board of engineers' examiners, and licensing engineers in the State of Colorado, was discussed. A motion was passed that the sentiment of the meeting was unanimously in favor of the repeal of this bill. A motion was passed that the chairman appoint a committee of three members to endeavor to secure the repeal of the engineers' license bill, and to communicate with the local sections of other national societies with a view to securing their assistance; and that every member of the Colorado Section of the American Institute of Mining and Metallurgical Engineers assist in this matter as far as possible. In accordance with the motions passed at the meeting, the following two letters, under date of Sept. 30, were sent to members of the Colorado Section:

Gentlemen: At the meeting of the Colorado Section held in Denver on Sept. 19 the following resolution was unanimously adopted:

"Whereas, There exists today in our Government in Washington a state of chaos in various departments, divisions and bureaus, caused by conflicting or overlapping calls for engineering services, therefore be it

"Resolved, That it is the sense of this meeting that no effort should be spared in securing the passage of Senate bill 2232, believing that economy in operation and co-ordination of government agencies affected will be secured by its passage; that the Secretary of this local section of the American Institute of Mining and Metallurgical Engineers be instructed to inform our various Representatives in Congress of this belief, requesting their wholehearted aid and assistance in obtaining its adoption; and that a copy of this resolution be sent to M. O. Leighton, Esq., chairman at Washington of the Engineers', Architects' and Constructors' Conference on National Public Works."

Senate Bill No. 2232 changes the name of the Department of the Interior to the Department of Public Works. It transfers the non-engineering activities of the Interior Department to other appropriate branches of the Government, and, in turn, transfers to the Department of Public Works the following bureaus:

A. The Supervising Architects' office from the Treasury Department.

B. Construction Division, U. S. Army, River and Harbor Improvements, Mississippi River Commission and California Debris Commission, from the War Department.

C. Coasts and Geodetic Survey and Bureau of Standards from the Department of Commerce.

D. Bureau of Public Roads and Forest Service from the Department of Agriculture.

The bill provides that all secretaries of public works shall be qualified by "training and experience" to administer the affairs of the department, and that there shall be four assistant secretaries, each especially qualified by experience and training to administer the functions under his control. These assistant secretaries are to serve an indeterminate period, and can only be removed for cause.

The Department of Public Works is necessary for the following reasons:

1. The United States is, with one exception, the only nation of importance not now administering its public works through such a department.

2. The public works activities are now spread out over many departments, with no co-ordination of effort. Duplication necessarily results as well as conflict of authority and great waste of public funds.

3. Public works are strictly technical in their character and require the services of a permanent and skilled personnel for their efficient construction and operation.

4. The creation of such a department would result in the formation of a technical organization competent to administer the engineering work of peace and further to provide the nucleus of an organization capable of being expanded immediately to meet the war construction and research needs of the country.

5. The formation of such a department would attract to its service competent men of a calibre not now available for Government work, and would create a permanent body of skilled, experienced men, competent to undertake new enterprises, whose permanence and pride of accomplishment would create an excellent esprit de corps.

6. There is no Government organization in existence capable of rendering this service.

7. It would permit of a unified control over public works and a comprehensive plan for their continuance over a term of years, according to a modern and businesslike financial plan based on an annual budget.

Any private or corporate business conducted according to the methods of the Government would speedily become bankrupt, and would deserve such a fate. There are twelve federal organizations engaged in making surveys, more than a score in chemical investigations, some of them competing and quarreling for preference under the same departmental rule. In the "Congressional Directory" there are listed twenty-nine bureaus and agencies of the Government engaged in construction of one or another kind, while four Government departments are engaged in fuel tests. To educate the people concerning the need of consolidating the vast public enterprises of the nation under one central department, which would be known as the Department of Public Works, there has been organized the Engineers', Architects' and Constructors' Conference on National Public Works. At the formation of this conference in Chicago in April, 1919, there were represented seventy-four technical societies, with a membership of 105,000.

At a recent meeting of the Engineering Council of the State of Colorado the movement to obtain the passage of this bill was unanimously endorsed. The Engineering Council consists of representatives of all the national engineering societies and several local societies. The purpose of the Engineering Council is to secure greater co-operation among engineers in matters of public policy, and the enactment of laws which concern the welfare of the engineering profession.

To carry on successfully the work of securing the passage of the above-mentioned bill, a minimum of \$100,000 is necessary for educational purposes. These funds must be furnished by professions and industries making up the conference. For the first time there is a united movement of the engineering professions and industries to support a movement of national interest and importance. To succeed, it must be supported with our efforts and with our money. We as engineers cannot afford a failure. The funds will be controlled and accounted for by men of national standing. The quota of Colorado is about \$900, which means a minimum contribution of \$1 from each engineer in the State. Send it today to our State Chairman, Mr. Richard A. Parker, 802 Equitable Building, Denver, Col.

Yours respectfully,

Robert M. Keeney,
Secretary.

Gentlemen: At a meeting of the Colorado Section of the American Institute of Mining and Metallurgical Engineers, held on Friday, Sept. 19, 1919, a resolution was unanimously passed condemning the Engineers' Licensing Bill passed at

the last session of the State Legislature, and requesting the chairman to appoint a committee to act in conjunction with the other national engineering societies and the Colorado Metal Mining Association, with a view to securing its repeal at the extra session of the Legislature which the Governor has expressed his intention of calling.

It may be within your knowledge that the bill in question was passed by the Legislature and signed by the Governor without the knowledge of any of the national societies, and of few if any of their members. Under its provisions residents of other states cannot even come into this to examine a mine without securing a license, and aliens (among whom are many honored members of the profession in Colorado) cannot obtain such a license at all. The mining industry in this state needs the co-operation of outside engineers, and we should welcome any assistance from them that will tend to develop our resources. To attempt to discourage the activity of visiting engineers will inevitably react on us, and brand the state as being hostile to brains and capital from outside.

The difficulty of securing a license will prove a serious handicap to young engineers starting out in the independent practice of their profession. Moreover, a license issued to an engineer qualified in one branch will entitle him to practice in any other; so that the license is apt to mislead the public.

All members of the Institute are requested to communicate immediately with State Senators and Representatives, and to request them to write to the Governor expressing their readiness to co-operate in the repeal of this obnoxious measure.

The Governor of the state has expressed a willingness to include the repeal of this bill as one of the objects of the special session of the Legislature which he is about to call together, if a general sentiment is shown to exist sufficient to assure him that its repeal is generally desired.

Yours respectfully,

George E. Collins,
Robert Hursh,
J. C. Roberts,
Committee.

Tungsten Bill Protested

At a recent meeting of consumers and importers of tungsten and tungsten ore, the following resolution was passed in protest against the tungsten ore tariff as proposed in the Timberlake bill, H. R. 4437, which has been passed by the House and is now pending before the Senate Finance Committee:

Resolved, That this meeting, representing a large majority of tool-steel manufacturers, exporters of finished tools, ferro-tungsten producers and refiners, and consumers of tungsten ore in the United States, unanimously declare its undivided and determined opposition to the Timberlake tungsten tariff bill, H. R. 4437, as passed by the House of Representatives, as being against the spirit of the time as indicated by the balance of trade exchange, etc.

It is further resolved, That in the opinion of this meeting no case has been made out by the Western producers before the Ways and Means Committee during the consideration of this measure in Washington in favor of such an exorbitant duty as \$10 per unit and per ton of tungsten ore.

It is further resolved, That it is of vital interest to the country that the small and available deposits of tungsten ore in the United States, which were estimated by such a high authority as Frank L. Hess, of the U. S. Geological Survey, as sufficient to last only for three years, be conserved to meet the emergencies of the steel industry should foreign supplies of tungsten ore be cut off by reason of international complications.

Resolved, further, That this resolution be brought to the attention of Senator Penrose, Chairman of the Committee on Finance, and to each member of the committee.

David Dows,
Secretary.

Monthly Copper Production in 1919

The table which appears herewith is compiled from reports received from the respective companies (expect in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 were as follows:

	1918	1919
January	166,431,668	135,733,611
February	169,011,364	111,649,512
March	185,625,168	102,040,460
April	163,207,096	98,808,998
May	181,070,360	92,662,975
June	166,723,699	96,856,570
July	159,329,031	100,569,247
August	165,560,799	107,994,040

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Granby, Cananea, Braden, Cerro de Pasco, and Chile. As a matter of record, however, the individual figures are given after the total. We also report the copper output of the Boleo and Katanga companies, which does not come to the United States.

MONTHLY CRUDE COPPER PRODUCTION, 1919

	June	July	August	September
Alaska shipments (c)	2,374,843	3,021,912	4,333,609	6,208,840
Arizona:				
Arizona Copper	2,400,000	2,400,000	2,600,000	2,900,000
Calumet & Arizona	4,872,000	4,802,000	4,814,000	4,494,000
Cons. Ariz. Smelting	625,000	650,000	650,000	600,000
Inspiration	6,300,000	6,000,000	6,500,000	5,800,000
Masama	936,117	903,179	856,453	770,937
Miami	4,385,885	4,113,452	3,996,159	4,139,103
New Cornelia (a)	2,708,000	2,736,000	3,066,000	3,092,000
Old Dominion	2,015,500	1,629,000	1,937,000	2,460,000
Phelps Dodge	6,680,335	7,239,075	7,150,731	6,402,000
Ray	3,890,000	3,865,000	3,895,000	3,560,000
Shattuck Arizona	Nil	Nil	386,027	70,412
United Verde	3,625,000	4,040,000	4,970,000	4,990,000
United Verde Extension	2,806,849	4,682,572	3,276,452	3,247,216
California:				
Mammoth	Nil	Nil	Nil	Nil
Michigan:				
Calumet & Hecla	5,439,761	6,208,517	7,586,601	8,605,991
Other Lake Superior (b)	5,750,000	5,750,000	5,826,000	6,490,000
Montana:				
Anaconda	10,530,000	11,122,000	12,600,000	12,780,000
East Butte	1,613,360	1,458,420	2,064,760	2,093,780
Nevada:				
Nevada Cons.	3,716,482	3,706,103	Nil	4,260,000
New Mexico:				
Chino	3,615,468	3,626,364	3,321,867	3,538,704
Utah	9,928,000	8,406,863	8,640,000	8,220,000
Eastern Smelters	1,400,000	1,400,000	1,400,000	1,400,000
Total reported	85,011,570	87,669,247	89,994,040	.....
Others, estimated	10,845,000	12,710,000	18,060,000	.....
Total United States	95,856,570	100,369,247	107,994,040	.....
Imports: Ore and concentrates, etc.	7,732,950	13,417,814	7,434,970	.....
Imports in blister, etc.	19,842,478	18,033,812	16,954,604	.....
Grand total	123,431,998	131,820,873	131,383,614	.....
British Columbia:				
Granby Cons.	2,072,964	2,050,000	2,171,204	1,477,280
Mexico:				
Boleo	1,256,640	1,256,640	1,597,040	1,477,280
Cananea	3,000,000	3,200,000	4,200,000	4,200,000
Phelps Dodge, Mexican properties	1,735,000	2,516,000	3,422,000	2,827,000
Other foreign:				
Cerro de Pasco	4,026,000	3,984,000	5,726,000	5,266,000
Chile	5,003,430	7,161,444	8,594,210	7,034,000
Katanga	4,619,430	4,442,270	5,026,488	4,440,064
Bakus & Johnston	2,107,000	2,174,000	2,118,000	1,280,000

(a) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smelter. (b) Estimated. (c) Official figures of the U. S. Department of Commerce; includes Kennecott production from its Alaska mines.

The Federated Malay States in 1918 exported the following metals, according to Commerce Reports: Gold, 18,309 oz.; wolfram, 710 tons; scheelite, 111 tons; tin and tin ore, 37,370 tons. In 1917, the metal exports were: Gold, 18,154 oz.; wolfram, 421 tons; scheelite, 340 tons; tin and tin ore, 39,833 tons.

PETROLEUM SECTION

Engineering Notes and Equipment Details
Production Statistics—Progress
in Important Fields

West Virginia Oil Output

West Virginia now ranks higher than Pennsylvania, according to information by Henry L. Doherty & Co., in both quantity and value of oil produced. In 1918, the state produced 7,868,000 bbls. valued at \$31,652,000, or \$4.02 a bbl.; Pennsylvania produced 7,408,000 bbl., valued at \$29,606,000, or \$4 a bbl. West Virginia did not begin to produce oil until 1876, and oil was not found in important quantities until 1891. Pennsylvania began producing oil in important quantities as early as 1861.

The West Virginia fields have declined greatly since 1900. In that year production reached its high point, amounting to 16,200,000 bbl. Efforts are being made to find additional oil-producing territory, and some wells have been put down 7,500 ft., but with no success up to the present. The theory is that the rich Clinton sand of Ohio can be reached in the state at a depth of between 7,000 and 8,000 ft.

West Virginia has produced 294,745,000 bbl. of oil since 1876. The state's production in recent years is shown in the following table:

1918.....	7,867,000	1911.....	9,795,000
1917.....	8,379,000	1910.....	11,753,000
1916.....	8,731,000	1909.....	10,745,000
1915.....	9,265,000	1908.....	9,523,000
1914.....	9,680,000	1907.....	9,095,000
1913.....	11,567,000	1906.....	10,120,000
1912.....	12,129,000	1905.....	11,578,000

The West Virginia fields produce oil which is especially good for lubricating purposes. This oil is worth more than \$4 a bbl. at this time.

Latest Gusher of the Standard Oil

California's oil production was increased during the week ended Oct. 7 by more than 12,000 bbl. of oil daily as a result of the Standard Oil company's gusher which was brought in on Section 36 of the Elks Hills district, about ten miles northeast of Taft. The well is known as the Carmen No. 1 well. It has been spouting oil 30 to 40 ft. above the derrick, and the flow has varied from 10,000 bbl. to more than 15,000 bbl. It is probably the largest gusher since the famous Lakeview No. 1 was brought in, in the Sunset field, on Mar. 15, 1910. The Lakeview spouted from 35,000 to 60,000 bbl. daily for six months.

This is the first big gusher in the Elk Hills field, although several big gassers have been brought in. The well is regarded as an indication of unusual development activity in this section in the near future. It is situated about one mile east of the big gasser brought in in June of this year, and the oil is of high gravity.

This well has been under drilling operations for about six months, and has a 6-in. drill casing with a 10-in. well casing at the mouth. The crown of the

casing was left intact by the blow-off, and this facilitated the work of bringing the enormous producer under control.

Anglo-Persian Oil Co. Plans Pipe Line to Mediterranean

Plans are under way for the construction by the Anglo-Persian Oil Company of a pipe line, 350 to 400 miles in length and costing approximately \$48,665,000, to provide an outlet for the company's products on the Mediterranean, according to a report received by the Bureau of Foreign and Domestic Commerce. It is anticipated, according to the report, that the saving in freight on oil for European countries would more than compensate for the heavy initial cost.

No decision as to the route of the pipe line has yet been reached. It is understood that the terminus of the line will be at Haifa, whether the route is along the Bagdad railroad or a direct line across the country. In the event that the direct line be chosen, it is reported that an all-British railroad across Mesopotamia from side to side may become probable.

Distillation of Oil Shale in Germany

Prior to the outbreak of the Great War, shale was worked in the Rhine provinces and near Reutlingen, but only one company was occupied in producing paraffin and mineral oils, according to an article in the Zeit. d. Ver deut. Ingen. of July 19, 1919, abstracted in the Journal Soc. Chem. Ind. From the bituminous shale which occurs near Messel (containing 40 to 45 per cent water, 6 to 10 per cent tar and 40 to 50 per cent residues), the following yields per ton of shale are obtained: 32 gal. of crude oil, together with 71 gal. of ammonia water and 1,900 cu. ft. of gas, which is burned as fuel in gas engines or under the vertical retorts. During the war the oil-shale deposits in South and North Germany have been investigated in regard to their yield, but the results have not been published.

El Progreso District, Mexico

In answer to inquiries from American firms regarding the mining probabilities in the Progreso Consular District, Mexico, the American Consul at Yucatan, Mexico, in a report to the Department of Commerce, states that there is no mineral production in that district.

The efforts of several Americans, the report states, who have worked in connection with oil production and who have prospected through portions of that district, led to no discovery of formations that would indicate the existence of mineral oil.

Two large tanks and a pumping station, which are owned by the Compania de Fomento del Suresta de Mexico, in the district of Progreso, it is reported will be offered for sale.

Fuel Supplies For the New American Oil-Burning Ships

Greater Cruising Radius Reduces the Number of Fuel Stations Necessary—The Need of Foreign Supplies For American Ships—Advantages of Oil-Burning Type

During the early stages of the war, Great Britain put into effect a system of bunker license as a necessary military measure. The United States Shipping Board realized that after-war conditions might develop a situation with respect to coal supplies which would dictate the necessity of a modified application of bunker license at British stations. In that event we would have been at a serious disadvantage unless immediate steps were taken to assure unrestricted operation of our ships in the world's trade. To accomplish this it was necessary to have oil-burning steamships, instead of coal burners, with a large steaming radius, and so far as practicable, this to be fixed at a minimum of 10,000 miles. The British order of Sept. 29, 1919, justified these apprehensions.

The next task was to find suitable places for the establishment of fuel stations along the trade lanes or adjacent to them. At the Panama Canal, the turn at the world's cross road, facilities already existed and only required to be amplified. To take care of the east coast trade of South America, a station was erected at St. Thomas. This station, which had an initial capacity of 15,000 tons of storage, was opened on Oct. 2.

Arrangements have been made for establishing a station at the Azores and another at Bizerta, a small French island off Tunis and situated on the ocean highway to the Indies. Material has been assembled at Manila where another large storage tank is to be erected.

"Despite what has been done," said J. H. Rosseter, Director of the Shipping Board's Division of Operations, "we feel that we are still at the threshold of the major part of the question, this involving an increase in storage capacity of fuel stations and additional tank steamships for transporting oil to them. We must also take into account the fact that we must now carry oil to our Atlantic seaports, not only from Mexico but from the Texas and Louisiana fields as well.

"Finally we must awake to the importance of encouraging the establishment of national interest in other known and probable oil regions of the world. For two years our British friends have been admirably directing their attention to new oil regions, notably those of Colombia, Venezuela and Ecuador, and also to the fields of the Levant in which it is surmised that the fields of Turkey promise results exceeding the output of the great oil fields of California, which the Turkish fields are said to resemble. It has become necessary for us to look far afield, to safeguard the future. The value of this great mineral wealth can fairly be stated as three to one for sea use as compared with use on land."

Today, the United States possesses a fleet of 486 oil-burning steel steamships, representing 3,798,733 deadweight tons of new construction. In addition,

there are forty-nine freighters of the oil-burning type which have been reconveyed by the Shipping Board to their American owners, and still another group of eighteen which have been sold by the board and which are under the American flag. Of the 720 steel vessels under construction and contracted for, 636 are oil burners, these aggregating 4,691,659 deadweight tons. When the steel program has been completed there will be a total of 1,731 of the oil-burning type under the American flag.

Our new merchant marine was a by-product of the war and its creation brought with it this problem of bunker facilities, one that demanded immediate consideration, for upon its solution depended the success or failure of our re-entry upon the seas. Great Britain's control of the supplies of bunker coal along the main trade routes of the world has been one of the chief factors in the maintenance of her maritime supremacy. The other lies in the fact that the imports of Great Britain consist largely of produce and raw materials requiring a large amount of tonnage and that the British use coal as cargo for the outward voyage.

Coal does not command a high freight rate, but by carrying this product on their outward voyages, British ships are able to bring back raw materials at a rate that shows a profit for the round trip. After being worked into finished products by British labor, these imports are exported in British bottoms at rates remunerative to the ship operators, and so the cycle goes.

With the United States, shipping conditions are practically the reverse. The bulk of this nation's trade comprises exports rather than imports; moreover, the goods moving in the export trade have been of a greater value than coal, and have borne a higher rate of freight. This American coal has not had a ballast value comparable to that of the British product.

With Shipping Board fuel stations established on the important trade routes, the enormous advantages which this fleet of oil burners will possess, may be summarized as follows:

Oil requires less bunker space than coal for a given steaming radius.

It can be carried between double bottoms and in other places where neither coal nor cargo can be stored.

The space usually given to coal can be occupied by freight-paying cargo.

Bunkering can be effected with greater dispatch, and is not interfered with by darkness or the state of the weather.

It is not attended with the dirt and other discomforts incident to coal bunkering.

Labor and machinery are not required for handling ashes.

Oil fuel eliminates stoking, thus reducing the size of the crew and labor costs.

It possesses greater thermal efficiency than coal and reduces fuel costs.

Uniform steam pressure is easily maintained, thus insuring a steady rate of speed.

Oil and Gas in Utah

U. S. Geological Bulletin Summarizes the Possibilities of Petroleum and Gas Production of the Farnham Anticline and Reviews Natural Conditions*

BY FRANK R. CLARK

THE Farnham anticline, about ten miles south-east of Price, Carbon County, Utah, is structurally favorable for the accumulation of oil and gas. It is a small uplift in a great north-westward-dipping monocline. The south and east flanks are short compared with the north and west flanks, and within a short distance from the crest of the anticline conform to the regional monoclinical dip. If petroleum were present in any of the underlying rocks and were associated with water under pressure it would migrate up the dip. Under such conditions the west and north flanks would afford a good gathering area, and oil might be expected to accumulate in the crest of the anticline and on its north-west flank. The Farnham fault, west of the axis of the anticline, may, however, have cut off any migration, and petroleum may have accumulated on the west or down-dip side of the fault unless the displacement dies out below the surface or unless the oil- and gas-bearing stratum is offset and abuts against a higher or lower porous rock on the east side of the fault.

The known occurrences of petroleum in the Rocky Mountain States in rocks older than Cretaceous are few and widely separated. In Utah A. R. Shultz noted considerable evidence of petroleum in the Nugget sandstone and Park City formation on the south flank of the Uinta Mountains. The Nugget sandstone in many places is highly saturated with asphaltic substances, and the Park City formation contains cavities filled with asphalt, gilsonite, and related hydrocarbons. In some places the material is soft and waxy, and in others it is hard and brittle. Schultz considers it unlikely that the asphaltic material originated in the Nugget, and states that it may have migrated from the beds beneath, probably the Park City. This suggestion seems improbable, however, because the Nugget and Park City are separated by 1,000 to 1,200 ft. of impervious shale.

In southeastern Utah asphaltic-saturated sandstones are reported in the Jurassic of Castle Valley. Oil is reported in the Permian in the Virgin River field; several sandstones in the Pennsylvanian are oil bearing in the San Juan field; and oil seeps are reported in the Shinarump conglomerate (Triassic) and in the Pennsylvanian (?) in the Green River Desert. The only other known occurrences of petroleum in beds older than Cretaceous in southeastern Utah are several reported oil seepages along Colorado River, probably in rocks of Carboniferous age.

From the above descriptions it seems possible that in eastern Utah the upper Carboniferous and in places the Triassic rocks may yield petroleum in commercial quantities. The Farnham anticline is structurally favorable for the accumulation of oil and gas, and the nearest exposures of Triassic and Pennsylvanian rocks contain oil seepage. These conditions appear to warrant one or more test holes of this fold, though

it should be clearly understood that such tests would be purely "wildcatting."

San Juan Field—Oil occurs in the San Juan field in rocks of upper Pennsylvanian age (Goodridge formation), which contain five reported oil-bearing sands at about the following depths below the top of the Goodridge formation: Baby, 29 ft.; Goodridge, 74 ft.; Third, 190 ft.; Mendenhall, 231 ft.; Little Loop, 381 ft. Oil seepages are reported to occur at several localities in the Goodridge formation along San Juan River westward from Goodridge to the boundary of the field. At some places the oil seeps from crevices and at others it saturates the unbroken rock, but the oil impregnation seems to be local and to occur at no definite horizon in the sand. Several wells were drilled no deeper than the Baby sand, but most of them went as far as the Goodridge sand and a few penetrated to a depth of 1,425 ft. E. G. Woodruff believes that as all the wells with more than a good showing of oil are in the syncline, the area of basin structure contains most of the oil. In this field during 1916 one dry hole was completed and one well formerly classed as a producer was abandoned. The five other wells in the field reported as capable of producing were closed through lack of marketing facilities.

Green River—Prospecting for oil near Green River has extended over twenty years, and interest has several times been revived by the increasing demand for petroleum and by the discovery of other oil seeps. Two wells, Levi No. 2 and Collins, have penetrated Lupton's McElmo and entered the underlying La Plata sandstone. The Levi well, in Sec. 35, T. 22 S., R. 17 E., was drilled to a depth of 1,500 ft.; and the Collins well, in Sec. 20, T. 21 S., R. 17 E., to a depth of 2,100 ft. No oil or gas was reported from the Levi well, but gas was reported in the Collins well at 850 ft., (in Dakota sandstone) and at 976 ft., gas and salt water at 1,840 ft., and dry gas at 1,980 ft. Rainbow colors on the water accompanied each flow of gas. Most of the other wells in this area were drilled into the McElmo, but a few stopped in the overlying Mancos shale, from which most of the gas was derived.

The results of drilling up to 1912 gave little encouragement for further exploration, because three out of seven wells proved to be dry holes, three encountered traces of oil and small quantities of gas, and one struck "pockets" of gas without oil. The Green River field contains no anticlines or domes favorable for large accumulations of oil or gas.

San Rafael Swell—Several wells have been drilled for oil or gas southeast of the San Rafael Swell and northeast of Hanksville, near the junction of Fremont and Dirty Devil rivers, in T. 26 and 27 S., R. 12 and 14 E., in Emery and Wayne counties. A well 600 ft. deep was drilled just south of the "Flattops" in Sec. 18 or 19 (unsurveyed), T. 26 S., R. 13 E., which possibly passed through Lupton's McElmo formation and penetrated about 35 or 40 ft. into the La Plata sandstone, but found no oil or gas. The Des Moines Oil Co.'s well near the center of Sec. 29, T. 26 S., R. 14 E., had in November, 1912, been sunk to a depth of 2,140 ft. but did not obtain oil or gas. It is estimated that the upper 600 ft. of this well was in the Navajo and Todilto; from 600 ft. to 1,325 ft., the drill penetrated the Wingate. Fresh water was

*Excerpt from Bull. 711-A, U. S. Geological Survey.

encountered at several horizons from 310 ft. down. The Mount Vernon Oil Co.'s well, ten or twelve miles southwest of the Des Moines well, in the NE. $\frac{1}{4}$ Sec. 9, T. 27 S., R. 12 E., probably started in the Navajo and penetrated to a depth of 2,715 ft. Oil is reported to have been found in this well at 2,175, 2,530, and 2,655 ft. below the surface, all of which may be in the Pennsylvanian (?), but it is possible that the first show of oil, at 2,175 ft., was in younger rocks. These wells, according to C. T. Lupton, are near the axis of a broad, nearly flat east-west anticline which connects the San Rafael Swell, on the west, with another reported anticline occupying a position near the junction of Grand and Green rivers on the east.

Southwestern Utah—The rocks exposed to the Virgin River field range in age from Carboniferous to Eocene, and so far as known contain oil only in the lower red beds, of probable Permian age. Oil seepage near Virgin, on Virgin River in Washington County, southwestern Utah, has probably been known for many years, but no prospecting by drilling was undertaken there until recently. The first well, in the flood plain of North Creek about two miles north of Virgin, was drilled in the summer of 1907 to a depth of 610 ft. and struck oil in the Permian (?) rocks at 556 ft. This well yielded oil at the rate of ten barrels a day and stimulated the drilling of six other wells, none of which produced oil in paying quantities, but it is reported that some oil was found in all the wells. Interest in the Virgin River field has again been revived, but, although some drilling is reported, at the date of writing (September, 1918) there had been no commercial production. The oil has a specific gravity of 0.9225 (22° Bé.), contains some paraffin and a large percentage of asphalt, and is essentially a fuel oil. G. B. Richardson believes that the source of the oil is in the underlying Carboniferous limestone, that the oil-bearing rocks occur as lenses rather than as persistent beds, and that oil accumulated in this field only in lenticular beds and not in folds, because the rocks are flat-lying.

Great Salt Lake and Sevier Lake Basins—At many places in the Great Salt Lake and Sevier Lake basins considerable drilling for oil and gas has been done, but, so far as I know, oil has not been encountered in commercial quantities.

Juab Valley—Several holes have been drilled in Juab Valley, near Juab, in Juab County, but no production of oil has been reported. The rocks exposed in the valley are probably Lake Bonneville beds. Rocks of Eocene age dip westward from Gunnison Plateau beneath the valley floor, but I have no knowledge of the local structure of the rocks in the vicinity of the wells.

San Pete Valley—A hole was drilled in the north end of San Pete Valley near Mount Pleasant, but no information is available regarding the results. The beds that crop out on both sides of the valley are Tertiary.

Shores of Great Salt Lake—More or less interest and some excitement has for many years attended the drilling for oil and gas along the shores of Great Salt Lake. Oil has not been encountered in commercial quantities, but considerable gas was produced by wells about twelve miles north of Salt Lake City. This drilling has probably been stimulated at various times by the gas bubbling from hot-water springs, by reports regarding "showings" of oil in water wells and springs, and by the occurrence of solid asphalt deposits such as those

south of Rozel Hills, on the west side of the Promontory Range, on the north shore of the lake.

A well was drilled to a depth of 2,480 ft. near the Southern Pacific R.R. track at Lemay, about eighty miles west of Ogden, but found no oil or gas. The drill penetrated, according to reports, 850 ft. of clay carrying gypsum, fossiliferous limestone, and brown sandstone. Another well along the same railroad was drilled to a depth of 800 ft. at Strong Knob, at the north end of the Lakeside Mountains, about fifty-two miles west of Ogden, and obtained some gas but no oil. Several shallow wells were drilled south of the Rozel Hills, on the west side of the Promontory Range, to test the extent of asphalt beds, but no wells deep enough to test the oil or gas possibilities of this region are reported.

A well about one mile southwest of Farmington was drilled to a depth of 2,000 ft. in unconsolidated lake beds, but found no oil or gas. It is reported that another well is now (September, 1918) being drilled near the site of the old well, but no information is available regarding the results. Several wells drilled a few miles south of Farmington and about twelve miles north of Salt Lake City produced considerable gas. The deepest well was 1,400 ft. deep, but did not pass through the unconsolidated lake beds. The gas in most of the wells came from depths of 500 to 700 ft. below the surface and was piped to Salt Lake City, where it was used for about nineteen months, until the wells failed to yield sufficient gas to pay the costs of operation. A deep well has been drilled on the south shore of the lake near Grants Station, on the Western Pacific R.R., and in April, 1916, oil was reported to have been encountered at a depth of 1,900 ft. Many shallow wells have been drilled for water on the east and south sides of the lake, but so far as known these wells have found no oil or gas.

Drilling in the Lake Bonneville beds for oil or gas is attended with great uncertainties and is purely "wild-cattin'" because the nature and thickness of the lake beds and the underlying bedrock are not known.

California Crude-Oil Prices

Prices offered by the Standard Oil Co. of California under date of June 10, 1919, and which prevail at present for crude oil delivered at the well in California oil fields, according to the *Standard Oil Bulletin*, are as follows:

CRUDE-OIL PRICES IN CALIFORNIA FIELD	
SAN JOAQUIN VALLEY FIELDS	
(Kern River, Midway-Sunset, McKittrick, Lost Hills-Bchidge, Coalinga)	
	Per Bbl.
14° to and including 17.9° gravity	\$1.23
18° to and including 18.9° gravity	1.24
19° to and including 19.9° gravity	1.25
For each increase in gravity of one (1) full degree above 19.0° gravity, up to and inclusive of 36.9° gravity, two (2) cents per barrel additional	
37° to and including 37.9° gravity	1.62
For each increase in gravity of one (1) full degree above 37.0° gravity, three (3) cents per barrel additional	
WHITTIER-FULLERTON AND SANTA MARIA FIELDS	
	Per Bbl.
16° to and including 17.9° gravity	\$1.23
18° to and including 18.9° gravity	1.24
19° to and including 19.9° gravity	1.25
For each increase in gravity of one (1) full degree above 19.0° gravity, up to and inclusive of 36.9° gravity, two (2) cents per barrel additional	
37° to and including 37.9° gravity	1.62
For each increase in gravity of one (1) full degree above 37.0° gravity, three (3) cents per barrel additional	

Good Analytical Weights are made of three metals: 2 gr. and over of brass, gold plated; 0.05 to 1.0 gm. of platinum; and 0.001 to 0.02 gm. of aluminum.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War Minerals Relief

Legislation which will liberalize the War-Minerals Relief Act is to be considered at once by the Committee on Mines and Mining of the House of Representatives. The bill which will be taken up by the committee is House Joint Resolution 170, which was introduced by Representative Garland, the chairman of the Committee on Mines and Mining. Mr. Garland states that he is not wedded to the terms of this bill, but has introduced it as a basis for such action as the House may see fit to take. In the bill he brings out that war-minerals claims in excess of \$15,000,000 were filed, but that a considerable proportion of the claims are being denied because of the Attorney General's interpretation of the act. He also includes in the bill the statement that it was the intention of Congress in passing the War-Minerals Relief Act "that all producers of the minerals mentioned should be repaid such sums as they were in equity and good faith entitled."

Mr. Garland's resolution provides that all claimants "who in response to any personal, written or published request or demand 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 filed their claims within the time and in the manner prescribed in said act," are to be reimbursed for the net losses incurred.

Another important feature of Mr. Garland's resolution is that in the event that the appropriation is not sufficient to liquidate all claims allowed, a pro-rata share of the appropriation is to be awarded to the claimants. The resolution also provides that 50 per cent of the amount of any adjudicated claim is to be paid immediately.

American Petroleum Institute

Details are now available regarding Van. H. Manning's proposed plan of organization for the Division of Research and Statistics of the American Petroleum Institute, which it is understood will be accepted. The amount to be expended is placed at about \$500,000 annually, which the industry can well afford, as this sum is only one-fiftieth of 1 per cent of the value of the 1918 output of crude oil and refined products in the United States.

The plan provides for a technical director, in general charge of all the work, assisted by consulting experts, who are to serve without pay. In addition, there will be an advisory committee, to meet regularly, consisting of one representative from each of the following: Bureau of Standards, Bureau of Mines, Geological Survey, Society of Automotive Engineers, National Automobile Chamber of Commerce,

American Institute of Mining and Metallurgical Engineers, American Society for Testing Materials, American Chemical Society, and the National Research Council.

The principal officials under the director are to be the chief economist and an engineer. The economist will be in charge of statistics, economic phases of the industry, and publicity. He will also give particular attention to international policies affecting the petroleum industry of the world. It is suggested that the petroleum industry in the United States, following the example set by other governments, "should unite to see that Americans engaged in development of foreign oil fields are protected properly, and that this country act as a unit to that end." Agents will be stationed in important foreign commercial centers in order that economic studies of the petroleum industry in foreign countries may be made. Uniform cost accounting and uniform laws and regulations in the industry are to be sought.

The engineer of the division is to co-ordinate the research work undertaken by the subdivisions of production, chemical engineering, utilization, and correlated activity. Systematic study will be made of the questions of leasing and bonuses, drilling, pipe lines, storage, and tank cars, and active steps will be taken in an effort to improve the internal-combustion engine for use of heavy oils.

The policy of the American Petroleum Institute, it is announced, will be to employ only the highest type of men and to pay them salaries attractive enough to insure continued service.

Leasing Bill Reported in the House

After extended consideration, the general mineral leasing bill has been reported out by the Committee on Public Lands of the House of Representatives. The committee struck out all of the bill passed by the Senate and rewrote the text. Though the general features of the Senate bill were maintained, material changes were made by the House committee. The Senate bill provides maximum as well as minimum royalty. This was changed by the House committee to provide for a minimum royalty only. The determination of the maximum royalty is left to competitive bidding or to the discretion of the Secretary of the Interior. Changes were made in the matter relating to alien ownership, due to the fear that retaliatory action against American investors in foreign countries might result.

Sections 40 and 41 of the Senate bill, which were attached to that measure in the form of a rider, are stricken out.

At the request of the Secretaries of War and Navy, the House committee added a provision reserving to

the United States all deposits of helium in public land. The United States is to have preferential right to remove helium from all lands and all deposits leased under the act.

Safety Meet at Cleveland

Sessions Marked by Lively Discussions of Numerous Papers on Various Phases of Accident Prevention—Election of Officers

THE eighth annual safety congress of the National Safety Council was held on Oct. 1 to 4 at the Hotel Stattler, Cleveland, Ohio. More than 2,100 persons registered, and it is estimated that 3,000 attended the sessions and many more witnessed the safety show.

The annual meeting took place on Oct. 1. It was opened with an invocation pronounced by Ferdinand A. Blanchard, president of the Federated Churches of Cleveland, and was followed by an address of welcome delivered by Harry L. Davies, Mayor of the convention city, to which President D. Van Schaak of the National Safety Council responded. Mr. Van Schaak then read his annual report. He referred to the removal of the council to larger and more adequate offices, the resignation of W. H. Cameron, "that far-seeing enthusiast whose works justified his faith"; the appointment of C. W. Price, "whose administration of his new office has proved, even in a few months, that we made no mistake in advancing him to a wider field of opportunity"; the addition to the staff of a new safety engineer, a librarian, a director of publicity, two regional secretaries, and a public-safety field secretary.

The meeting of the mining section was called to order by B. F. Tillson, the chairman, on Oct. 2, and after the annual reports of the committees had been made, A. H. Fay read an article on "Mine Accidents of English Speaking and non-English Speaking Employees." Five papers followed, one by W. W. Gidley, safety inspector of the Phelps-Dodge Corporation, Copper Queen Branch, Bisbee, Ariz., entitled "The Management and Training of Men," and one by Charles F. Willis, consulting supervisor of industrial relations of the Phelps-Dodge Corporation, Bisbee, Ariz., on "Industrial Relations in the Mining Industry." These were followed by "Labor Turnover and Its Relation to Mine Accidents," by E. E. Bach, chief of the Americanization Bureau of the State of Pennsylvania, which was read by B. F. Tillson. C. W. Goodale, in discussing this paper, said that turnover certainly did increase accidents, but not altogether in proportion to the degree of turnover. The peaks of turnover and the peaks of accident frequency of the Anaconda Copper Mining Co. occurred on the same ordinates of the time curve, but did not seem in any way proportional. Mr. Goodale also said that 52½ per cent of the Anaconda Copper Mining Co.'s employees were from non-English speaking countries. B. F. Tillson commented upon the fact that people were willing to spend large sums of money for accident prevention and yet had little inclination

to install a complete accounting system of accidents which would show the results obtained from the expenditure.

On Thursday afternoon, a luncheon was held by the Employee's Publications Section and a general session dealt with Americanization. Four speakers were on the program.

On Friday morning, the mining section held a meeting at which the following papers were presented: "The Desirability of Standardizing Mine Rescue Training and a Plan for Standardization," by D. J. Parker, mine safety engineer of the U. S. Bureau of Mines Experiment Station, Pittsburgh, Pa. In the absence of the author, the article was introduced by A. F. Knoefel, of Terre Haute, Ind. A lively discussion followed on the proper use and care of the oxygen breathing apparatus and training of rescue crews.

Other papers presented at the meeting were: "Effective Use of Rescue Apparatus in the Fighting of Mine Fires," by J. T. Ryan, of the Mine Safety Appliance Co., read by Mr. Riggs, followed by discussion by J. C. Roberts, F. F. Morris, J. L. Boardman, Robert H. Seip, and Mr. Woodburn; and "Fire Prevention in Anthracite Coal Mines and Necessary Equipment for Fighting Mine Fires," by N. W. Price, which was read by the chairman.

On Saturday morning, B. F. Tillson read for C. A. Mitke a paper entitled "A Compilation of Chute Types for Loading Ore Into Tram Cars in Metal Mines," which paper will be republished in the Journal. This was followed by an extended discussion. Major Arthur S. Dwight read an article on the "Importance of Safety Measures to the Miner."

Oil Resources of the United States

ACCORDING to an estimate of David White, oil geologist of the U. S. Geological Survey, the amount of oil underground in the United States is equal to about sixteen years' supply at the present rate of consumption. The total amount existing underground is estimated at 6,740,000,000 bbl., distributed as follows: California, 2,250,000,000 bbl.; mid-continent (excluding Texas), 1,725,000,000 bbl.; North Texas, 450,000,000 bbl. The following table has been compiled from figures of the Geological Survey, and shows the available oil left in the ground and the oil production in the United States in 1917 and 1918, in barrels:

Field	Marketed Production, 1918	Marketed Production, 1917	Available Oil in Ground
Appalachian	25,300,000	24,900,000	550,000,000
Lima, Indiana	3,100,000	3,700,000	40,000,000
Illinois	13,300,000	15,800,000	175,000,000
Mid-Continent	139,600,000	144,000,000	1,725,000,000
North Texas	15,600,000	10,900,000	400,000,000
North Louisiana	13,900,000	8,500,000	190,000,000
Gulf Coast	21,700,000	24,300,000	750,000,000
Wyoming	12,400,000	9,000,000	400,000,000
California	101,300,000	93,000,000	2,250,000,000
Alaska, Colorado, Michigan, Montana, etc.	230,000	230,000	350,000,000
Totals	345,530,000	335,330,000	6,740,000,000

The present conditions have been summed up by Mr. White in the following:

"To fill the gap between our actual domestic production and the requirements of domestic consumption, it has been necessary to reduce oil in storage to the extent of 27,000,000 bbl. and to supplement this

with a net importation of 31,000,000 bbl., chiefly from Mexico. The deficiency of our current production during 1918 has, therefore, amounted to 58,000,000 bbl., nearly half of which has been withdrawn from storage.

"According to general expectations, the consumption curve is destined during the next year, and probably longer, to continue its present upward trend beyond the 400,000,000 bbl. mark.

"The situation demands not only prevention of waste, but the most economical and efficient use of our oil. Also, it warns operators to consider more thoughtfully and promptly the acquisition of foreign oil reserves. Mexico, to which the American public looks optimistically, probably contains less oil than remains in the ground in the United States.

"The discovery of deep sands in this country is likely to give new life to many old or even abandoned fields. Pools will be found after prolonged search and repeated wildcatting in old as well as new regions, and this is probably especially true of the Gulf Coast, where, unless geologic discovery and consequent new methods of search, come to the aid of the driller, it may be seventy-five years before some of the productive salt domes are revealed.

"The most significant feature of the prospect, however, is the probability that the peak of production will soon be passed—possibly within three years."

27th Engineers

The administration of the Comfort Fund for the 27th Engineers was considered to have ended with April 30, 1919, the demobilization of the regiment having been completed a few days previously. The fund was solicited and administered under the auspices of the Engineering and Mining Journal, and the promise was made that all contributions should go to the regiment, for its purposes, without any deductions for administrative expenses. Judd Stewart, at the request of the officers of the Association, as a personal contribution of his own, arranged to have the accounts audited by Loomis, Sufferin & Fernald, Certified Public Accountants, 54 Wall St., New York. Their report follows:

Oct. 29, 1919.

Walter R. Ingalls, Esq.,
President, Association of the 27th Engineers, 115 Broadway, New York City.

Dear Sir:

We have audited the cash records of the Comfort Fund of the 27th Engineers for the period from February 6, 1918, to April 30, 1919. The receipts of cash as shown by the cash book were traced into the bank, and all disbursements reported were supported by vouchers or other evidences of payment and by canceled checks returned by the bank. The balance of cash shown to be on hand at April 30, 1919, \$6,894.32, was reconciled with the balance reported by the bank at that date, as follows:

Balance of cash—April 30, 1919, as per cash book.....	\$6,894.32	
Outstanding checks:		
No. 51 H. Hanks	5.00	
No. 52 W. A. Holt	5.00	10.00
Balance of cash—April 30, 1919, as per statement of Guaranty Trust Co.		\$6,894.32

The following is a statement of the receipts and disbursements to April 30, 1919:

Receipts		
Contributions	\$20,853.26	
Less check of W. R. Davis, protested and uncollected	590.35	\$20,262.90
Dues	10.00	
Sales of wool	651.28	
Interest on bank balances	250.45	
Repayment of portion of money granted to Mrs. K. for assistance	10.00	
Repayment of loan to Pvt. M.	75.00	
Total receipts		\$21,269.63

Disbursements	
Athletic goods	\$2,054.68
Musical instruments and music	2,809.84
Cigarettes, tobacco, etc.	2,165.97
Games	95.75
Typewriters	341.50
Wool, garments and knitting apparatus.....	1,834.82
Assistance to men and families.....	958.65
Miscellaneous purchases, etc.	28.95
Company funds, representing remittances to the companies for purchases made by them in camp and abroad	1,501.62
Special 1918 Christmas remittance through Lieut.-Col. O. B. Perry, disbursed for dinners, presents, and sundries.....	2,500.00
Total Disbursements for account of the members of the Detachment	\$14,291.78
Bank exchange and charges	15.53
Protest fees—check W. R. Davis.....	3.00
Loan to Pvt. M.	75.00
Total Disbursements.....	14,385.31
Balance of Cash on hand—April 30, 1919.....	\$ 6,894.32

The distribution of the receipts and disbursements in the above statement is substantially the same as shown in the reports rendered by the treasurer and is a verification of the totals so reported.

No charges were made for the collection or administration of the fund, and the entire revenue accrued to the benefit of the Association.

Respectfully yours,
(Signed) Loomis, Sufferin & Fernald,
Certified Public Accountants.

The mission of the original Association having been fulfilled, the Association was reorganized in such a way that the former members of the regiment participate in it, in order to keep alive their regimental associations, and the balance of cash, as of April 30, 1919, was taken over by the reorganized association and has been used in part for the issuance of a service medal to the men, in part for the relief of men and their families, who were in need, and a further part will be appropriated to the publication of the regimental history. The remainder will be reserved as a relief fund. Members of the regiment are now paying dues of one dollar per annum to the association, which payment is, however, optional, and the money received from that source pays for postage, stationery and sundry expenses of administration.

W. R. Ingalls.

Measuring Liquid Flow by the Orifice Method

The selection of the type of meter to be employed in measuring the flow of liquid through a pipe should be based upon a consideration of the difficulties of installation, permanency of operation, accuracy of measurement, and the cost of installation and maintenance. Tests to determine the practicability of employing thin-plate orifices in pipe lines, and the conditions most favorable for their use as measuring devices, have been completed by the Engineering Experiment Station of the University of Illinois. The results are given in detail in Bulletin 109 entitled, "The Orifice as a Means of Measuring Flow of Water Through a Pipe," copies of which may be had without charge by addressing the Engineering Experiment Station, Urbana, Ill.

A Process for the Treatment of Zinc Retort Residues has been patented by Spitzer and Conover (U. S. Patent No. 1,315,349, Sept. 9, 1919). Instead of burning up the carbon, sintering the residues, or washing out the carbon, the residues are first artificially cooled in a non-oxidizing atmosphere and then subjected to magnetic separation before the magnetic particles become sufficiently oxidized to lose their magnetic permeability. This leaves the metals in a condition to be sent direct to the smelters without further treatment, and the unconsumed carbon is in a condition to be used again in charging of the retorts.

BY THE WAY

Tin for War Memorials

Cornish mining authorities, suggests the Financial Times, of London, would welcome the adoption of the suggestion made by Sir Herbert Maxwell that tin should be used as a material for war memorials. "It does not tarnish," he says, "but retains its beautiful silvery appearance for an indefinite period." Adoption of this suggestion would certainly be a more practical way of assisting the Cornish tin-mining industry than any proposal the government has yet made.

Welcoming Hoover in Verse

An incident in the rousing welcome given Hoover upon his return to the United States a short time ago, was the following poem which was published anonymously in the A. I. M. E. bulletin "Mining and Metallurgy" for October:

HAIL HOOVER!

Old Abou Ben Adhem, in his "deep dream of peace,"
Had nothing on Bert Hoover with his bread recipes;
For Abou loved his fellow men, according to the scribe,
While Hoover loved and fed them too, of every race and tribe.
Through war's dread reign he garnered grain in all the seven
seas;
To every famine-stricken land he sent his argosies.
That he's our leading dough-boy is clearly manifest;
In head-lines and in bread-lines "his name led all the rest."
Then cheer, cheer for Hoover, the mining engineer,
Philanthropist and statesman and matchless financier!
No chronicle of history a worthier feat narrates.
Thrice welcome, Herbert Hoover, home to United States!

Apologizing in Advance

American aviators flying into Mexico will be fired upon by Mexican troops according to a message received recently from Mexico City by El Nacional, a Mexican newspaper published at El Paso, which stated that Ignacio Bonillas, Mexican ambassador at Washington, had been instructed to convey this information to the State Department. It will be recalled that shortly after the wounding of an American lieutenant while flying over American territory, first it was denied that the firing was done by Mexican troops; then it was asserted that he was flying over Mexican territory; and finally an apology was proffered and the incident was happily closed as far as our Government was concerned. Present conditions recall an anecdote of the penitentes of the Vermejo district of northern New Mexico, where the custom of self-torture with barbed whips was prevalent. A mestizo was trudging along the road with bowed head, going through the orthodox motions of torture without inflicting any visible wounds. Interspersing some explanatory remarks with his mumbled prayers, he chanted "That lashing was for the sheep that I stole last week from the gringo at Laguna Colorado." Then, with an extra flourish of the whip that never touched his skin, he grimaced, "This is for all the sheep I am going to steal from him next month."

The Great Divide

"Speaking of the latest Nevada mining-stock boom," said a canny mining engineer who sometimes takes a flier himself, "I know of one stock booster who may be regarded as quite reliable when it comes to the point of collecting accurate information about mining prospects. In fact, he is almost too conservative nowadays. You see, he had his lesson. In the early days of —field, the telephone service was not what you might call perfection. Most of us had to be contented with being tacked on to a party line already loaded up with subscribers. It got to be as bad as one of those farmer lines where every Jane, Samantha and Maria cuts in and listens to the neighborhood gossip every time the bell rings. Well, the buying and selling activities of this wise guy gave our crowd the impression that he was getting the habit of using the gossip he milked from our telephone talk. So one day we framed up a highly-confidential talk about a deal being made for some \$50,000 to be spent in developing a certain hole in the ground. Care was taken not to give the actual name, under the guise that secrecy would be essential if we hoped to buy in much stock below 10c. per share; but the description of the worthless prospect was unmistakable. Our little group had corralled all available certificates for practically nothing. Next day various agents of our dupe took it off our hands at rising prices that averaged a little better than 6c. per share. We whacked up a net profit of about \$12,000 on the practical joke."

Gold Placers in Sonora

An item in the New York Sun of Sept. 22, purporting to be a despatch from Guaymas, Mexico, dated Sept. 21, announces the discovery of gold deposits in the district of Altar in the State of Sonora as having caused considerable excitement in that region. It is stated that the best deposits have been discovered near Sauqui (sic), northeast of Hermosillo and that only the lack of water has prevented a great rush of gold seekers to the region. A glance at the map of Sonora and a careful perusal of the report of Consul Bartley F. Yost, dated Guaymas, Sonora, July 8, 1919, and published in Commerce Reports of Sept. 12, 1919, leads one to remark, "Oh, scissors."

In the consular report the lack of water in the Altar district is emphasized; but it is stated definitely that there is plenty of water in the Sauqui district, northeast of Hermosillo, where the 18c. gravel can only be worked by dredges. The Altar field was described in the Journal, vol. 63, 1897, by W. George Waring. In the Boletin Sociedad Geografica, vol. 11, 1865, p. 138, M. Parades had a few words to say about silver placers, as well as gold placers of Sonora. Doubtless a reference to the personal narrative of John Russell Bartlett, on explorations in connection with his work as Boundary Commissioner during 1850, '51, '52 and '53, might demonstrate that the gold placers of the Altar region of northwest Sonora were not unknown at an even earlier date.

PERSONALS

J. A. Battle, Jr., who has been acting as chief engineer in the investigation of claims filed with the War Minerals Relief Commission, has resigned to enter private practice. Prior to entering the Government service, Mr. Battle served in a managerial capacity at several Canadian mines. His professional education was obtained at Cornell and Columbia Universities.

H. R. Plate is in New York in consultation with his associates concerning their Western properties.

Louis A. Wright sailed from New York on Oct. 22 for Italy. His address will be Via Parlamento 22, Rome, Italy.

C. V. Corless, General Manager of the Mond Nickel Co., Coniston, Ontario, was in New York the first week in November.

Edward H. Benjamin, of San Francisco, and Mrs. Lucile Joullin were married in Pacific Grove, Cal., on October 17.

Harley E. Hooper, of the Kanbauk (Burma) Wolfram Mines, Ltd., Tavoy, Burma, is returning to Australia on six months' furlough.

N. H. Kuryla, general manager of the Sunnyside Department of the United States Refining & Mining Co., left for the East on Oct. 7.

Orvil R. Whitaker recently returned to Denver after a tour of inspection of the properties of the Cia de Minerales y Metales, in Mexico.

Montrose L. Lee, who has been on examination work in the Far East, is en route to London, where his address will be 47 Parliament St., S. W.

C. W. Van Law has an executive engagement on the staff of the Sinclair Consolidated Oil Corporation, and has moved from Boston to New York.

Russel B. Paul, general superintendent of mines of the Empire Zinc Co., is making a tour of inspection of the company's properties in the Southwest.

Max W. Ball, general manager of the Rocky Mountain Division of the Roxanna Petroleum Co., is making a tour of inspection of the company's holdings.

E. H. Jones, assistant superintendent of the International Nickel Co. at Copper Cliff, Ontario, arrived in New York on Nov. 3 for a stay of two or three weeks.

C. Quimby Schlereth, general manager of the Cia de Minerales y Metales, South America, is in the United States on a short vacation from Monterey, Mexico.

W. H. Wright, of the Malm-Wolf Co., has returned to New York from Alaska, where, for three months, he had been engaged in examining power and gold-dredging projects.

Alpheus F. Williams, general manager De Beers Diamond Mines, Ltd., Kimberley, South Africa, concluded his stay in San Francisco on Oct. 15., when he left for New York.

K. H. Matheson, superintendent of the San Marcos mine, Sabana Grande, Honduras, is in Denver on a vacation. Mr. Matheson expects to return to Honduras when the revolution subsides.

J. W. Bennie, for fourteen years manager of Shannon Mines and Smelter at Metcalf and Clifton, has moved to Gleason, Cochise County, Ariz., to take charge of the Amster interests there.



Harris and Ewing
JOHN A. DAVIS

John A. Davis, the superintendent of the Alaska Mining Experiment Station, is in Washington discussing plans for an expansion of the work being done at his station. The certainty that the railroad is to be completed in the near future is stimulating mining activity in the Fairbanks region, making advisable Government assistance in solving the various problems which confront the mining industry in Alaska.

Charles W. Wright, formerly a geologist of the U. S. Geological Survey, who has been visiting the United States for a month, has returned to Sardinia and Rome, where he has offices as consulting mining engineer.

E. P. Mathewson has been engaged to act as consulting engineer of the Consolidated Coppermines Co. Under Mr. Mathewson's direction plans will immediately be prepared for the construction of the reduction works at Kimberley, Nev.

Wallace Macgregor, who was formerly with Phelps-Dodge Co., and more recently acting as consulting engineer in Nevada, has opened an office at 2120 Channing Way, Berkeley, Cal., as consulting engineer and metallurgist.

R. T. Walker has resigned as superintendent of the Virginia-Louise Mining Co. at Pioche, Nev., to accept the position of manager of the ore-purchasing department of the United States Smelting, Refining & Mining Co. at Salt Lake, Utah.

R. C. Allen was incorrectly reported to have taken a position as secretary of the Lake Superior Iron Ore Association in the Sept. 13 issue of the Journal. Dr. Allen has been elected vice-president of the Association and **W. L. Tinker** is secretary.

George K. Burgess, chief of the division of metallurgy of the Bureau of Standards, has accepted an invitation to speak before the members of the Royal Canadian Institute, Toronto, during the early part of December. Dr. Burgess will talk on recent metallurgical developments at the Bureau of Standards.

E. C. Morse has been appointed director of sales of the War Department. He succeeds **C. W. Hare**, resigned. Mr. Morse has been assistant director of sales since the organization of the office. The director of sales is in immediate charge of all the surplus property which the War Department is called upon to sell.

SOCIETIES

Society of Chemical Industry failed to hold the general meeting on Sept. 5, as previously announced. The meeting was postponed to Oct. 23.

Mining and Metallurgy Society of America, New York section, held a meeting at the Columbia Club, 4 West 43d St. on Oct. 21. **Walter Renton Ingalls** addressed the meeting on "The Wealth and Income of the United States."

Associated Engineers held the annual excursion, Oct. 10-11. The itinerary included visits to the Loon Lake Copper Mines, Northwest Magnesite mill and quarry, United Silver Copper Mine, American Minerals Production Co.'s property, and Colville Valley coal mine.

American Institute of Mining and Metallurgical Engineers, New York Section, will hold a meeting at the Machinery Club, 50 Church St., on Nov. 5. The dinner will be at 6.30 p.m. with a program devoted to the subject of Oil at 8 p.m. **Chester W. Washburne** will make an address on oil prospecting, to

be followed by a discussion by prominent oil geologists and operators. Captain Altmayer, late of the French Army, will give his impressions of United States metallurgical plants.

OBITUARY

Captain Kenneth A. Mickle, D.S.O., R.G.A., metallurgist, died in Melbourne on July 30, aged thirty-three. Captain Mickle served two years in France with the 9th Division of the British army, and was invalided home after having been severely gassed. He was a government research scholar at the Melbourne University, and in 1912 won the Grimwade prize. Captain Mickle as a young man was employed by the Cassilis Gold Mining Co., and there gained experience in the treatment of complex ores. Subsequently he carried out a great deal of experimental work in connection with the flotation of minerals and contributed a paper on the subject to the Royal Society of Victoria in 1910. At the outbreak of the war he was on the staff of the Burma Mines.

TRADE CATALOGS

National Tube Co., Pittsburgh, Pa., has recently issued its National Bulletin No. 7 describing the manufacture and advantages of "National" welding scale free pipe.

Davis Bournville Co., Jersey City, N. J., has issued an eight-page pamphlet describing a portable cabinet truck for oxy-acetylene welding and cutting, made in large and small wheel types.

Steel Gears. R. D. Muttal Co., Pittsburgh, Pa. Bulletin 25, covering the heat treatment of steel gears for mining and electric railway purposes. Bulletin 26 describes the use of helical gearing.

The **New Jersey Zinc Co.**, New York, has issued a series of five books, "Rolled Zinc," "Zinc Dust," "Metals," "Chemicals," and "Pigments," which describe in detail the various products manufactured by this company.

"Asbestos" is the name of a monthly market journal devoted to the interests of asbestos and magnesia industries recently published by Secretarial Service, 721 Bulletin Building, Philadelphia, Pa. Price, \$1.00 per year in advance.

Typical Graphic Records. The Esterline Co., Indianapolis, Ind. Describes the applications of curve-drawing instruments to particular problems. In-

strument engineers and files of data on graphic meters are available upon request.

Fluid Meters. Bailey Meters Co., Cleveland, Ohio. Bulletin No. 30; 8 x 10½; 16 pp.; illus. Describes fluid meters for low-pressure gas and air, the design of which, it is claimed, will give the same power and accuracy on a two-inch water differential as the standard fluid meter gives on two pounds' differential.

Alberger Centrifugal Pumps. Alberger Pump and Condenser Co., New York. Catalog F; 64 pp.; illus. Describes the various types of centrifugal pumps and steam turbines for pump drives manufactured by the company. Designs and construction of pumps for different uses and information required for making estimates, along with formulae and tables, are included.

Weber Chimneys. The Weber Chimney Co., Chicago, Ill. Catalog 19; 56 pp.; illustrated. Describes the reinforced-concrete construction of coniform chimneys, using a series of wooden units held together in a rigid manner which is claimed to be superior to iron or steel forms. The chimneys are stated to be monolithic, airtight, smooth inside, to possess a high working capacity and to be unaffected by the influence of the atmosphere. Illustrations of a number of the 1200 chimneys of this company's construction are reproduced, including what is said to be the highest chimney in the world, 570 feet, at Saganoseki, Japan.

INDUSTRIAL NEWS

Chicago Pneumatic Tool Co. has appointed C. W. Cross the manager of Western Railroad Sales, with headquarters at Fisher Building, Chicago.

The **Oliver Continuous Filter Co.** announce the removal of their New York offices to the Aeolian Bldg., No. 33 42nd Street, New York City. The rapidly increasing business of the company requires much larger space than they were able to obtain at the old quarters. Gordon Walker is in charge of the New York office.

Westinghouse Electric and Manufacturing Co. has announced the awards of four annual War Memorial Scholarships of \$500 each. Each scholarship carries with it an annual payment of \$500 for a period not to exceed four years, the payment to be applied toward an engineering education in any technical school approved by the scholarship committee.

NEW PATENTS

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

Roasting—Process of Roasting Ores, Furnace Products, Ore Mixtures and the Like. Edmund B. Kirby. (1,316,726; Sept. 23, 1919.)

Screen—Gyratory Screening Device. Henry William Falcker. (1,314,135; Aug. 26, 1919.)

Screening—Portable Screening Apparatus for Coal and Other Materials. Charles Milton Morton, Newcastle, and Charles Herbert Steavenson. (1,315,835; Sept. 9, 1919.)

Separating and Grading Material—Process of and Apparatus For. Henry M. Sutton, Walter L. Steele and Edwin G. Steele. (1,315,881; Sept. 9, 1919.)

Separation—Process of and Apparatus for Sizing and Separating Comminuted Material. Henry M. Sutton, Walter L. Steele and Edwin G. Steele. (1,315,880; Sept. 9, 1919.)

Settling Tank. Lachlin Donald MacRae and Peter A. MacEachern. (1,313,714; Aug. 19, 1919.)

Sintering Machine. William Miller Davison and Guy Crosby Riddell. (1,315,910; Sept. 9, 1919.)

Smelting Furnace or Cupola. Andrew Poulson and William Charles Augustus Mate. (1,311,711; July 29, 1919.)

Smelting Process and Apparatus. Frank H. Franklin Hampton. (1,315,551; Sept. 9, 1919.)

Steel—Manufacture of Steel. Charles Albert Keller. (1,316,724; Sept. 23, 1919.)

Steel Alloy. William C. Honhorst. (1,313,894; Aug. 26, 1919.)

Sulphide Ores—Process for Treating Ores and Concentrates. Melville F. Coolbaugh. (1,315,761; Sept. 9, 1919.)

Sulphur—Apparatus for Fusing Sulphur from Low-Grade Ores. Paul P. Austin, Jr. (1,315,940; Sept. 16, 1919.)

Sulphur—Process of Extracting Sulphur from Ore. (Jesse Coffeen. (1,314,856; Sept. 2, 1919.)

Sulphur—Process for the Extraction of Sulphur from Metal Sulphids. Max Helbig. (1,315,496; Sept. 9, 1919.)

Tempering Machine (Automatic) for Tools, Such as Rock Drills. Clarence Orrin Stee and Karl Holger Kolhede. (1,311,722; July 29, 1919.)

Titanium—Pigment and Paint. Louis E. Barton, assignor to the Titanium Alloy Manufacturing Co. (1,313,874; Aug. 26, 1919.)

Tools From Wells—Device for Recovering. Augustus B. Scott, Burkburnett, Tex. (1,315,581; Sept. 9, 1919.)

THE MINING NEWS

New York, October 25, 1919

Hayden, Stone & Co. Have Option on Flin Flon Property

Deposit Has Been Diamond Drilled, But Further Investigation Is to Be Made

It is understood that Hayden, Stone & Co., of New York, who have conducted an extensive campaign of diamond drilling on the Flin Flon property near the border of Saskatchewan and Manitoba, Canada, have an option for \$1,500,000 on the property that is good until January. However, they wish to do some sinking, and the owners are prepared to grant an extension for this purpose. No payment has been made, and, as a matter of fact, although the price is \$1,500,000 for the whole property, one of the owners will stay in for part of his interest at least, so that the actual amount of money to change hands will be less than the amount stated.

to construct a railroad for one hundred miles or more, probably from the northern termination of the Canadian Northern R. R. at The Pas, Manitoba. It is understood that either the Canadian Northern R. R. or the Province of Manitoba, or both, are willing to construct the railroad if the building of a smelter at Flin Flon is assured.

Coeur d'Alene Strike Off

Strikers Lose, Returning to Work on Old Terms—Mines Shut Down for Almost Two Months

The strike of miners and millmen in the Coeur d'Alene district, Idaho, which resulted in closing down the Morning, Hunter, Hecla, Hercules, Interstate-Callahan, and Tamarack mines, was officially called off by the district organization of the International Union of Mine, Mill, and Smelter Workers on Oct. 8. The strike began on Aug. 15,

companies would not recognize the union, though willing at all times to meet their employees and adjust working conditions and discuss matters in which they were mutually interested. Subsequently, and before the strike was called, the companies advanced wages 50c. per day, making the rate \$5.25. This did not satisfy the union, however, and the men were called out.

Cleveland-Cliffs Co. Wins Suit Brought by Arctic Iron Co.

Celebrated Iron Country Case Decided After Fifteen Years of Litigation

The United States Circuit Court of Appeals, Cincinnati district, has rendered a decision in favor of the Cleveland-Cliffs Iron Co. and W. G. Mather in the case of the Arctic Iron Co. vs. The Cleveland-Cliffs Iron Co. and Mr. Mather. The decision was handed down on Oct. 7, after the case had been in the Federal courts since 1904. The Arctic Iron Co. holds the fee to the Regent group of mines, Negaunee, Mich., which are now idle, the available ore supply having become exhausted, and never did any mining itself, merely leasing the lands and collecting and distributing the royalty. The Breitung-Kaufman interests hold three-fourths of the stock of the Arctic company, the remainder being in the hands of the Cleveland-Cliffs Iron Co.

In 1902 the Oliver Iron Mining Co. took a lease on the lands to mine the ore, but prior to the drawing of the agreement, the Cleveland-Cliffs Iron Co. entered into a separate agreement with the Oliver company, the terms specifying that the Cleveland-Cliffs Iron Co. was to have one-quarter of the stock in the Regent Iron Co., which was organized as a subsidiary of the Oliver Iron Mining Co. to operate the mines, and that one-quarter of the ore mined was to be delivered to the Cleveland-Cliffs Iron Co. at the cost of mining. Some time later the Breitung-Kaufman interests learned of the separate agreement and began suit against the Cleveland company and its president, W. G. Mather, who was also trustee for the Arctic Iron Co., for an accounting of profits and interests received because of the agreement entered into outside of the lease granted by the Arctic Iron Co. in its corporate capacity. It really meant that the Cleveland-Cliffs Iron Co. was sued by a company in which it held a one-quarter interest.

The Federal court for the western district of Michigan, which first heard the



VIEW IN THE COEUR D'ALENE DISTRICT, IDAHO, SHOWING SURFACE PLANT OF SUCCESS MINING CO., AT WALLACE

The Flin Flon property is an immense deposit of primary sulphides carrying copper, gold, silver, and zinc. The diamond drilling indicates 20,000,000 tons of ore running 1.7 per cent copper, 1.5 oz. silver, and \$1.40 gold. The deposit was discovered in 1914 by Tom Creighton and Jack Mosher, of Toronto. It takes its name from Flin Flon Lake near by. The Mandy mine of the Tonopah Mining Co. is in the same region, being situated on Schist Lake. The ore of the latter is high-grade copper.

If it should be decided to develop and equip this property, it will be necessary

its duration thus being almost two months. The strikers won no concessions from the mining companies, and returned to work on the same terms that prevailed when they walked out. Their failure has given a serious setback to organized labor in the Coeur d'Alene district. The union demanded 50c. a day increase in wages, eight hours a day "from portal to portal," and recognition of the union. In a public statement following these demands, signed by all mining companies, the increase of wages was refused, claim was made that the eight-hour day law was being strictly observed, and that the

case, gave a decision in favor of the Arctic Iron Co., and the master of chancery set the amount of profits derived from the separate bargain at a figure in excess of \$800,000. The case was then appealed to the Circuit Court of Appeals, being argued in 1916, and that court certified to the United States Supreme Court certain findings of fact which exonerated the Cleveland-Cliffs Iron Co. and Mr. Mather in having participated in any actual fraud. Six questions of law were certified, and the Supreme Court was asked for guidance in rendering a decision. This latter the Supreme Court refused to do, and instructed the Circuit Court of Appeals to render a decision and dispose of the case. The final decision is that there was no cause for action, and the case has been dismissed. It was one of the most important mining suits which ever originated in the Lake Superior district, and probably occupied the courts for a longer time than any other piece of mining litigation.

Butte & Superior Accounting Deferred

The Butte & Superior Mining Co. has secured an extension to Dec. 1 in which to file an accounting made necessary through mandate of the U. S. Supreme Court in the litigation against it by the Minerals Separation-North American Corporation. The time was originally set for Oct. 27. Upon the figures revealed in the accounting, which will be submitted to Judge George M. Bourquin of the U. S. District Court of Montana, as master, will be determined the amounts due the Minerals Separation for infringement of its patents over a series of years.

The Nevada Consolidated Copper Co., which has been sued in the U. S. District Court at Portland, Me., for alleged infringement of patents, has received an extension of time in which to make answer to the charges.

Montana Southern Ry. Completed to Elkhorn Mines

The proposed ore-carrying road of the Boston & Montana Development Co. has been completed from Divide, Mont., on the Oregon Short Line, to Elkhorn, where the company's Beaverhead County properties are situated. The road is narrow-gage. W. R. Allen, president of the company, in an announcement to stockholders dated Oct. 21, stated that ore shipments will begin to go forward almost immediately. There will be some ballasting and leveling up, which, however, will not interfere with transportation. Mill construction will be pushed with all possible speed. In the meantime the company will ship the higher-grade ores direct to the smeltery. From now on, production will be the sole object, increasing monthly.

According to the general manager's report, in crosscutting the central vein on the 300 level, ore assaying 100 oz. in silver and 16 per cent copper per ton was met. The central vein is from 20 to 30 ft. wide. Crosscutting on this level should reach the Park vein in about forty-five days, where more high-grade ore is expected.

Hancock Consolidated Resumes Operations

Operations of the Hancock Consolidated Mining Co., which were suspended last May, were recently resumed. Production, however, will be deferred for at least ninety days, according to present plans of the company. All miners will be put at work in development of new territory to the south of the shaft. It is expected that by Jan. 1 next enough new ground will be opened so that when production begins it will be maintained on a more substantial basis than was previously possible. Since last May, Hancock has made a sale of land to the Quincy Mining Co., whose property adjoins, receiving therefor \$250,000 in cash.

The reopening of the Hancock mine recalls the fact that it is the only property in the district in which John D. Ryan has an interest. Years ago Mr. Ryan's father and uncle tried to make the mine pay but without success, and for forty years the property was idle. The corporation was then reorganized and refinanced, largely through the instrumentality of Mr. Ryan. It is believed that the property can be put on a paying basis, if the tonnage can be worked up to the capacity of the shaft.

Colorado Engineers at Odds Over Licensing Law

Opposition to the law enacted by the last Colorado Legislature requiring all engineers practicing in the state to secure a license came to a head recently when the Colorado section of the A. I. M. E. passed a resolution condemning the act and asking all members to work for its repeal.

The principal contention is said to have arisen over that section of the bill which stipulates that the engineer who receives a license to work in Colorado must be a citizen of the United States. It is maintained that, according to this, residents of other states cannot come into Colorado to examine a mine without securing a license, and that aliens, among whom are many honored members of the profession in Colorado, cannot obtain such a license at all.

Bureau of Mines May Select Joplin for New Station

If Congress passes an appropriation bill now pending, an experiment station will be established at Joplin, Mo., by the U. S. Bureau of Mines.

Trail Smeltery's Schedule C Revised

In response to numerous complaints from shippers, the Consolidated Mining & Smelting Co. of Canada, has announced in a recent circular that a definite settlement for the lead and silver contained in shipments of lead ores to the Trail smeltery will be made at the end of the second calendar month succeeding the date of sampling. The circular referred to amends certain clauses of Schedule C, according to which settlements have been for shipments received since July 1, 1919. Schedule C was published in the Journal of Aug. 9, 1919.

The circular is as follows:

"In addition to the Mexican competition for Canadian domestic business, considerable quantities (of lead) had to be exported at the open market price to reduce stocks and take care of current production. This was due to the light Canadian demand. In spite of these adverse features we have been able to average in each month's sales considerably more than the New York price for lead. We are, therefore, changing our method of lead settlement commencing with shipments received here on Oct. 1, and are amending Schedule C as follows (The clauses which follow include):

"The price for lead to be used in settlement will be our average sales price delivered at destination in Canada, for the second calendar month succeeding the date of sampling, or the American Smelting & Refining Co.'s New York average quotation for the said second calendar month, whichever is the greater, less a deduction in either case of $1\frac{1}{2}$ ¢ per lb. for refining and marketing.

"There will be deducted also from the settlement price \$2.30 per ton on sales at Toronto and common points, and \$4.50 per ton on sales at Montreal and common points, and similar differentials to other points. This freight adjustment is to cover actual increases in freights.

"Settlement—(a) Shortly after sampling, an advance payment of 90 per cent of the apparent value will be made. The prices used in estimating the apparent value will be the New York price of silver of the date of sampling, and the previous month's sales price for lead.

"(b) Shortly after the close of the second calendar month after sampling, when the data is available, the final value will be computed and any adjustment necessary will be made between the smelter and the mine.

"Settlements for monthly receipts prior to October will proceed under the pooling scheme until fully liquidated."

PROGRESS OF MINING OPERATIONS

Important Events of Interest
Condensed and Classified
for Easy Reference

ALASKA

Alaska shipments of domestic copper ore to United States in September totaled 7,366 tons, containing 6,208,840 lb. copper, valued at \$1,376,257.

ARIZONA

Cochise County

Phelps-Dodge (Bisbee)—September production of copper was as follows: Copper Queen branch, 5,056,000; Burro Mountain, 203,000; custom ore, 506,000; Moctezuma Copper, 2,827,000; total for Douglas smeltery, 8,592,000; Detroit Copper (Morenci branch), 637,017; total all branches, 9,229,017.

Commonwealth Development (Pearce)—Milling ore in Commonwealth mill from Commonwealth mine, as well as old tailings. Lessees getting out siliceous ore for shipment to smeltery.

Republic (Johnson)—Resumed shipping copper ore at rate of 2,000 tons a month. New three-compartment shaft to be sunk to 800 ft.; seventy men employed.

Middlemarch (Pearce)—Mill repairing damage caused by carborundum thrown into bearings of Diesel engine.

Gila County

Gibson (Bellevue)—Mill running three shifts on dump ores; producing car of concentrates every three days.

Arizona-Globe (Globe)—On 480 level struck low-grade chalcopryrite. P. J. Hickey, Jr., superintendent.

Inspiration Cons. (Inspiration)—September production of copper was 5,800,000 lb.; August, 6,500,000.

Golden Eagle (Kirkland)—To install hoist and compressor. Small force working on development.

Zonia (Kirkland)—Being worked by three groups of leasers, who are taking out copper carbonates of shipping grade.

Miami (Miami)—Installing headframe and machinery at new No. 5 shaft.

Van Dyke (Miami)—Shaft below 400 level. Contract is for 1300 ft., taking it through ore proven on contact of Pinal schist by drilling.

Mohave County

Diana (Chloride)—Native and ruby silver cut at 200 ft. when sinking shaft.

Fountain Head (Kingman)—Property at Stockton Hill shipping high-grade lead ore to smeltery. A. C. Goodwill,

lessee, has tunneled to vein, 125 ft. below outcrop.

Oatman Amalgamated (Oatman)—Will develop to 500 ft. at point where management believes Tom Reed and Gold Road vein systems converge.

Pinal County

Arizona Hercules (Kelvin)—Four modified Callow flotation cells completed and put in use, replacing original rougher cells in one unit of mill. Jigs in Marcy mill circuit also in operation, recovering most of the native copper.

Gila Development (Kelvin)—Equipment for 25-ton milling plant has begun to arrive. Mill consists of crushers, rolls, Lane mill and amalgam plates. Considerable tonnage of ore already broken, and development work will be resumed when mill starts.

Gross Group (Kelvin)—Engineers have been examining Gross group, two miles east of Kelvin. Principal metals found thus far are silver, lead, and molybdenum. Other rare metals said to occur in quantity sufficient to warrant exploitation.

Ray-Boston (Kelvin)—Power plant being overhauled, and building new wagon road to county road. Expects to have two diamond drills in operation Nov. 1. C. E. Hart, in charge.

White Metals (Kelvin)—About twenty men working in old Pioneer group in Dripping Springs Mountains recently taken over by this company. Old workings in order, and development proceeding rapidly with modern equipment. About 40,000 tons of ore developed. J. C. Devins in charge.

Ray Broken Hills (Ray)—Operations suspended on original holdings after unfavorable report by C. P. Berkey and L. D. Huntoon. Other properties of company will be developed.

Magma (Superior)—Has acquired noted Reymert silver mine, 15 miles southwest of Superior. Consists of ten patented claims, with 28 more claims located by Magma. To be developed by drilling.

Magnetic (Superior)—Extending tunnel. Has cut 4-ft. iron-manganese body.

Potts Canyon (Superior)—Power house and new headframe equipment being installed. Sinking has cut silver-lead stringers.

Silver King of Arizona (Superior)—Crosscut from old shaft in chimney cut

new shaft Oct. 18 at 415½ ft. point. Station being cut. Company has 19½ tons concentrates on hand. In cleaning 4½ x 4½-ft. Marcy mill recently 1,400 lb. of sand was recovered running 4,700 oz. silver per ton.

United Superior (Superior)—Reported to have been financed in Michigan for development of group of 32 claims.

Magma Chief (Winkelman)—Recently opened up high grade ore in new shaft, has begun to ship to Hayden. Property, formerly known as Sombrero Butte group, is managed by Charles Kumke.

Santa Cruz County

Tres de Mayo (Nogales)—Sinking shaft; now down about 150 ft. Drifting on 100 level disclosed ore sampling high in silver, lead, and vanadium. Property leased by A. L. Peck and associates, of Nogales, to Dr. O. B. Bachman and others, of Los Angeles.

Hardshell (Patagonia)—Three-compartment shaft down 400 ft.

Duquesne (Patagonia)—Under lease to Panick & Curry, who are shipping 400 tons a month.

World's Fair (Patagonia)—Again in operation after shutdown due to litigation. Lower levels being pumped out.

Yavapai County

Consolidated Arizona (Humboldt)—Experimenting in leaching low-grade carbonate copper ores. One car load received from surface capping of Dundee property, Jerome.

Jerome-Grande (Jerome)—Reported financed in Troy, N. Y. Company is reorganization of Verde Grande. Development comprises 800-ft. shaft, and 500-ft. crosscut, latter to continue to contact. J. C. Cain, of Jerome, president.

Shea (Jerome)—Electric transmission line completed and mine pumped out. Ore shipment awaits completion of new road and construction of ore bins.

American Eagle (Prescott)—Group lying partly in Maricopa County and partly in Yavapai County, southeast of Hot Springs, sold to Montana people. Active development will be started at once under direction of Howard Winthrop, of Butte.

Arizona Victory (Prescott)—Arizona Victory Mining Co. has been organized in Prescott by Mark Bradley and associates to operate Swiggert property in Walker district.

Calcium Fluoride Development Co. filed a petition in Prescott asking dissolution. Organized in 1908 as Illinois Fluorspar Co. Claims all debts paid.

Poland (Prescott)—Mill and camp buildings being torn down and taken to Prescott for re-use.

Thumb Butte (Prescott)—Operations to be resumed on Thumb Butte Consolidated, better known as Anderson group.

Tiptop-Heath (Prescott)—Meeting called in Prescott Nov. 1 for dissolution of corporation. Mine in Tiptop section operated for silver and tungsten. Assets include hoist, small mill and electric plant.

Blue John-Wedge (Walker)—Bonded by Joe Cavanaugh and Harold Colwell, who will ship silver ores.

Yuma County

Quartzsite badly damaged by cloudburst. Rich gold ledge near camp reported revealed by flood.

Bullard (Salome)—Noted property reported bonded from Bullard brothers by number of Los Angeles and Denver mining men, represented by Frank H. Sawyer, of Phoenix.

CALIFORNIA

Amador County

Keystone Mining (Amador)—Timbers of main shaft being replaced by reinforced concrete throughout. System proved very satisfactory in neighboring Bunker Hill Consol.

Calaveras County

Utica Mining (Angels Camp)—Sinking shaft at Gold Cliff mine, present depth 1,900 ft. Fifty-stamp mill crushing 240 tons good quartz ore daily. Good grade of ore exposed in bottom levels. Faulted main orebody recovered after crosscutting 800 ft.

Morgan Mine (Carson Hill)—New mill crushing approximately 300 tons a day. High-grade ore maintained on 685 level, the lowest. W. J. Loring, manager.

Sheep Ranch (Sheep ranch)—Down to 1,700 ft. and employing 55 men, but has not resumed milling.

San Benito County

Klau Quicksilver (Paso Robles)—Being reopened; planned to erect camp buildings, engine house, and to sink shaft. E. W. Carson, manager.

Sierra County

Tightner Mine (Alleghany)—Sold to interests represented by Fred Searles, Jr., and controlled by Senator Clarke of Montana. Work starts within thirty days. Cash consideration small, payments to extend over four years. Equipment includes twenty-stamp mill and hoisting machinery.

COLORADO

Clear Creek County

Capital M. & T. (Georgetown)—Rich strike made on Aetna vein after

over 2,000 ft. of fruitless development. Vein three feet wide and carries gold, silver, lead and copper.

Lake County

Paul Morel Placer Ground in McNulty Gulch in Birdseye section taken over by Milwaukee interests. Several test pits sunk and 130-ft. drift driven in gravel. Dredging planned.

Western Mining (Leadville)—Wolf-tone mine has resumed operations after being idle for several months. About fifteen men employed mining zinc carbonate above water level.

Ouray County

Kansas City (Ouray)—Mine in Red Mountain district leased and bonded to Everett J. Sloane by Paul J. Walker, owner. Company organized to operate property.

Pitkin County

Midnight (Aspen)—Pushing tunnel since strike of high-grade ore in adjoining Oakland mine.

IDAHO

Adams County

Red Ledge (Landore)—Hydro-electric plant being installed on Deep Creek to furnish plant for mining operations. Property owned in Duluth, Minn., and situated on Idaho side of Snake River, seventeen miles from Homestead, Ore., nearest railroad point.

Shoshone County

Columbus (Murray)—Eight men to be employed during winter. Will drift on lead-silver ore in main tunnel and continue crosscut to parallel vein. Vein outcropping in creek will be developed. Thirteen claims at junction of Eagle and Tributary creeks owned by company. E. P. Gallagher, of Philadelphia, chief owner.

Interstate-Callahan (Wallace) — A Crosscut north on 600 level encountered 9-ft. of high-grade zinc ore with some lead. Raise has been driven in ore to 400 level, where drifting eastward is in progress. Strike is east of fault, cutting vein, and ore is identical with famous orebody west of fault. This is most important development in recent years, adding greatly to known resources. Development of Niosie property will continue.

North Bunker Hill (Wardner)—Electric hoist, compressor, and pump recently installed. Unwatering 300 ft. shaft and will deepen 200 ft. Will also explore vein on 300 level, where lead-silver ore of good grade has been reported.

KANSAS

Joplin-Miami District

Crescent L. & Z. (Waco)—New mill near Waco in operation. Only mill in field using classifier ahead of rougher jig. Overstrom tables used in sludge department.

MICHIGAN

Copper District

Calumet & Hecla (Calumet) September production of copper was as follows: Ahmeek, 1,378,987 lb.; Allouez, 362,562; C. & H., 4,504,464; Centennial, 95,050; Isle Royale, 1,287,228; La Salle, 14,600; Osceola, 849,100; Superior, 14,000; total, 8,505,991.

Franklin (Houghton) — Crosscut should cut vein on 39th level within 30 days, having 40 ft. yet to go. Shaft will sink to 41st level, and another crosscut will be run to vein. Still has unsoft copper.

Winona (Winona)—Two shafts working one shift, and underground force increasing steadily. Small shipments of mineral made to Quincy smeltery from mill.

Gogebic Range

The State Tax in Gogebic County Mich., is about \$270,000, an increase of more than 90 per cent over 1918, and the greater part of this has to be paid by the iron mines. The city tax in Ironwood has increased about 25 per cent and the rate is considerably over 3 per cent.

Ashland (Ironwood)—Purchased Corliss hoist from Norrie-Aurora, which will be installed soon. Drift on 20th level in ore for several hundred feet; width and depth of orebody not yet proved. Raising from 24th level through dike where bottom of orebody is expected.

Oliver Iron (Ironwood) — Electric hoists completed and in operation in Norrie-Aurora mine.

MINNESOTA

Mesabi Range

Billings (Chisholm) — New underground property of Tod-Stambaugh Co. rapidly becoming large producer. Now loading about ten cars per day for direct shipment, besides placing some ore on stockpile.

St. James (Aurora)—Mine closed down during slack period early in season, resumes operations. McKinney Steel Co., operators.

Williams (Biwabik)—Thomas Furnace Co. shipping stock-pile of old-abandoned property to their furnaces at Milwaukee. Mine abandoned in 1912 on expiration of lease.

Hobart (Gilbert)—Filling in stock-pile grounds. Timber shaft will be extended from 133 to 200 level.

St. Paul (Keewatin)—Shipped 25 cars siliceous ores for test run at Trout Lake concentrator.

Vermilion Range

McComber (Armstrong Lake)—Cutting station and pump room at 400 level. Will drift and develop northward; expect orebody at 180 ft.

Pioneer (Ely)—This mine, also Sibley, Chandler, Pattison, and Zenith closed down indefinitely because of miners' strike. These mines represent entire production of Ely district, and all shipments suspended. Eight hundred miners out of work, and all business at standstill.

Phoenix (Mud Creek)—Pumping out old workings well under way. Plan to pump out down to old 300 level and redevelop.

MONTANA

Beaverhead County

Boston & Montana Dev. (Wise River)—Montana Southern Railway completed from Oregon Short Line at Divide to Elkhorn properties. Crosscut on 300 level in central vein showed ore running 100 oz. silver and 10 per cent copper. Vein 20 to 30 ft. wide. Crosscut should reach Park vein within 45 days.

Jefferson County

Legal Tender (Clancy)—Three hundred sacks of ore, estimated to run from \$300 to \$400 in silver, ready for shipment, with half carload of second-class, running about \$40 per ton.

Liverpool Mining (Clancy)—Good grade ore in shoot being mined on 200 level. Water in shaft lowered near 700.

Jefferson (Whitehall)—Raising for shaft started from 35-ft. level. Engine will be installed at this level and sinking to 200 level begun.

Silver Bow County

Butte Copper and Zinc (Butte)—Emma mine kept clear of water, but no decision on date for resuming mining operations.

Davis-Daly (Butte)—Installation of skips begun. Steel for enlarging bins is on ground, and construction has started. September tonnage about 9,300, against 7,900 for August and 4,900 for July. Average copper content in September was 6.6 per cent.

North Butte (Butte)—Large body of native copper ore opened on 900 level at Sarsfield property.

NEW MEXICO

Grant County

Republic M. and M. (Hanover)—Plan installing 100-ton concentration and flotation mill for zinc sulphide ores.

Lucky Bill Group (Silver City)—At Bayard station being developed by Black Hawk M. & M. Co. Lead carbonate ores on both 200 and 300 levels. E. D. Lidstone, manager.

Sierra County

Silver Monument Metals (Chloride)—Plan installing small concentrating-flotation mill for silver ores.

Lady Franklin (Lake Valley)—Test to determine best treatment of these ores by Texas State School of Mines. W. H. Paul, engineer for company.

UTAH

Beaver County

Golden Reef (Frisco)—Shaft now down 540 ft. Will continue to 700 level where drifting will be started. Equipment will be electrified.

Salt Lake County

South Hecla (Alta)—September shipments were 1,000 tons. Development work in progress. Rapid advance being made in tunnel to cut Albion workings.

Wasatch Drain Tunnel (Alta)—Tunnel in 5,000 ft. and within 700 to 800 ft. more will be under old Columbus Consolidated workings abandoned years ago owing to water. Columbus Consolidated shaft now unwatered 200 ft.

Cardiff (Salt Lake City)—Orebody recently opened on 800 level about 280

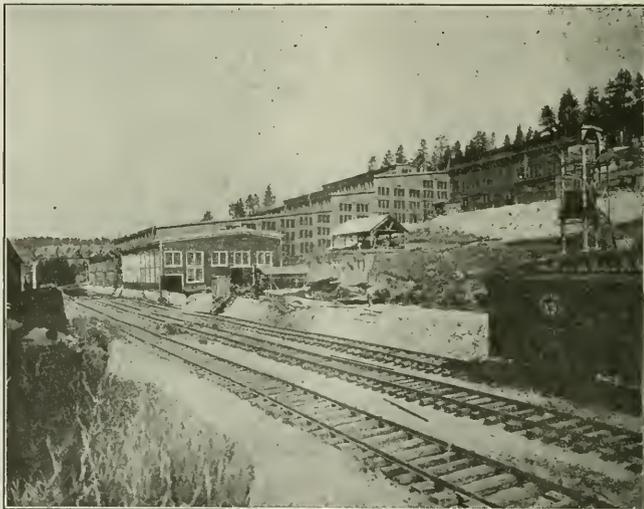
CANADA

British Columbia

Florence Silver (Ainsworth)—F. R. Wolfe states average of 100 tons has been daily delivered to mill during last five or six months. Intends to increase rate of output. Large ore reserves opened up by recent work.

Highland (Ainsworth)—Concentrator is being operated after standing idle seven months. Ore developments have been made and group increased to seven claims. Consolidated M. & S. Co. of Canada, owners.

Dolly Varden (Alice Arm)—Has shipped over 1,000 tons averaging \$50 since taken over by Taylor Engineering Co. using entire capacity of its railroad to tidewater.



CANADA COPPER CORPORATION'S NEW 2,000-TON MILL AT ALLENBY, B. C.

ft. from shaft. About 50 men at work. Shipping 50 to 60 tons silver-lead ore daily. Mine work recently held up by snow drift.

Tar Baby (Salt Lake City)—Tunnel being driven in hard limestone and believed to be approaching contact. Situated in Big Cottonwood Canyon.

Summit County

Park City Shipments week ended Oct. 4 amounted to 3,949,240 lb. of ore and concentrates. Shippers were as follows: Silver King Coalition, 1,221,520 lb.; Ontario, 1,303,400 lb.; Judge M. & S., 1,001,680 lb.; Daly West, 208,640 lb.; Silver King Consolidated, 110,000 lb.; Daly, 104,000 lb.

Glen Allen (Park City)—Excellent progress being made on mill.

Utah County

Treasure Hill (American Fork)—Shipping silver-lead ore. Will work through winter.

Royal Group (Alice Arm)—These five claims sold to J. Miller, of Prince Rupert. Adjoins Dolly Varden.

United Metals (Alice Arm)—Has two 12-horse pack trains transporting to tidewater.

MEXICO

Baja California

Boleo (Santa Rosalia) — September production of copper was 1,477,280 lb.

Chihuahua

Cusi (Cusihuiriacic)—Building flotation mill, 200 tons' capacity daily.

San Patricio (Parral)—Building 800-ton cyanide mill.

Sonora

Greene Cananea (La Cananea)—September output was 4,200,000 lb. copper, 177,500 oz. gold, and 940 oz. gold.

CHOSEN

Oriental Cons. (Unsan) — September clean-up was \$89,500; August, \$62,500.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
16	416 $\frac{1}{4}$	118 $\frac{1}{8}$	63 $\frac{3}{4}$	20	415 $\frac{1}{4}$	118 $\frac{1}{4}$	64 $\frac{1}{4}$
17	415 $\frac{1}{4}$	117 $\frac{7}{8}$	63 $\frac{3}{4}$	21	417 $\frac{1}{8}$	120 $\frac{1}{4}$	64 $\frac{5}{8}$
18	414 $\frac{1}{2}$	117 $\frac{7}{8}$	63 $\frac{3}{4}$	22	416 $\frac{3}{8}$	118 $\frac{1}{4}$	63 $\frac{3}{4}$

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.

Daily Prices of Metals in New York

Oct.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
16	21 $\frac{3}{4}$	54 $\frac{1}{2}$ @54 $\frac{3}{4}$	6.47 $\frac{1}{2}$ @6.50	6.25@6.35	7.50 @7.60			
17	21 $\frac{3}{4}$	54 $\frac{1}{2}$ @54 $\frac{3}{4}$	6.47 $\frac{1}{2}$ @6.50	6.30@6.40	7.57 $\frac{1}{2}$ @7.62 $\frac{1}{2}$			
18	21 $\frac{3}{4}$	54 $\frac{1}{2}$	6.47 $\frac{1}{2}$ @6.52 $\frac{1}{2}$	6.30@6.40	7.60 @7.65			
20	21 $\frac{3}{4}$	54 $\frac{1}{2}$ @55	6.47 $\frac{1}{2}$ @6.52 $\frac{1}{2}$	6.35@6.40	7.70 @7.75			
21	21 $\frac{3}{4}$	54 $\frac{1}{2}$	6.50 @6.60	6.35@6.40	7.75			
22	21 $\frac{3}{4}$	54 @54 $\frac{1}{4}$	6.50 @6.60	6.35@6.40	7.75			

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
16	105 $\frac{1}{4}$	105 $\frac{1}{2}$	116	279 $\frac{1}{4}$	280 $\frac{7}{8}$	28 $\frac{3}{4}$	29 $\frac{1}{4}$	44 $\frac{1}{4}$	44 $\frac{7}{8}$
17	106 $\frac{1}{4}$	106 $\frac{1}{4}$	117	281	282 $\frac{1}{4}$	28 $\frac{7}{8}$	29 $\frac{1}{4}$	44 $\frac{1}{2}$	45
18									
20	107 $\frac{1}{4}$	106 $\frac{1}{4}$	117	281 $\frac{1}{2}$	282 $\frac{1}{2}$	29	29 $\frac{1}{2}$	45	45 $\frac{1}{2}$
21	106 $\frac{1}{4}$	105 $\frac{3}{4}$	117	281	282	29 $\frac{1}{4}$	29 $\frac{3}{4}$	45 $\frac{1}{2}$	46
22	104 $\frac{1}{2}$	104	116	279 $\frac{1}{4}$	280	29 $\frac{3}{8}$	30 $\frac{1}{4}$	45 $\frac{1}{2}$	45 $\frac{3}{4}$

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

Metal Markets

New York, Oct. 22

Copper was dull, and there was a good deal of uncertainty as to the true position of the market. In lead and zinc, there were spectacular advances, with the probability that in both cases the rise will continue. Tin was irregular, especially as to the spot market, under the varying influences of the longshoremen's strike.

Transatlantic freight rates were about the same as in the previous week, with an easier tendency, however, especially owing to the large number of steamships now in the harbor. The rates from San Francisco to Hongkong and Kobe advanced to \$20.

Copper

There was the same irregularity in the market that we reported for the previous week, but the range of prices was not so great. The major part of the business was done at prices ranging from a little above 22c. to a little below 21 $\frac{1}{2}$ c., with 21 $\frac{1}{4}$ c. as an average, taking into account not only the extremes, but also the volume of business. In the previous week some considerable sales to domestic manufacturers were made. This week the aggregate of the domestic business was much less. Such as was done was largely with consumers, i. e., those concerns that manufacture the last marketable products into which copper enters. Such concerns buy wire-bars and have wire drawn on toll.

A few good sales at good prices were effected in that way.

Though the domestic demand on the whole was sluggish and inconsequential, a fair business for export was done, mainly with countries on the Continent of Europe. However, both Great Britain and Japan bought some copper. This business was done chiefly through the Export Association, but some was done outside of it. The Continental countries bid prices higher than what could be realized in this country, and their orders were promptly accepted. Great Britain, on the other hand, would not pay anything above the lowest of our market.

Germany was a buyer of copper here, and also has been trying to buy in Great Britain. The stocks of copper in Great Britain and Australia are being used to control the British market, and, American producers being under-sold, their failure to export anything more than small quantities of copper to Great Britain is explained. However, the British stocks are running down more rapidly than has been commonly supposed.

Copper Sheets—32 $\frac{1}{2}$ c. per lb. Wire, 25@25 $\frac{1}{2}$ c. Domestic buying dull.

Tin

The steel strike being practically over, manufacturers of tin plate evinced more interest in buying tin, and on the whole there was a pretty good demand. The vagaries of the longshoremen's strike in New York created a good deal of unsettlement in the spot position and explain the erratic fluctuations up and down.

Singapore quoted, c.i.f. London, £288 $\frac{1}{2}$ on Oct. 16, 17 and 20; £287 $\frac{1}{2}$ on Oct. 21; and £286 $\frac{1}{2}$ on Oct. 22.

In our issue of Oct. 4, the price of tin at New York on Sept. 20 was incorrectly printed at "55 $\frac{1}{2}$ c." The correct figure is 54 $\frac{1}{2}$ c.

Lead

As was anticipated, the A. S. & R. Co. advanced its price to 6 $\frac{1}{2}$ c., which was done the afternoon of Oct. 16. The St. Louis market steadily showed increased strength, and during the last two days independent producers realized prices in the New York market above that named by the A. S. & R. Co. Speculators and dealers bid even higher prices, but all possible efforts to prevent lead from falling into their hands will be made. The position in the lead market is acute, and any injudicious behavior might easily lead to excitement. It

is expected that the price will go higher, but much will depend on buyers keeping their heads, as well as producers.

Bonded lead for export is quoted at 5% c. France inquired for a large quantity, and Belgium for a little. Great Britain made some inquiries but was unwilling to pay the price asked. Germany also would like to buy lead.

The strike at Alton, Ill., continues.

Zinc

Up to the last fortnight, American producers apparently did not understand the situation of the zinc industry in Europe, and by making relatively low and erratic offers over there confidence abroad was rather upset. With a better appreciation of the European situation, however, American producers became firm in their attitude and buying for speculative account, which had temporarily halted, was resumed here. Great Britain bought a further large quantity in this market this week and the inquiries from France and Belgium took more definite forms. France in particular, seems to want a large tonnage. Our advices from Europe are to the effect that zinc will surely be scarce there by the end of the year. There is no chance of Europe producing much at current prices. There was not much domestic business done in this country this week, but toward the close, galvanizers became buyers in a small way and the steel strike being practically over, further buying by them is to be expected. With this combination of bullish influences it was only natural that a sharp advance in the spelter market should have been experienced. There is much reason to expect that it will go further.

In our Market Report published Oct. 11, the price of zinc at St. Louis on Oct. 7 was incorrectly given as 7½ to 7% c. This should have read 7¼ to 7½ c.

Zinc Sheets—\$10.50 per 100 lbs.

Aluminum—33c. per lb.

Antimony—There was a distinctly better tone, and more business was done. We quote spot at 8% c. Futures were quoted at 9c., duty paid.

Bismuth—Unchanged at \$2.96.

Cadmium—Unchanged at \$1.40.

Nickel—Ingot, 42c.; shot 43c.; electrolytic, 45c.

Quicksilver—Following the sharp decline to \$75 last week, no considerable quantities were offered, and the market rallied to \$80 to \$85 for quicksilver to arrive. There seems to be an actual scarcity of spot metal, and from \$95 to \$102 was reported realized. San Francisco telegraphed \$82.50, strong.

Silver—Market has advanced, owing to an insistent demand from China. It is understood that much of the bullion shipped to Hongkong and Shanghai is

for mintage purposes, and the coin is attracted to the interior, where the demand has been large. No shipments were made to Europe in the last week, owing to the longshoremen's strike.

Mexican dollars at New York: Oct. 16, 92½; Oct. 17, 92; Oct. 18, 92; Oct. 20, 93; Oct. 21, 94¼; Oct. 22, 93.

Platinum—Continued in good demand, but nevertheless the market was distinctly easier. We quote refined ingot at \$130.

Palladium—Unchanged at \$120.

Tungsten Ore—More interest in this market seems to be developing. European buyers are reported to have been making inquiries. Some Chinese scheelite is reported sold at \$7 per unit.

Molybdenum Ore—Unchanged at 75c. per lb. of molybdenum sulphide.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace size ore, free from fines, c.i.f. New York or other Atlantic ports.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 18.—Zinc blende, per ton, high, \$47.40; basis 60 per cent zinc, premium \$46; Prime Western, \$45; fines and slimes, \$42.50 to \$40; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$44.84; calamine, \$34.15; all zinc ores, 44.56.

Lead, high, \$79.35; basis 80 per cent lead, \$80 to \$77.50; average settling price, all grades of lead, \$77.74 per ton.

Shipments the week: Blende, 8,896; calamine, 245; lead, 1,342 tons. Value, all ores the week, \$511,570.

Sellers continue to sell lightly, holding the bulk of ore for advance prices, which they believe will come with the nearer approach of winter. Buyers continue firm in refusing to advance prices further this week, and purchases are reported light. The works of the Illinois Zinc Co., at Peru, Ill., are closed by a strike and no buying is done by the local company. Ore on hand has been turned to other buyers.

Lead is selling for next week's delivery on \$80 basis.

Platteville, Wis., Oct. 18.—Blende, basis 60 per cent zinc, \$48 to \$48.50 for both premium and Prime Western grades. Lead ore, basis 80 per cent lead, \$75 per ton. Shipments reported for the week, 1,690 tons blende, 206 tons galena, and 397 tons sulphur ore. For the year to date totals are 79,756 tons blende, 5,223 tons galena, and 13,629 tons sulphur ore. Shipped during the week to separate plants, 2,645 tons blende.

The zinc and lead ore markets for Sept. 27 were inadvertently omitted from the market report which we issued on Oct. 4. They are given below in order that the record may be complete.

Joplin, Mo., Sept. 27.—Zinc blende, per ton, high, \$46.90; basis 60 per cent zinc, premium, \$43.50; Prime Western, \$42.50; fines and slimes, \$40 to \$37.50; calamine, basis 40 per cent zinc, \$28 to \$26. Average settling prices blende, \$45.60; calamine, \$25.96; all zinc ores, \$44.64.

Lead, high, \$71.40; basis 80 per cent lead, \$70 to \$67.50; average settling price, all grades of lead, \$68.47 per ton. Shipments the week: Blende, 6,749; calamine, 353; lead, 1,104 tons. Value, all ores the week, \$392,540.

Shipments nine months: Blende, 358,293; calamine, 10,110; lead, 53,922 tons. Value all ores nine months, \$18,474,730.

An effort to reduce the price level to \$40 basis failed because one buyer desired a heavy tonnage and was willing to pay \$42.50 basis. All buyers "on the market," and expecting settlements on \$40 basis, changed their basis to conform to the same price level current the previous week. About 8,000 tons reported sold for next week's delivery.

Platteville, Wis., Sept. 27.—Blende basis 60 per cent zinc, \$43.50 base for premium grade and \$42.50 base for Prime Western grade. Lead ore, basis 80 per cent lead, \$70 per ton. Shipments for the week are 1,719 tons blende, 167 tons galena, and 296 tons sulphur ore. For the year to date, the totals are 73,632 tons blende, 4,696 tons galena, and 12,582 tons sulphur ore. Blende shipment to date decreased 23 per cent from that of 1918 to corresponding date. During the week, 2,506 tons blende was shipped to separate plants.

Iron Trade Review Pittsburgh—Oct. 21

Ferromanganese—The market remains stagnant. English 80 per cent could probably be had at \$95, c.i.f.; the asking price of domestic producers remains at \$110, delivered.

Steel—There is an acute scarcity of sheet bars, as sheet and tin mill operations have been in greater ratio than operation of steel mills producing sheet bars. Sales of sheet bars are reported at \$44.50 and at \$45, Pittsburgh, against the Mar. 21 price of \$42. Billets remain nominally at the old price of \$38.50, with slabs at \$41 and rods at \$52.

Coke—The Connellsville coke market has stiffened further. The curtailment in output in the first fortnight was sufficient to balance the reduced consumption due to the strike, and as furnaces resume, the consumption increases, and operators increase output only as they can obtain a fair price. Foundry coke is easy. We quote furnace at \$4.25 and foundry at \$5.50 to \$6.25, per net ton at ovens.

Engineering and Mining Journal

JOSIAH EDWARD SPURR Editor WALTER RENTON INGALLS Consulting Editor GEORGE J. YOUNG Western Editor D. E. A. CHARLTON Managing Editor A. H. HUBBELL EDWARD H. ROBIE E. F. MCCROCKEN HARRY J. WOLF Assistant Editors

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The Turn of the Tide

OUR editorial of Oct. 18 on "The Steel, Strike and Others," which defined strikes establishing economic blockades against the public as conspiracies and acts of civil war which should be promptly punished, anticipated by only a week the proclamation of the President in which he enunciated similar principles and warned the conspirators implicated in the threatened coal strike that any attempt to carry out their attack on the public would be punished by the full exercise of his Executive power. This firm attitude met with a hearty response all over the country. Governors of many states in which coal was mined lost no time in making public announcements that they were prepared to back the President's attitude with the full power of their state authority; and a feeling of relief was felt throughout the nation.

The foreboding induced by the constant aggravation of the industrial situation and the revelation of the nation-wide and world-wide underlying anarchistic plotting, changed to a consciousness of a firm footing discovered in the morass. Such progress as our subterranean conspirators had made had been partly under favor of the usual public sympathy with the cause of the workingman; and to the subsequent gloom that followed the revelation of the ringleaders as "red" revolutionists succeeded the calm of the fighting American spirit.

The President's analysis of the "Labor" conspiracies as directed against the commonwealth was verified by the defiance of the President and the law, which was the answer of the organizers of the coal conspiracy to the President's message, which defiance is in harmony with that of the railroad brotherhoods to Congress and the law, in regard to the intention of Congress to include an anti-strike provision in the Railroad Act. Nevertheless, a weakening all along the line has been pronounced. The latest public sentiment is that if there is to be actual conflict between the traitorous organizations and the forces of Americanism, the sooner it comes the better; and that in any case the ringleaders and as many of their followers as need be should be deported; and this change of feeling was not lost on the secret councils of Bolshevism.

Immediately the labor leaders proceed to give the public the inside facts. It appears that the coal strike was incited at this time by the operators, that they might put the miners in a false position before the country. In regard to the steel strike, Samuel Gompers has revealed the astounding fact that paid agents of the United States Steel Corporation have

brought this on; that the Steel Corporation has subsidized Bolshevist periodicals and revolutionary agitators, so that a trial of strength between Capital and Labor might be had, and Labor not only crushed once for all, but stigmatized as anarchistic and disloyal. Simultaneously there is revealed by Mexican authorities the fact that the American Consul who was kidnapped and ransomed at Puebla had arranged to have himself kidnapped by orders from Washington, in order to create a grave international situation. These are the angry recriminations of losing parties, who acknowledge that they have been wrong by accusing the other side. We are sorry for Mr. Gompers, whom we believe to be a lover of mankind, as Secretary Wilson called him. He was put in an awkward position between Scylla and Charybdis, between the devil and the deep sea, between Bolshevism and Capital; and he has chosen the untenable ground of approving the actions of the steel strikers while denouncing the strike as the work of anarchists and the Steel Corporation.

Meanwhile, to carry out the President's intention, the Attorney General has found that the Lever War Food Control Act applies, so that under it the ringleaders of the coal strike can be indicted and imprisoned; and he has announced that he will so proceed. At last we have reached, we trust, the turn of the tide.

Emerging from its former position of helplessness under employers, Labor has gradually grown, through exemption by complaisant Congresses from the anti-trust, or anti-conspiracy laws which were imposed upon Business, till it hit upon the weapon of hostile conspiracies called strikes, by which it now proposes to dominate all other classes and defy the Government of the United States. The Executive, listening to the voice of the majority of the people, has indicated that the patience of the lawful Government with the anti-government or anarchistic elements is necessarily at an end; and Congress, if in any degree awake, can do no less than follow the same course.

Bolshevism at Kyshtim Copper

AT THE meeting of the New York Section of the Mining and Metallurgical Society in New York Oct. 21, Mr. F. J. Jones, manager of the copper works at Kyshtim in the Ural region of Russia, gave a simple and instructive account of the changing conditions there since the fall of the Russian Empire. Under the Kerensky regime, conditions remained

fair; the workmen rejoiced in their newly won liberty, but remained industrious and friendly. They made moderate demands for higher wages, which they obtained. With the progress of Bolshevik (radical) doctrines and control, their attitude passed through independence to insolence; they made repeated demands for shorter hours and higher pay, with no opportunity to the employers for discussion, the alternative being the pulling down of the works.

Under these conditions, production fell off from a thousand tons of copper a month to three hundred; and the stage was soon reached when the expenditures of the plant for labor exceeded the income. The deficit was made up by the Bolshevik "government" at Petrograd, which regularly remitted, in order to maintain the needed production of copper. The management were relegated by the dominant workmen to a state of gentle slavery: they were informed that their business was to direct, and that they would not be allowed to leave their work. The problem finally became how to close down without rioting and destruction, a difficulty which was finally solved by getting word to Petrograd not to send the regular funds, and then obtaining permission from the workers to go to Petrograd to investigate!

That is the end of the tale for the present. Mr. Jones observed that in the incessant radical demand in America for shorter hours and higher pay, regardless of economic laws, he saw little difference from the march of events which he had witnessed in Russia; but he was confident that the intelligence and good sense of the American people would prevent the extremes to which Russia had fallen.

That is the comforting and optimistic reflection with which we all close our investigations into the present alarmingly unsound industrial conditions in America, just as, for example was done in our editorial of Oct. 13. Senator Frelinghuysen, speaking in the Senate the other day, characterized the radical campaign accurately and without mincing; and stated that the only thing that would avert the impending catastrophe was the force of Public Opinion.

Unfortunately for our comfortable optimism over the coffee and cigars, facts do not really warrant this reliance. Mr. Jones stated that only 8 per cent of Russians were radicals, and that the 92 per cent were overcome because they would or did not fight until it was too late; and the Bolsheviks disarmed them, and so it became possible for Russia to exhibit for so long a classic example of the rule of a tyrannical minority.

The proportion of radicals in the United States has not been stated. Labor unions and those controlled thereby have been estimated at 4 per cent of the total population, but, together with the families, must make up around 20 per cent. As is well understood, however, there are two distinct factions in the labor unions, of which the radicals are one; and from the strength they are showing in their effort to overthrow conservative unionism and the American government, their proportion to the whole population would seem not to be far different from that quoted for Russia.

Now, what effect will Public Opinion have on this movement? This is already as decided as it can be; but as such it manifestly does not influence the disturbing element, whose reply "The public be damned!" has been actually voiced in recent strikes both in Chicago and New York, and laid down as a principle in the books of their leaders. A supine and complaining public, a supine and threatening Congress, a supine and admonishing Executive Department, will deter this militant radical element about as much as the Aztecs throngs in Mexico stopped the progress of the little band of Spanish invaders under Cortez; or about as much as was the case in Russia. As has often been pointed out, these radicals are aliens. They do not understand English in many cases; they do not understand Public Opinion; they do not understand nor revere the Constitution, Congress, the Executive, nor the will of the majority. Whatever message the above institutions wish to convey to them must be translated into a language which they do comprehend—Action.

By all means, let us trust implicitly in the American people as a whole; but it is not too soon for the Executive, Congress, and the governing Majority to act decisively.

Indian Mineral Lands And the Apex Law

THE regulations covering the working of mineral lands in Indian reservations, which hitherto had not been available for development, were promulgated by the Indian Bureau of the Interior Department on Oct. 11.

A feature of the regulations, in interpreting the law, is that although mining claims may be located in the usual way and of the usual size, these are leased from the Government by the locator, instead of becoming his property; moreover, the mineral leased is only that within the boundaries of the claim, vertically projected downward.

From the legal point of view we have nothing to contribute to this question. From the viewpoint of the engineer and geologist, however, we would consider it unfortunate if the Apex Law were to obtain for these newly released lands. Our opinion is that the Apex Law is and was from the beginning a monstrosity and a mistake, the results of inexpert legislation. To be sure, not very much was known about mineral veins and ore deposits when this law was proposed and carried through by a Western lawyer in the Senate; but this should have indicated the wisdom of corresponding conservative legislation, which would have meant the vertical boundaries determined upon, earlier and since, in most other countries.

The Apex Law was based upon an ideal conception of the nature, form, and extension of an ore deposit, a conception so simplified and conventionalized as to be hardly recognizable in comparison with the facts, which have been established by the process of observation, by miner and engineer. Were all mineral deposits straight and of tabular form—narrow,

regular zones, like sheets of cardboard—passing through the end lines of claims located to cover them, then the Apex Law would have in it the element of equity to the discoverer of an ore deposit which was contemplated by those who enacted it. With the actual endless diversification of form and extent of orebodies, however, the law has at times become a farce, a source of perplexity and inequity, and occasionally a tool in the hands of those who keep within the law by twisting it so as to cover them.

The lack of correspondence between the ideal application of the law and the local facts has given rise to a vast deal of hard-fought litigation, in which justice is often conspired against with fantastic theories; and lawyers, mining engineers, and geologists alike sometimes find themselves perforce so far removed from the realms of reality that there is little if any strain on their consciences if they seek out and recognize only those geological phenomena which will support the side they are fighting for. The mass of legal opinions and decisions has reached formidable proportions, and the courts have turned out, and are still in desperation emitting, in the case of certain special problems, solutions that from the standpoint of the uninvolved geologist are sometimes grotesque. When we reflect upon Anglo-Saxon racial superiority, let us remember with humility the greater good sense of the mining laws of Mexico, as compared with those of our own country; and among the provedly superior features of the Mexican law is the limitation of mineral rights by vertical boundaries of claims.

The elimination of the right of extralateral mining in those mineral lands of the United States last thrown open is therefore, in our opinion, an enlightened act; and we trust that Secretary Lane is correct in so interpreting the law.

Whether anything can be done to correct the situation in the case of older claims, located under the Mineral Law, has long been a subject of debate, many holding that it would be worse confusion to try to simplify the law at this late date than to let it take its own mad course to the end. Some time ago, the Mining and Metallurgical Society addressed itself to this problem, with the co-operation of other societies interested in the welfare of the mineral industries, and made recommendations to Congress; but our impression is that the seed fell upon a stony ground.

Settlements at Trail

THE prominent place that the Consolidated Mining and Smelting Co. of Canada occupies in the affairs of the independent ore shippers of British Columbia makes its methods of settling for shipments, especially of lead ores, of considerable importance. There was much dissatisfaction on the part of shippers with the lead-pooling scheme and the scale of treatment charges set forth in the so-called Schedule B that was in effect at the Trail smeltery up to July 1 last. So pronounced did this become as to lead to the appointment by the Do-

minion Government of a special committee to investigate the rates charged.

This committee, consisting of S. S. Fowler, Ivan de Lashmutt and James Anderson, with A. G. Langley representing the British Columbia government, met at Nelson, B. C., on Jan. 21 of this year and, after carrying the investigation to Trail itself, reported that no undue margin from increased treatment rates had been derived by the smeltery and that furnace operation under the schedule had greatly improved. Concessions were obtained for shippers, however, which were embodied in the revised schedule known as Schedule C, which became effective on July 1, 1919. This provided the promised reduction in ore-treatment rates, more especially affecting those ores containing zinc and sulphur.

Many complaints have continued to come in, however, from shippers who desired a more definite method of settlement than that afforded by the lead-pooling scheme outlined in Schedule C. In a circular recently issued, certain clauses of Schedule C have been amended. The Consolidated company now guarantees that it will not settle for lead on a lower price than the American Smelting & Refining Co.'s average New York quotation. Soon after sampling, 90 per cent of the apparent value will be paid the shipper, and soon after the close of the second calendar month after sampling the final value will be computed and adjustments made.

The relations between shipper and smelter are vital, to the former at least. A narrow policy on the part of the smelter can greatly retard the development of mining properties in the district that is tributary to it. The act of the company in question in voluntarily easing the situation for shippers augurs well for the mining industry of British Columbia.

Welding Pipe for Oil and Gas Lines

THE practice of electric or acetylene welding of pipe used in the construction of oil and gas pipe lines is growing. This method will be employed upon a ten-inch gas line soon to be under construction in California. There are other examples of its use. Though it cannot now be considered standard, it is the practice of some of the most advanced engineers to specify the method. The use of a welded joint saves the coupling and the threading of the ends of the pipe. The pipe ends require "scarfing" only, the metal for welding being worked into the V produced by the butting of the pipe ends together.

According to experienced engineers, the joint made by the weld is as strong as the pipe itself. On a pipe line a hundred or more miles in length the saving of weight is an important item. We are of the opinion that welding would be a good thing for compressed-air columns in mine shafts and for air lines of more than nominal size where they have to be placed on the surface and where they are of considerable length. Such a practice would be a saving in first cost, but, more than that, leakage would be reduced to nil by efficient welding.

Some Prominent Canadian Engineers



R. B. WATSON
General Manager Nipissing Mining Co.



D. H. McDOUGALL
President, Nova Scotia Steel and Coal Co.;
President, Canadian Mining Institute.



S. G. BLAYLOCK
General Manager, Consolidated Mining
& Smelting Co. of Canada, Ltd.



C. V. CORLESS
Manager, Mond Nickel Co.

Political and Commercial Geology Series

No. 1—The Tungsten Resources of the World*

BY FRANK L. HESS

THE world's known large tungsten fields are grouped along the shores of the Pacific Ocean—not always very close to it, but somewhere in the great mountain masses paralleling its margin, and the western shore is much richer than the eastern shore. In 1918, fully 92 per cent of the world's tungsten came from the Pacific's shores, of which more than 61 per cent was from the west side and more than 56 per cent from the Asiatic border. The east coast produced a little less than 31 per cent, nearly equally divided between the United States and South America. There is only one considerable tungsten-bearing area not situated close to the Pacific, that of the Iberian Peninsula, mostly in Portugal but partly in Spain. Of the less than 8 per cent not produced around the Pacific, it contributed nearly 5 per cent. There are, of course, small deposits in England, Germany, and other places near the Atlantic, but together they produce less than 3 per cent of the world's tungsten ores. The huge continent of Africa has only negligible known deposits; none of consequence are found on the borders of the Arctic, Antarctic, or Indian oceans, except along the narrow Malay Peninsula dividing the Indian and Pacific oceans, and only minor deposits are known in Siberia.

Geographical Distribution

The distribution of tungsten ores is far from being as wide as the distribution of the granitic rocks, and some countries with large areas of granite have almost no tungsten minerals, such as the Scandinavian peninsula, large stretches of Canada, the eastern United States, and Brazil.

Considered as a single metallogenic province, by far the greatest production comes from the region in southeastern Asia which includes the Malay Peninsula, Burma, the Shan States, Siam, Tonkin, and southeastern China. The second largest producing metallogenic province is the Cordilleran, including Bolivia and the adjacent closely related areas of Peru, Argentina, and Chile, to which the United States and Mexico would be a close third. Portugal, Spain, and Italy form the fourth province, to which are closely related the Cornish-French producing areas. Australia, including Tasmania, is next in importance, and is a distinct province, practically all the ores being found in the ranges of the eastern side of the continent. Japan and Korea also form a rather distinct province, which may continue into Manchuria. Mexico, as has been indicated, should be included in the same province as the western United States.

Tungsten, even more than tin, is found almost exclusively with granitic rocks. In a few places tungsten deposits are found in volcanic sedimentary, or metamorphic rocks, but, as is postulated with certain tin deposits, many of these cases may be explained on the supposition that it is not far vertically to underlying granite. There is among the deposits themselves a considerable variety of forms, and they may be classed as segregation deposits, pegmatite dikes, veins, replacement deposits, contact metamorphic deposits, and placers.

Segregation deposits are few and of little importance, and constitute those deposits in which wolframite is segregated in granite like biotite or hornblende. A closely related form is the occurrence of tungsten minerals in aplitic granite, and this grades almost insensibly into the second type, the pegmatites. The pegmatites are also of comparatively small importance, but do yield certain quantities of tungsten minerals. The pegmatites also grade into the next type, the veins, which have heretofore furnished the greater part of the tungsten minerals of the world. Intimately connected with the veins are the fourth type, replacement deposits, in which the country rocks alongside the veins, though the veins may be very small, are replaced by various minerals, including those of tungsten.

Closely related to the replacement deposits are the contact metamorphic deposits, the fifth type. These only recently have begun to be of commercial importance, but promise to be among the greatest, if not the greatest, producers of this country and possibly of other countries. The tungsten mineral in such deposits is invariably scheelite. Placers, the sixth type, are formed from all grades of deposits, but their value depends largely on local conditions. They are both residual and fluvial deposits, and have been large producers of tungsten minerals, especially of wolframite.

Uses of Tungsten

The essential uses of tungsten are as an alloy in high-speed tool steel, for the making of filaments for incandescent lamps, for targets and cathodes of Roentgen ("X") ray tubes, for electric contacts to be used in explosion engines, and whenever an intermittent electric contact is needed. Other uses are the addition of tungsten to saw and some other steels, as a constituent of stellite, in a tungsten iron alloy for valves in automobile and airplane engines, for kenotrons and similar instruments, in a manganese-chromium-tungsten-iron alloy for wire drawing dies, wire cloth, luminescent screens for Roentgen ("X") rays, mordants, and minor chemicals. The use of tungsten in high-speed steels is as standard as the use of yeast in bread and, though assiduously

*Department of the Interior, Political and Commercial Control Series No. 15, revised by the author and somewhat abridged for publication by the Engineering and Mining Journal.

hunted, no substitute is known which will satisfactorily take its place. The Alloys Steel Co., one of the larger producers, makes a large part of its steel in the electric furnace, and it is understood that the Crucible Steel Co. and some other steel companies also make a part or all of their steels thus. The removal of tin, copper, and other impurities from ferrotungsten by grinding and chemical treatment has made possible the use of impure ores in the production of high-grade ferrotungsten in the electric furnace.

Production

The world's production of tungsten ores by metallogenic provinces and political areas is shown in the following table. Unless otherwise noted, the short ton of 2,000 pounds is used throughout this paper, and the term "tungsten ores" denotes material carrying 60 per cent WO_3 .

THE WORLD'S PRODUCTION OF TUNGSTEN ORE, 1913-1918 (INC.) BY METALLOGENIC PROVINCES AND POLITICAL AREAS.

In Short Tons (2,000 Pounds) of Concentrates Containing 60 Per Cent WO_3 .	1913	1914	1915	1916	1917	1918
PROVINCE						
Asia						
Korean.						
Japan	327	226	478	771	808	650
Korea (Chosen)	—	—	74	612	993	1,000
Chino-Malayan.						
China	20	39	120	1,500	10,500	—
Tonkin	100	119	219	250	422	450
Burma and Shan States	1,733	2,388	2,716	3,818	4,600	4,870
Siam	1	33	475	584	800	800
Federated Malay States	273	317	363	577	853	920
Trengganu	—	173	175	312	350	350
Johore and Kedah	33	—	—	48	200	532
Billiton and Singkep	30	30	60	60	60	60
Indian.						
India (excluding Burma)	—	—	—	51	75	46
Australia	2,497	3,306	4,599	7,203	10,661	20,228
Australian.						
Queensland	587	442	708	503	519	393
Northern Territory	42	50	173	257	273	459
New South Wales	220	244	109	345	297	325
Victoria	1	—	—	1	—	—
South Australia	—	—	—	1	—	—
Tasmania	89	61	114	129	315	485
Western Australia	1	1	—	—	—	—
Oceania	940	798	1,104	1,236	1,404	1,562
Oceanic.						
New Zealand	297	274	261	346	241	146
South America						
Cordilleran.						
Chile	—	—	—	10	3	—
Argentina	591	482	189	908	1,247	725
Bolivia	328	320	902	3,624	4,645	4,625
Peru	357	254	455	586	470	277
Brazilian.						
Brazil	—	—	—	6	—	—
North America	1,276	1,036	1,546	5,134	6,365	5,927
Southwest American.						
Mexico	—	—	155	175	340	325
United States	1,537	990	2,332	5,923	6,112	5,029
Alaskan.						
Alaska	—	—	—	46	32	12
Canadian.						
S. E. Canada	12	—	—	—	—	20
Europe	1,549	990	2,487	6,144	6,484	5,387
Scandinavian.						
Norway	11	4	10	10	10	10
Franco-Cornish.						
England	204	230	399	449	265	330
France	200	200	200	182	182	180
Iberian.						
Portugal	900	1,000	1,030	1,563	1,741	1,300
Spain	169	136	211	187	446	425
Italy	—	—	—	6	1	—
Erzgebirgan.						
Germany	150	150	150	350	200	200
Austria	75	75	75	150	150	150
Russian.						
Russia	—	—	—	36	110	150
Africa						
South African.						
South Africa	—	—	1	3	24	57
World's total production	8,268	8,198	12,073	22,999	28,284	35,832

Developments and Changes in Geographical Distribution in the Near Future

The increase of output from eastern Asia has been marvelous. In 1913 it amounted to 2,497 tons, and in 1918, to 20,228 tons—more than 56 per cent of the world's production. As in other parts of the world, production must decrease until the accumulated stocks in the reducing centers are used; then it will again proceed as it has in the last few years. The alluvial deposits of China are by no means exhausted, the veins are scarcely touched, the tungsten-bearing area is large and only partly prospected, and such prospecting as there has been has been almost wholly for placers. Labor is cheap, and a large future output is sure. Although proceeding slowly, more liberal ideas of trade and government are taking root in China, and educated Chinese or trained foreigners will in time work the deposits, and the output will be large for a long time, though it may never again be as large as it was in 1918.

So far as can be learned, the easily worked placers of Burma and the upper parts of the veins are becoming exhausted rather rapidly,¹ and recourse must therefore be had in the future more and more to the mining of those parts of the veins below water level and in harder rock, and this will probably mean a diminution rather than an increase in output. Siam seems to be a country which should give an increased production, as the mines are comparatively new, and there still should be opportunity for discoveries. The Federated Malay States and the unfederated states—Johore, Kedah, and Trengganu—should produce at least as much in the immediate future as in the past—given demand and an equal price.

Like other British possessions, Australia labored under the handicap of a comparatively low fixed price for tungsten ores during the war. This price, at first 55s. per long ton unit c.i.f. London, was later raised to 60s. The price paid in Australia during the earlier part of the war averaged less than one-half that paid in the United States, and only a little more than half that paid in regions other than the British provinces, with the result that the Australian tungsten production did not increase as it might have done during the war, had prices been higher. The cream of the known deposits is gone, except in Tasmania, where contact metamorphic deposits on King Island have quadrupled the Tasmanian output. The tungsten minerals produced in Australia are largely wolframite, with smaller quantities of huebnerite and scheelite. The huebnerite is apparently rarely recognized as such in the British market, but is all sold as wolframite. Except for the contact metamorphic deposits on King Island, Tasmania, the deposits worked are mostly veins, with some pegmatites.

In New Zealand, the production is wholly scheelite, and increased considerably during the war until its last year—1918—when, apparently owing to a lack of efficient labor, it fell to the lowest point since

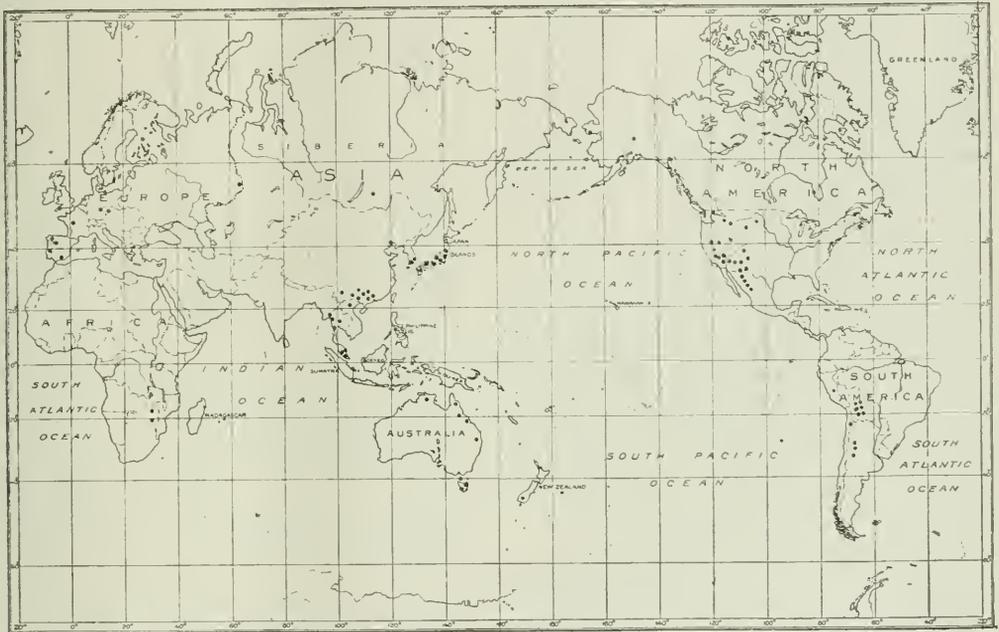
¹ Burma Chamber of Commerce and Tavoy Chamber of Mines, Memorial to Sir George Barnes, Mining Journal, London, Vol. 121, May 4, 1918, p. 261

1909. The probabilities are that there will be a stoppage of output for the present.

The increase in production of Bolivia has been very great. The deposits seem to be wholly veins and derived placers. The veins are closely connected with the tin deposits, and tin and tungsten are frequently found in the same veins, but many tungsten deposits contain little or no tin. The tungsten minerals mined are ferberite, wolframite, scheelite, and some huebnerite, mixed in some veins and in others wholly separate. The mines occur in and on both sides of the eastern Cordillera of the Andes through a distance of nearly 400 miles from a point near Puerta Acosta on the northwest to Chorolque on the southeast. Prices for mining during the war rose greatly, in sympathy with the rise in other parts of

The Peruvian output as now produced is apparently dependent upon high prices, and could probably remain at the level of 1916 for several years if prices were sufficient. The Huaura deposits are reported to be large, though of low grade, and may, under proper management, yield largely even at lower prices. They have been under the control of German firms during the war, and probably still are.

Until 1911 the United States was the leading tungsten-producing country, but in that year was passed by Burma, which kept the lead until 1916, when the United States again became the principal miner of tungsten ore, but in 1918 China came into the excessively high-priced market with a production that exceeded by nearly 1,000 tons the world's production of any year before 1915. North America



GEOGRAPHICAL DISTRIBUTION OF THE TUNGSTEN RESOURCES OF THE WORLD

Frank L. Hess

the world. Wages did not rise to great heights, but the cost of materials increased materially. Transportation conditions are always bad in most of Bolivia, and heavily increase expenses. These circumstances cause great sensitiveness to a decrease in demand or prices, and the output from Bolivia fell quickly after the armistice, but should high prices come again, the output will probably again increase quickly. Some modern plants were placed at mines before or just as the armistice was signed, and when world stocks of tungsten are used, and there is again a demand, some ore will be produced at even less than \$10 a unit, though the average cost seems to be about \$12 a unit, at the mine.²

increased its output from 1,549 tons in 1913 to 6,512 tons in 1917, but it dropped back nearly 1,000 tons in 1918 (to 5,567 tons). The decrease of production in the United States was due almost wholly to the fall in price, and only partly to exhaustion of deposits. Although the Boulder tungsten field has seen the exhaustion of some of its best deposits, and the cost of production has become much greater, owing to the impoverishment of others, and though the same thing is true in some other places, it seems possible that in the country as a whole the production can temporarily be made about equal to the highest made before, providing prices are as high as at that period, owing to the discovery of the contact-metamorphic deposits of the Great Basin.

In Mexico the tungsten deposits are apparently a continuation of those of southern Arizona. So far

² Hazeltine, Ross, United States Consul, La Paz. Report dated May 14, 1919.

as known, all the Mexican deposits carry scheelite, in places partly replaced by cuprotungstite. The known worked deposits are in the Sahuaripa district of Sonora and are described as veins in which scheelite is found with copper minerals and a pegmatite dike in which large masses of scheelite and molybdenite are found.

European Tungsten Production

European production increased about 50 per cent between 1913 and 1918, mostly in Portugal, and the production of tungsten ores in Portugal apparently did not reach its maximum. The deposits exploited have been both placers and veins, and there still seems to be placer material to be worked, as well as the veins, which are said to be far from exhausted.

For the Spanish output it is difficult to prophesy, because the data concerning the mines are meager. It seems probable that from the English and French deposits, under similar prices, about the same output as in the past may be expected. The English output decreased in 1917 and raised only a little in 1918, despite the British government's interest in a larger quantity of concentrates. No accurate data are available from France. The German and Austrian deposits have probably been worked so hard during the Great War that less is to be expected from them than they have heretofore produced.

The principal changes in the distribution of production during the next few years would seem to be: Further development of veins and contact-metamorphic deposits in Korea; the possible development of veins in Manchuria; development of new placers and veins in southern China and Siam; both veins and placers in Bolivia; a tendency in our own country to largely increased production from the contact-metamorphic deposits of the Great Basin; and both veins and contact-metamorphic deposits in Mexico. There will possibly be a decrease in the Atolia and Boulder fields of the United States; in Australia, Japan, Germany, and Austria.

Political and Commercial Control

Actual control of the world's tungsten deposits is considerably different from that indicated by the production within political areas. That actual control is justly obtained through ordinary competitive purchasing, ownership, by nationals (sometimes by governments) of deposits, and through commercial alliances. Control through ownership of banks and transportation lines may be just, or it may be bulldozing and commercial brigandage, such as that made possible by seized ports used for coaling and repair stations which command the junctions of trade routes—methods that are merely refinements evolved since the days when "They sought their fortunes as they pleased abroad, the crown annoying them with no inquiry to embarrass their search for Spanish treasure ships, or their trade in pirated linens and silks."

Owing to the close relationships between foreign governments and private firms, illustrated by the German government's interest in dye, potash, and shipping firms, and the British government's partici-

part in nickel mining and ferrotungsten-making companies, it is not practicable entirely to separate governmentally and privately controlled deposits. Under the weaker governments, deposits owned by British subjects are to all intents and purposes British, but owing to the difference in national policies, foreign deposits owned by Americans are not necessarily under American control; in fact, instead of helping and encouraging our pioneers in foreign trade, we are likely to harass them and destroy their business with drastic tariff laws.

THE ACTUAL CONTROL OF THE WORLD'S TUNGSTEN OUTPUT IN 1917 AND 1918

	In Short Tons of 2,000 Pounds		1918	
	Quantity	Per cent of World's Output	Quantity	Per cent of World's Output
British Possessions				
Burma and Shan States.....	4,500		4,870	
Federated Malay States.....	853		920	
Trengganu	350		350	
Johore and Kedah.....	200		582	
India	75		46	
Australia	1,404		1,562	
New Zealand	241		146	
England	265		330	
South Africa	24		37	
	8,012	28.4	8,943	24.9
Obtained through trade and political pressure:				
Japan and Korea (including ores for France)	790		None	
China and Hongkong (including ores for France)	1,105		900	
Siam	600		600	
Billiton and Singkep	60		60	
Argentina, Bolivia, Peru (including ores for France)	2,035		950	
Portugal	950		800	
Spain (including ores for France)	445		425	
	5,996	21.3	3,735	10.4
Total ores under British control.....	14,008	49.7	12,678	35.3
French				
France	182		180	
Tonkin	422		450	
Siam	170		190	
Portugal	550		440	
Bolivia (see Great Britain).....	?		?	
Argentina (see Great Britain).....	?		?	
	1,424	5.3	1,260	3.6
German				
Germany	200		200	
Austria	150		150	
Norway	?		?	
Portugal	?		?	
Spain	?		?	
	350	1.2	350	1
American				
Canada .....	.....		20	
Mexico	340		325	
Peru, Bolivia, Argentina.....	4,330		4,677	
Japan and Korea (includes some Chinese ore)	1,010		1,650	
China and Hongkong	395		9,300	
Portugal	130		60	
Siam	30		12	
Domestic production	5,144		5,041	
Totals	12,379	43.9	21,150	59
Japanese (Quantity smelted only)				
China	?		300	
Norwegian				
Norway	10		10	
Russian				
Russia	110		150	1.3
Totals	28,188		35,832	

The above table practically shows only where the ores of various countries go for treatment, and is, of course, only a generalization, and is obsolete before it is made, for trade conditions change constantly. For instance, Japanese electric furnaces are beginning to smelt tungsten ores, though at present to the extent of only 10 or 15 tons of contained tungsten per month, but it is conceivable that the output may be greatly increased. Although

¹ Wilson, Woodrow. "A History of the American People," Vol. 1, p. 25.

Japan could control the disposition of its ore, it is given credit for control only of its smelted ore. It is impossible properly to divide the ores from Argentina, Bolivia, Peru, Portugal, and Spain among their customers; and other weaknesses, those inherent to most statistical studies, are also present. The table is approximate only, but is thought to furnish instructive data.

British Control

The British government during the war demanded and obtained all of the tungsten ores produced in its colonies and possessions. This restriction was later lifted as applied to Canada, and the new rule allowed Canada to ship tungsten ores to other Entente nations, but as Canada was not a producer the license granted amounted to nothing except as it eased the feelings of the Canadians. Scheelite deposits have been discovered in Manitoba, however, that for a time seemed to be potential producers. Nominally, Siam has remained free from British control, because more or less under the zone of influence of the French, but diplomatic pressure seems to have been exercised at Bangkok. Most Siamese tungsten-bearing ores contain some tin, and have gone to Singapore for separation, and when once within the British possessions, of course, the ores could not be shipped out of them. British control of Siamese shipments is thus apparently as complete as if the shipments were made from a British province.

In southern China, Hongkong being the port of Kwangtung and Kwangsi, and parts of southern Kiangsi and Hunan, the British exercised control over the export of ores produced in those districts, for a while⁴ refusing to allow the re-shipment of ores unless they were sent to England. Foreigners, including Americans of course, are not allowed to own mining property in Burma, the Federated and unfederated Malay States, or Australia, territory producing nearly all the tungsten ores of the British Empire. In Argentina small tungsten mines are owned by English companies.⁵ In Bolivia the English and French governments during the war leased mines directly, and came into direct competition with American business men engaged in the buying or production of tungsten ores.

British Efforts to Extend Control

British traders are constantly striving to increase their control of Bolivian tungsten ores, and the efforts are not confined to the control of properties through buying. The English apparently have complete control of the financial system of Bolivia so far as foreign exchange is concerned. An American interested in a tungsten mine in Bolivia has stated to the writer that it is almost impossible to do business with English banks, because they insist that if they extend commercial courtesies, even for pay, the recipient must buy only English mining machinery. If miners do not wish to deal through English banks, they are compelled to cable money to and from New York at a considerable expense. The

American banking interests represented in Bolivia are apparently too conservative to advance money on ore shipments, as have German and English representatives, who, I am told, advance up to 80 per cent of the market value of ores shipped. This is good business. Mining corporations are also controlled by English firms, and, of course, the material is then shipped to England, and it is impossible for Americans to compete for the production. The control of the Bolivian mines by the English is not yet dangerous to American interests, except through the banking system, but entire control may be passed to them, to the Germans, or the French through American tariff legislation.

In Portugal, English companies control a number of the mines, and it has been alleged by at least two Americans⁶ that the British government, through its representatives at Lisbon, for a period of more than two years, prevented title passing to American companies. The Thermo Electric Ore Reduction Corporation, Ltd., seems to be the principal English owner of Portuguese tungsten mines. In the Dutch Indies, the British are understood to have control at present of the wolframite production, which, however, is comparatively small, about five tons a month.

French Control

French control of tungsten deposits is not large. It includes the production of France and that of Tonkin, a part of that from Portugal, and a comparatively small interest in Bolivia. During the war, control in Portugal was attempted by England and France. The prices offered by the English and French were much below the market prices of New York, and the Portuguese government stepped in and raised prices to a point somewhat lower than those of the United States, but 20 per cent higher than the prices offered by England and France.

Japanese Control

Japan has within her own borders a considerable number of tungsten deposits situated in the southern part of the islands, but all are small. In Korea important deposits have been discovered and actively worked, especially within the last two years. Deposits in Manchuria are also said to be controlled by the Japanese, but little is known of them, and if they exist they are probably small. Japanese ores have come largely to the United States for several years. As has been said, Japanese firms have erected electric furnaces in which a part of the tungsten ores are reduced, probably the equivalent of 25 to 35 tons per month of concentrates carrying 60 per cent WO_3 .

American Control

The United States controls entirely the tungsten deposits within its own borders and Alaska. Americans operating in Mexico have produced 200 to 300 short tons of scheelite concentrates per year from deposits in the Sahuariipa district, Sonora. Wolframite is said to have been shipped from Sinaloa to the United States, but its real origin is unknown. Contact metamorphic deposits carrying 0.7 per cent

⁴ Anderson, George E., American Consul General, Hongkong, China. "Tungsten From South China." Commerce Reports, Nov. 9, 1917, p. 646.

⁵ Sharp, Ralston C., "Wolfram Deposits in the Argentine." Mining Magazine, London, Vol. 18, May, 1918, pp. 230-233.

⁶ Personal communications.

WO₃ and 1 to 2 per cent copper have been found about sixty miles southwest of Nacozari and are owned by Americans, but are not now productive.

In Bolivia, Americans own some of the more important tungsten mines. The American firms known to own tungsten properties in Bolivia are W. R. Grace & Co., local address, La Paz; Stewart, Wilson & Hepburn, Oruro; Easley & Inseele, La Paz; and C. Dillon, Oruro. Their total output is estimated to amount to about 1,600 tons, out of a total output of more than 4,000 tons for the country.

In southern China, as already noted, American firms have worked up the tungsten trade extensively, so that, through this source, the United States controls (or, more properly speaking, Americans control), unless interfered with, a trade of possibly 9,000 short tons of tungsten concentrates per year. In Siam one or two United States companies have attempted to produce tungsten, but British influence during the war made it difficult to ship even small lots of ores to this country.

Because it offered higher prices than other countries, and because the trade route was more direct and shorter, so that it was to the advantage of the Japanese to trade with this country, the United States largely controlled the Japanese output of tungsten ore in 1918. This trade probably has been somewhat and will be further curtailed through the erection of electric furnaces in Japan.

United States Imports in 1918

The United States imported in 1918 36 per cent of the tungsten output of the world, and adding this to the domestic output makes a total of 17,921 tons, or 50 per cent of the world's production. There is a lag in the shipments from South America of about two months and from China of about three months, so that the South American ores received in January and February were from the output of 1917, as were the Chinese ores arriving up to the end of March. Subtracting the ores from the two regions arriving during the first two and three months respectively of 1918, and adding the ores arriving during a like period in 1919, the quantity of ore controlled by the United States in 1918 was equivalent to 21,131 tons of concentrates carrying 60 per cent WO₃, amounting to 59 per cent of the world's production. These ores were all controlled through the private initiative of American firms, which offered better prices and better terms than could be obtained abroad. Probably a larger proportion could be handled in the future should interference not come from within our own borders. It is now proposed to put a tariff of \$10 a unit on tungsten ores, without regard to purity or quality, and a bill providing such an impost has passed the House of Representatives, with a correspondingly high tariff of \$1 a pound, plus the 15 per cent ad valorem duties now in force, on metal in any form—element, alloy, or salt. It is believed by its advocates that the price, now about \$7 a unit in New York, will be raised to \$17 a unit.

Hereafter the quantities of tungsten ore handled will be much smaller than during 1916, 1917, and 1918, and will be confined to peace-time needs, un-

less an unforeseen war should occur. England has at present two years' supply on hand, according to government estimates. France is probably equally well supplied. The United States presumably has on hand an equivalent of 8,000 tons of ore carrying 60 per cent WO₃. Tool-steel makers have figured on a consumption of 7,500 tons during the current year, but, as shown by the lack of market for ore, this is undoubtedly much too high, and probably 4,000 tons is amply large, so that there will likely be little if any market for new supplies for nearly two years, except as ore may be bought speculatively. During this time, mines everywhere must close and remain so until a demand again arises, except for the number required to furnish the tungsten to be taken by Germany, Austria, and Russia, and the small quantity required by Sweden, Norway, and Italy.

If Germany, Austria, and Russia recover economically, so that they can buy and use tungsten, Germany will have regained, in the ores that will be eagerly offered by producing nations needing a market, a part of the trade she has lost. Traders of England, France, and the United States will be glad to sell tungsten and ferrotungsten, but Germany will undoubtedly reach out for raw material in order that she may make as much use as possible of her abundant unemployed labor. Should a tariff law like that now proposed be passed, the United States will have cut off its foreign supplies and will have ended its control of any considerable part of them. However, should a high price be maintained, artificially or otherwise, the development of other alloy steels for use in multiple-edged tools may have reached a point where not so much tungsten will be needed.

German Control

Germany has had no considerable tungsten deposits at home and none in the foreign territory which she held, but her control of the tungsten trade through business alliances covered in 1913 about two-thirds of the entire tungsten-ore output. In that year, according to the German official figures, 5,295 short tons of tungsten ores were imported. Most of this probably carried 65 per cent or more WO₃, equivalent to, say, 5,736 tons of concentrates carrying 60 per cent WO₃. Adding the 106 tons of Saxon concentrates produced in that year, it is apparent that Germany treated a total of approximately 5,840 tons out of a world's output of 8,864 tons, or about 66 per cent of the total. The United States in the same year produced 1,537 tons and imported 449 tons of unknown content, but the whole was probably equivalent to more than 2,000 tons of ore carrying 60 per cent WO₃, leaving only about 1,000 tons for other countries, most of which seems to have been treated in France. This trade Germany lost when, with Austria, she started the Great War, and control shifted to England and the United States. With the cutting off of all shipments by ocean to Germany, most of the foreign ores were denied to her, but undoubtedly small quantities leaked in through Sweden and Norway for a considerable time after the beginning of the war. The small output of Austria was always available, but it is said that a

considerable amount of ore was smuggled over the border of Portugal into Spain, thence by water to the western frontier of Italy, into Switzerland, and from there shipped direct to Germany. A large part of the Spanish production is said to have reached Germany in this way also, and the "crippled" submarines which landed at Spanish ports are reported to have carried out cargoes of tungsten for Germany.

In the Allied countries and the United States, the German interests were taken over by the respective governments, but in South America, German firms still hold some control of tungsten-bearing properties. In Bolivia four German firms are said to have an output of about 600 metric tons of ore per year. In Peru what is said to be the larger part of the tungsten deposits have been controlled by firms thought to be German, E. y W. Hardt and Carlos W. Weiss y Cia. In Argentina the Hansa Mining Co., a German company, is the principal producer, and is said to have an output of about 500 tons of concentrates a year. Even this firm's output is said to have come to the United States during the war. If the United States is placed under the prohibitive tariff passed by the House of Representatives, German control of the world's tungsten trade may be in large part easily recovered.

What Control Means in the United States

In good business years before the Great War, the United States used an equivalent of 3,000 to 4,000 short tons of concentrates carrying 60 per cent WO_3 per annum. When the war began, there was a lull while the attacked countries caught their breath and prepared for a long struggle. After plans had been made, and the manufacture of munitions began on a great scale, the demand for tungsten ores rose enormously. All kinds of ores were taken at fabulous prices. Ores carrying tin, phosphorus, sulphur and bismuth, that before would not have been considered by steel makers, were bought with avidity, and there was a great scramble for deposits. In October, 1918, the United States was using tungsten ores at the rate of 20,000 tons per annum. Meanwhile, prospecting had uncovered so many new deposits, and they were so actively exploited, that great stocks of ore were accumulated in the Entente countries. On the other hand, in this country many of the known deposits showed signs of impoverishment, a number which gave a profitable production for a short time became wholly imperative, and it is likely that some of the deposits that have seemed to be the richest will never again produce largely. Among the new discoveries were the contact metamorphic deposits of the Great Basin—California, Nevada, and northeastern Utah. They were partly developed, and several promise well, but the irregularity of contact metamorphic ore deposits is notorious.

In 1916, under prices ranging from \$15 to \$93.50 per unit, the United States produced 5,969 tons of concentrates; in 1917, while still under the impetus of the 1916 boom and prices ranging about \$25 per unit, 6,144 tons; and in 1918, still under a price averaging about \$25 per unit, 5,041 tons, though

little was produced in December. Under a price of \$17 per unit, which tariff advocates think can be reached by means of a tariff of \$10 per unit, it seems improbable that the United States can depend on a production of more than 3,000 tons a year for the next three years. There are, of course, possibilities of larger production, and there are equal possibilities that it would not be so large. Should another great war takes place and, in the belief of many, this does not seem beyond the range of imagination, instead of gradually working up to such a consumption, the United States would probably begin by using tungsten at the rate of 20,000 tons of concentrates per annum. Unless the price were even more extravagant than the highest price in 1916, \$93.50 per unit, the United States would not produce half of its needed concentrates, and the time required to reach that output would be far too long for safety. Of course, such a production would be much better than none, but the United States should, for safety, have within reach at least a year's supply.

The Pacific, around the borders of which are the largest tungsten deposits, is by many looked upon as the next theatre of war, and, however vitally needed, it might not be possible to get supplies of tungsten ores, owing to the blocking of trade routes. It would, therefore, seem vastly better that, instead of putting a premium on the quick depletion of our own already too meager supplies, we should use the rich low-priced ores now being produced in the Orient. These cheap ores we may have in trade for the asking, and it would be one of the best forms of national life insurance were the government to store 10,000 tons of these ores while they may be had.

The argument is often made that by putting a high tariff on tungsten ores we would have our own deposits developed so that quick production could be made when needed; also that with the need we would find more ores. Both arguments are specious. What is meant is not development but removal. No one will open up a tungsten mine to let the ores stand against the country's day of need. The finding of new ores is a probability, but the quantity is wholly a question. Few tungsten mines of the United States can be profitably operated at the present price of less than \$7 per unit, and the mines are now closed. The number of persons dependent on the mining of American tungsten ores is small, probably less than 900 in peace times. At present most tungsten miners have already obtained other-employment, and practically all could obtain employment fully as profitably in other mines, many of which are short handed, so that no great hardship would be worked, though the inconvenience of moving a family must be recognized. As a matter of national economy, the United States cannot afford to throw away its chance to buy cheap tungsten ores while they are available. Aside from the question of national life insurance as meaning a guarantee of mere existence, not to buy South American ores is to throw away South American trade. In a degree this is also true of Chinese and Japanese ores.

Metallurgy of Tungsten

The metallurgy of tungsten, like that of other metals, is being improved constantly, and should our ores remain in the ground for a time they will be of greater absolute value when mined, because they can be utilized to better advantage, for there will be less waste in conversion. If our ores are mined now under an artificially high price, we will always pay a high price for tungsten ores, for when ours are used the ores in other countries will have diminished in quantity and increased in cost, and therefore become higher in price, and we must buy at the advanced rate. On the other hand, by holding our markets open to cheap ores from any quarter, we will stand on an equal footing with other countries and will always have a reserve of high-priced ores to fall back on when necessary.

There is but one crop of ore. To turn over deliberately all the cheap tungsten ores of the world to our competitors, allowing them this advantage in making high-speed steels with which to compete in foreign trade with our steels and with all products on and in which they are used; to put a premium on the early depletion of our own deposits, leaving us without resources of this indispensable material for peace and war; and to compel our use always of high-priced ores would be economic crimes.

Copper Producers Hope for an Early Improvement in Market Conditions

There are many influences at work at the present that are affecting the copper producers in the United States, both directly and indirectly, and which they are endeavoring to surmount, according to an October report on copper by Eddingfield and Wormser, issued by the Bureau of Mines. The industry's own labor troubles, the effect of the steel and coal strikes, the vicissitudes of other metal markets, and the outlook for copper itself all bear upon the situation. The large unsold stock of copper in the United States, estimated in some quarters at half a million tons, represents a reserve accumulation that can be marketed if necessary. During a session held a few weeks ago, the International Trade Conference echoed the impression felt in this country that the European nations are in need of large quantities of copper.

It is reasonable to suppose that producers prefer to continue at their present output rather than increase the cost of their copper by turning out a smaller amount of metal each month. Until the market improves, little increase in production is to be looked for.

The Utah Copper Company is milling 17,000 tons per day, about half its normal output. In Michigan, where the output is about 75 per cent of normal, it is not expected that production will return to normal until the Central Powers become a factor in the market. The Michigan copper country fortunately lays in a store of coal in the summer sufficient to carry operations through the winter, and hence will not be affected by the coal strike as seri-

ously as some other districts. Michigan formerly sent most of its copper to Germany.

The order of the Railroad Administration requiring the metal mines to use closed cars, to leave the open cars available for coal and sugar-beets, if carried out, will not tend to help production, for a number of the metal mines are not equipped to load into closed cars, and it would be difficult for the smelters to unload sufficient ore to run at normal capacity.

World-Wide Demand for Iron and Steel Expected to Continue for Some Time

The demand for iron and steel products in this country and abroad should tax the capacity of all the steel plants for an extended period of time, according to the October report of Investigation issued by the Bureau of Mines. The greatest domestic demand for steel comes from the railroads, the oil industry, the manufacturers of automobiles and agricultural implements, and for use in construction work. Foreign business, as a consequence, will be subject to rather indefinite future delivery, and thus the rehabilitation of foreign countries affected by the war will in a great measure be dependent on the resources of Continental mills.

Germany, being stripped of her largest iron-ore reserves, is prospecting for new iron deposits within her own borders. The Idarwald, near Coblenz, is a field in which exploration has recently been taking place. Although the deposits have long been known, it was not considered feasible to exploit them while the more profitable Lorraine fields were available.

The Swedish iron industry, according to "Commerce Reports," during the first half of 1919, has been operating under adverse circumstances. This is due mainly to industrial difficulties and sales in the British market of government stocks which accumulated during the war. The exports of pig iron during the second quarter of 1919 were only 23,100 tons, against 54,900 during the same period in 1918.

Tungsten Imports

The following table gives the imports of tungsten-bearing ore into the United States in 1917, 1918, and the first seven months of 1919, as reported by the U. S. Department of Commerce:

Country or Origin	Long tons 1917	Long tons 1918	Long tons Jan.-July 1919
Portugal	107	24	.....
Argentina	192	479	65
Chile	1,723	1,116	387
Peru	1,071	1,631	299
Japan	538	1,215	515
Other Countries	726	5,897	3,296
Total.....	4,357	10,362	4,472

Coarse Ore Weighs More Than Fine Ore of the same composition. Sometimes it is thought that the opposite is true, on account of the comparatively large size of the voids which occur in a pile of coarse ore, but the larger number of voids in a mass of fine particles more than compensates for their small individual volume. Often, however, the fine ore contains more mineral, and is heavier on that account.

Rand Ore Reserves

A Complete Analysis, Made Upon the Basis of Present Economic Conditions, Showing the Decrease in Tonnage on Account of Higher Working Costs Eliminating the Low-Grade Ore.

BY A. COOPER KEY
Johannesburg, South Africa

THE gradual though insistent advance in the rate of working costs of the Rand gold mines has led to the elimination from ore reserve estimates of considerable tonnages of rock which under earlier normal conditions were considered to be commercial. From the pre-war figure of 17s. per ton, the rate advanced last year to 21s. 7d., and in March, 1919, the average was 22s. 6d. To put it another way, the rise is equivalent to 1¼ dwt. When it is stated that 40 per cent of the aggregate ore reserve has a value of 6½ dwt. or under, the incidence of such a rise, equivalent to a fifth of the value stated, will be apparent. Besides this economic elimination of tonnage, some of the older mines are completely opened up, and little ground remaining to be explored, there has been considerable encroachment into the reserves previously accumulated. Some of the tonnage now excluded will automatically re-enter as costs recede. Whether they will ever come back to the 1913-14 level is extremely doubtful, in view of the increased rate of wage of the white workers (there has so far been no advance in wages paid to the unskilled native workers) and, what is a far more serious item, the enhanced prices of all necessary stores.

A Classification of 89,250,000 Tons

Analysis of the figures for about fifty mines shows an aggregate of 89,300,000 tons as at December, 1918, which compares with 95,700,000 tons for the same companies the previous year, and 102,000,000 tons at the end of 1916. Values are assigned to the whole of this tonnage, except in respect of 322,000 tons at Robinson, the historic mine of the Rand, now fast approaching exhaustion. With the exception of rather less than 1,500,000 tons at the Cinderella Deep, which has been closed down for some years, and the Modder East, the figures apply to producing mines.

The ore reserves may be classified thus:

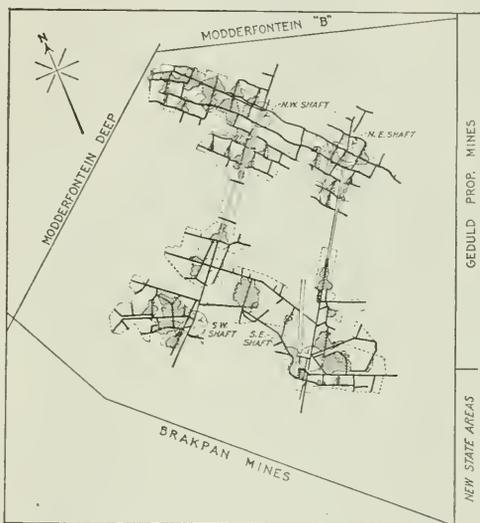
Companies	Tons	Value, Dwt.
1	1,882,000	Below 5
15	15,780,600	Between 5 and 6
10	17,932,500	Between 6 and 6½
6	10,171,800	Between 6½ and 7
5	5,157,400	Between 7 and 7½
3	10,725,500	Between 7½ and 8
1	605,000	Between 8 and 8½
4	17,613,000	Between 8½ and 9
2	5,746,000	Between 9 and 9½
1	3,378,700	Between 9½ and 10
2	891,500	Over 10

It will be seen from the table that about 35,500,000 tons (representing about 40 per cent of the whole) has a value of less than 6½ dwt. per ton, or an actual value of 27s. 6d. per ton, without allowing for mining and metallurgical losses. Putting these at 10 per cent as a rough average, it is evident that there is a small margin with costs in the neighborhood of 22s. 6d. Going up 1 dwt. in the classification, there are

39,000,000 tons valued at over 7½ dwt. Of this, 27,500,000 (as valued at over 8½ dwt.) can rightly be considered as high grade.

Higher Values Caused by Eliminating Low-Grade Ore

The shutting out of low-grade tonnage has, automatically and mathematically, had the general effect of increasing the value assigned to ore of commercial grade. But there are exceptions to this, as the values at Brakpan and Springs have each dropped by ½ dwt. and at the Van Ryn (where, in addition, a



THE GOVERNMENT GOLD MINING AREAS (MODDERFONTEIN) CONSOLIDATED LTD.

Areas stoped out are shaded. The ore reserves are indicated within the dotted lines.

more stringent safety factor has been employed) by practically a pennyweight.

In one or two instances improved values are in evidence, and, as this applies to the whole tonnage developed, both in the past and currently, it means that the latter has been exceptionally favorable. A case in point is that of the City Deep, the most important mine in the vicinity of Johannesburg, where the value of the whole reserve has increased from 9 to 9.6 dwt. That improvement is in respect of no less than 3,350,000 tons. The advance is owing to the fact that the previous estimate, including ore conservatively valued pending further work, and now

found to be higher in value than anticipated, and the year's development (8,500 ft.) has exposed satisfactory values, namely 19 dwt., over 28 in. Even more striking is the rise of $\frac{1}{2}$ dwt. in the assessed value of the 9,500,000 tons at the Government Gold Mining Areas. Here 23,600 ft. of development was accomplished, of which 17,250 was commercial grade, showing 16 dwt. over 43 in.

One Mine Showed Over 15 Dwt.

The Meyer & Charlton stands in a category of its own, the single representative on the Rand proper of a mine showing more than 10 dwt. (though there is also the Sub-Nigel, at Heidelberg, giving just over that value). The ore reserve value is now slightly under 16 dwt., instead of just over $17\frac{1}{2}$ a year previous, but this is mainly owing to an increase of $4\frac{1}{2}$ in. in the stopping width assumed.

Government Areas' Huge Increase

The outstanding feature of the whole ore reserve position is the remarkable advance of nearly 2,500,000 tons shown by the Government Gold Mining Areas, besides the improvement of $\frac{1}{2}$ dwt. At the year end it had 9,500,000 tons "in sight," valued at 8 dwt., over a stope width of 78 in. In the March quarter a further 230,000 tons was added. The aggregate is now the largest on the Rand, exceeding that of the New Modderfontein, which had for some years held the premier position, with a huge ore reserve, by 445,000 tons. The increase achieved in the year would constitute in itself a handsome reserve. To particularize in respect of far-Eastern concerns, it approximates to the total of such important mines as Brakpan, Geduld, Van Ryn Deep, and Springs. Leaving out the New Modderfontein, whose reserve position, as stated, is practically as sound, the aggregate at Government Areas is as great as that of the next three largest mines of the Benoni district, namely Modder Deep, Modder B., and Brakpan Mines, combined.

A General Decrease at Central Western Mines

The decrease of 6,400,000 tons in respect of the same companies in each period is spread over about thirty-three companies. The drop has been general, inasmuch as the rise in costs has affected all companies without exception. The largest individual drop is in the case of the Randfontein Central, whose total is 4,254,000 tons, as against 5,185,000. Besides economic elimination, recurring strikes have prevented development being upon such a scale as might have been wished. Before the war the former control (the J. B. Robinson group) claimed a reserve of 8,665,000 tons. Fortunately, driving exposed a reef of consistent value, of good commercial grade even upon a cost figure which is 3s. 4d. per ton higher than that of four years ago.

The Crown Mines has decreased 700,000 tons, owing to shortage of development. The South reef, which was such a fine gold carrier in the Crown reef, is becoming patchy and losing its value at depth. Included in the 8,300,000 tons reserve are 3,275,000 tons on this reef, valued at only 5.6 dwt. over 64 in. With costs at the present level, the profit obtainable from ore of this value is either negligible or entirely absent. Almost as great a decrease in

tonnage is shown by the Nourse Mines; though expressed proportionately it is far greater, inasmuch as the reserve at the Crown Mines is four times as large. At the Robinson there is an apparent drop of 620,000 tons, of which, however, only 121,000 is in respect of the Main reef leader and South reef. A year ago a tentative figure of 500,000 tons main reef was included, but it is highly problematical if in these times and under existing conditions any considerable portion of this could be worked with profit.

Low-Grade Mines in Difficulty

As might have been expected, the low-grade mines of the Germiston district have had to reduce their ore reserve estimates, owing to economic elimination of tonnage. In the case of the Simmer & Jack—the first exponent on the Rand of the big-battery policy—the largest decrease was shown, namely 514,000 tons. In that of the Simmer Deep it was 418,000; in the Jupiter, 230,000. The former has been doing so badly of late that there is a probability of its having to close down. In this district, the Glencairn and Ginsberg have stopped milling, owing to the exhaustion of their mines, and the New Primrose's ore reserve has dwindled to 65,700 tons. Wit Deep's ore reserve has dropped from 1,383,000 to 953,500 tons. Only 111,000 tons was developed during the year, in contrast with 377,000 tons milled. Several blocks of ore have been excluded, owing to high working costs and to unsatisfactory disclosures made in them during the year.

Ore reserves at the East Rand Proprietary Mines, one of the great consolidations, have fallen by 465,000 tons, the total now being 2,250,000 tons "scattered over an enormous area; indeed, the whole of the mine workings," three and a half miles along the strike of the reef. It has been found impossible to proceed with the southern development scheme, and the policy of the company is to work out the existing reserves, which will enable milling to be continued during the greater part of next year. At Knights Deep, the decrease has been even greater, 574,000 tons.

Some Western Companies

In the West Rand, in addition to the Randfontein Central, already referred to, there are recorded decreases of over 300,000 tons in the fully developed ore reserve of that low-grade mine, the Roodepoort United. The Bantjes Consolidated has suspended crushing, and its reserves have been reduced to 95,000 tons, a drop of 375,000 tons. Adjacent, the Aurora West comes down from 400,000 to less than 250,000, in this case owing to the exclusion of several blocks of South reef ore. Another West Rand concern, the Luipaardsvlei Estate, decreased 150,000. In all these instances the declines are serious, as the companies, unlike those of the far East Rand, never possessed large ore reserves in the best of times.

Mines Nearing Exhaustion

A considerable number of mines opened in 1887 or thereabouts, at the time of the discovery of the Rand blanket deposits, are fast approaching exhaustion, and rapidly dwindling ore reserves are naturally to be expected. In this category we have the City &

Suburban and New Heriot. But for amalgamation, several of the earlier deep levels would be nearing the end. This represents the case of the Ferreira Deep, whose reserves dropped 375,000 tons last year. The company was formed in 1898, and will rather bear out the original idea of putting down plants with a twenty-year life, allowing for the hiatus of the Anglo-Boer War. The Van Ryn, another old company, shows a reduction of 385,000 tons, owing to higher working costs, to low values in one of the sections, and to the limited number of working faces available. Three other mines, the Wolhuter, Village Main Reef, and New Goch, have limited development faces, and show decreases of 215,000 tons in the case of the first named and of about 120,000 tons in the latter cases.

Some Other Far East Mines

Mines in the Far East tract, apart from the great advance shown by the Government Areas already referred to, show in the aggregate little change. Brakpan Mines figures are down by 550,000 tons, owing mainly to elimination of tonnage previously included, but which, as stoping progressed, proved to be below the commercial limit. It must not all be considered as definitely discarded. Springs Mines records a drop of 200,000 tons, in spite of an increase of 3 in. in stoping width.

An estimate made by Mr. Davis, who has succeeded Mr. Knecht as consulting engineer, confirmed the figures, but revealed the important fact that 1,117,000 tons was not available for stoping. Of this, 65,000 tons was in shaft pillars and 325,000 tons in haulage pillars. The remainder of 727,000 tons comprises blocks which will become available on the completion of subsidiary development or as stoping in contiguous areas progresses. It is the practice of the Central Mining-Rand Mines Group to state the block ore comprised in safety pillars, and some other companies mention ore partially developed, but it is usually an insignificant portion of the whole. The Geduld mine reveals an increase of over 300,000 tons in the ore reserve, Van Ryn Deep one of nearly 200,000 tons, and Modder Deep—the two latter among the most prosperous mines of the Rand—one of 130,000 tons.

The Village Deep forms a gratifying exception to the general run of decreases in bulk reserve. No less than 1,160,000 tons was developed during the year (practically double the quantity crushed). This is partly explained owing to the fact that the company secured rights from the government under Springfield Extension permitting ore partly developed to be transferred to the definite reserve. Unfortunately, it is accompanied by a decrease in value.

New Method of Determining Chromium

A new method of determining chromium is described by Terni and Malaguti in Gazz. Chim. Ital., 1919, 49, I., pp. 251-256, abstracted in Jour. Soc. Chem. Ind., Sept. 15, 1919. A solution of a chromic salt is boiled with 20 c.c. of nitric acid (sp. gr. 1.4)

and about 1 gm. of lead dioxide until reduced to a few c.c. of water, and treated with sufficient sodium hydroxide solution (25 to 30 per cent) to redissolve the precipitate of lead chromate. The solution is heated nearly to boiling and filtered, and the residue washed with boiling water rendered slightly alkaline with sodium hydroxide. The filtrate is diluted to 150—200 c.c., and treated with nitric acid (sp. gr. 1.2), free from nitrous acid, until the lead chromate has dissolved, when a further 25 c.c. of the same acid is added. The solution is treated with 5—10 c.c. of 10 per cent potassium iodide solution, and the liberated iodine is titrated with a solution of sodium thiosulphate (about 25 gm. per litre), which has been standardized against N/10 potassium bichromate solution in the presence of 25 c.c. of nitric acid (sp. gr. 1.2). The method is applicable in the presence of iron, manganese, and aluminum.

Head-Box Capacity in Hydro-Electric Mine Power Plant

In hydro-electric mine power plants, the importance of having a large surplus supply of water in the head-box supplying the penstock is sometimes overlooked. Under normal operating conditions this surplus water is used to overcome peak loads that overload the power plant from 10 to 25 per cent. If the overload covers only a short period, one-half a minute to two minutes, or even a longer time, this surplus capacity will prevent drawing down the head of water in the penstock, with consequent loss of considerable head and a sharp, continuing drop in power output. If an excess of water is flowing into the head-box, a peak load operates merely to reduce the excess flow. The following table indicates the quantity of water per minute for 100 brake hp. or 125 water hp.:

Head Water in Cu. Ft. per min.	QUANTITY OF WATER PER MINUTE PER 100 BRAKE HORSEPOWER (80 PER CENT EFFICIENCY)						
	30	40	50	60	75	100	200
	2,210	1,650	1,320	1,100	880	660	440
	330	240	192	165	132	99	66

Under low water conditions this surplus capacity of the head-box is especially important, for an overload may empty the head-box and penstock, necessitating a shutdown of the turbine. The best way of providing for the surplus capacity will be determined largely by the topographic conditions in the immediate vicinity of the head-box. The upper part of the head-box should provide for the surplus capacity. This is best obtained by making it as wide as possible, and, with this as one limiting dimension, to increase the length sufficient to provide an excess of water that will carry the maximum overload. The surplus capacity portion of the head-box should be as wide and as shallow as possible, so as to supply the excess volume of water with little loss of head.

Transvaal Gold Production in September, 1919, amounted to 698,558 fine oz., according to report by the Transvaal Chamber of Mines. This was a decrease of 8,111 oz., compared with August. Total for the first nine months of this year is 6,273,208 fine oz., compared with 6,440,949 fine oz. in the corresponding period last year.

Mine Accidents

English Speaking vs. Non-English Speaking Employees—Conditions that Retard Americanization of the Foreign-Born Worker—Importance of Adapting the Immigrant to His New Environment

BY ALBERT H. FAY,
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THE employment of non-English speaking labor in American mines has been brought about by reason of the rapid expansion of the mining industry, beginning in the early 80's. The Americanization of this great body of labor, and its relation to accidents in the mining industry, are two problems of prime importance—the first as affecting citizenship and the growth of this Republic, and the second as an economic problem in mining costs. The former exerts an influence upon the latter, for the former implies education, social welfare, civic pride, and a general uplift to the ideals for which America stands. Ignorance, dirty and filthy living conditions, ill-health, disregard for law and order, discontent, and lack of civic interest lead to indifference and carelessness, perhaps the greatest of all accident causes. Eliminate carelessness and at least 50 per cent of the accidents will disappear from industries.

Immigration to American Mines

During the decade previous to the year 1880 (as well as in earlier years), the greater part of the employees in the coal and metal mines were Americans or representatives of the English, Scotch, Welsh, German, and Irish races.¹ The majority of the men of foreign birth had been in this country for some years previous to the great expansion of the mining industry which began about this time. English speaking miners continued to immigrate, and to find employment in the mines in large numbers, until about 1890. Since that year comparatively few immigrants from Germany and Great Britain have entered this industry, although Swedes and other Scandinavians have been constantly employed since the early 80's.

The employment, in the mining industry, of immigrants from southern and eastern Europe began about 1880. The Slovaks were the first arrivals, and immigrated in considerable numbers. They were followed within a year or two years by a few Magyars, and the number of immigrants of this race gradually increased each year. The Polish immigrants began to come about 1890, although individual members of the race had been coming for a period of nine or ten years. After the year 1890 Poles and Slovaks arrived in great numbers. A few Italians were employed before the year 1895, but the immigration of this race did not begin upon a large scale until about 1900. They were at first engaged in railroad construction and maintenance-of-way work, and gradually drifted into the mines.

¹Many of the statistics given herein are from "Immigrants in Industries," a report of the Immigration Commission, 1911, Senate Document No. 663, 61st Congress, 2d Session; Vols. 6, 7, and 16.

Croatians were employed in some districts before 1890, and Serbians began to arrive in small numbers in the early 90's. The great bulk of all the immigration from southern and eastern Europe, however, has occurred within the last eighteen years. Russians, Bulgarians, Rumanians, Ruthenians, Syrians, Armenians, Macedonians, Croatians, Serbians, as well as Poles, Magyars, Slovaks, and Italians, have been among the recent arrivals. The races of southern and eastern Europe continued, up to the time of the war, to find employment in the mines in increasing numbers in almost every important mining district in the Eastern states and the Lake district. Many of these recent immigrants have found their way to the Central and Western states. As a result of the rapid expansion of the mining industry, many mining communities have been founded, the population of which are largely made up of immigrants who have arrived during recent years.

The pioneer American, English, Irish, German, Scotch, and Welsh miners are thus outnumbered and their positions filled by the more recent immigrants. It is not difficult to account for this racial change, which is still going on. The former operatives and their descendants had opportunities to secure more congenial and safer work in other industries. Many of them advanced in the industrial scale, becoming foremen and attaining other responsible positions. A large number have abandoned the occupation of miner for positions as day or shift men. Many also migrated and established themselves in the Middle West and Western states.

A considerable number of the former miners who left the industry entirely because of change in mining methods or the employment of immigrants entered mercantile, clerical, mechanical, or more pleasant work of other kinds. Many of the business and professional men in the mining towns were formerly mine workers. Their places were filled without difficulty with recent immigrants, who were content with the wages and working conditions which prevailed in the mines. The wages paid in American mines seem very attractive to the recent arrivals of agricultural laborers from southern Europe.

Failure of Native Born to Enter the Industry

Another noteworthy tendency is seen in the fact that the racial displacement has occurred not only through the departure from the industry of the former employees, but also through the refusal of their children to enter the industry and the attitude of the parents themselves, who frequently discourage them. Of the total native born, of fathers who were miners, a large percentage enter occupations other than mining. The conclusion from the

limited data, therefore, seems to be that though the foreign-born males of more than sixteen years of age, whenever employed, work in the mines, the persons native born of native father, together with the second-generation immigrants, are entering the mines only to a limited extent. This inference bears out in a large measure the experience of the mine operators, who state that the native born and the second-generation immigrants are not entering the mines in the same numbers as formerly and that the industry is receiving a constantly decreasing number of employees of these classes.

There exists a prejudice against recent immigrants, which also operates to an important extent in the displacement of former employees. Many Americans, English, Germans, Scotch, Irish, and Welsh did not and do not desire to be associated in the mines with the recent immigrant, and the feeling has become prevalent that a sort of reproach attaches to an intimate working relation with the foreigner. The races of former immigration have, therefore, left the industry and have entered other work, which, they feel is more dignified and congenial.

The relatively small number of American miners who remain in the industry must work side by side with the recent immigrant. To a greater or less degree the standard of safety in the mine is set by the demands of the ignorant and inexperienced immigrant, not by the more intelligent American, and the standard of life is decided to a large extent by those conditions which will be accepted by the same recent immigrant. In short, to work in the coal-mining industry, the American must compete with the recent immigrant, who, as a rule, is not particular as to the living and working conditions. These conditions, however, are in most cases far better than in factory towns where congestion prevails.

Another effect of recent immigration from central and southern Europe has been the preventing of the English, Irish, Scotch, and German immigrant from entering the mining industry. As already noted, these western European races were coming to the industry in large numbers prior to the early 80's, but began to decline toward the end of the decade and practically stopped about 1893 or 1894. There can be no question that the immigration of the Slovaks, Poles, Magyars, and other races operated to prevent the further coming of these older immigrants to the industry, precisely as it operated to drive out of the industry those already employed, together with the native Americans. There is, therefore, no incentive for the English or German miner to migrate to the mining regions and compete with the Slovaks, Croatians, Italians, and other foreign laborers.

Citizenship

A point of general interest is the tendency on the part of the different races of foreign birth working in the mining industry to acquire citizenship, and their general interest in public and civic affairs. The recent immigrant manifests little real or intelligent civic interest. This may be ascribed to his igno-

rance of our political methods, his inability to read or speak English, the social and political aloofness of these races in the more or less remote mining villages, and a desire to avoid taxation. Those who reside in or near the cities seem to exhibit more interest than do those of the isolated communities. It seems that the Bohemians and Moravians, 94 per cent of whom can read some language, take a much more active part in civic affairs than any other race of recent immigration in the bituminous districts of Pennsylvania. Among the other Slavic races, the Slovaks (82 per cent read) and Poles (77 per cent read) lead in this regard, whereas the Croatians (67 per cent read) make the poorest showing. It is almost the universal statement that this latter race shows little civic interest and that few become naturalized.

The Italians (81 per cent read), both North and South, are more active than the Slavic races in their efforts to become citizens, and appear to take a more active part in civic affairs. In cases where there seems to be encouraging civic activity it is nearly always due, not to their own intelligent efforts to attain citizenship and exercise its privileges, but to the influence of interested politicians, who in many cases may be leaders of their own race; for example, an intelligent banker and steamship ticket agent. It seems true of all the later immigrating races that they take far less interest in civic affairs than did the German (97 per cent read) and English (98.5 per cent read) immigrants.

The foreigner should be taught that the laws of America were made to protect, and not harass, every good citizen, rich and poor alike, and it is the duty of well-informed Americans to make this understood. If well-meaning foreigners, the making of good citizens, are left entirely to their own devices, they fall an easy prey to the designing I. W. W. and the Bolsheviks. Somebody who understands their language fully, and in whom they have confidence, should explain to them that they are being deceived so long as they listen to anti-American propaganda.

Church and the Immigrant

The church association between the native Americans and the southern and eastern European immigrants is limited. The general attitude of the native churches toward the immigrants is one of indifference, and there is a strong inclination in many communities to shun association with the immigrant in church activities. In many cases where missionary efforts are made by native churches of any denomination, services for the immigrants are held in barns, stores, or other unattractive places, thereby lessening the interest in them. The races from the southern European countries, which compose a large portion of the mining population, have been reared where there is no social caste in religious organizations, and have worshipped in buildings which are unsurpassed in beauty and grandeur the world over. When these people are offered services held in stores, barns, and similar buildings, their interest in the services naturally is slight, and they become indifferent. Lack of interest in church

affairs tends to decrease activities in civic matters. The church and its allied organizations can be an important agent in teaching immigrants the rudiments of the English language and pointing out to them their duties as American citizens.

Lack of Mining Experience on the Part of Recent Immigrants

Men of the races of the old immigration (western Europe) have been employed in the mines of the United States for many years. As a result of their experience, both in this country and abroad, they are far better qualified as miners than are the southern and southeastern Europeans. The older immigrants speak English, either as their native tongue, or, as in the case of the Germans and Scandinavians, because of long residence in this country. They may be treated in almost every respect upon the same basis as the American miners.

The employees of recent immigration, on the other hand, have been in the United States for so short a period that, even though it be assumed that they have been employed in mining ever since their arrival, they must have had only a brief experience at most in the mines of this country. The data further show that few of their number had mining experience abroad. Over 80 per cent of the Scotch and English miners had mining experience in their native country before entering the American mines, whereas of the south Italians and Croatians, less than 5 per cent have had mining experience. Most of the latter were farm laborers in their native countries. Upon coming to the United States they decided to follow the occupation of mining because the work was better paid than any other obtainable, although many of them had been here only a few months and many more only a year or two years. Under these circumstances it is not surprising that they know little or nothing of rock formations, of fire damp, of the properties of coal dust, and of the handling of explosives,—matters about which every coal miner should be thoroughly informed. To determine whether a piece of slate or roof is or is not likely to fall, often requires a considerable degree of experience, and the majority of the Slavs, Magyars, and Italians have not this experience.

Immigration in Its Relation to Mining Accidents

The mines are presumably less safe than they would be with native American, English, Irish, Scotch, Welsh, or German labor, because recent immigrants often accept more dangerous working conditions than the first-named employees. Furthermore, the later immigrants are ignorant and untrained, and are a source of danger to themselves and to the other workmen. Among the older mine workers the feeling is strong that the employment of non-English speaking races has complicated the problem of safety in the mines. They assert that carelessness on the part of recent immigrants, and the ignorance of those who are suspected of having obtained their places without having had the required experience as miners, have tended to render the mines less safe, and thus to increase accidents.

A large proportion of the deaths and injuries reported for the coal mines of the United States occur among the non-English speaking miners. The employees consisting of the races of southern and eastern Europe, having had little experience in mining either in this country or abroad, are particularly liable to accidents, and as the responsibility for accidents rests in many cases with the men injured, to state that they are particularly liable to accidents is in effect to say that they are responsible for a considerable proportion of all the accidents occurring in the mines.

The mine accidents for which the workmen are themselves responsible fall naturally into two classes—those caused by carelessness and those due to ignorance. As regards the first of these, it is probable that the foreigner is no greater offender than the person of native birth. Many of the Americans and other English speaking miners are undoubtedly reckless, and a large proportion of all the accidents occurring among their number seems to be attributable to this cause. Grave risks are often incurred for the sake of avoiding a little extra labor. Props are left unplaced, open lamps are used instead of closed lamps, cars are driven in a careless manner, explosives are handled recklessly—all in defiance of the most elementary rules prepared by men of long experience in the industry.

Among the recent immigrants, on the other hand, many of the accidents are unquestionably due to ignorance, for by reason of their lack of experience, they do not see nor realize the dangers that confront them; nor do they readily comprehend the necessary precautions that must be taken to make their working places safe.

Lack of experience in the mines has a marked effect upon the high accident rate, as indicated by a study of accidents among the immigrants whose experience in mines, before coming to this country, was known. The fatal, serious, and non-fatal injury rates in the coal mines of Pennsylvania and West Virginia are approximately 14.5 per 1,000, for those of whom 10 per cent had mining experience prior to coming to the United States. The accident rate for those of whom 10 to 20 per cent had mining experience is about 12 per 1,000, showing a rapid decrease as mining experience increases. It would seem from this though their experience is limited, these immigrants soon gain sufficient knowledge to use a certain amount of caution, thus giving a decline in accident rate.

Carelessness of Experienced Miners

As contrasted with the decrease in accident rates among those of whom 5 to 30 per cent have had mining experience, the accident rate based on similar data for those of whom 50 to 60 per cent have had mining experience prior to coming to this country is 10.5, whereas the rate is 12 for those of whom 80 to 90 per cent have had experience in the mines—a marked increase with the extra experience. This is due largely to the tendency of those with considerable experience to become more or less careless or reckless and to think that they can slight certain

features of work without an accident. A new man entering the mine would not consider for a moment crimping a cap with his teeth, whereas many of the men who have been in the mines for eight to ten years would not hesitate and do not hesitate to crimp caps with their teeth. Other instances of carelessness might be cited. The available data, therefore, seem to indicate that inexperience is responsible for many accidents, and that a little experience begets much caution on the part of the recent or new employee. As indicated, there is thus a tendency toward a rapid reduction in accident rates to a point where between 30 to 40 per cent of the employees have had mining experience. Beyond this percentage, caution wanes and is replaced by carelessness, with a resultant increase in accidents. The green miner may be over-cautious, but he lacks experience. The seasoned miner has the experience, but too often caution is replaced by carelessness. Caution combined with experience will go far toward accident reduction.

Another element of danger is contributed by the fact that few of the recent immigrants speak or understand English, and almost none are able to read or write the English language, and placards of warning do not reach them. It is probable that the instructions of the mine bosses and inspectors are, because of this fact, frequently misunderstood. An inspector, for example, tells an immigrant miner, in English, of course, that his roof needs propping. The miner seems to understand, but does not, and a fall results.

In some mines printed signs are used to indicate the presence of gas or other peril. These signs are quite unintelligible to most of the foreigners. A common language is absolutely necessary in every safety-first campaign. Accident rates are much lower in England, France, Belgium, Germany, Austria, and Japan than in the United States. In these countries but few foreigners are employed, a common language being used in each country. The difference in fatality rates cannot be entirely attributed to the lack of mixed languages, but certainly a large percentage of the accident reduction may be attributed to the "common language" mines.

A comparison of accident rates with the ability of the miner to read some language or to speak the English language shows that the ability to read, although it may not be English, has a greater influence on accident reduction than the ability to speak English. This may be accounted for by the fact that ability to read develops a higher degree of intelligence and places the employee in a better position to realize dangers more readily than one who cannot read. Furthermore, if he is able to read, he is more likely to heed danger signs put up in certain places.

The recent immigrant, because of his lack of experience, his inability to speak English, and his keenness for earning money, is often willing to work in places where more experienced or more intelligent men would refuse to work. For the same reasons he

will frequently be satisfied with and accept mine equipment too defective for safety.

Comparative figures by occupations, based on the payroll of ten typical coal mining companies in Pennsylvania, show that about 33 per cent of the English speaking employees are employed as pick miners, as compared with about 52 per cent for the southeastern Europeans. As a matter of fact, from trackman to loader, the English speaking employees represent about 61 per cent of the total, as compared with 82 per cent for the southeastern Europeans. These figures, therefore, indicate that the non-English speaking foreigner is employed in the most hazardous of the mine occupations; hence one reason for the higher accident rate.

Accidents by Nationality, in Pennsylvania and West Virginia

In the Pennsylvania anthracite mines 43 per cent of the employees are English speaking, and this number is charged with only 28.8 per cent of the fatalities, whereas the other 56 per cent (representatives of Continental Europe) sustained 71 per cent of the fatalities. Likewise in the Pennsylvania bituminous mines the English speaking employees represent 35 per cent of the total and are charged with 27 per cent of the fatalities, whereas the other 65 per cent (representatives of Continental Europe) are charged with 73 per cent of the fatalities. As regards the figures for West Virginia, the English speaking employees represent 67 per cent, and, notwithstanding the fact that this includes 17 per cent of colored employees, only 53 per cent of the fatalities are charged to the English speaking employees, whereas the other 33 per cent sustained 47 per cent of the fatalities. Almost the same ratio holds for non-fatal injuries in the three groups of mines cited.

Had the fatality and injury rate for the English speaking American been maintained throughout the three groups of mines, there would have been a saving of 716 fatalities and 900 serious injuries, a strong argument for Americanization and education of the miner.

The Permeability of Zinc Retorts

Experiments on the permeability of zinc retorts, reported in an article in *Metal and Erz*, Vol. 16, pp. 323-326, and abstracted in the "Journal of the Society of Chemical Industry," showed that with increasing pressure in the retort less gas flows out of the condenser, and not only the amount but the nitrogen content of the retort gases decreases. Using a new retort and diminishing the pressure in the furnace, the permeability decreases toward a minimum value, with increasing density of the walls of the retort, due to shrinkage and to formation of a skin of silicate. Penetration of certain components of the gases of combustion leads to the formation of larger quantities of zinc dust, which tends to stop up the muffle and condenser, and the increase in pressure in the distillation apparatus inducing diffusion of the gases of reduction into the combustion chamber causes greater metal loss.

The Use of Naphthylamin and Xylidin in Flotation

Improved Recoveries and a More Easily Dewatered Concentrate Result From Substitution of These Chemicals for Oil in Several Western Mills No Special Apparatus¹
Required—Crude Compound Is Known as X-Cake

BY EDWARD H. ROBBIE

THE study of the agents used to secure a mineral-bearing froth forms one of the most interesting branches of the technology of the flotation process. In the vast amount of experimental work that has been done in flotation, more attention has been given to this subject than to any other, for every investigator has been anxious to find the one oil, or whatever it may be, that will give the best results. Two general classes of substances have been demonstrated to possess the widest field of usefulness in practice. One of these, the coal and petroleum distillates, has been found to be suitable as "collecting oil" to coat the sulphide particles. The other class consists of the volatile constituents obtained in wood distillation. These substances, agitated with ore pulp, form a foam or froth in which the "oiled" mineral particles are carried upward.

Some years ago Colonel William Boyce Thompson and associates established a fellowship at the Mellon Institute of Industrial Research at Pittsburgh, for the investigation of the flotation process and of the reagents which might be used in this connection. A large number of experiments were carried out, and, among the numerous compounds tested, certain coal-tar derivatives were found to give particularly good results when used in laboratory flotation machines. The most promising from all standpoints was crude alpha-naphthylamin, which could be used alone as a flotation agent, apparently functioning as both a collector and a frother. After the laboratory tests had been completed, this compound was given a trial on a commercial scale at the experimental plant of the Magma Copper Co.

Alpha-naphthylamin being a somewhat unwieldy name, the term "x-cake" has been adopted for the crude product, and it will be so called hereafter in this article. The raw material for its manufacture is naphthalene. This is first treated with a mixture of sulphuric and nitric acids to form nitro-naphthalene, from which x-cake is produced by reduction, usually by the use of iron turnings and hydrochloric acid. X-cake is a non-oleaginous solid, melting, when pure, at 122 degrees F. and boiling at 572 degrees F.

Discovery of Xylidin as a Flotation Agent

The problem of solution made the use of x-cake somewhat difficult in the ordinary flotation mill, as large tanks had to be provided and steam furnished for heating. No particular difficulty was encountered once the apparatus was set up, but the ordinary millman does not care to go to much expense in trying out a new flotation agent. In view of these conditions, the problem was attacked of finding something similar to x-cake in metallurgical results,

but more convenient to use, requiring a minimum of change in the standard methods employed by mills using oils as flotation agents. Several substances appeared promising in further trials at the Mellon Institute. The conclusion was reached that crude xylidin met the requirements better than any other substance of the kind. In itself it is not as good a flotation agent as x-cake, but when mixed with the latter excellent results are obtained. The x-cake is easily soluble in xylidin and the solution is a liquid of such consistency that it can be handled easily in any of the usual oil feeders with which all flotation mills using oils are equipped. No changes in the flow sheet are necessary, the x-cake-xylidin mixture being simply poured in after the oil tanks are emptied.

Crude xylidin is a liquid made up of different xylidins which have the same ultimate chemical composition but differ from one another in the arrangement of the atoms in their molecular structure. It is manufactured from xylol in much the same manner as is x-cake from naphthalene.

The favorite proportions for the mixture are 60 per cent x-cake and 40 per cent xylidin, but these can be varied considerably. If the pulp feed to the cells is reasonably warm, and the flotation agent is introduced at such a point that it may become thoroughly mixed with the pulp before entering the cells, less xylidin may be used. The addition of the mixture to the ball-mill feed is not necessary in any case; commonly it is added in the launder preceding the first flotation cell. The mixture is non-volatile, non-inflammable, and chemically inactive. X-cake has a very offensive odor, which, strange to say, is most disagreeable when very slight. In mills where it is employed, the odor is neither objected to nor noticed, but the odor from the small amount which will be picked up by a shoe sole in walking through a mill where x-cake is used will be noted in a large room. The mixture of x-cake and xylidin may be made by putting the proper proportions of the two substances together in a suitable container and heating and stirring for a few minutes. Heating is unnecessary if the lumps of x-cake are broken up and the mixture allowed to stand for a day or two with occasional stirring.

Neutral or Alkaline Pulp Is Preferred

Experience with these agents has shown that a neutral or slightly alkaline pulp is necessary for the best results. This has usually been accomplished by adding a small amount of lime to the ball-mill feed at intervals of five minutes or so. This, however, has been found to have certain disadvantages, as it tends to form crusts on the tables, if the latter

are used before flotation, and also the canvas cell blankets require more frequent cleaning than when lime is not used, acidulated water being used for scrubbing. The addition of the lime to the settling pond which furnishes the return water has been found more advantageous. Any precipitation caused by the lime will then be made in the pond, and still the mill water will have the neutrality or slight alkalinity desired.

When operating with x-cake-xylidin, economy requires the use of the largest possible amount of return water. Flotation operators have found that when oils are used in a closed circuit only a little less oil is required than when the mill-feed is made up entirely of new water. The insoluble parts of the oil are probably lost entirely, and only a part of the soluble constituents is returned to the cells with frothing properties unimpaired. With x-cake, this has not been found to be the case. Whatever amount is returned in the water from concentrate or tailing seems just as efficient as ever. Apparently little or no deterioration occurs in settling ponds, although the water gradually turns a dark brown. Considerably less of the agents under discussion are therefore required if the make-up water is kept at a low proportion of the total.

X-Cake First Used by Magma Copper Co.

The first test of x-cake on a commercial scale was made at the mill of the Magma Copper Co., Superior, Ariz. Results have been so satisfactory on the bornite-chalcopyrite ore that it is still being used there, a solution apparatus having been erected so that xylidin is not required. During the year 1918 the results obtained by the use of x-cake in the Magma mill were as follows: Feed, 4.50 per cent cu.; tailing, 0.35 per cent; concentrate, 10.78 per cent; recovery, 95.33 per cent. Besides the high recovery shown by these figures, some operating advantages have resulted from the substitution of x-cake for oil. In handling the concentrates with vacuum filters the time of filtering was reduced to one-sixth, or less, of the time necessary for filtering oil concentrates, and a drier filter cake is also obtained.

Last year, tests were carried on at Superior with a mixture of x-cake and xylidin. The mixture gave a slightly more voluminous froth than had been obtained with x-cake alone, but this was the only noticeable difference. The metallurgical results were practically identical, and so, on account of the slight additional cost of the mixture, the use of straight x-cake was continued.

X-Cake and Xylidin Displaced Oil at the Consolidated Coppermines Mill

The mixture of x-cake and xylidin has been commercially applied at the mill of the Consolidated Coppermines Co., Kimberly, Nev., and at the mill of the Arizona Copper Co. at Clifton. At the former plant, the flotation department operated until Sept. 1, 1918, with a mixture of coal tar, coal tar creosote, and pine oil. After Sept. 1, x-cake-xylidin in alkaline circuit was used to the extent of a little less than $\frac{1}{2}$ lb. per ton of ore. The copper occurs as chalcocite, with some chalcopyrite and oxidized mineral.

The following table shows a comparison of the results obtained with oil as against the x-cake-xylidin mixture:

CONSOLIDATED COPPERMINES MILL DATA			
		Using Oil	Using X-cake-Xylidin
Mill Feed			
Per cent Cu		1.19	1.34
Ounces Au		.02	.02
Ounces Ag		.06	.07
Per cent SiO ₂		87.1	85.9
Per cent Al ₂ O ₃		1.5	2.5
Per cent Fe		3.5	3.7
Per cent CaO		2.1	2.5
Per cent S		2.1	2.5
Mill Tailing			
Per cent Cu		0.28	0.21
Ounces Au		.01	.01
Ounces Ag		.04	.04
Per cent SiO ₂		91.5	90.1
Mill Concentrate			
Per cent Cu		13.52	18.33
Ounces Au		.44	.21
Ounces Ag		.33	.44
Per cent SiO ₂		27.3	13.5
Per cent Al ₂ O ₃		7.2	4.5
Per cent Fe		20.9	27.6
Per cent CaO		1.3	0.3
Per cent S		22.9	32.1
Recovery			
Cu		78.22	82.81
Au		52.95	69.30
Ag		38.11	40.34
Ratio of concentration		14.68	17.00
Per cent H ₂ O in conc.		17.15	9.39
Cost of flotation agents per ton milled		7.46c.	15.6c.

1. A smaller tonnage of concentrate was dewatered and handled in the mill.

2. A smaller tonnage of concentrate was treated by the smelter, cutting freight and treatment charges per ton almost in two.

3. The higher-grade concentrate was made largely by the elimination of colloidal matter, giving a more granular product. This, combined with the smaller tonnage to be handled, made it possible to filter the concentrate in one shift with one or two filters, whereas with the old concentrate, produced with coal-tar reagents, three shifts with three filters were required to handle the concentrate produced.

4. Owing to the more granular nature of the concentrate, a thicker, dryer cake was produced by the filters, thus saving freight on moisture.

The Arizona Copper Co., which has a 4,000-ton concentrating plant at Clifton, Ariz., is now using x-cake and xylidin in the entire mill. The use of these compounds was decided upon after a careful test, the results of which showed sufficient improvement over those obtained by the use of oil, to justify the additional cost of the new agents.

In general, x-cake froths are much more easily broken down than oil froths and the thickened concentrate is more readily filtered. Improved recovery is obtained on many ores, particularly those containing considerable colloidal matter. The cost of the x-cake-xylidin mixture per ton of ore treated is in general greater than that for the oil mixtures commonly employed.

X-cake and xylidin are manufactured by several companies, among whom are the Barrett Co., the Newport Chemical Works, the Butterworth-Judson Corporation, the Calco-Chemical Co., and the National Aniline and Chemical Co., all of whom have offices in New York City. The price of 60 per cent x-cake-40 per cent xylidin mixture, in tank-car lots, is 35c. per lb., f.o.b. New York. A royalty of $2\frac{1}{2}$ c. per ton of ore treated by the agents named is also payable.

In view of the results which have been obtained with x-cake-xylidin in pneumatic flotation cells, they will no doubt find considerably wider commercial application. X-cake-xylidin can easily be tested in a commercial mill or in a laboratory flotation machine, but it must be remembered that when the agent is not present in the return water, a greater quantity will be required. Oils giving excellent results on one kind of ore are not necessarily adapted to another, and the probability is that x-cake will also find its commercial application limited to those classes of ore in which recoveries or concentrate handling charges can be materially improved by its use.

Difficulties of Unloading Merchandise in South American Ports

The following illustrations contain suggestions of value to mining men in regard to the shipment of material to South American or other ports where facilities for the discharge of cargoes are limited.



DISSEMBARKING AT MOLLENDO, PERU

One illustration shows the method of disembarking passengers and merchandise at Mollendo, Peru, which at present is the only available means. It clearly portrays the difficulties involved, and perhaps will suggest precautions which could be taken in the method of boxing to prevent damage to machinery or perishable merchandise. Frequently, because of the contour of the shore line, the sea is rough and the goods are exposed to the danger of becoming water soaked. Furthermore, increased bulk and

weight render the operation more difficult. The other illustration shows passengers going aboard at Salaverry. The illustrations are reproduced through the courtesy of H. Secchi, of W. R. Grace & Co., New York.



METHOD OF PUTTING PASSENGERS ABOARD AT SALAVERRY

An American Miner

I feel sure that there are quite a number of mining men, like myself, willing and in a position to lend their services to help the country through this crisis by service with the coal mines. Personally, I am a good miner. Have worked in that capacity throughout the continent in a considerable variety of metal mines, but never in a coal mine. At present I am ready to serve as miner in the coal mines, but am ignorant as to where my services would be most acceptable. A little direction by you in this line might induce a number of good miners and patriotic men to volunteer their services at this time when they are most needed. A notice in your issue to this effect might be of value, and for my own part any direction which you can give me as to where I might apply to advantage for employment as a coal miner would be appreciated by me, and I trust would be a service to the country.

Allow me to congratulate your publication for the splendid stand it is taking against the Nihilist movement which is now shaking the civilized world.

Arthur O. Christensen.

Beaufort, S. C., Nov. 7, 1919.

New Angles to the Apex Law*

Exceptions of Known Veins From Land Patented as Placer Renders Titles Uncertain—Community Injured by Such Instability—Exchange of Placer Patent for Lode Patent Must be Safeguarded To Prevent Loss of Rights

BY JOHN A. SHELTON
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ONE of the heaviest burdens uselessly cast by our mineral laws upon the holder of the title by a patent from the United States is due to the provision excepting known veins from land patented as placer. In many instances the expense of defending such titles from the assaults of the owners of lode locations, made upon the theory that the veins so located were known to exist at the date of the placer application for patent, has exceeded many times the value of the land in question. Neither the lapse of time, however long after the issuance of the patent, nor repeated adjudications by the courts serve to quiet such titles or to prevent them from being questioned.

In the passage of laws providing for the acquisition of the title to the mineral lands of the United States, Congress provided that the title to known veins should not pass from the United States by a patent based upon a placer location. As constructed by the courts, the law (Sec. 2,333 R. S. U. S.) provides that the applicant for a patent upon a placer claim may, if any vein of sufficient value to justify the expenditure of money in its development is known by him to exist within the boundaries thereof, include in his patent application an application for patent upon this vein as a lode claim; and failure to do so is to be deemed a conclusive declaration that the applicant makes no claim to the vein nor to an area of surface ground extending for 25 ft. (7.6 m.) on each side of its middle or center. As to such vein and such area of inclosing surface ground under the circumstances stated, the title remains in the United States, notwithstanding the issuance of a patent that purports to convey the entire surface of a described area and everything beneath it, excepting only the segments of veins the apices of which lie outside of such area. Such known veins, with such area inclosing surface ground, are, of course, at any time, so long as they remain unlocated, subject to location and appropriation in the same manner as other veins upon the public domain.

Bad Effect of the Law Demonstrated in Butte

The history of the operation of this law in one district will serve to illustrate its effect generally throughout the mining regions of the United States. In the Butte district, the mineral that first attracted the attention of the miner was placer gold and not until some years later were attempts made at quartz mining. A few years after the discovery of mineral, practically the whole district, embracing several square miles of territory, was covered with mineral locations, upon which patents were afterward issued. Roughly speaking, the low-lying land along Silver Bow Creek and its branches extending part way up the slope in the direction of the Butte hill

comprised the portion of the district within which the placer-mining operations were carried on. There the surface and subsurface for several feet generally consisted of loose earth and gravel or boulders in which was found the deposit of placer gold and beneath which was the solid formation or bedrock. As to that land covering about one-half of the district, the patents issued were placer patents or patents based upon placer locations. Though the apices of the veins showed in the surface of bedrock generally throughout the whole district, their existence in ground covered by placer wash could not have been known until bedrock was exposed by the removal of the placer wash in the placer-mining operation or otherwise. When discovered in the early days, they were not generally considered worth development. Frequently they did not contain mineral, on or near the surface, that could be profitably mined. Later development showed that many veins carrying little mineral at the surface were rich in copper at depth, after which it became a practice in the district to sink on veins that had no showing of surface mineral, with the hope of discovering paying ore at depth. As time went on, copper smelteries were built and underground explorations were extended, and it was proved that some of the veins in ground held under placer patents were of considerable value because of the facilities then existing for the treatment of ore of such character. This circumstance, coupled with the fact that the surface had in many instances been built upon and improved, and had greatly increased in value, furnished the inducement to lode claimants to appropriate and obtain title to veins held under placer patents.

The litigation resulting has been carried on more or less continuously ever since, and, after a lapse of forty years from the issuance of the placer patents, still continues. As the title to all veins known to exist at the date of the placer application for patent remained in the United States, no statute of limitations would bar such suits; and as a judgment in one suit will bind only those who are parties to it, or their privies, a judgment in favor of the placer owner in one suit does not prevent a new lode location by another party, and a new suit concerning it. The judgment in such cases in every instance rests chiefly, if not solely, upon the determination of a question of fact; namely, whether or not the vein in question was a vein known to exist; that is, whether or not it was known to exist by the applicant for placer patent at the date of his application and was, under the then prevalent conditions, of sufficient value to justify exploitation and development. In every case it is necessary to call those as witnesses

*Presented at the Chicago meeting of the A. I. M. E., Sept. 22-26.

who at the date of placer application possessed such knowledge of the ground in question as qualified them to testify whether or not the vein was known to exist. Upon this point the testimony generally consisted of either affirmative or negative statements as to whether or not the vein outcropped on the natural surface of the ground or was exposed by the removal of the placer wash, so that its existence was known prior to the date of the placer application and visible to the placer applicant, and whether, if it was known, it was of such character that it would have justified exploitation and development under the conditions then existing.

Outcome of Such Litigation Uncertain

As might naturally be expected, those who were called as witnesses in any particular case were in direct conflict in their statements upon such questions. It is scarcely necessary to remark that in many instances the witnesses testifying were mistaken as to the matters concerning which they testified, and, such is the weakness of human nature, in other cases their testimony appeared to be knowingly false. As the litigation concerning such question was carried on, those who were called as witnesses became divided into hostile camps. Partisanship was not confined to those testifying as witnesses. The sentiment in the community concerning the merits of such controversies was divided. Under such circumstances it is not surprising that the outcome of such litigation was, in most cases, uncertain. Occasionally different courts gave directly opposite decisions. To illustrate, a portion of one vein was involved in litigation in a case in the Federal court and an adjacent portion of the same vein was involved in litigation in a state court. The two portions were covered by different lode locations, both included within the same placer patent. The testimony relied on in each case was substantially the same, but the decision in one case was in favor of the known existence of the vein at the date of the application for the placer patent, and in the other case it was against such known existence.

The importance of the stability of titles is recognized by everyone. It is needless to point out that if the title is uncertain, development of the property is in consequence discouraged. As a large proportion of the titles acquired under the mineral laws of the United States are held under placer patents (so called), the effect of such uncertainty of title in the sections of the country where such titles are held is very considerable and must necessarily retard the development of those sections.

Uncertainty as to Titles Injures Community

Although what has been said about the importance of the stability of titles acquired and held under patents of the United States is everywhere recognized, it is also true, probably, that a large proportion of the people are not conscious of the extent to which the prosperity of the community may be unfavorably affected by such uncertainty of titles. It is possible to gain a better conception of such effect by considering a similar, though extreme, case. Much

of the land of Mexico is more fertile than any land of the United States. The country is richer in its deposits of oil and minerals, and it has, besides, a great capacity for the production of rubber, for which there is a great and constantly increasing demand. In a word, Mexico is potentially a richer country than ours. But, with all of such natural wealth, a large proportion of the Mexican people are in a pitiable state of abject poverty. There is no reason why they should be, except for their government or lack of government, and uncertainty of title is one of the principal consequences of their unstable government.

It is certainly true, though the confession is decidedly humiliating, that by reason of the provision which excepts veins known to exist from land patented as placer, and because of the lack of a provision by means of which any such defect may be cured or an attack upon the placer title barred by the lapse of time, a portion of the territory of the United States has been, to a limited extent, Mexicanized. Congress has been asked to pass a law that would prevent an attempted lode location upon ground patented as placer after the expiration of some fixed limit of time from the issuance of the placer patent; but for some reason no relief has been given.

The title held under a placer patent covering land within which there is a vein sufficient to support a lode location is uncertain, and cannot be rendered otherwise.

Exchanging Placer Patent for Lode Patent

In procuring a lode patent to be issued covering land as to which a placer patent has already been issued two different courses have been followed. While the placer patent is outstanding, whatever land was conveyed by it has passed from the public domain and is not subject to disposal by the Government, and an application for a second patent upon the same land will not be entertained by the Land Department of the Government. There is nothing, however, to prevent the officers of the Land Department from accepting, on behalf of the United States, a deed from the owner of the placer title conveying back to the Government whatever was conveyed by the placer patent, and the land, having been in that manner restored to the public domain, is again subject to disposal by the Government, and the necessary preliminary steps having been taken, a lode patent covering the same ground may be issued.

In practice, the placer owner, in following such course, may first make a lode location or locations covering the ground, perhaps embracing in a single location the same extent of surface area as in the case of a lode location made upon unpatented land. Then, having in other respects complied with the law entitling him to a patent upon his lode claim or claims, application for such patent is filed and with it a deed is tendered conveying to the United States the title conveyed by the placer patent or such part of it as is covered by his lode location or locations. In the absence of any adverse claim, the Land Department will treat such location as though made

upon unpatented land, and, the deed being accepted, there is no longer an outstanding patent and no obstacle to the issuance of a second patent.

Of course all precautionary measures necessary to prevent a loss of rights are taken. The deed tendered becomes effective only when accepted by the Government. Immediately upon its acceptance, the placer owner makes a lode location covering the ground for the purpose of preventing an adverse location by some other person, upon the theory that until the acceptance of the deed the land was not subject to location.

If within the land covered by the placer patent there is a vein that was, in fact, known to exist at the date of the placer application, the titles to such vein and to an inclosing strip of surface ground fifty feet in width in the United States, and the placer owner, equally with any one else, may locate it as a lode claim and, by performance of the acts required by law to enable him to procure patent, may procure the issuance of a lode patent on such location in the same manner that patent is procured upon a lode claim made outside of the limits of ground patented as placer, except that in connection with the application for patent, satisfactory proof must be furnished the Land Department, by affidavit or otherwise, of the known existence of the vein, and except, of course, that the extent of area that may be embraced in such location is limited to twenty-five feet on each side of the middle or center of the vein. If the question of the known existence of the vein is involved in doubt, the placer owner may proceed upon the theory that it was known, provided that satisfactory evidence is procurable to the effect that it was known.

When such a lode location is made by a person other than the placer owner, and judgment is recovered in his favor against the owner of the placer title that such vein was known to exist, and such lode locator then institutes proceedings to procure patent, such judgment is entitled to be given a conclusive effect in the Land Department, as elsewhere, upon the question of the known existence of the vein, and may be relied upon as proof of such fact, dispensing with the necessity of affidavits.

If such judgment is rendered as the result of a compromise of a lawsuit, or is rendered in a suit in which the placer owner does not resist the demands of the lode claimant, such facts in no way affect the question of the effect to be given such judgment. If the placer owner has a good title, but allows it to be taken, the United States or any private individual is not thereby the loser, and if his placer patent did not convey title to him, and the title remained in the United States, the vein was subject to location, and its locator upon compliance with the law is entitled to a patent to it.

Of course, the owner of the lode patent has extralateral rights, though the owner of the placer patent has not, and assuming that the vein was in fact not known to exist, the lode locator who procures a lode patent on it on the theory that it was a known vein thereby may procure a greater right in the vein

than was held by the placer owner. The segments of any veins lying outside the placer boundaries, the apices of which are within the placer boundaries, which veins were not known to exist at the date of the placer application for patent, of course do not belong to the placer owner, but the title thereto is in the United States, and they are something, therefore, which the placer owner does not lose by allowing such judgment to be taken against him, and the lode locator does acquire them by his lode location and patent. The fact remains, however, that the recovery of the judgment affects the rights of no one except the lode locator and the placer owner, for such segments of veins are not, as something separate and distinct from the veins of which they are a part, subject to appropriation by private individuals or to disposal by the United States under existing laws.

October Mining Dividends

Dividends disbursed in October, 1919, by 16 United States mining and metallurgical companies making public reports, amounted to \$4,792,394, as compared with \$5,628,584 paid by 29 companies in October, 1918. Canadian, Mexican, and Central American companies paid \$1,450,918, as compared with \$1,131,950 in October, 1918. The only holding company to pay this month was the California Exploration Co., which disbursed 1s. per share (about \$28.140).

Homestake Mining Co. found it necessary to omit its dividend in October after a long record of continuous payments. The rate on the common stock of United States Smelting, Refining, and Mining Co. was increased to \$1.50 per share. Tonopah Belmont reduced from 10c. to 5c. per share, on account of the strike.

MINING DIVIDENDS

United States Mining and Metallurgical Companies		Situation	Per share	Total
Am. Smelters, pfd. A.	U. S.-Mex.		\$1.50	\$146,071
Am. Smelters, pfd. B.	U. S.-Mex.		1.25	39,855
Caledonia, ls.	Idaho		.01	26,500
Fairview Round Mountain, g.	Nevada		.02	19,049
Golden Cycle, g.	Col.		.03	45,000
Inspiration, c.	Ariz.		1.50	1,772,951
Iron Blossom, ls.	Utah		.02½	25,000
Phelps Dodge, c.	U. S.-Mex.		.87½	425,555
Portland, g.	Col.		.02	60,000
Shattuck Arizona, c.	Ariz.		.25	87,500
Tonopah Belmont, g.s.	Nev.		.05	75,000
Tonopah Ex., g.	Nev.		.10	128,280
Tonopah Min. g.s.	Nev.		.15	150,000
United Eastern, g.s.	Ariz.		.07	95,410
U. S. Smelting, com.	U. S.-Mex.		1.50	526,873
U. S. Smelting, pfd.	U. S.-Mex.		.87½	425,555
Vindicator, g.s.	Col.		.01	15,000
Wolverine, c.	Mich.		.50	30,000
Canadian, Mexican and Central American Companies				
Asbestos Corp., com.	Que.		\$1.25	\$ 37,500
Asbestos Corp., pfd.	Que.		1.50	60,000
Cons. Min. & Sm., c.z.l.	B. C.		.62½	261,836
El Oro Min. & Ry., g.s.	Mex.		.24	278,843
Hollinger, g.	Ont.		.05	246,000
Home Sound, c.	Can.-Mex.		.05	99,208
McKinley-Darragh-Savage, s.	Ont.		.03	67,431
N. Y. & Honduras Rosario, g.s.	C. A.		.50	100,000
Nipissing, g.s.	Ont.		.25	300,000

The totals for the first ten months of 1919 are as follows, the 1918 figures being given in parentheses: United States mining and metallurgical companies, \$7,339,463 (\$135,030,615); holding companies, \$1,141,578 (\$1,718,438); Canadian, Mexican, Central and South American companies, \$13,873,152 (\$15,202,875).

PETROLEUM SECTION

Engineering Notes and Equipment Details
Production Statistics — Progress
in Important Fields

British Petroleum Policy

Control Sought by Great Britain of Oil-Producing Areas of Canada, Trinidad, Persia, North Borneo and of All Prospective Petroleum Territory of the Empire

BY A LONDON CONTRIBUTOR

FOR a number of years Great Britain has been slowly maturing plans having for their object the domination of the world's oil supplies. Great Britain needs oil for her navy, for her mercantile marine, and for her industries, and the demand is that the sources of supply should be under British control. In this the British Admiralty has led the way.

For example, in the early exploration of Trinidad it was possible for American companies, either directly or through British subsidiaries all of whose stock was frankly owned by Americans, to obtain oil rights on Crown lands in Trinidad. The General Asphalt Co., of Philadelphia, which through a British subsidiary operating the Pitch Lake, was already established in the island, secured rights to 2,500 acres about 1909. The company has been refused further areas, and no American company can now secure oil rights in Trinidad, either directly or indirectly.

In 1912, the British government put into force in Trinidad a form of lease containing clauses referred to in the government departments as the "Admiralty Clauses," which require that any company holding a lease must be a British company, with the chairman, the majority of the board, and the managing director, British, and that "neither the lessee nor the premises, liberties, powers, and privileges granted, or any land occupied for any purpose under the lease, should, at any time, be or become directly or indirectly controlled or managed by foreigners or a foreigner or any foreign corporation or corporations."

Under this form of lease exclusive exploration rights for oil over about 200,000 acres were granted to the United British West Indies Petroleum Syndicate, Ltd., composed of representatives of the Burma Oil Co., Royal Dutch Shell, and a British investment house. Subsequently, a similar area was granted to a company organized by S. Pearson & Son, Ltd.

During the first year of the war, the policy crystallized to cover all British possessions so far as the home government had any power, and was so extended as to secure oil lands in other countries. The policy was adopted not only with respect to the war, but for the period after the war, that no rights would be granted in any British possession except to a British company whose antecedents, and par-

ticularly whose thoroughly British character or control, were entirely satisfactory to the specially created department called the Petroleum Executive, which was responsible to the War Cabinet and which was placed in charge of Professor John Cadman, since made Sir John Cadman. This special Petroleum Department has, among its objects, to control the granting of oil rights in the British Empire, and to assist British companies in securing concessions in other countries. The department has been energetically and systematically canvassing the potential oil possibilities of the world and suggesting to its pioneering companies projects, in particular in South America and Asia.

In Trinidad, where there was a slight loophole for the entrance of foreign capital, owing to the fact that in all lands alienated prior to Feb. 17, 1902, the surface owner was also the owner of the oil, it was provided that any grant of oil rights by a landlord was void except with the special approval of the government, which approval would be granted only in the case of British companies undertaking all the obligations of nationality required by the government lease. As a general measure, the sale by British subjects to a foreigner of any oil shares was prohibited. Under this Order in Council, the British Admiralty prohibited the sale of the Mexican Eagle to American capitalists.

The British Admiralty has already secured a controlling interest in the Anglo-Persian Oil Co., which held a concession covering the southern half of Persia. The D'Arcy Exploration Co., a subsidiary of the Anglo-Persian, now has a concession covering 10,000 square miles in Canada and one of 30,000 square miles in British North Borneo.

Of even greater significance is the relation between the British government and the Royal Dutch Shell, which is today easily the most powerful oil company in the world. Theoretically this is under Dutch control, and there have been many allegations and denials in respect to the relation between the British government and this group. In considering the denials one must bear in mind the little-known fact that the management of this company is vested not in the shareholders but in a dozen management shares. Whoever owns a majority of these management shares controls the company, whatever the ownership of the share capital.

Knowing how thoroughly the British government, the British Admiralty, and the special division of the Petroleum Executive, under Sir John Cadman, is committed to the policy of British control of the oil resources of the world, the following facts are explicable only on the basis that the majority of the

management shares of the Royal Dutch are owned either directly or indirectly by the British government:

1. The British government, with the entire concurrence of the Admiralty and Sir John Cadman, granted permission for the sale of the Mexican Eagle to the Royal Dutch.

2. The British government has made recommendations to the Canadian government for the granting of a large concession to the Royal Dutch in the Peace River district, Canada.

3. It is announced that the important oil area of Mesopotamia "will be shared between the Royal Dutch Shell, Burma, and Anglo-Persian groups."

It is of interest to America to define clearly, and maintain what, in the opinion of its government, constitutes a "mandate." It would seem that the British and European conception of a mandate is nothing short of annexation, for with regard to Mesopotamia the British papers speak of this as theirs "by right of conquest."

It is the adopted policy of the British government that no foreigners, or any but thoroughly accepted British companies or companies under the control of the British government, should obtain any rights in any part of the British Empire. It is also the policy of the British government to further, by every means within its power, the bringing of prospective oil territory in other countries under British control.

In order that Americans may combat this British program, it is essential that the American Government recognize, as the British government has done:

1. That foreign petroleum development rests on a very different basis from the foreign marketing of petroleum or any other commodity.

2. That for the good of all concerned, including the country in which the development takes place, large areas are necessary.

3. That in such development honest enterprises require the protection and continued support of their own State Department.

Explorations for Oil in Sumner County, Tenn.

Government Geologist's Advice to Drillers—Better Locations for Wells Suggested—Limits of Depth for Prospecting—Drilling Done at Unpromising Places.

THE success of oil operators in Allen County, Ky. has naturally led to considerable exploration for oil in the adjoining counties of Tennessee. At least thirty wells have been drilled in the northeast quarter of Sumner County, but no producing well has yet been completed.

The part of Sumner County that lies north of the Highland Rim, or "The Ridge," as it is locally called, is recognized as prospective oil territory, for it is underlain by the geologic formations from which oil in Allen County is obtained. To ascertain why no oil has been found in this part of Sumner County the State Geological Survey co-operated with the U. S. Geological Survey in sending a geologist to investigate the area, Kirtley F. Mather, of the last-named

Survey, who has just completed several weeks' field work in the northern part of Sumner County.

Mr. Mather reports that the geologic conditions in the Highland Rim section are practically the same as those in the oil-producing territory immediately across the state line, in Kentucky. In this area there are at least four anticlinal folds that are well suited for the concentration and storage of oil. Well records and cuttings from wells now being drilled indicate that in at least a part of this area the formations beneath the "black shale" are well adapted to serve as oil reservoirs. Five drilling machines are now at work in this area, and further explorations will soon be made.

Of the four anticlinal folds that Mr. Mather has mapped, only one has been tested by the drill—one that may be called the Westmoreland dome, as it extends from the western outskirts of the town of Westmoreland in a general northwesterly direction for about a mile. Two dry holes were drilled a few years ago on the property of the New Hope Church near the crest of this anticline. A dry hole that was drilled on the Escue farm, two miles northwest of Westmoreland, is on the northwestern flank of the Westmoreland dome. None of the other dry holes in Sumner County north of the Highland Rim escarpment and east of the main line of the Louisville & Nashville R. R. were drilled at places where the structure is in the slightest degree favorable to the accumulation of oil, nor are any of the machines now drilling in places where the structure is favorable. The failure of these wells to find oil in paying quantities should therefore not be a sufficient reason for regarding Sumner County as unfavorable oil territory.

It is suggested that future exploration should be made on or near the crests of three untested anticlinal folds that Mr. Mather has mapped, which may be called the Dutch Creek anticline, the Big Trammel Creek dome, and the Garretts Creek anticline.

The Dutch Creek anticline trends in general from northeast to southwest and is crossed by Dutch Creek, $1\frac{1}{4}$ miles downstream from the Westmoreland-Portland pike. This fold has a large feeding ground, and the results obtained by drilling in that general vicinity indicate that the rocks beneath the "black shale" are probably suitable to serve as an oil reservoir. This fold should be tested by at least two holes. A good location for one of these is a point $1\frac{1}{4}$ miles south and $1\frac{1}{4}$ miles west from Turner's station. A second test should be made at a point about 2,500 feet southwest of the first.

A smaller but more pronounced dome lies in the drainage basin of Big Trammel Creek, northeast of Westmoreland. Its summit is one mile north and two miles east from that town. Test wells should be sunk near that point and at places not far north and west of it. Good locations will be found between $1\frac{1}{4}$ and $1\frac{1}{2}$ miles south-southwest of Pleasant Grove Church.

The Garretts Creek anticline is another northeast-southwest fold, which lies almost in a line with the Dutch Creek anticline. It has a closure toward the

southeast of nearly twenty feet and a large drainage area toward the northwest. The wells recently abandoned or now being drilled in the region northeast of Sugar Grove are far down the northwestern flank of this fold, and the reported showing of oil in Carter well No. 1 suggests the presence of oil nearer the summit of the fold. Good locations for test wells are close to Garretts Creek Church or on the Marsh property, a short distance to the northwest.

There seems to be little use of drilling to depths greater than 125 or 150 ft. below the base of the "black shale" in this part of the county, for the formations below those depths are probably not oil reservoirs. The formation known to geologists as the "Corniferous" limestone, which carries the top pay sand in the vicinity of Scottsville, Ky., is not found in this region, but at least two pay sands may be looked for in the Louisville limestone, which underlies the "Corniferous" in the Scottsville fields, but lies immediately beneath the "black shale" in Sumner County. Both these pay sands should be penetrated by the drill within 125 ft. below the bottom of the "black shale," and if either of them gives a showing of oil the well should be shot before it is abandoned.

The Economic Position of Great Britain With Respect to Petroleum Products

The United States, under war conditions, became the principal exporter of mineral oils to Great Britain, according to a bulletin recently issued by the Department of Commerce, entitled "The Economic Position of the United Kingdom: 1912-1918."

Before the war the United States led in the exportation of kerosene, lubricating oil, and gas oil, and in 1917 the United States was still the principal exporter in each commodity, with no other country even a close second. In that same year, Great Britain received 85.9 per cent of the fuel oil that she imported from the United States. The most striking development in the mineral-oil trade of the United Kingdom was the sharp increase in the receipts of fuel oil in the last two years. In 1918, imports of fuel oil by Great Britain were more than 1,700 per cent of the 1912 total and 900 per cent of the 1913 figure. The need for fuel oil in industry and as ship fuel under war conditions, it is pointed out, was responsible for this development.

Another striking feature of the mineral-oil trade of Great Britain is the insignificant imports of crude petroleum. In 1913, importations of crude petroleum amounted to something more than a million gallons, and in 1914 approximately 15,000,000 gallons was received. Since that date, however, importations of crude petroleum have been slight, indicating a small oil-refining industry in the United Kingdom.

"The only mineral oil produced in the United Kingdom," the report reads, "is secured by the reduction of the oil shale mined from the shale beds of Scotland. About 3,000,000 tons of shale is produced each year, furnishing from 70,000,000 to 80,000,000 gal. of oil. This means that the United

Kingdom is dependent upon the outside for 85 per cent of her normal petroleum requirements. Recently there has been a good deal of discussion as to the possibilities of developing a petroleum industry in England. Lord Cowdray has offered a large sum for experimental purposes, and has secured the services of American oil experts in locating oil deposits and in doing the preliminary drilling. Thus far this matter is entirely in an experimental stage, and it is impossible to predict what effect it may have upon the British oil trade."

Texas Oil Production

According to information sent out by Henry L. Doherty & Co., New York, large quantities of light oil that has been discovered in North and Central Texas promises to put that state in a position to compete with California in importance as an oil producer. Predictions have been made placing Texas production for 1919 at more than 90,000,000 bbl. This is not based on mere prospects, for Texas had produced so far this year more oil than in the entire year 1918. Texas production is estimated at 34,000,000 bbl. in the first six months.

The Burkburnett district, Ranger and Breckenridge, as well as Desdemona, the principal light-oil fields of Texas, are bringing in new wells at from 1,000 to 5,000 bbl. daily output, and there is no doubt that Texas production for the latter part of this year will exceed that of the first six months. The following table shows production in the principal fields of Texas for the first six months of 1919, and the years 1918 and 1917, in barrels:

Field—	First Six Mos., 1919	Yr. 1918	Yr. 1917
Ranger	9,621,115	3,784,434	29,055
Wichita County (Burkburnett).....	8,640,110	11,527,034	9,541,535
Breckenridge	1,505,470	598,437	35,219
Goose Creek	3,362,580	8,943,635	7,300,279
Damon Mound, West Columbia.....	2,933,420	283,527	124,325
Humble	1,765,805	6,655,173	7,389,831
Sour Lake	1,302,215	3,407,696	4,763,904

In 1918 the production of Texas was divided into 17,280,612 bbl. of light oil and 21,469,419 bbl. of heavy oil. This year the light-oil output of the state will total more than twice that of heavy oil. Texas has produced a total of 327,500,000 bbl. of oil since oil was first struck in the state in 1889. The state's production by years since that date is shown in the following table:

1918.....	38,750,000	1910.....	8,900,000	1902.....	13,100,000
1917.....	32,410,000	1909.....	9,530,000	1901.....	4,330,000
1916.....	27,540,505	1908.....	11,200,000	1900.....	840,000
1915.....	24,940,000	1907.....	12,320,000	1899.....	670,000
1914.....	20,100,000	1906.....	12,570,000	1898.....	540,000
1913.....	15,010,000	1905.....	28,100,000	1897.....	65,000
1912.....	11,740,000	1904.....	22,240,000	1896.....	1,400
1911.....	9,630,000	1903.....	17,950,000	1889-1895	360
Total					327,547,760

Texas did not come into great importance as an oil-producing state until 1901, but from that year to 1905 her output increased from 4,000,000 to 28,000,000 bbl. Following 1905 a decline took place until 1910, when 8,900,000 bbl. was produced. From 1910 to 1918 the state's production increased from 9,000,000 bbl. to 38,000,000 bbl., or more than 300 per cent.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical
Industry Dealing With Pertinent
Subjects of Interest

Mexican Issue Must Not Be Sidetracked ¹

Several groups of intellectual Mexicans, we among them, have undertaken the duty to write to all so-called technical papers in the United States, in order to rectify the erroneous ideas, which they are recently publishing, referring to our country. We belong to a social class which has always tried to establish a current of sympathy and good-will between the two nations, and for this reason, first of all, we are sorry that the American technical papers heap outrages upon our country and do their best to destroy all the ties of union which some men, who in both countries pursue high ideals, have tried to establish.

The Engineering and Mining Journal publishes in its issue of Aug. 16, 1919, an article called "The Mexican Issue Must Not Be Sidetracked." Your correspondent, who has informed you that there is "no noticeable improvement in conditions" in Mexico, is misinformed, for it is understood by thousands of Americans who live among us, and whom we meet daily, that our situation, in every sense, even if we still suffer great evils, has greatly improved, compared with the state of affairs prevailing two years ago. We do not want to make this letter too long, and for this reason we cannot go into details of all the points we think are necessary in order to make the intelligent people of your country acquainted with our true situation. Suffice it to say that, with the exception of a few well-known regions, everybody can travel and work in full security, especially all foreigners.

We, the same as you, desire that no more Americans be killed by bullets bought in the United States, and for this reason we wish that you would insist that in the future the rebels in Chihuahua and the oil region of the Gulf receive no more protection from American business men. Besides, we also wish that the American gold, proceeding from Mexican oil, be not used any more to pay newspapers who insult Mexico, publishing even grave errors. We are referring principally to the use made of the now fashionable word "confiscation," employed always to point out legitimate acts of the Mexican nation in order to maintain her sovereignty.

In the actual state of human civilization no nation can live in isolation. There exists a respective dependence, interpreted by economical, social and moral ties, in virtue of which humanity aspires to the supreme ideal of good will and peace, proclaimed by President Wilson, which includes, as an indispensable factor, the respect of weak nations. If a nation, supposing she is very big and powerful, pre-

tends to appoint herself tutor and guardian, and even imposed administrator, with no other right than the one derived from power, this only means the destruction of the basis of this beautiful ideal of human solidarity. And this role of imposed tutor benefits still less a country which, like the United States, has still many interior problems to solve and many vices to cure.

The same number of your paper in which the article referred to was published gives us notice of the appointment as Editor of the Engineering and Mining Journal of Mr. J. E. Spurr, prominent geologist, well known in Mexico through his books, his studies in the mining camp of El Oro, and his many articles in different technical papers. Our desires are that Mr. Spurr, upon taking charge of his post on Oct. 1, 1919, will introduce a radical change in your paper, making it a purely scientific and technical one.

L. Perez Castro, C. E., Mem. Am. Soc. C. E.,
Apartado 1394, Mexico City.

Santa-Ana Almada,
P. O. Box 2049, Mexico City.

J. Vasquez Schiaffino, C. E.
P. O. Box 1204, Mexico City.

S. Suluguis, M. E.
El Oro St., No. 11, Mexico City.

The following is the reply to the above letter:
New York, Oct. 15, 1919.

Sr. L. Perez Castro,
My Dear Senor Castro:

Your recent letter, of yourself and associates, addressed to Mr. Parmelee, has been turned over to me. I am taking the liberty of making extracts from your letter and publishing these under your signature. I hope that you will approve of my rather severe editing, but I wish to eliminate statements that might cause prejudice.

The mining industry, and the Engineering and Mining Journal as its representative, is vitally interested in industrial or political problems which affect it, and I think our policy must be to continue to cover all these problems in the future even more fully than in the past. Rest assured, however, that this journal is not controlled or in the pay of oil interests or any other interests, that I myself have a feeling of friendship toward Mexico and the Mexicans, and it is for this reason that I am publishing extracts from your letter, in order to give our readers your point of view.

I must confess that my own feeling has been that Mexico, since the days of the successful administration of Diaz, has been unable to gather enough strength to restore a peaceful and prosperous administration, and that it can hardly do it without the friendly assistance of other powers. It has never been my thought, however, that any such assistance should be taken with any other view than to assist in establishing a state of good government which the Mexican people might thereafter carry on unaided.

If this point of view is in error, I should like very much to know the facts, and I think you may believe that the American people, as a whole, are very far from wishing to do anything that is not for the advantage of Mexico and the betterment of the world.

Thanking you for your letter and hoping for further correspondence from you and other intelligent Mexican citizens, I am,

Very truly yours,
J. E. Spurr,
Editor.

Geological Survey Reports

Your suggestion that it would be helpful to have a review of the oil possibilities of Nevada appears to me excellent. In fact, such reviews are needed for all the states, outlining the portions of the state where prospecting may be regarded as money wasted and other portions where information is either insufficient to permit definite statements regarding oil possibilities or where it is believed there is at least a chance for the production of oil and gas.

There is a particular dearth of information on the oil and gas possibilities of Nevada, and, even though all the available data were assembled, there are large portions of the state which are terra incognita so far as their oil and gas prospects are concerned. It is known that much of the state is mountainous and that in these mountainous regions the formations either are not of a character to contain petroleum or else deformation has been so severe that any oil which may once have existed in the strata must be reduced to residuum, so there can be no chance of commercial production from them. In other parts of the state it is known that there are Tertiary formations which might possibly be petroliferous. However, these formations are of fresh-water origin, and it has not been established that petroleum can be derived from fresh-water organisms, although it is the belief of many of the geologists of the Survey that this is entirely possible or even probable.

It may be possible some time later in the year to assign a geologist to the task of constructing "safety maps" for some of our Western states, outlining the areas which are believed to be unfavorable for prospecting, those concerning which the prospects are indeterminate, and those where conditions are most favorable. At present, however, the work in hand exceeds the capacity of the available force.

In planning a series of reports on the geology and ore deposits of individual states, New Mexico was chosen as the subject of the initial volume of the series, because the general geology of the state is

more simple than that of many parts of the West and the mining districts are less numerous than in most of the other Western states. Consequently, no special effort at condensation was required to keep the report down to a reasonable size.

The report on Utah, by B. S. Butler and others, now in press, is much larger than that on New Mexico, and this difference suggests that it may be necessary, if reports on other states are not to become too unwieldy, that some more definite policy must be followed in planning these reports. Are they, for example, to be essentially encyclopedias within which is to be found in condensed form practically all that is known of the geology and ore deposits of a state, or are they to be readable outlines rather than comprehensive reference books? The report on Utah is partly a compilation of published material on the more productive districts, with considerable original description of less known or less developed districts and with discussion of the general relations of the ore deposits to geologic structure and history.

It appears to me that the ideal to be aimed at in these reports is the elimination, so far as is practicable, of detailed description, this being published elsewhere in special reports devoted to particular districts or problems. The state report should contain a clear and comprehensive account of the geology of the state and should show how the ore deposits are related to geologic structure and history. It should contain, also, a history of mining within the state—condensed, generalized accounts of the principal mining districts, with complete references to other publications that treat these in greater detail. If a district has not previously been studied in detail, it is likely to be difficult to decide how comprehensively it shall be treated in a report on the state as a whole. The geologist is tempted to present his facts and conclusions in full, but I am inclined to think that the main purpose of such a report as I have in mind will be better fulfilled if he exercises considerable restraint and emphasizes his general conclusions rather than the facts upon which they are based. At times, especially if a district is of particular interest and there seems to be no likelihood of giving it adequate description in the near future in a separate publication, it may be advisable to compromise between thorough detailed treatment and a generalized outline.

The report on the Geology and Ore Deposits of Utah to be published as Professional Paper 111, should be ready for distribution in about three months. By comparing it with the report on New Mexico (Professional Paper 68), geologists and mining engineers will be able to appreciate some of the questions to be answered with respect to reports planned for other states. Expressions of opinion in your columns, from men of these professions, as to how these reports can be made most useful to them, will be heartily welcomed.

George Otis Smith,
Director U. S. Geological Survey.
Washington, D. C., Sept. 22, 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Centralization of Government Statistics Suggested

Great saving of public money and increased efficiency will result, in the opinion of Representative Good, chairman of the Committee on Appropriations of the House of Representatives, if all statistical activities of the Government are concentrated in a single bureau. He believes that the Bureau of the Census would be the best agency in which to assemble all the statistical work. He also is of the opinion that the industries of the country are entitled to more prompt statistical returns, which, in most cases, he is convinced, should be made every ten days.

Basing Point for Steel

Useless agitation, with no prospect whatever of benefiting the great body of consumers, according to disinterested specialists, is certain to result from the proposal to have the Federal Trade Commission pass on the matter of abolishing the system of basing prices of raw steel on Pittsburgh. Though it is admitted that a few communities might benefit, it nevertheless must be recognized, it is said, that the raw materials used in the making of steel can be assembled more cheaply at Pittsburgh than at any other point. In addition to the necessity of making over the whole economic structure on which the steel industry operates, there would be long litigation, which Judge Gary predicts would be the greatest lawsuit in the history of the country. The Federal Trade Commission has given out a statement in connection with the matter.

Economy Liaison Committee

Official status for the Economy Liaison Committee of the State Department is suggested by Van H. Manning, Director of the Bureau of Mines, in a letter to the President of the Senate. He points out that that committee, despite its informal status, has done a great deal to promote foreign commerce in mineral and other commodities by acquainting the representatives of the various departments with the current situation with respect to foreign trade. The Liaison Committee, made up of representatives from interested bureaus, has been operating under the direction of Wesley Frost, Chief of the Economic Intelligence Section of the State Department. The Bureau of Mines and the Geological Survey have taken active part in the work pertaining to foreign trade in minerals. The committee already has issued reports on the situation pertaining to coal, petroleum, potash, cotton, finance, and credits.

Phosphate Not Under Government Control

Reports that phosphate rock and bulk acid phosphate were to be subjected to Government control have been denied at the Department of Agriculture. Following a conference on Oct. 6, the Secretary of Agriculture decided that no effort would be made to name fair profits for any fertilizer ingredients. He will, however, stand ready to exercise his powers under the licensing system against profiteering in acid phosphate or any other fertilizer ingredients.

The matter of undertaking a special investigation of the recovery of petroleum from oil shale is receiving the active attention of the Mines and Mining Committee of the Senate. Senator Henderson has asked that \$140,000 be authorized for that purpose, but some members of the committee are of the opinion that the work should be started with a lesser amount.

New Process for Roasting Lead-Zinc Sulphides

M. F. Coolbaugh has patented a process for the roasting and sulphatizing, followed by the leaching and smelting, of sulphide ores and concentrates containing lead, zinc, copper, and iron (U. S. Patent No. 1,315,761, Sept. 9, 1919). The ore is first roasted in the ordinary type of mechanically rabbled furnace for the purpose of changing the sulphides to oxides. The calcined material is then transferred to a second similar furnace, through which passes the gaseous products from the first treatment. The temperature and time of treatment are so regulated that in the second furnace the oxides of zinc, copper, and lead and the silver chloride are changed into sulphates. The resulting product is treated with water, the sulphates of zinc, copper, and silver being dissolved and the metals later electrolytically recovered. The insoluble residue containing the lead sulphate, iron oxide, and metallic gold and silver is smelted.

Lead and zinc in many cases cannot be efficiently separated by mechanical means. Under present processes any lead going to the zinc retorts makes the recovery of the zinc more difficult, and vice versa. Commercially, the ore of either metal is penalized for containing appreciable amounts of the other. These difficulties, it is claimed, are overcome by the process described.

Trade with Yugoslavia.—The import and export of all mine products and the importation of machinery and appliances for mining purposes have been declared free of duty by the Ministerial Council of Yugoslavia, according to a report recently received by the Bureau of Foreign and Domestic Commerce.

BY THE WAY

Hoover and the Geological Survey

A large photograph of Herbert Hoover, appropriately framed, has been hung in the conference room of the U. S. Geological Survey. This was done because Mr. Hoover formerly was an employee of the Survey. In 1895 he served with that organization as a field assistant with a geological party in Nevada.

Gold

The dross of droning commerce! No more than gilded lead!
The tinsel-foil that sweating toil must count the worth of bread!

No longer virgin metal—stained with minted brands—
That each in turn, to save or earn, must wrest from other hands!

To seek you—there the splendid game! From fissures thinly run

In deepest mine—such treasure fine is ever cleanly won!
A smiling nature yields you—her gracious gift to men
Who dare to choose—who risk and lose—yet seek and find again!

W. H. Gardner.

Poisonous Plants

At the cyanide plant of the Empire mine in Grass Valley, Cal., particular care has been taken to post conspicuous signs calling attention to the poisonous nature of the solutions and the cyanide salt used. In the West, botanists have for a long time been investigating "poisonous plants" but no mention has been made of the "cyanide plant," which flourishes in some silver mining districts and more often than not can be found in gold mining camps. Their attention is called to the excellent specimen at the Empire mine.

Twenty-five Cents Par Value

A Chicago dispatch states: "A new alloy that can be substituted for platinum or gold where acid-resisting metals are required has been discovered by Prof. W. S. Par, of the department of chemistry of the University of Illinois. The alloy, which Prof. Par has named "illium" in honor of the University, costs approximately 25c. an ounce, whereas platinum costs \$140 and gold \$40."—Illium may possibly find a market in our Troy laundry where we believe that acid-resisting metals must be needed. At any rate, gold at \$40 will interest the members of the National Gold Conference which recently met in St. Louis.

What's in a Name?

With an airy wave of the fairy wand that turns deficits into profits, Divide, Nev., becomes "Sigold" at the command of the Post Office Department. The new name is apt if not euphonious, for it is derived from "silver" and "gold" which metals brought the camp its fame. Would that this same felicitous touch might tame the wildcats! But it is to be regretted that the change is made so late. Under the name of Divide the camp has acquired a reputation that for both practical and sentimental reasons

the Post Office Department might well have retained. There is magic in the word "Divide," as brokers all will testify.

From Sourdough to Earldom

One of the recent boats out of Dawson, Y. T., carried Robert Leeson, who has followed mining and prospecting in the North for twenty-one years. Leeson was on his way to Ireland to claim the title and estate of the Earl of Milltown, it is said. His elder brother is believed to have lost his life in a shipwreck, having been missing for ten years. Leeson has never known the thrill of a big strike, though he has spent the better part of his life in the quest for gold. He knew the town of Dawson when it was the Mecca of the world's greatest gold stampede, and was there recognized as the champion chess player of the Yukon. He left Dawson in the garb of the frontier, and was given a rousing send off, as, carrying his own baggage, he boarded the boat for the "outside." Leeson said that if he secured the estate he will satisfy his ambition to cruise round the world—and then return to the Klondike.

An Old Report

In the days before the great uplift in technical writing, the report of even a competent engineer was sometimes a crude affair. In such a report written in 1876 we read the following:

Your lowest level and adit have reached the deposit, and I saw the galena in the heading, 220 ft. from the surface. I believe the lode to be a regular true-fissure deposit and therefore, with the consentient opinion of all authorities, likely to continue in depth.

The underground works you have already accomplished which have enabled me to inspect the conditions and form the foregoing opinion, are as follows: A vertical shaft in the vein, with five levels and certain cross cuttings. The shaft being now 230 ft. deep, and the levels on the chimney averaging 100 ft. in length, it is evident that the laying open of the mine is adequate to afford an intimate examination and pretty general conclusions.

You have now connected your first level with shaft No. 2, 150 ft. west of your actual service shaft. We may say that the ore in sight on your first level is 1,500 cu. yd.; on the second, 2,500 cu. yd.; on the third, 5,000; on the fourth, 7,500; and on the fifth, 10,000; in all—say 40,000 gross tons, which, according to your own experience at your mill will concentrate into not less than 4,000 tons of dressed ore, the average sale value of which has hitherto been \$94 per ton.

As for the underground works themselves, their disposition and execution deserve nothing but praise. Your shaft No. 1, which has been sunk in the best manner by Burleigh drills moved by compressed air, is solid and well timbered, 12 ft. by 4, divided into three compartments, in one of which is your Cornish pump, established in perfect condition; in the other two, your hoisting, which, although it will later be modified, has now one excellent guided cage and one bucket in service. Ultimately the hoisting apparatus, amplified only by replacing the bucket by a cage, will serve in that shaft for any extraction you will probably desire to attain.

Your levels, when somewhat enlarged for the accommodation of cars, will satisfy also the most complete and rapid stopping, so that, so far as preparation is concerned, you have little farther to expend in order to break down, transport and hoist 100 tons per day.

PERSONALS

M. Leopold is installing the Bureau of Mines exhibit.

Colby Dodge, of Los Angeles, was in Lovelock, Nev., on professional business on Oct. 20.

H. A. Megraw, metallurgical engineer for Kennedy-Van Saun Mfg. & Eng. Corp., was recently in San Francisco.

Rene de Sallier du Pin has accepted a position with the Societe Franco-Americaine de Metaux, at Paris, France.

E. J. Schrader, of Herbert Humphrey's engineering staff, was examining mines in Pershing County, Nev., during October.

Ralph T. Hirsh arrived in Havana, Cuba, early in October. Mr. Hirsh intended to leave on a professional trip into the interior.

William Sharp, engineer for George Wingfield, made a general examination of the Loring district in Nevada during the latter part of October.

W. T. Lundy, of San Francisco, Cal., and C. S. Boalich, of the State Bureau of Mines, are in the southern part of Nevada on mine-examination work.

Stanley Mahon has returned to Virginia, Minn., having completed the installation of a mill to treat pyrites at a Georgia property of the Hanna interests.

John Butler, of Butler Bros., is inspecting the various ore-drying plants of the Lake Superior district with a view to installing one at the Margaret mine.

Marion L. Thomas expected to return to New York during the last month after investigating mining properties in Nevada and other states for several months.

C. N. Schuette is leaving San Francisco, Cal., to accept the position of superintendent of the Mariscal Mining Co.'s quicksilver mine, at McKinney Springs, Tex.

Frank Billings and Carmi Thompson, president and vice-president respectively of the Tod-Stambaugh Co., have completed a tour of inspection of the company's Minnesota holdings.

P. S. Smith, the administrative geologist of the Geological Survey, is installing the Survey's exhibit, which will be shown at the convention of the American Mining Congress at St. Louis.

C. W. Newton, of Wallace, Idaho, manager of the Consolidated Interstate-Callahan Mining Co., has gone to Rochester, Minn., where he will sub-

mit to an operation at the Mayo hospital.

Emmett Flynn, safety inspector for the northern mines of the Republic Iron & Steel Co., represented that company at the safety conference recently held at Pittsburgh by the U. S. Bureau of Mines.



Harris & Ewing
R. B. MOORE

R. B. Moore, superintendent of the Golden station of the U. S. Bureau of Mines, has been appointed chief chemist of the bureau, succeeding Charles L. Parsons. Dr. Moore will leave for Washington about the middle of November. S. C. Lind, assistant superintendent, has been appointed to Dr. Moore's place, and Will C. Coghill, of the Seattle station, will succeed Dr. Lind.

Major W. H. Ferguson, who was with the 317th Engineers in France, was in the Loring district in Nevada during the latter part of October, to examine the Treasure Hill property for New York clients.

SOCIETIES

The National Safety Council in accordance with the action of the annual meeting on Oct. 1 through its Executive Committee has approved the organization of an engineering section for the purpose of bringing together the mining, civil, mechanical, electrical, and chemical engineers among the membership. The membership qualifications are similar to those of the national engineering societies. Among the functions of the section will be the following: To furnish technical information

as desired; to perform technical services for the council such as the development of standards and by inquiry or research to solve special engineering problems arising in safety work.

American Institute of Mining and Metallurgical Engineers, Colorado Section, held a meeting at the Denver Club, Denver, on Oct. 15, in honor of Horace V. Winchell, president of the Institute. The gathering was informal.

American Institute of Mining and Metallurgical Engineers, Montana Section, will hold the Fall meeting on Nov. 8 at the Montana Hotel, Anaconda, Mont. The following papers will be read: "The Reverberatory Furnace for Treating Converter Slag at Anaconda," by Frederick Laist and H. J. Maguire; "The Dust Problem and Cottrell Treater Installation at the Washoe Smeltery" by James K. Murphy.

The Mining and Metallurgical Society of America will hold a reception and dinner in honor of Eugene Schneider, head of Schneider & Co., operating the Creusot and other steel works of France; honorary member, American Iron and Steel Institute; president, Iron and Steel Institute of London; president, Comite des Forges de France, on Nov. 24, 1919, at the Hotel Biltmore, New York. The gold medal of the society will be presented to him on this occasion.

OBITUARY

Herbert G. Thompson, for several years superintendent of the Nevada Packard mine, in the Rochester district, Nevada, was killed on Sept. 25 as the result of a fall from the 300-ft. level. Mr. Thompson was thirty-one years old and is survived by his wife, child, and mother. The funeral was held in Oakland.

INDUSTRIAL NEWS

W. D. Ward has been transferred from the San Francisco office of the Pelton Water Wheel Co. to their New York office, where he will have the title of manager of the Atlantic department, which includes the territory east of the Mississippi, Europe and South America. Mr. Ward has been with the Pelton company for twenty-five years and until recently held the position of contract and sales engineer. In New York he succeeds F. W. Gay.

Collins & Webb, of Los Angeles, Cal., have opened offices at 229 Rialto Building, San Francisco, with G. A. Fisher in charge.

Walter Hasendahl, formerly in charge of Allis-Chalmers Mfg. Co. district office in Los Angeles, has entered the firm of Rosenberg & Co. as consulting engineer. Rosenberg & Co. have offices and warehouses in Los Angeles and Congress Junction, Ariz., and handle both new and used mining, crushing, power and pumping machinery.

Smith, Booth, Usher Co. announce the removal of their San Francisco offices and warehouse to 140-42 Fremont Street.

The Pacific Tank and Pipe Co., a California corporation, has issued \$750,000 of first mortgage, 7% sinking fund gold bonds of date Sept. 1, 1919, and due Sept. 1, 1929.

The Merchants' Association recently issued its year book, which covers the year ended April 30, 1919. The book contains a list of members and the reports of the president, the secretary, the chairman of the member's council, and the heads of the various bureaus.

The Dickey Steel Co., Inc., Woolworth Building, New York, has been appointed eastern sales and export representative of the Hammond Steel Co., Inc., of Syracuse, N. Y., manufacturers of high-speed, alloy, and straight-carbon tool steels. The alloy steels are manufactured in bars, weldless rings, die blocks, and special shapes.

Parsons-Moorhead Machinery Co., Hostetter Building, 237 Fourth Ave., Pittsburgh, has been organized to do a general machinery business. William L. Moorhead, of this company, was formerly vice-president of the Duquesne Electric & Manufacturing Co., and Mr. Parsons has been engaged in a general machinery business for several years.

Black and Decker Manufacturing Co., Baltimore, Md., is erecting a new plant at Towson Heights, Md. The new building will be 100 x 200 ft., erected on the west side of the present plant and planned to conform architecturally to the residences being erected on Joppa Road. The general offices have been removed from Baltimore to Towson Heights.

The Lidgerwood Manufacturing Co., of New York, announces the opening of a branch office in the Hammond Building, Detroit, Mich., for the sale of the company's contractors' hoists, derricks, and cableways, mine hoists, ships winches and steering gear, and logging machinery. R. S. Hutchinson, formerly of the Lidgerwood office in Philadelphia, will have charge of the Detroit office,

under the direction of F. B. Knight, of the Chicago office, who previously handled this business in Detroit.

The Electric Furnace Co., Alliance, Ohio, has announced the installation of nine new Bailey electric furnaces for melting non-ferrous metals and alloys as follows: The Drew Electric and Manufacturing Co., Cleveland, Ohio; the Nolte Brass Co., Springfield, Ohio; Kennedy Valve Co., Elmira, N. Y.; American Bronze Corporation, New York City; Dominion Steel Products Co., of Brantford, Ontario; the Deming Co., Salem, Ohio; Miller Pasteurizing Co., Canton, Ohio, and Landers, Frary & Clark, New Britain, Conn.

H. A. Wilson Co., Newark, N. J., have recently placed on the market a new product known as "Wollaston" wire. It has a platinum core and a silver exterior. It is drawn to about .004 in. diameter of silver, and the platinum core is reduced to the extremely small size of .00006 in. diameter. The silver outside may be dissolved off in acid, leaving the platinum core intact. This wire is manufactured in long lengths with a continuous platinum core. Wire of this description was made in Germany before the war and exported to other countries.

Western Wood Pipe Publicity Bureau has been formed by the four largest manufacturers of wood pipe upon the Pacific slope, for the purpose of disseminating information about Western wood pipe. The bureau will make an especial effort to have wood pipe properly installed and to promote its use for purposes for which it has proved suitable. The four companies are: Continental Pipe Manufacturing Co., of Seattle; the American Wood Pipe Co., of Tacoma; and the Redwood Manufacturers Co. and the Pacific Tank and Pipe Co., both of San Francisco. Offices of the bureau have been established in the White Building, Seattle, with E. J. Bartells, manager.

TRADE CATALOGS

Magnetic Manufacturing Co., Milwaukee, Wis., has sent out a circular describing the Type L separator, which, it is claimed, possesses a large capacity for handling material efficiently. A high-duty magnetic pulley is also described, as well as Type F separator for steel and iron.

Steam Shovels, Cranes, and Dredges. The Osgood Co., Marion, Ohio; 8 3/4 x 11; 31 pp.; illustrated. Describes revolving and railroad types of shovels for various kinds of work. The catalog is

written in Spanish, with an English translation on the opposite page.

The Terry Turbine. Terry Steam Turbine Co., Hartford, Conn.; 8 1/2 x 11; 30 pp.; illus. Describes the company's non-condensing turbine, possessing particular features, which it is claimed results in increased efficiency and economy in space. A condensing type which is built in sizes from 1 to 1,500 hp. is also described.

Champion Kerosene-Burner Co., Kenton, Ohio, has sent out information describing a new portable furnace claimed to generate a temperature of 3000 degrees within five minutes. This heating unit, which is self-contained, has been designed for heating rivets, heat-treating tools, "shrinking-on" processes, and similar operations requiring an intense heat in a small portable furnace.

Milliken Buildings. Milliken Brothers Manufacturing Co., Woolworth Building, New York. Catalogs Nos. 10 and 11; 8 1/2 x 10 3/4; 44 and 32 pp. respectively; illustrated. Contain complete foundation plans, erection diagrams, construction details, and directions for the erection of buildings. It is stated in the introduction that this is a supplement to Catalog No. 10 and is designed to be a complete guide for the erection of Milliken buildings, including, as it does, in simple and ready reference form, the essential information needed for the erection of the building from foundation to completed structure. This has been made possible by the use of the standardized truss-unit system.

NEW PATENTS

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

Tools—Pneumatic-Tool Handle. Morton C. Hutchinson, assignor to Chicago Pneumatic Tool Co. (1,315,554; Sept. 9, 1919.)

Tungsten—Compressed Tungsten Powder. Carl A. Pfanstiehl. (1,315,859; Sept. 9, 1919.)

Welding—Method and Compound for Welding Steel and Other Metals. Hughes L. Siever, Erie, Pa. (1,315,611; Sept. 9, 1919.)

Zinc-Retort Residues, Treatment of. Oscar Spitzer, New York, N. Y., and Cairy Clyde Conover, Springfield, Ill. (1,315,349; Sept. 9, 1919.)

Zirconium—Basic Sulphate of Zirconium and Method of Making the Same. Edward J. Pugh, assignor to Pennsylvania Salt Manufacturing Co. (1,316,107; Sept. 16, 1919.)

THE MINING NEWS

New York, November 1, 1919

Disaster in Cornish Tin Mine

Rod of Man Engine Breaks as Shifts Are Changing—Many Lives Lost

A large number of men were killed on Oct. 20 when the man engine of the Levant mine, at St. Just, Penzance, Cornwall, broke down as the crew was being raised to the surface. The Levant man engine is said to be the only survivor of the type in the world. The rod broke at the nose at the moment when the engine was at the top of its stroke, thus permitting the giant lift ladder, a ponderous beam 300 "fathoms" long, on which were over 100 men, to drop the length of the stroke, a distance of 12 ft. Consequently some of the men were knocked off and squeezed against the sides of the shaft, and some of the ladder sollars were smashed, as well as the platform on which the men stood. The passage up the shaft was thus blocked in places.

Surfacemen were at once organized into rescue parties and sent to various levels leading into the man-engine shaft to get out any injured, other shafts being used for the purpose. The rescuers were within speaking distance of the men in the 12 and 24 levels, but the platforms had been knocked out, and it was impossible for them to go up or down. A road, however, was put in for these men and they were freed. Most of the men who were on the man engine are stated to have again returned to the levels to help in the rescue work.

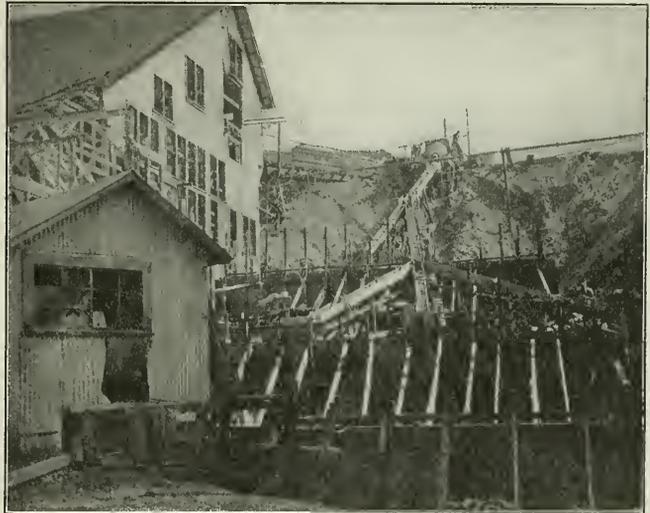
It was stated by the manager that the engine was inspected and oiled every day. At the place where the breakage occurred a new beam was put in a short time ago, and the iron rod and two iron caps were practically new. This method of raising and lowering men has been in use at Levant about seventy years.

Improvements at Empire Mine at Grass Valley, Cal.

An addition is being made to the Empire Mines & Investment Co.'s stamp mill at Grass Valley, Cal. The number of stamps will be increased from 60 to 80. The cyanide plant is being enlarged to a corresponding extent. Between the mill and the Pennsylvania shaft a narrow-gauge trolley line is under construction and has been

practically finished. All of the ore produced from the Pennsylvania shaft will be transported over this line to the mill at the Empire shaft. The effect of this will be to concentrate all milling in one plant instead of at two plants, as at present. The addition to the mill, which is shown in the accompanying cut, is of substantial construction, retaining walls and mortar block being of concrete. A new tailings dam is also being constructed. It is expected that this dam will provide ample storage for tailings for a long time.

carry over. One mine on the Marquette Range has over 300,000 tons of crushed hard ore awaiting a market. The lump ore from this property finds a ready buyer, but the crushed is not in demand, owing to changes in furnace practice in recent years. Another Marquette Range property which produces high-grade Bessemer hematites must carry most of the 1919 output over for another year at least. This mine never had difficulty in finding furnaces to take its ores, but the open-hearth furnace has brought about the change.



CONSTRUCTION OF 20-STAMP ADDITION TO CYANIDE MILL OF EMPIRE MINES & INVESTMENT CO., GRASS VALLEY DISTRICT, CALIFORNIA

Iron-Ore Shipments Curtailed by Steel Strike

It is estimated that Lake Superior iron-ore shipments will be in the neighborhood of 47,000,000 tons in 1919, or 13,000,000 tons short of last year. A tonnage of 50,000,000 would probably have been attained if the steel strike had not occurred, as the Lake movement has slowed up considerably since the strike was declared. The September shipments totaled 8,178,483 tons, a decrease of 816,531 tons from the figures for the same month of 1918. The total movement to Oct. 1 was 37,776,531 tons. It is because of the hopeful outlook for next season that the operators are stocking at the mines, although many of them have considerable ore to

Employment Office Re-established at Wallace, Idaho

1. W. W. to be Barred From Mines—George T. Edmiston Will Again Take Charge

The employment office has been re-established at Wallace, Idaho, in the Coeur d'Alene district. The office opened on Oct. 21 in charge of George T. Edmiston. The plan, in fact, was never wholly abandoned, for after all other companies had discontinued it, the Bunker Hill & Sullivan company stuck to it, which to a large extent explains why that company alone was not involved in the recent strike. Following the trouble twenty years ago, when the miners' union blew up the Bunker Hill & Sullivan mill, a permit system was

devised by the military authorities through which all mines were supplied with men, the purpose being to prevent the employment of all those members of the Western Federation of Miners who were in sympathy with the lawless element. With the withdrawal of the military, the permit office was succeeded by the employment office. This was a voluntary arrangement among the operators to prevent the lawless element from gaining control. An office was established at Kellogg and at Wallace, and all companies employed their men through one of the offices except the Hercules, which was controlled by the Days.

The Wallace office was discontinued about three years ago, but the Bunker Hill company continued the Kellogg office. The chief purpose of the office at this time is to guard against the employment of members of the I. W. W. The mines to be served by the Wallace office are the Morning (Federal) and Hunter, at Mullan; Hecla and Hercules, at Burke, and Tamarack and Interstate-Callahan, at Nine Mile.

Sampling Charges on Nevada Ores Announced

Announcement has been made for the benefit of Nevada ore producers by F. C. Lincoln, State Ore Sampler of Nevada, that at Hazen, Nev., there is a minimum charge of \$5 on small lots of ore and 25c. per ton is charged on lots in excess of twenty tons. At the Selby smeltery and at the Nichols plant of the General Chemical Co., in California, there is a minimum rate of \$7.50 on small lots and a charge of 25c. per ton on lots in excess of thirty tons. At the Mammoth smeltery in California and the Garfield and Murray smelteries in Utah, the minimum rate is \$6.25 on lots of less than twenty-five tons. Minimum rates at other points will be fixed as rapidly as possible, but, at present, rates at purchasing points not mentioned are actual costs of supervision for lots of less than fifty tons, and 25c. per ton on lots of fifty tons or more. Special low rates may be made upon large lots to suit local conditions.

Mr. Lincoln recently made the following announcement of appointments at smelteries and ore buying establishments outside of Nevada: Abbot A. Hanks, of San Francisco, is deputy for the Selby smeltery and Nichols plant of the General Chemical Co. Charles Kunze, of Kennett, Cal., is deputy for the Mammoth smeltery. W. E. West, of Salt Lake City, is deputy for the American Smelting & Refining Co.'s Murray and Garfield plants, for the U. S. Smelting & Refining Co.'s Mid-

vale smeltery and for the Utah Ore Sampling Works. George Howarth is deputy for the International Smelting Co.'s Tooele plant.

New Capital Enters Eureka District, Nevada

The Mining & Development Corporation, of Maine, has acquired a large interest in the Richmond-Eureka Mining Co. which owns several of the old mines in the camp of Eureka, Nev. The buying company, which is controlled by the E. A. Holter and H. P. Henderson Syndicate, of New York, will spend a large sum in equipping and developing the property. The stockholders of the Richmond-Eureka company include the U. S. Smelting, Refining & Mining Co., Henry C. Frick, J. H. MacKenzie, and others.

Utah Mines Pay Seven Taxes

Seven different kinds of taxes are among the burdens with which Utah mines are struggling during the period of reconstruction. This means not only a large pecuniary outlay on the part of mining companies endeavoring to adjust themselves to present labor conditions, slowness of delivery of materials, and high costs, but also a large amount of clerical labor, which is an additional expense.

The heaviest taxes are the Federal income and excess-profits taxes. The remaining five forms of taxation, including the cost of workmen's compensation as a tax, are briefly: The state property tax, based on the valuation of ground purchased from the Government and the tax on equipment; the tax on the net proceeds of mines, which is based on three times the net proceeds of mines, the rate of taxation being that of the county in which the mine in question is situated; the Federal capital stock tax, on which the rate has been increased to \$1 per \$1,000, this year on everything over \$5,000, the basis of valuation of stock being the market value, capitalization, or capitalization of earnings; the Federal tax of 10 per cent on the corporation's undistributed earnings, carried from year to year; and, lastly, the cost of workmen's compensation.

Mayflower Lode Proved to Have Been Cut Two Months Ago

Unusual interest is taken in the fact that development operations in the Mayflower-Old Colony shaft, near Calumet, Mich., show, beyond a doubt, that the shaft cut through the lode at 1,403 ft. Diamond-drill exploration, upon which the shaft work was based, showed the lode at two points, 1,400 ft. and

1,700 ft. There was a peculiar geological condition in the shaft. Physical developments at 1,550 ft. verify the assumption that the lode was cut in the shaft proper sixty days ago.

Although this work has not resulted in opening the lode to an extent which will assure its commercial operation on a successful basis, the mere fact that this formation has possibilities is increasingly important in its bearing on the future of the district, particularly because the Mayflower is outside the accepted limits of the mineralized area.

Mason Valley Smeltery May Be Re-opened on Custom Basis

Freight Rates on Ore Must First Be Lowered on Western Pacific Railway

One of the important matters brought to the attention of the Nevada Public Service Commission is the application of the management of the Mason Valley Mines Co. for satisfactory railroad rates covering the movement of ores from Plumas County, Cal., north of Reno, over the Western Pacific Ry., to the smeltery at Wabuska.

Contingent upon the securing of such rates the company has declared its intention of reopening the smeltery for operations on a custom basis, something that it has not done heretofore, its operations having been confined to smelting its own ores from the Mason Valley mines. This change would necessitate the installation of reverberatories. It is claimed that the success of the project would mean much to the State, as it would make possible the mining of low-grade ore deposits situated at or near points along direct railroad lines, but that will not bear the cost of transportation to either Salt Lake or California smelteries.

The rates in question, in this particular application, are interstate, and are not within the jurisdiction of the Nevada Public Service Commission. However, the commission may act as attorney in fact, and Commissioner Shaugnessy has been authorized and directed to take the matter up with the regional committee of the U. S. Railroad Administration at San Francisco.

Yukon Navigation Closed October 8

Navigation on the Yukon River was closed on Oct. 8. The movement of Yukoners to the coast for the winter was not as great as usual, owing chiefly to reports of unrest on the outside and to the fact that silver-mining prospects are very bright in Mayo, Twelve Mile, and Fairbanks camps, where many will be engaged. The usual winter gold mining also requires many men.

PROGRESS OF MINING OPERATIONS

Important Events of Interest
Condensed and Classified
for Easy Reference

ALASKA

Kennecott Copper Co.'s production, including that of the Braden Copper Co., was 9,928,000 lb. in September, compared with 8,224,000 lb. in August and 5,508,000 lb. in September, 1918.

ARIZONA

GLOBE-MIAMI DISTRICT

Inspiration—The Inspiration Consolidated Copper Co. is operating fourteen of the twenty sections of its concentrator and milling about 13,500 tons of ore per day, which is about two-thirds capacity. The company is preparing to resume churn-drilling operations to check up data already obtained and to complete its records. Drilling will start in the vicinity of the Bull Dog fault. The data obtained will enable the engineering staff to complete its work of preparing sections of the orebodies.—At Miami, the new 50-ton concentrator of the Miami Mining & Milling Co. will be ready for operation Nov. 1. Equipment for a second 50-ton unit has been ordered. The shaft of the Van Dyke Copper Co. has reached the 450-ft. point.

Globe—Excavations for the foundations of the Iron Cap Copper Co.'s new concentrator are nearly complete and the concrete work will be started soon. Extension of the power line to the new mill is under way. A new sump and pump station have been cut on the 130 level, where a large Aldrich quintuplex, electrically driven pump will be installed, which will deliver 18,000 gal. of water per hour for use in the mill.—Operations at the Superior & Boston are confined to development work, except for two leases. Diamond drilling to pick up the eastern extension of the Old Dominion vein is being done from the 12th level.—At Bellevue, the Arizona Globe's shaft entered the hanging wall of the vein at 480 ft. disclosing high-grade milling ore. The Gibson Consolidated's new mill is operating three shifts on dump ores and turning out three cars of concentrates per week. The company is planning to treat a limited tonnage from the Arizona Globe. The "A" shaft of the Old Dominion company is down to about the 20th level, sinking being impeded by a flow of 2,000,000 gal. per day.

PIMA AND MARICOPA COUNTIES

Silver Bell—Percy Williams and associates leasing the old El Tiro mine near the Silver Bell have opened up 35 ft. of 8 per cent copper ore at the 100

level. Eight cars a week are being shipped to the Hayden smeltery.

Tucson—Suit has been entered against the operating company of the Reiniger-Freeman property by William L. Wakefield, alleging forfeiture by reason of non-payment of instalment on purchase due Oct. 9. Damages of \$5,000 are claimed for alleged removal of machinery.—The Silverita property is shipping ore valued at \$250 a ton in copper and silver. This property was formerly known as the Yellow Bird.

CHLORIDE, KINGMAN, AND HACKBERRY

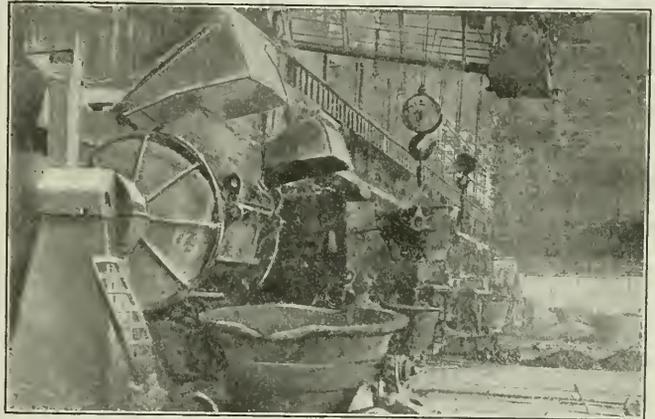
Chloride—The Chloride tunnel project is reported by J. C. Rankin, manager, to have been financed through T. B. Scott, of New York, for \$100,000 subscribed by companies controlling the

shaft is planned to permit exploration without interfering with hoisting.—The Senate Silver company now has a station completed at the bottom.

PRESCOTT AND CROWN KING

Copper Basin—This district west of Prescott is showing much activity with development work being done on the J. & J., L. L. Le Varr, and Martin Shuber groups. The J. & J. has a strike of rich silver ore at 270 ft.

Crown King—The Montezuma property has been taken over by a Colorado company.—The Philadelphia Mining Co., operating the Nelson property, has cut ore 3,000 ft. from the tunnel portal and 700 ft. below collar. A raise will be started as well as a crosscut toward several parallel veins.



CONVERTER BUILDING, MAMMOTH

COPPER MINING CO, KENNETT, CAL.

CALIFORNIA

MINING ON THE MOTHER LODE

Plymouth—The Plymouth Consolidated Gold Mines encountered very heavy ground in deepening its shaft from the 2,600 to 2,700 level. Other means of support than wooden sets was necessary. Sixty feet of the worst ground is now carried by steel girders in the form of ordinary shaft sets. Girders rest on concrete pillars placed on each side of the shaft. The experimental work will be finished soon and if found successful other parts of the shaft will be treated likewise. The shaft will be flattened to 45 deg. to pass through the broken ground as soon as possible. When the hanging wall is reached the shaft will be straightened and sinking

Samoa, Lucky Boy-Brighter Days, and Rainbow properties, to be benefited by the tunnel.—Sinking on the Diana property has cut the ledge on the dip at 370 ft., the ore running well in silver and gold. Water is giving trouble.

Kingman—The new electrically driven hoist and compressor plant of the Rural-Buckeye property at Mineral Park is now in operation. The Buckeye tunnel is to be driven further. This property was taken over by M. B. Dudley and associates.—The Catherine gold mine west of Union Pass has developed 12 ft. of good ore in a 30-ft. vein on the 200 level.

Hackberry—The Hackberry Consolidated Mining Co.'s new mill is operating and making good recovery. A new

continued. The nature of the foot-wall country makes it impossible to turn the shaft to follow the foot wall, where it should be, for the economical working of the vein.

Jackson—The 3,700 level south drift of the Central Eureka Mining Co. at 240 ft. south of crosscut has the vein 18 in. wide but low grade. The north drift 92 ft. from the station has 3 ft. of milling ore. The two-compartment, north foot wall raise, from the 3,700 level is up 41 ft. This will connect with the winze from the 3,500 level. The 3,350 south drift is cleaned out and the track laid to grade. Ten stamps have been hung up to permit replacing rotten mortar blocks with concrete. Thirty stamps will be used.

Angels—The Morgan mine's production for September was over the August record of \$105,000. The force will be doubled to increase production. Diamond drilling is under way in the search for the downward extension of four known oreshoots.—The Lee mine has purchased the Utica chlorination plant and will use the lumber for building purposes.

Alleghany—William Simpkins will make arrangements for immediate resumption of work under option to Fred Seales, Jr.

Grass Valley—The Central Consolidated Mines Co. has acquired the Central, Banner, and North Banner properties. A development campaign is being planned as well as the erection of a mill.

THE COPPER DISTRICTS

Kennett—The Mammoth Copper Co. has increased its force to sixty men, and placed four drills in operation. Development of new territory is claiming principal attention. Shipments of silicious ores from the Reid mine and other properties are being received at the smeltery and stored in yards for future use. The smeltery has been idle since the strike of last spring.

Engelmine—The Feather River Copper Co. has taken over the Snowstorm group adjoining the property of Engels Copper Co. Orders have been placed for mining machinery and compressors.

BISMUTH IN INYO COUNTY

Keeler—Bismuth has recently been found in the Silver Reef property, occurring as tetradymite. Leases have been granted.

COLORADO EMPIRE—TELLURIDE

Empire—The Primos Chemical Co. has about seventy men on the payroll at its plant at Urad, near Empire, Col., employed on development in both upper and lower tunnels, on mill repairs, and on tramway construction. The 60-ton plant, which has been idle since June, is said to have two Marcy

mills, flotation equipment, and concentrating tables. The new tramway is 1,200 ft. long, with steel towers and concrete footings. The vein worked is said to be 43 ft. wide and porphyritic and runs about 2 per cent molybdenum sulphide. Commercial lead-silver ore was recently cut. Appearances indicate company is planning steady operation.

Telluride—Concentrate shipments from the station in September were: Tomboy 55 cars; Smuggler-Union 41; B. Perrino 2; and John M. Wagner shipped 3 from Cimarron. Shipments were larger than last year's.

MICHIGAN GOGEBIC RANGE

Bessemer—The Tilden company plans to sink another shaft about 500 ft. deep west and north of No. 10 shaft near 11th level ore. No. 10's hoist is working to capacity. Extent of the 11th level orebody has not been determined.

MARQUETTE RANGE

Ishpeming—It is impossible to work the plans of the Cleveland Cliffs Iron Co. to capacity, owing to lack of rain, which has lowered the streams supplying the power plants. A new and larger storage basin is to be created on the Dead River, north of Ishpeming.

MENOMINEE RANGE

Vulcan—The Penn Iron Mining Co. is working all mines on a basis of four days a week, because of large stocks of ore on hand. This is the first Michigan company to reduce to this basis. Some have closed and others have reduced forces.

NEVADA

VIRGINIA CITY—MCGILL—DIVIDE

Comstock Lode—Active development has been resumed on all properties in the district. A feature of the week was Consolidated Virginia's production of 457 tons of ore, valued at \$12,000, from the new vein on the 2,150 level.

McGill—The September production of the Nevada Consolidated Copper Co. was 4,250 lb. copper, against 6,670,415 lb. a year ago. There was no production in August, owing to the strike.

Divide—The Post Office Department has given the townsite in the Divide district the name of "Sigold," instead of Divide City, as the promoters wished.

NEW MEXICO

Santa Rita—The September production of the Chino Copper Co. was 3,538,704 lb., against 3,321,857 in August and 7,936,000 a year ago.

UTAH

TINTIC DISTRICT—BINGHAM CANYON— PARK CITY

Eureka—Tintic shipments for the week ended Oct. 18 were 114 cars. The May Day company has let a contract for 500 ft. of drifting to the west on the 1,800 level, starting from the Yan-

kee side line. The Pinion Queen is said to have let a contract for sinking a shaft the first 500 ft. to Jack Aho.—The Tintic Standard will deepen the south shaft, now down 1,050 ft., by 500 ft.

Bingham C. nyon—The Utah Apex company recently resumed shipments, and expects to reach 500 tons daily. Preparations are being made under Waldemar Lindgren for the suit with Utah Consolidated to begin Nov. 6.

Park City—The Silver King Coalition Co. was granted a writ of certiorari in its suit with the Conkling company, claiming damages for ore illegally extracted from adjoining claims.

WISCONSIN

ZINC-LEAD DISTRICT

Platteville—The Wisconsin Zinc Co. has just started a 170-ft. shaft on the Booty land one-half mile west of the Winskell. The C. A. T. No. 2 mine has been connected by a 700-ft. drift with the old workings of C. A. T. No. 1, on the C. A. Thompson land at New Diggings.—The Vinegar Hill Zinc Co. has proved up an extension of the Hoskins Range for 550 ft. by drilling on the William Fields land; a shaft will be sunk and the Meloy mill equipment utilized. A new run has been proved up on the Houghlett and Gray land at Days Siding where a new shaft is being sunk. The new shaft on the James Copeland land at Shullsburg is completed. The Dale Rundell mill has just been placed in operation at Livingston.

Linden—The new Fearless company began milling on the Rule land with equipment newly assembled on the Optimo No. 4 tract at Linden.—McKay Brothers are operating the mine and mill recently purchased from Ross Bros., of Mineral Point.

Cuba City—The old Beacon Hill property one mile south of Cuba City is being developed by Newton Varker and others. The Anthony mine is being reopened by Baldwin and Uren.

MEXICO

The American Smelting & Refining Co. started up its Velardena smeltery at Asarco, Dgo., with one furnace on Oct. 23. For several months the company has been working on the construction of the Veta Grande 600-ton cyanide plant near Parral as steadily as conditions would permit. This plant may be ready for operation by Mar. 1, 1920.

The El Oro Mining & Railway Co. recently declared a dividend of 5 per cent, or 1s. per share, which was payable on Oct. 31, absorbing £57,375.

CHILE

Chile Copper Co. produced 7,044,000 lb. copper in September, compared with 8,994,210 in August, and 7,346,000 in September, 1918.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
23	416	118 ⁸ / ₈	63 ⁷ / ₈	27	417	120 ³ / ₄	65
24	415 ¹ / ₂	118 ⁷ / ₈	64 ⁴ / ₄	28	417	121 ¹ / ₂	65 ⁵ / ₈
25	415 ³ / ₄	119 ¹ / ₈	64 ¹ / ₂	29	415 ⁵ / ₈	123 ¹ / ₄	66 ¹ / ₂

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

Daily Prices of Metals in New York

Oct.	Copper		Tin		Lead		Zinc
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.
23	21 ¹ / ₂ @21 ³ / ₄	54 ³ / ₈ @54 ⁷ / ₈	6 ³ / ₄	6 ³ / ₄	6 ¹ / ₂	6 ¹ / ₂	7.75@7.80
24	21 ³ / ₈ @21 ⁵ / ₈	54 ³ / ₈ @54 ⁷ / ₈	6 ³ / ₄	6 ³ / ₄	6 ¹ / ₂	6 ¹ / ₂	7.75@7.80
25	21 ³ / ₄ @21 ⁵ / ₈	54 ³ / ₈ @54 ⁷ / ₈	6 ³ / ₄	6 ³ / ₄	6 ¹ / ₂	6 ¹ / ₂	7.75@7.85
27	21 ³ / ₄ @21 ⁵ / ₈	54 ³ / ₈ @54 ⁷ / ₈	6.75@6.80	6 ³ / ₄	6 ¹ / ₂	6 ¹ / ₂	7.60@7.70
28	21 ³ / ₄ @21 ⁵ / ₈	54 ³ / ₈ @54 ⁷ / ₈	6.75@6.80	6 ³ / ₄	6 ¹ / ₂	6 ¹ / ₂	7.55@7.60
29	21 ³ / ₄ @21 ⁵ / ₈	54 ³ / ₈ @54 ⁷ / ₈	6.75@6.85	6 ³ / ₄	6 ¹ / ₂	6 ¹ / ₂	7 ¹ / ₂

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

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.15c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
23	102 ³ / ₄	102 ³ / ₄	115	280	281	30 ¹ / ₂	31 ¹ / ₄	45 ¹ / ₂	45 ³ / ₄
24	100 ¹ / ₂	100 ³ / ₄	114	279	280	30 ³ / ₈	30 ⁷ / ₈	45 ¹ / ₂	45 ³ / ₄
25									
27	98 ³ / ₄	99	114	273 ¹ / ₂	274 ¹ / ₂	29 ⁷ / ₈	30 ³ / ₈	45	45 ¹ / ₂
28	99 ⁵ / ₈	99 ³ / ₄	114	275 ³ / ₄	277	30 ³ / ₈	30 ³ / ₄	45	45 ¹ / ₂
29	100	100 ³ / ₄	114	276 ³ / ₄	277 ³ / ₄	30 ¹ / ₂	30 ³ / ₈	44 ¹ / ₂	44 ⁷ / ₈

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

Metal Markets

New York, Oct. 29, 1919

The quotation for zinc blende of Prime Western grade in the Joplin market for the week ending Aug. 30, 1919, should have been \$45 basis, instead of \$47.50. Our attention was called to the error soon afterward, and some settlements were held in abeyance on account thereof. It was necessary for us to make an investigation of the situation; wherefore the delay in making the correction, which is now formally made.

Copper was very dull and was weakish. In lead a further sharp advance was recorded. In zinc there was a sharp recession, with rather active business.

Transatlantic freights were un-

changed. The rates from San Francisco to Hongkong and Kobe continued at \$20.

Copper

Scarcely any business was done by the principal producers. The report that one of them had cut prices and secured a large order was entirely unfounded. However, one agency succeeded in disposing of two or three round lots. Among producers and agencies there is active competition, and any one of them is ready to meet the market. The latter eased off a little from day to day, and at the close 21¹/₂c., f.o.b. refinery, could be done in any quarter, with the probability that 21¹/₄c. would be accepted. Business was actually accepted at 21¹/₄c. by some of the smaller agencies.

United States copper production in August, 1919, amounted to 107,994,040 lb., compared with 100,369,247 lb. in July, 1919, and 165,550,799 lb. in August, 1918. Imports of copper in ore and concentrates, and blister, during August, 1919, amounted to 23,389,574 lbs.

Copper Sheets—32¹/₂c. per lb. Wire, 25c. Domestic buying dull.

Tin

The market for spot tin was erratic, owing to conditions resulting from the longshoremen's strike, which continues.

Singapore quoted £287¹/₂, c.i.f. London, each day of the week.

Lead

The A. S. & R. Co. advanced its price to 6¹/₂c. early on Oct. 23. Demand continued good, and later in the week independent producers began to realize higher prices. At the same time there were a few transactions in lead at prices below that of the A. S. & R. Co.

These represented metal in out-of-the-way places, and to some extent probably were the re-selling of lead purchased from the Government.

The demand for lead products continues very large, especially from the building trade. The requirements for pipe, lead traps, and other plumbing supplies, is extraordinary. Business in white lead also continues good. The demand from the storage battery people is insatiable. An active business in shot is going on, and there is a good deal of foreign demand for that manufacture.

Zinc

Some further large quantities were sold for export, especially to England, these transactions occurring at the beginning of the week, and the market advanced to about 7.80c. on the average. At that level very free selling was encountered, this representing in part the liquidation of a good many small speculative accounts, but there was also considerable selling by the smaller producers. These free offerings resulted in a sharp decline, but the metal that was offered was readily taken by strong hands, and there is no reason to suppose that the reaction of this week was anything but a temporary setback. Economic conditions making for a strong market continue unchanged. It is certain that Europe is going to require a good deal more of our zinc than it has yet bought in this movement.

Business in high-grade zinc was done this week at 8½c., delivered, but it is understood that there is still a tonnage in New York that can be bought at 8c.

The following zinc smelters are now idle, owing to strikes: Donora, Terre Haute, Peru. Labor troubles at La Salle were reported this morning.

An active foreign demand for American sheet zinc is developing.

Zinc Sheets—\$10.50 per 100 lbs.

Aluminum—33c. per lb.

Antimony—Unchanged at 8¼c. for spot. Futures were quoted at 9@9¼c., duty paid.

Bismuth—Unchanged at \$2.96.

Cadmium—\$1.40@1.50.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c.

Quicksilver—Quicksilver to arrive was quoted at \$80@85. San Francisco telegraphs \$82.50, steady.

Silver—Owing to limited supplies, London has advanced rapidly during the last few days. With no shipments at present from New York, London is dependent on the white metal from other sources. It is understood that Canada, Australia, and France have been making moderate consignments to that quarter. China is still a buyer, and has been the chief factor in causing the advance.

Mexican dollars at New York: Oct. 23, 93; Oct. 24, 93½; Oct. 25, 94½; Oct. 27, 95¼; Oct. 28, 95¾; Oct. 29, 97.

Platinum—Shortage in the supply continues, and the market responds quickly to any increase in demand. This week it was a little stronger. We quote refined ingot at \$130@135.

Palladium—Unchanged at \$120.

Manganese Ore—Brazilian ore of 45 per cent grade was offered at 50c. per unit, c.i.f. Atlantic ports, without finding buyers.

Tungsten Ore—Some business in Chinese ore was done at \$7.

Molybdenum Ore—Quoted nominally at 75c. per lb. of molybdenum sulphide.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace size ore, free from fines, c.i.f. New York or other Atlantic ports. Sulphur companies reported to be selling at prices as low as 14@15c. Market unsettled.

Zinc and Lead Ore Market

Joplin, Mo., Oct. 25.—Zinc blende, per ton, high, \$49.50; basis 60 per cent zinc, premium, \$48.50; Prime Western, \$47.50; fines and slimes, \$45@42.50; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$45.09; calamine, \$32.20; all zinc ores, \$44.64.

Lead, high, \$86.15; basis 80 per cent lead, \$85@80; average settling price, all grades of lead, \$82.58 per ton.

Shipments the week: Blende, 8,231; calamine, 285; lead, 1,646 tons. Value, all ores the week, \$517,230.

Shipments ten months: Blende, 392,229; calamine, 10,865; lead, 59,944 tons. Value, all ores ten months, \$20,472,800.

The rumored transfer of the Ontario lead smelting plant to the Eagle-Picher Lead Co. is denied by the retiring President, Mr. Jones, who acknowledges he may go with the Eagle-Picher Lead Co., but asserts the plant will be continued as an independent concern.

Platteville, Wis., Oct. 25.—Blende, 60 per cent zinc, \$50@51 was paid for Prime Western grade, due to keen competition among buyers who had to get ore. Lead ore, basis 80 per cent lead, \$80 per ton. Shipments for the week are 2,527 tons blende, 115 tons galena, and 328 tons sulphur ore. For the year to date the totals are: 82,283 tons blende, 5,338 tons galena, and 16,457 tons sulphur ore. During the week 2,934 tons blende was shipped to separating plants. (A total of 2,500 tons sulphur ore shipped previously and not before reported is now included in year to date.)

Iron Trade Review

Pittsburgh—Oct. 28

The iron and steel strike, now in its sixth week, is receding somewhat less slowly than in the first three or four weeks. The Lackawanna Steel Co., in the Buffalo district, has made a fair start at resuming. There is a little operation at Cleveland, formerly closed tight. In the Mahoning Valley not less than six blast furnaces are operating, against none during the first three weeks, together with about a dozen open-hearth furnaces and one bessemer converter. The Wheeling district remains tightly closed. At Chicago and Gary operations are better, the district as a whole now running at nearly 50 per cent in point of tonnage. In western Pennsylvania production of pig iron, unfinished steel and finished products is between 85 and 90 per cent of normal. The last report as to the Homestead Steel Works showed production at 83.3 per cent of rated capacity, and the plant was not producing at capacity before the strike. The Sheriff of Allegheny County testified to the Senate committee investigating the strike that not more than 5,000 strikers remain in the county, but up the Monongahela, beyond the county line, Monessen remains almost closed, one plant doing nothing, another operating 10 per cent and the third doing about 15 per cent in its primary operation but not finishing the material. The Shenango and Allegheny Valleys are almost normal.

The United States Steel Corporation is positively opposed to there being any steel price advances at this time, and some of the leading independents are probably of the same mind. As the end of October is already at hand this means that in due course regular customers will be booked for first quarter or first half of 1920 at March 21 prices. The free play of demand and supply would easily force much higher prices, and some of the smaller independents, which do not normally sell far ahead, will probably secure stiff delivery premiums, as it is probable there will not be enough steel to go around.

Pig Iron—An advancing tendency is noted in the local market, following advances in Philadelphia, Chicago, Birmingham and other markets, and some sales at advanced prices are reported, but in the main the market is quotable at Mar. 21 prices: Bessemer, \$27.95; basic, \$25.75; malleable, \$26.25@27.25; foundry, \$26.75; forge, \$25.75, f.o.b. Valley furnaces, with \$1.40 freight to Pittsburgh.

Ferromanganese—English ferromanganese has sold at \$100, c.i.f., against \$95 quoted at the end of August and for some time afterwards, and it is difficult now to secure a quotation at \$100. Domestic producers continue to quote \$110, delivered, as their regular figure, but the price has sometimes been shaded slightly. Spiegeleisen remains in no demand for domestic consumption, but some export demand has sprung up lately, and one lot of 16 to 18 per cent has gone at \$33, f.o.b. furnace.

Steel—The Steel Corporation is operating 88 per cent of its sheet mills, while 52 per cent of the independent sheet mills are operating, and tin mill operations are about 55 per cent. This means much more consumption than production of sheet bars and stocks are beginning to play out. Occasionally a lot of sheet bars can be picked up, at \$2@3 premium. We quote Mar. 21 prices: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; rods, \$52. Rods for export have brought \$60.

Coke—The threatened strike of union coal miners has stiffened Connellsville operators' views, as there would be a heavy demand for Connellsville coal, and the strike might even extend into the Connellsville region, though it is nonunion. Furnaces are unwilling to stock up except at bargain prices and would pay above \$4.75 only in exceptional cases, while there is hardly any coke available at that price. Foundry coke is very strong, regular quality commanding \$6@7 depending on brand and whether open top or box car loading.

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New York and San Francisco, November 8 and 15, 1919

Number 19

An Announcement to Our Readers

We desire to thank each one of our readers personally for the gratifying support that has been given us during our fight with the radical printing unions, which has now been successfully terminated with the complete vindication of the "Engineering and Mining Journal." Despite the fact that a number of issues of the "Journal" have been delayed on account of this trouble, we have not received a single letter reproaching us for this delay or exhibiting any impatience from our subscribers. On the other hand, we have received many letters encouraging us and exhorting us to stand pat, as we have done.

Our advertisers have been equally generous with us. They have told us to go ahead and repeat their copy as often as expedient. Combined co-operation of subscribers and advertisers has, in short, been most gratifying.

It required a good deal of effort for us to take up publication in San Francisco, and that this was successfully accomplished is due in a large measure to those editors who took charge of this work in San Francisco—Mr. Charlton and Mr. Young—and also the hearty co-operation which we received in the plant of the "Journal of Electricity," both from the management and from the workmen. It may take some little time before things settle down to normal in our New York printing office, and considerable adjustment will be necessary before transferring the publication back to New York, which we will do as soon as possible.

Our problem now is to catch up as fast as we can with the delayed issues. On account of the limitation of our plant, it is hardly possible to get out an issue in less than five days, and we have decided to double up the editorial section for two issues, thus bringing the reader up to date by the beginning of January.

This expedient of double issues, it is hardly necessary to say, is vastly more expensive, inasmuch as we, by so doing, omit the equivalent of two complete issues of advertising. We feel, however, it is a matter of duty on our part to bring the reader up to date on his issues just as soon as possible, and also a duty, on our part, to pay the cost of this strike out of our own pockets and not to pass it along to the advertisers. It is the "Engineering and Mining Journal's" cash contribution to the cause of sane American industrialism. In this issue, therefore, we are publishing an enlarged editorial section covering the issues of Nov. 8-15, but the advertising section corresponds to one issue only. We plan to double up again in this way in the near future, and then, having caught up with the current issue, we hope to greet you as regularly and heartily in the future as we have in the past.

THE growth of the Journal calls for an expansion of its staff, which is already so adequate that it has been divided between New York and San Francisco without interfering with efficiency at either end. We should like applications for the position of an editor to take especial charge of our

petroleum section and another to take special charge of the non-metallic mining section, which we purpose introducing as soon as present mechanical difficulties have been passed. Applications for either of the above-named positions should be addressed to the New York office.

The Gold Mining Problem

HIGH prices for other metals and other commodities only mean decreased earnings or downright disaster to the gold miner, for they increase the cost of his supplies and labor, whereas the price of his product is fixed. More accurately speaking, his product correspondingly decreases in price. The price of potatoes or wheat or iron is expressed in terms of gold, the standard measure of value. A quotation of potatoes at \$2 a bushel means that a bushel of potatoes will buy a tenth of an ounce of gold; when potatoes are \$1 a bushel, a bushel will buy only one-twentieth of an ounce. Conversely, the price of gold may not be determined by the arbitrary and fixed quotation of \$20.67, which means nothing—saying in effect that an ounce of gold is worth twenty times one-twentieth of an ounce of gold—but by its purchasing power of some other standard commodity.

At present, then, an ounce of gold will buy ten bushels of potatoes, though a few years ago it would buy twenty bushels. Therefore, gold is worth roughly only half what it was previously. The price of gold may be determined more closely if we find its average purchasing power of various commodities, weighted according to the relative quantities ordinarily required by an individual.

Gold is not a symbol but a commodity; the idea that it is a substance of intrinsic value, worth what it is exchanged for, is a sound one, as every gold miner knows. Real machinery, supplies, and labor are necessary for its production and, once produced, it is an object of utility and real value—if not comparable in point of necessity with wheat and potatoes, certainly to silver, nickel, lace, paintings, and Venetian glassware, all of which have a well-understood, real exchange value in return for other commodities, whether pork, feathers or lumber. Therefore, the logic and the stability of its immemorial use as a standard commodity for exchange purposes.

To go back, then: Wheat at \$2 a bushel means that a bushel of wheat will buy a tenth of an ounce of gold. If it does not mean that, it means nothing. But will it? Try and see, friend miner, farmer, or seller of your own labor. Bring to market your apples and your potatoes or your copper and lead, and ask for the corresponding gold. You will not get it. You will get paper instead; and you cannot exchange this paper for dollars—twenty to an ounce. Some of the paper carries the Government promise so to be exchanged on demand; more of the paper contains no such pledge. If your dollars, then, are not gold dollars, what are they? Nothing. We are on a gold standard; the dollars are gold or nothing. Have they, then, no value? They have indeed. They are the I O U's of a strong and prosperous government—temporarily bankrupt, having out far more paper promises than it can redeem. They are worth the amount they stand for, less a substantial discount due to the fact that they are only promises. This discount varies with the prospect men see of having the commodity, gold, delivered to them—if and when. The more I O U's there are in circula-

tion, and the more they become disproportionate to the Government's present ability to deliver the gold, the greater the discount—the less the barter value of these paper promises.

The United States is not the only nation on a gold basis. England, France, Germany, Russia, and many other countries have the same system, and all have reserves of gold on which they found their paper currency. They promise to pay five, fifty, five hundred gold dollars to one dollar which they actually have to pay with, and the trading discount of this paper varies accordingly. We hear much of prices in Europe, which tell us nothing. Bread is \$36 a loaf in Petrograd; clothes are \$1,000 a suit in Constantinople. It simply means that the people of Russia and Turkey have not that faith in their governments' promises that we have. But our own faith is not 100 per cent. It would only be that if we could get the gold at once. Do you not think that an ounce and a half of gold would buy more than a loaf of bread in Petrograd? Doubtless it would buy hundreds of loaves and doubtless fifty ounces (\$1,000) would buy fifty suits of clothes in Constantinople. If our own paper money were withdrawn, and all available gold was put into circulation, do you suppose you could buy an ounce with ten bushels of potatoes? By no means. Gold is comparatively scarcer than recently. There is less of it, and there are more potatoes than formerly, and according to natural laws of supply and demand, it might cost you forty bushels to buy an ounce of the metal. The fact is that gold is not traded in, but is hoarded by the governments and withdrawn from the market, so that the gold miner cannot trade his product for powder, steel, and bacon; nor is any other commodity standard of exchange substituted for gold; and we buy and sell on a basis of I O U's which grow less and less likely of redemption as their number increases and the supply of the nominal standard exchange commodity decreases, and so are offered more and more cheaply in exchange for real goods like cabbages and coal.

Once we get away from tangible assets as a basis for business, the little golden anchor drags after the balloon of reckless promises to pay, till it clears the ground and mounts higher and higher, with no means of measuring its probable ascent. Under these conditions, prices, here as in Europe, mean nothing; nor with a fluctuating discount which we have no means of quoting accurately, can we tell whether a given thing is dear or cheap, except by comparison with other real commodities. Wages may be doubled, but if the average cost of necessities is more than doubled, wages are lower than formerly. You may give labor any wage it asks: as the prices of necessities will rise accordingly, it makes no difference to labor or to the country, except to such as are tied down to the anchor of the now inactive gold commodity standard by investments in Liberty Bonds or other stable and fixed securities. But such a process of raising wages and prices is confusion itself, and all the rational adjustment between various classes of wage-earners and various kinds

of commodities, according to their relative true value, which came about when they were exchangeable on the basis of a real commodity, vanishes in the effort to adjust prices piecemeal to a great and shifting discount rate.

Europe is truly bankrupt. She has destroyed more wealth than she possesses, and has bought the surplus by promises to pay more than she will have in the form of commodities of any kind (to spare) for a long time. But the United States is rich and prosperous: although she has destroyed much wealth in war, she has produced enormously; she is only gold bankrupt, and, even so, by no means to such a degree as the countries of Europe. But her plight in this respect is getting worse instead of better. As the governments have destroyed the market for gold by hoarding it as theoretical "reserves" for mountainous piles of I O U's, the gold miner cannot, as before stated, trade his gold for other commodities. For his ounce of metal he can get only twenty paper promises, secured mainly by other promises, to pay one dollar each—never; and those whose commodities of timber or quicksilver he must have, require twice as many of these as if they considered them absolutely safe. In other words, gold has been practically demonetized, and no tangible substitute has been provided. The result is that its production is growing less and less, whereas, if it were employed as an actual medium of exchange, it would grow larger and larger, on account of its relative scarcity and greater demand; and, with the dwindling production, the golden anchor to the balloon grows less and less restraining.

Certainly no safe outcome of this solution is indicated without some new move. The gold miners are striving to find a remedy by means of which they may be able to live; the nation, by which it may obtain more gold and so weight its anchor. Secretary McAdoo recognized this and stressed it, in the thick of the war, and gold mining was given the privileges of a necessary war industry.

As one solution, it has been proposed to increase the price of gold from \$20.67 per ounce to, say \$40 per ounce, to keep pace with the other prices. That is to say apparently, that an ounce of gold shall be worth forty one-fortieths of an ounce of gold; but the plan has this in it, that it recognizes the discounted I O U currency and proposes for an ounce of gold to exchange forty promises to pay one-fortieth of an ounce of gold some day, provided somebody else pays somebody else the said gold, according to their several I O U's; so that the gold market is temporarily pegged somewhere near the current valuation of Uncle Sam's promises. But the pegging will not adjust itself, any more than before, to the fluctuations of the discount rate, and only adds to the confusion, if we are searching not only for the relief of gold mining but for a way to get upon a real commodity basis of exchange. Internationally, it would not help; for the gold miner in Russia, in order that he might resume business, gold would have to be pegged at, say, \$6,000 per ounce, and so on.

Another plan proposed is not to meddle with the gold standard, but for the Government to pay the miner temporarily, and while the inflation continues, a corresponding bounty—say \$20 per ounce—which relieves the miner as above, giving him his forty discounted promises. This plan seems fair, but we fear it may not be practicable.

The Government must thus give its note without date for double the amount of gold that it receives; it agrees to pay 100 per cent "commission" for the loan, but it is doing that on all other commodities that it purchases, and, of all these, gold is the most valuable permanent asset. But this practice would not help it to reduce inflation nor to progress with its process of paying its obligations. To buy gold at 100 per cent premium for the purpose of paying at par its debts of Liberty Bonds and Treasury notes would be doing a rushing business but not one calculated to increase its financial standing.

The one partial remedy would appear to be to put all gold into circulation; but the governments dare not do this; otherwise they would hold the paper and some one else the gold—they know a good thing, even when they expect their publics not to know how essential it is. The fact is that there is not enough gold for this purpose. Better to keep up the fiction of the validity of the I O U's indefinitely.

If, then, our wealthy and prosperous nation has not enough gold to serve as a current medium of exchange, and if, as seems to be the case, there is no likelihood of having enough, both on account of the discouraged production and the fact that the gold mines of the world are being exhausted, the obvious thing would seem to be to provide some more abundant commodity medium of exchange, whether it be copper or wheat. Silver is obviously the most convenient, already a preferred commodity exchange medium among millions of people. The monetization of silver would, with gold, give the so-called bi-metallic system; it would increase the supply of real money, would at once add great weight to the balloon's anchor, and so tend to deflate prices; moreover, it would tend to increase the price (purchasing value) of gold, and so to increase the production of gold, and still further bring down the balloon. In a word, we submit that the monetization of silver would be the most substantial help that can be devised for the gold industry and for the general economic condition of the country.

Such a move is understood to be impending in Europe, where it is even more needed than here, as we have a far larger gold "reserve" than any other country. The loss of this fancied advantage should not worry us, for our great problem, even for our own interest, is to rescue Europe from its present bankruptcy.

The Petroleum Policy of England

PETROLEUM, as is well recognized by students of the subject, is the most important basic factor on which pivots future military and commercial power. In the immediate past the wealth and power of a nation have varied in direct proportion to its

coal and iron resources (granting that it retained control). That was the fundamental truth of the Age of Steam, with the use of coal as the highest form of fuel. Now, however, we are in the first flush of the Age of Gasoline and fuel petroleum, and oil outranks coal in immediate strategic importance. The petroleum resources of the world are mainly under the control of two great powers, both Anglo-Saxon—England and America. The latter predominates at present, because of the vast oil resources which have been discovered within her own boundaries, and because of the organizing genius of her private business concerns. The control of England is growing by leaps and bounds, because of a fixed national policy and, to a considerable degree, of direct government ownership and control.

America has had no government policy regarding oil since the government dissolved the Standard Oil Company. Since then the warfare against great and powerful business combinations has been neglected, but nothing new has been developed. England, on the other hand, has frankly adopted the opposite plan, of encouraging and even forming great oil monopolies, under government auspices. The power of this organized efficiency, with the great strength of the British government behind it, as compared with the weakness involved in the negligent policy of America, needs no explanation; and the result is that we must acquiesce in the prediction of various conservative American petroleum experts that before long the preponderant control of the world's petroleum, and with it the military and commercial domination of the world, will pass to Great Britain, and that if the United States sits down to the table of equal political and commercial power anywhere in the world, even at home, it will be by favor of England's request only.

These facts have been known for a long time in private as well as government circles; there is no secret about them, and the magnitude of England's official program in this respect is so great that it could not be concealed, even if she so desired.

We presented in our last issue an article written by an author whom we know personally, and who states a few plain facts and inferences as plain.

This British petroleum policy, it was shown, is frankly nationalistic and imperial, and bluntly discriminatory, against the United States in particular and all other powers in general. This is part of a similar nationalistic policy in regard to other minerals, the details of which we shall point out from time to time. Plainly, England desires to profit both by the threat and lesson of Germany. Plainly, she is determined that no other nation, Anglo-Saxon or otherwise, shall again put her into the extreme danger to which carelessness regarding Germany's schemes and methods submitted her. Her solution for the future, as to plan, is to dominate the world, not only by her old device of a twice preponderant fleet, but by political and commercial control of the fundamental mineral resources of the world. Her solution, as to method, is to adopt the efficient German system of state controlled monopolies; and to

further safeguard herself by discriminating against non-British investors.

This program was evident during the war, when the nationalistic sentiment was perforce stiffened, as in other countries, by the necessity of strengthening to match the unhealthy German nationalism; and was the cause of much dismay on the part of Americans who found themselves discriminated against by the program. For the United States to have made a strong point and issue of this condition during the war would have been to play into the hands of the Germans, who were endeavoring, without success, to promote the anti-British sentiment, for their own ends. The ultimate American belief in the fairness of Britain and the inevitable common destiny of America and England remained and still remains unshaken; but now that we two, standing together, have conquered the common enemy, it is opportune to have a plain talk as between friends and partners. America must not submit to be put in such a position as to risk being told by England that such a talk is unnecessary, since she has arranged matters with entire satisfaction to herself. There has been and is much talk of American world domination, which is as indiscreet as England's present policy. Partners in the world's wars, peace, and business must not seek to eliminate or dominate one another, but to divide activities, responsibilities, and profits equably.

Meantime, in view of America's sluggishness of insight and action, we can hardly blame England's vigorous and progressive nationalism (we believe it to be fundamentally against the Teuton and not primarily the American), so much as we do America's inactivity; and the firm yet fair method of joining issue with England in regard to her discrimination, in those countries which she controls, against American progress in the ownership and control of petroleum, would be to adopt corresponding retaliatory legislation, thus putting each on an equal footing as business rivals, but making it clear that we prefer that both should abandon selfish and domineering methods, and become true partners instead. In the shoulder to shoulder forward march of America and Britain, we firmly believe, lies the hope of the world; and not less important is the preservation of the dignity, independence, and power of America.

The Chrome Tariff Problem

WE ARE GLAD to publish in this issue an argument by W. P. Lass, a mining engineer interested in chrome mining in Alaska, in favor of an import tariff on chrome ores, as it presents the point of view of many domestic producers.

When our country entered the Great War, unprepared and at a time when Germany's star was in the ascendant, those mining engineers who were serving or advising the Government saw the necessity for an abundant supply of the necessary metals, without which our high-speed production of arms, supplies, munitions, and ships would slacken and the cause of democracy be lost. Heavy as this responsibility lay upon the miners, it lay still more heavily and directly upon those manufacturers of metal and

metal products upon whom the Government directly leaned and upon whom it made most imperative demands. The head of a great steel company frequently observed in conferences: "They say that gold will win the war; that this and that will win the war. I tell you it is through steel that we must win the war." That was his battle cry, and that of the Army and Navy—steel, chrome steel, manganese steel, vanadium steel, low-phosphorus steel, in quantity, immediately and continuously.

And the other metals were, and were recognized, as of supreme importance. The Army and Navy must have enough; too much was excellent, but not enough meant disaster. The one thought of all, miner and manufacturer, and Government man of every type (unless there existed traitors, of which there is no evidence), was to drive through a belated attack, which looked almost a forlorn hope, to victory against the Hun. Had Germany conquered Europe, America was preparing to fight her single handed.

To depart from this program, for the protection of this or that industry, at that critical period, would have been stupidity and folly. Sacrifice of life, wealth, and industry was the daily program—not protection; only the protection of humanity in the mass.

When a nation's life's in danger
We've no time to think of men.

Such regulations regarding minerals as were made by the Government, and such legislation as was introduced looking toward a war-mineral control, was simply with the above view, and no other. Certainly no restrictions on imports would have been desired or attempted had there been ships available. But the shortage of shipping, and the necessity for throwing an army into the battle line in France at once, and assuring its supply and support later, meant the forced withdrawal of ships from import trade for transatlantic service; and instead of such a withdrawal without plan, the withdrawal was made at once, under as good a plan as could hastily be drafted and agreed upon, for the exclusion of unnecessary imports, and for the reduction to an agreed program of such necessities as could, under the stimulus of Government appeal and high prices, be produced in the United States more abundantly than before. In the latter category was chromite.

The formulated program was abundantly justified and successfully carried out in that the dreaded shortage did not materialize; nor would it have done so had the war continued. Domestic production exceeded expectations, although not till the close of the war did it begin to assume proportions approaching the total necessity of war demands. Importations from overseas in New Caledonia and Brazil (little came from Rhodesia) were necessary during the conflict to maintain a safe reserve, and imperative in the beginning of the crisis. Had the German submarine campaign, which dismayed to the point of panic the steel manufacturers by the sinking (as commonly believed) in the Caribbean of a great cargo of Brazilian manganese bound for the United States, expanded and similarly blocked other ship-

ments of manganese and chromite, we should have been, to say the least, in a very unsafe position.

It is true that the program of importation of chromite was prolonged, and exceeded the estimate of those who had been commissioned to work out a schedule, and this contributed to the surplus which began to accumulate, which was added to by the domestic production being so far in excess of the most optimistic estimates made by the producers or the Government engineers, and further greatly increased by the campaign of economy in the use of chromium in steel making, demanded by the Government, and loyally carried out by the steel manufacturers; and in this element of importation the program announced to the miners as one on which they could count in their plans was departed from, due to the lack of sufficiently close co-operation between war committees and war boards in the intense drive of war activity. In war time this jar in the machinery was of minor importance beside the fact that the net results were an abundance of the metallic sinews of war; and would have been adjusted by special war remedies had the conflict continued.

With the war victoriously concluded, however, the time comes for readjustment and repair. The dead have been buried, the crippled sent to their homes with their trifles of insurance money; the homes of France will one day be rebuilt, and the mines of Belgium will eventually be unwatered. Unhappy should be the American who cannot count sacrifices made for what has been attained, and most happy is he if he has not received cash in full compensation. What of the host of volunteers and no less eager drafted men who forfeited their business and their acquired positions, to dodge shrapnel at \$30 per month? Do not worry about them. They have been paid in full (such as came back), although minus a limb or so, gay young d'Artagnans of the air, land or sea; stanch doughboys or graying resolute older men; and their message is that they will do it again if necessary. But the discharge of commercial debts and obligations legally contracted, or morally incurred, by the Government, is apparently not a difficult thing; and for this reason we have supported the plan to compensate chrome miners for their losses, for the reason that the strict letter of the assurances made to them by their government was not kept, and because they have, in many cases, suffered cash losses thereby.

So much for the past. We have only referred to it because it rankles so persistently and is viewed so disproportionately in discussion, of the present and the future, and because bitter feeling concerning it has been fanned by an uninformed and sensation-seeking press. The only constitutional method of discharging the debt of honor to the miner lay in Congress, which passed a bill that, under the back-and-forth battering of many views, emerged in a form so restricted as not to present an equitable and uniform remedy, but which must be administered as directed. So much for the present.

The question of the tariff is the question of the future, and should not be linked sentimentally with

the past. It is now proper, as the nation has been saved, for classes, industries, and individuals to consider their needs, advance their welfare, and argue for a recognition of their rights. Various domestic industries accordingly demanded protection from foreign competition through a tariff, following a well-established American principle. Among those asked for is the tariff on chrome, arguments in favor of which are presented by Mr. Lass. We should like to receive contributions of further discussions of this vital question, and from various points of view; and at a later time should like to make further comment.

Control of Spanish Potash

THE Spanish potash deposits, which were recently visited by Hoyt S. Gale, of the U. S. Geological Survey, and described by him in this issue, are of considerable interest to Americans. The pre-war German potash monopoly was held by the Germans to be one of their lasting assets, and a club to reduce refractory nations like America to submission and to force an exchange of raw materials like copper and cotton, which Germany needs. For America, looking forward during the war to the post-war period, relief from this monopoly was sought in the development of our own potash-producing industries, mainly as byproducts; but there was also taken into consideration the little-known deposits of Spain. The defeat of Germany and the acquisition by France of Alsace, broke up the German monopoly, however, so that we may now buy either from France or Germany. The development of Spanish deposits opens up a new field.

The strategic control of these Spanish deposits is of special interest to us. The Spanish government, as stated by Mr. Gale, has provided that the mines shall be grouped in a syndicate, in which the government shall own a share and have a voice—in other words, a state-controlled monopoly, patterned after the German Potash Syndicate. The law further specifies that the domestic prices shall be less than the export prices and that the government shall fix the maximum domestic price and the minimum price for the exported article; also that it shall fix the approximate output of each mine. Potash lands may be held for operation by the government, and all mining concessions are under supervisory control of the government.

Mr. Gale enumerates the principal owners of concessions. They include a Franco-Belgian syndicate, a Spanish chemical company with German affiliations, a Spanish-French chemical company, a German company allied to the German Potash Syndicate, and an American company. This is another instance of the adoption of the German system of state-controlled monopolies for strategic economic power for nationalistic purposes, which we have previously pointed out in the statement of the British petroleum policy. The Spanish program nullifies any attempt at commercial control by aliens, discriminating between foreign and domestic purchasers in favor of the latter, in order to give economic advantage to Spain through a protective

export tariff; and prevents competition between producing companies unless through political intrigue and favoritism. There would appear to be little attraction for American capital in this field.

The great business combination was the result of American inventiveness. Disowned in the land of its birth, it was adopted by the German state with that Teutonic faculty for utilizing the inventions of other nations, and was used as a means of strengthening an offensive and defensive nationalism. Demonstration of the centralized effectiveness gained thereby has been well noted by various nations, whose policies as regards mineral supplies as well as other resources it is worth our while to observe and consider. There is the germ of much international politics in such arrangements as this Spanish potash syndicate. Secret rebates to favored nations could easily be arranged. We can easily conceive, in view of Spain's unsatisfactory war record, secret understandings between the potash syndicates of Germany and of Spain in regard to the country that will probably be the chief customer, the United States. The organization of the French potash industry will be looked forward to with interest. It is for the benefit of France, and indirectly of the United States, that the latter should, under present economic conditions, purchase from France as much potash as possible, and France should not adopt the Spanish plan of charging a special price to us.

The 1918 Price of Copper, Compared With Its Cost

WE PUBLISH on another page a summary of the report of the Federal Trade Commission which assisted the Price-Fixing Committee of the War Industries Board in determining a fair price at which copper should be sold during the war. The report contains several interesting tables, some of which we reprint.

The price of copper for the year 1918 was 24.7c., and the average cost, as determined by the commission, was a trifle over 16c. The profit was therefore about 8.5c. per lb. As 85 per cent of the copper sold was produced for less than 20c. per lb., a certain amount of criticism, largely for political effect, has been directed at the Government price-fixing board for setting the price at too high a figure. The fact must be kept in mind, however, that the Government fixed price, which became effective Sept. 21, 1917, was over 7c. less than the average market price which had prevailed during the preceding nine months. Moreover, had the price been set at, let us say, 21c. per lb., 39 of the 85 companies, or 46 per cent, would have operated at a loss, and many would have been compelled to suspend operations. Yet these 39 companies produced only 14 per cent of the total copper. With the exception of some of the Michigan companies whose orebodies do not justify the investment, they are the younger properties still in the course of development. The Government happily did not set the price so low as to kill off the children of the industry.



Uncoupling while train is still moving
UNCOUPLING MOVING CARS IS DANGEROUS PRACTICE
Result: Brakeman thrown against timber
(By courtesy of National Safety Council)

Photographs From the Field

VIEW OF THE HONZAN CONCENTRATOR, ASHIO MINES, JAPAN,
SHOWING TWO DORR THICKENERS IN FOREGROUND



Potash Deposits in Spain *

Extensive Salt Basin, the "Salina de Cardona," a Possible Source of Chloride of Potassium—
Government Restrictions and Details of Plans for Development
Now in Process of Execution

BY HOYT S. GALE

THE announcement of the discovery of potash in deposits in the Province of Barcelona, in Catalonia, in the northeast corner of Spain, appeared in print in 1913 with the publication of the first of two excellent reports on the subject by engineers of the Instituto geologico de Espana.¹ There has been much discussion of the salt deposits of the region, which have long attracted attention as showing remarkable features. The potash associated with these salt deposits was recognized in 1912, and then only by accident, as a result of development to enlarge the production of salt.

The Spanish potash field, as now defined, lies northwest of Barcelona. The area is about seventy-five miles long, and forms a practically continuous

twenty miles north of Manresa. A branch railway is now under construction from Manresa to Suria, put in primarily on account of the potash developments now going on at Suria.

A large area of concessions has already been ceded to private claimants by the Spanish government. After the first rush to appropriate these mineral lands, restriction was put on the granting of further rights. A tract reserved by the state includes a total area of about 1,800 square miles. Much of this tract is undoubtedly not potash-bearing, but it includes in a general way the formations similar to those containing the salts at Cardona and Suria, and is a provisionally outlined field reserved for further exploration. An area of 350 to 400 square miles is outlined in the map of concessions already granted.

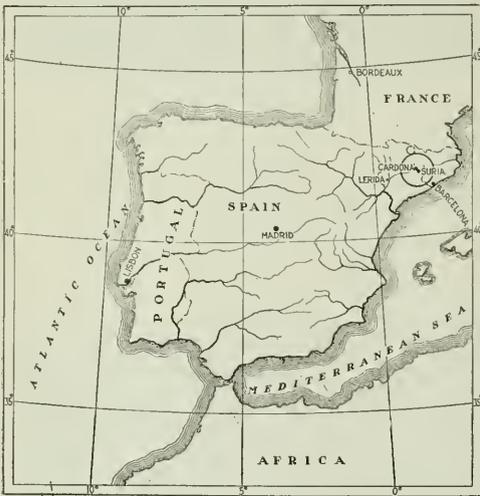
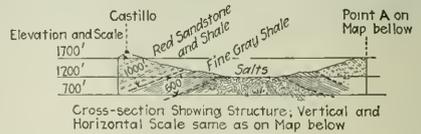


FIG. 1. INDEX MAP OF SPAIN, SHOWING THE SITUATION OF THE POTASH DEPOSITS OF CATALONIA.

belt, with a maximum width of fifteen to eighteen miles. The general situation of the field is represented on the accompanying index map (Fig. 1).

The principal discoveries of potash have been made in the immediate vicinity of the villages of Cardona and Suria. Both lie in the valley of Cardoner River and are reached by motor omnibus or "diligence" over an ordinary country road following the river. Manresa is forty miles by rail from Barcelona, and train service is frequent and fairly satisfactory. Suria is nine miles and Cardona about



Cross-section Showing Structure; Vertical and Horizontal Scale same as on Map below

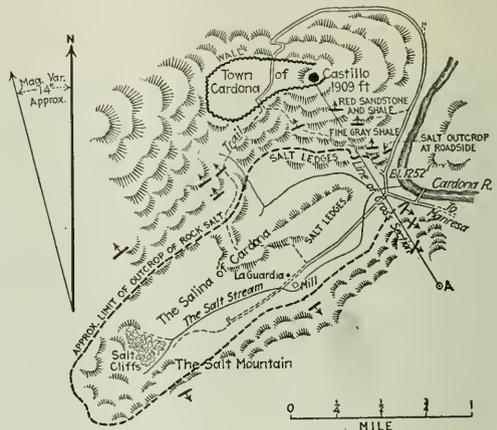


FIG. 2. SKETCH OF THE "SALINAS DE CARDONA."

Private interests or foreign governments are invited to participate in the development or operation of the field, under specific regulations of the state and local governments as to the manner and regularity of operation and the price and distribution of the product. This phase of the subject is discussed at greater length in the section entitled "Spanish Legislation."

*Abstracted from a forthcoming paper of the U. S. Geological Survey.
¹Rubio, Cesar, and Marin, Agustin, "Sales potasicas en Cataluna";
Inst. geol. Espana Bol., Vol. 34, pp. 173-230, 1913; "Sales potasicas de
Cataluna"; Idem, Vol. 39, pp. 1-38, 1918.

The principal owners of concessions in the Spanish potash field are as follows:

Solvay & Cie., 33 Rue du Prince Albert, Brussels, Belgium. This is the well-known Franco-Belgian syndicate, which already operates in Spain in the subsidiary soda works at Santander.

La Sociedad Fodina, which has engaged in exploring concessions ceded to Francisco Ripoli and Ignacio

isyndikat. La Minera controls an extensive area of concessions in various parts of the Spanish field.

The American Agricultural Chemical Co., 92 State St., Boston, Mass., holds concessions in the name of Roberto Sturz Bradley. Two properties called the Filadelfia and the Boston cover territory adjacent to or intermediate between areas in which the recorded discoveries of potash salts have been made.

Besides those named above there are other less extensive holdings, listed under the names of Juan Vives, Rene Paulus, and Demetrio Castellana Moreno, and there are also some concessions originally held for coal that may include potash.

"La montana de sal de Cardona," described by Calderon² as a veritable mountain of salt eighty meters high and four kilometers in circumference, shown in Fig. 3, has been one of the renowned natural features of Catalonia since a very early date. Baedeker says that this phenomenon is mentioned by Strabo, quoting a reference to Book III of his geographical works. The mining of salt from the Cardona deposit is an old industry and is still carried



FIG. 3. VIEW OF LA MONTANA DE SAL AT CARDONA

Marinello, of Barcelona. This concern is understood to be a subsidiary of or closely allied to the Sociedad Electro-Química de Flix, Calle de la Princesa 21, Barcelona. The last-named company is listed as a manufacturer of caustic and industrial chemical products, presumably fertilizer materials, and is said to have strong German affiliations.

La Sociedad General de Industria y Comercio, a Spanish and French company, with headquarters at Villanueva 11, Madrid. This company is engaged in the manufacture of fertilizers, explosives, and other chemical products, and has plants at Bilbao, Barcelona, and in other parts of Spain.

La Compania de la Salina de Cardona, the old salt company that has been mining and shipping rock salt for many years from the celebrated salt mountain of Cardona. The property belongs to the Duque de Tarifa. The local administrador is Juan Ratera Cendra, at Cardona.

La Minera, a German organization, is reported to be a subsidiary of one of the potash companies in Germany, and therefore allied to the German Kal-



FIG. 4. OUTCROP OF SALT AND THE OVERLYING SHALES AND GYPSUM.

on, both for local consumption and for export. The title to this property is apparently a local hereditary right, having recently passed from the Duque de Medinacelli to the Duque de Tarifa.

Cardona is an old fortified town perched on the summit of an almost isolated hill in a bend of Cardoner River, 600 feet above the river level. The town

²"Los minerales de Espana," Vol. 1, p. 385, 1910.

is surrounded by a wall and dominated at the very summit by an interesting old castle. In clear weather there is a wonderful view from the castle, with Cardoner River stretching away in either direction in the foreground, and, beyond it, to the north, the distant snow-capped peaks of the Pyrenees. To the south and southwest the town overlooks, at the very foot of the hill on which it is situated, a peculiar depression which is the salt basin, the "salina de Cardona." At the farther end of this basin is a great whitish-looking scar lying against the mountain side, and this is the famous mountain of salt. It is a great natural outcrop of rock salt which occurs as an interstratified part of the sedimentary rock section. It is brought to the surface along the crest of a distinct anticlinal fold, the structure of which is perfectly evident in the dip and stratification of the series of sandstones and shales which overlie it and whose outcrops encircle the basin in regular form. Smaller exposures of rock salt occur at many places in the bottom or on the lower slopes of the basin. Just at the foot of the hill below the castle is a large funnel-shaped sink hole.

The salt is mined in solid form and is sawed or hewn into regular-sized blocks for shipment. The Spanish yearbook "Anuario general de Espana" for 1917 says in reference to Cardona: "It owes its renown to its famous mountains of salt, from which there are extracted 40,000 quintals annually." The salt blocks are said to be chiefly exported to Africa, where salt is prized in this form. The industry is limited, however, by the cost of transportation. Salt from this source was supplied to the American army in France during the recent war, and it is said that production was pushed to the capacity of the equipment.

The upper layers of the deposit are a composite of relatively thin bands of variously colored salts and interstratified layers of gypsum and clay. These upper salt layers appear in a strangely contorted mass. Under them there is a great compact mass of white transparent salt, which is very pure. According to report, the mining was formerly done in a large open pit, the salt being cut in steps or terraces, but now it is obtained by underground methods. The workings have a depth of fifty meters, and the whole depth, it is claimed, is cut in solid salt without the intercalation of any other substance.

The accompanying sketch map, Fig. 2, I prepared from a pocket-compass traverse made at the time of my visit. It shows the general outline of the outcrop of the salt and the situation of the basin with respect to the valley of Cardoner River and the town of Cardona.

The salt basin is the eroded axis of a well-defined anticline. Apparently the massive rock salt is the lowest member of the section exposed by erosion and solution along the axis of this fold.

The view in Fig. 4 shows the outcrops of salt and the overlying shales and gypsum in the bluff at the base of the hill below the castle, at the outlet to the salt basin. The stratigraphic section exposed in the bluff below the castle is represented in the cross-section attached to the sketch map of the salt basin.

By rough computation from the data obtained in making the sketch map, the section exposed here totals about 1,800 feet of stratigraphic thickness, but the thickness can be obtained much more accurately with more careful measurements.

Little seems to be known about the total thickness of the salt beds. The cliff at the head of the salt basin is made up of banded salts in a strangely contorted mass. This contortion illustrates the plasticity of salt under such compression as has been exerted on it in the folding of these rocks. No estimate of the normal thickness of the whole could be obtained from such a mass. The folding is probably extreme in the axis of the fold, and possibly would not extend far on either flank. Fig. 5 is a view of the contorted bedding in the salt cliffs at the head of the salt basin.

Extent of Potash Occurrence Uncertain

The evidence of the existence of potash in the Cardona deposit is not very definite. This may be because of lack of adequate investigation at this locality, or the potash may not be present in large amount in this part of the field. As has been said, this exposure gives one of the most favorable opportunities in the field for observation of the general relations of the salt and the overlying beds. It is geologically an epitome of the Spanish field, whether the potash is found in commercial quantity at this locality or not.

Rubio, in his report, already referred to, quotes some analyses of samples from both red and white specimens from the Cardona deposit, which show the existence of pure chloride of potassium at this locality. He states, however, that these were found only in a small area, and it was said locally that the potash had so far been found only in thin seams in this deposit. Analysis of the salts in solution in the little brine stream that flows from the big salt cliff is stated to have shown 81.65 grams of potassium chloride per liter of the solution. This seems to be saturation with respect to potassium chloride, but in any solution this depends on the amount and nature of the other salts present, particularly magnesium chloride, the amount of which is not stated in this analysis. The amount of the potash indicated is high in any case. The value and workability of the potash beds in the Cardona region is therefore still problematical, but there is an excellent prospect at this locality that seems worthy of exploration.

Potash Prospects at Suria

The discovery of potash in the Spanish field was first made at Suria in 1912, by accident. In attempting to open a mine for common salt, at a site where there had been some ancient salt workings, Macary & Viader sunk some borings and a shaft that revealed the potash salts, and it appears that these were soon recognized as potash. An investigation carried out in 1913-14 by a French association resulted in the application for and granting of a concession near the village of Suria, which concession was later enlarged, and concessions in other parts of the field were added to it. This group combined

interest with the Belgian Solvay Co., and the subsequent explorations in the field have been conducted by the Solvay Co., principally in the immediate vicinity of Suria. The discoveries at Suria, of which there are now available only the records of the old shaft sunk for salt, and the borings sunk on the Solvay Co.'s concessions, constitute about the only evidence of the existence of potash in quantity in the Spanish field. These holes have been filled and carefully sealed to prevent damage to the deposit by water, and no new evidence is to be had from them. The records available have been published in the reports of Rubio and Marin already referred to. There is no doubt that the existence of potash in considerable masses has been demonstrated.

An old shaft, sunk at the edge of the river-bottom lands, has now been supplemented by about fifteen borings, mostly in the immediate vicinity of Suria, and nearly all of these are reported to have shown sylvinite and carnallite in fairly regular beds, so that in the main these beds could be correlated from place to place. The contorted beds, it is said, are confined to the axes of the folds. There are in general two beds of carnallite and a lower bed, in some places two, of sylvinite. The carnallite zone, containing workable beds three meters or more in thickness, averages 12 per cent potash (K_2O) as shown by taking a weighted average from the core samples so as to represent all the material removed from the section indicated. The sylvinite, in beds of two meters or more in thickness, is reported as averaging at least 20 per cent potash, and certain portions containing much purer material were found. Tonnage estimates of the reserve supply in the concession at Suria have been based on the evidence that is here summarized. The evidence was deemed sufficiently good to justify a company with a reputation for competence and conservatism in proceeding with some rather extensive plans for actual commercial operation in its property.

Standard Mining Shaft Put Down and Plant Erected

At the time of my visit, in May, 1919, a standard mining shaft, which was begun in April, 1918, had reached a depth of about sixty meters. Permanent foundations for a refining plant and substantial dwellings and offices for staff and employees were also being erected. The shaft had not yet reached the depth at which it was expected to encounter the potash, but water was flowing from a zone at about the level of the river, and the work going on at the time consisted chiefly in the attempt to seal this out. The new shaft at Suria is about 1,500 ft. from the old shaft. It lies in approximately the same stratigraphic position as the old working, and probably encounters a similar geologic section, with some variation in detail.

The area at Suria considered as proved by these prospects is about 3,500 hectares (75,145 acres), which, according to optimistic reports of interested engineers, establishes the existence of potash-bearing strata of an aggregate thickness of 80 to 200 meters, having a potential production of 200,000,000 tons of pure potash (K_2O).

Aside from the two localities at Suria and Cardona, which are only seven or eight miles apart in an air line, the field covered by concessions reaches about thirty miles to the east and forty-five miles to the west, the locations being based rather on the extension of similar geologic formations, with some evidence of salt, gypsum, and the shales associated with the salt, than on specific discoveries of the potash. A good deal of boring has already been done throughout this area, mostly with essentially negative results, but a few more positive indications have been found. The principal evidence of the existence of potash outside the valley of Cardoner River is at Villanueva de la Aguda, a village situated near a locally well-known brine spring a little over twenty miles west of Cardona. The brine is reported to carry 4.1 gm. of potassium chloride per liter, which

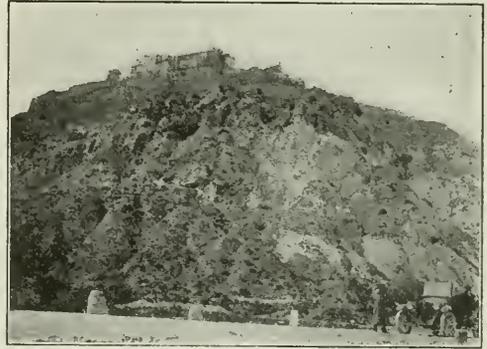


FIG. 5. CONTORTED BEDDING IN THE SALT CLIFFS.

is not necessarily an exceptional indication. However, a boring put down by La Sociedad Fodina is reported to have cut two layers of potash salts, the first at a depth of 303 meters and the second at 654 meters. The boring was continued to a depth of 737 meters, and was discontinued while still penetrating massive salt. The information as to the thickness or character of the potash seems to be rather meager. Many of the borings have shown the extension of the massive rock-salt deposits or of gypsum and salt mixed, and there is always the possibility that the record is incomplete through failing to reach sufficient depth or for other reasons.

General Geology of the Field

An extensive basin of Tertiary sediments in north-eastern Spain is limited on the north by the east-west axis of the Pyrenees Mountains, which is a well-defined anticlinal fold exposing the Paleozoic rocks, gneisses, and granitic rocks along its crest. This great low area extends eastward from the valley of Ebro River, and is sharply delimited on the south by the coast ranges of Catalonia.

From the conditions present it seems probable that during some portion of earlier Tertiary time in this region the Ebro basin may have been occupied either by a continental sea or by a great gulf with narrow passages connecting it with the ocean. According

to the observations of European geologists, the uplifting of the great anticlinal folds that give rise to the Pyrenees Mountains began in the Eocene but took place principally in Oligocene time. Thick salt and gypsum deposits are found among the sediments laid down in this basin during Eocene and Oligocene time. Thus the earth movements gave rise to inclosed areas where the evaporation of saline waters left thick deposits of crystallized salts, and in at least some parts of these areas this process was continued to a stage at which the potash and magnesian residues of the mother liquor brines were also crystallized. The historical record seems fairly clear in its major aspects. The section of Tertiary rocks, which is well exhibited, includes near its base a great mass of thick-bedded sandstones and conglomerates with interbedded shales.

To identify the position of the salt beds and the associated potash, and to trace the extent of the field in which they will be found, it seems necessary that the section beginning with the sandstones and shales exposed at Manresa as a base and extending to the top of the series represented in the field should be studied in detail. These Tertiary rocks are made conspicuous by a prevailing deep-red color in the weathered surfaces, so that the series superficially resembles the so-called red beds of the Triassic or Permo-Triassic of the United States. Aside from the general similarity of the rocks and their manner of exposure, both periods were characterized by the deposition of salts and gypsum. The salt, including the potash, occurs rather low in a complex series of sandstones, conglomerates, shales, clays, and some limestone and gypsum. A more favorable field for the study of both structure and stratigraphy is seldom found.

Although there appears to be little information about the total thickness of the beds overlying the salts, it seems likely that this section is thick enough to bury the salts deeply in a great part of the Tertiary basin. In at least the two places, however, that have been described folds have brought the salts to the surface along the Cardoner River channel, and the salts are relatively shallow in many other parts of the field.

Spanish Legislation Concerning the Potash Lands

Soon after the general announcement of the discovery of potash in Catalonia, efforts were made to put through special legislation concerning these deposits. This was in principle a perfectly natural and appropriate step, as applications for extensive areas and rights of a class without precedent in the country would naturally require special consideration.

In 1915, a bill was presented to the Cortes, the national legislature of Spain, by the Minister of Public Works. This bill seemed to place such restrictions on ownership, development, and operations that it aroused protest, and apparently was not passed. It was replaced, however, by a royal order dated June 10, 1915, which was in harmony with the general provisions of the bill still pending. It provided that

the concessionnaires in the potash field must work uninterruptedly either in exploration or by mining. According to this order, if regular production had been established under it the concessionnaires would have been obliged to reserve for consumption in Spain such part of the potash recovered as the government might require.

Another royal decree, published on Oct. 1, 1914, permitted the Spanish government to reserve the right of private concession in the potash field until investigations by the technical departments of the government had been carried out. This also granted a right for permanent withholding of land in the field for operation by the government, if that should seem desirable. Rewards for further discoveries of value in this field were offered.

These orders remained in force until increasing activity in the developments at Suria during the early part of 1918 again attracted attention to the subject, and on May 2, 1918, another potash bill was published in the "Gaceta de Madrid." This contained much of the original bill of 1915, including the obligation on the part of concessionnaires to continuous operation, protective measures in favor of internal consumption of potash, a provision that export prices for the potash produced shall be greater than the domestic, and annual regulation of the maximum price for the home market and the minimum price for export. The government is also directed to fix the maximum and minimum annual output of each mine. The Spanish government assumes supervisory control of all mining concessions granted or to be granted, and work on such properties must be under the supervision of the mining inspector of the district in which the concessions are situated. Provision is made that the government shall own a share in a syndicate of owners of the mines and shall have a voice in the administration of this syndicate—regulations evidently patterned after those of the German Kalisyndikat.

Quotations from royal order dated Dec. 14, 1918, state that conditions have been specified under which foreign and Spanish companies can compete for concessions to work the potash deposits.

The restrictions placed by the acts of the Spanish government have undoubtedly impeded progress in the development of the field, and the price-fixing feature of the present act must prove a deterrent to foreign capitalists desiring to enter the field. It is of course fair that Spain should safeguard her own interests, as, for instance, in providing against passing the ownership of these properties too largely into foreign hands and in insuring preferential treatment for domestic potash requirements from these deposits. However, assurance is needed that the conditions under which developments in the field are undertaken will be stable.

Prospects for Production

Production of potash for commercial use from the Spanish field is not expected during 1919, and, even with good fortune attending the work now going on, it seems unlikely that potash will be shipped from

these deposits before the middle of 1920 at the earliest. It is still too early to estimate with much confidence what the future of the Spanish field as a factor in the world production of potash will be. The prospects of production to meet Spanish needs seem promising, particularly as the lower grades of crude salts that may be obtained at first may be available locally before it may be possible to carry out the refining processes successfully.

Statements estimating tonnage reserves are accepted with considerable reservation, until some verification is obtained from underground development by mining. Well records in regions of such structural complications as are exhibited in these salt deposits must be very difficult of interpretation, and the thicknesses recorded for the potash beds encountered must be largely dependent upon the angle at which these beds are penetrated, which is often not determinable. It appears that the more regular parts of the deposits, if such exist, have not been explored.

For the reasons stated above, it still seems necessary to reserve judgment as to the magnitude or importance of the Spanish potash field. The prospects are excellent, and the development now going on should settle the matter in a practical way very soon. Although there is abundant potash in both the German and Alsatian potash fields, and in other possible sources to supply the world's needs for as long as there is now need of estimating, it is far to be preferred that the world should be supplied from numerous and abundant sources than that there should be any danger of monopolizing this resource. Further news of the success attending the development of this field is to be awaited with interest.

Caisson Alluvial Diamond Recovery*

New Plant, Designed for the Purpose of Recovering Diamonds From Vaal River, Provides Diving Bell with Tubular Shaft and Air Lock

AN INVENTION of Fabian M. Cox, consisting of a pontoon with a caisson attached, is expected to solve the problem of recovering diamonds from the deep pools of the Vaal. Briefly, the plant comprises two pontoons, rigidly connected by decks, between which a roomy caisson or diving bell is sunk to the river bed. The caisson is connected by means of a tubular shaft to a chamber above the water level, and the whole is air locked. In order to keep the caisson submerged, it is weighted with heavy iron ballast, and the upper chamber, above the water level, is similarly weighted by an outer concentric chamber or tank filled with water, which can be regulated as to quantity and adjusted to carry the necessary weight.

Compressed air is forced into the interior of the upper, or air-lock chamber, the shaft and the bell, or caisson, and the river water being thus forced out below it is possible to carry on digging and loading operations conveniently. The gravel is hoisted

up the shaft and delivered into a chute which holds about a ton. When filled, it is discharged by a mechanism of double doors, which prevents the escape of compressed air from the interior of the various caisson compartments. Safety is provided by means of the free communication of the bell with the upper or air-lock chamber through the shaft and ladderway and by an easily opened manhole above.

The following notes are taken from the provisional patent specification: The present invention has reference to caissons or diving bells of the air-lock type, and in this instance is designed for the recovery of gold or precious stones from deep waters. The invention consists of providing a diving bell having a tubular shaft and air lock with means of quick vertical adjustment through the agency of solid and liquid ballast and suitable guiding frame, and means of elevating minerals by (a) submerged pump, or (b) suitable hoist.

Apparatus Involves Diving-Bell Principle

The following is a description of apparatus constructed according to this invention, and in this instance it is presumed to be for purposes of diamond recovery: A metal cylinder or bell, having a dome roof which is surmounted with a tubular shaft in sections to suit the depth of water to be worked, is terminated by an air-lock chamber surrounded by a water-ballast tank. The dome roof of the bell is provided with means of securing and at will releasing a quantity of solid ballast. The tubular shaft is furnished with external runners, which engage in rollers or guides attached to the deck of a pontoon or raft, which carries an engine, air compressor, and centrifugal pump, and possibly a plant for the treatment of the gravel or material recovered. The air-lock chamber is provided with the usual man-hole door and equalizing valve, together with an air-lock chute for discharging gravel, a special door closing the entrance to the tubular shaft, which latter is furnished with ladder rungs and runners for skipway, operated by a hoist fixed in the air-lock. The base of the shaft where it enters the bell is fitted with an air-tight door, which may be used when it is necessary to lengthen the shaft. The bell is provided with collapsible seats attached to the wall for the accommodation of workers during lifting operations, and with a centrifugal pump or hydro-ejector having a flexible suction, by means of which the loosened gravel is deposited in the kibble or skip hoisted to the air lock or elevated direct above water level to the deck of the pontoon.

Bell Submerged and Held on River Bottom

Sufficient solid ballast, partly to submerge the bell, is placed on the dome roof; water ballast is then pumped into the tank surrounding the air lock in order to sink it and hold it securely on the river bed or sea bottom, and the gravel is elevated to the surface by pump or ejector direct, or hoisted to the air lock and thence discharged through the air-lock chute projecting through the water-ballast tank.

* From the S. A. Mining and Engineering Journal, Sept. 6, 1919.

Copper Costs Average 16c.

Federal Trade Commission Publishes Results of An Investigation of the Books of 85 Domestic and Foreign Companies for Year 1918

THE Federal Trade Commission has published a report on the cost of producing copper in 1918 which covers 85 companies, responsible for 95½ per cent of the total copper production in the United States, 94 per cent of that in Chile, 71 per cent of that in Peru, 58 per cent of that in Mexico, 50 per cent of that in Canada and 20 per cent of the copper production of Cuba.

TABLE I. QUANTITIES OF COPPER PRODUCED IN 1918 AT DIFFERENT RATES OF COST PER POUND

Item (a)	Number of Companies	Production 1918	Per Cent of Total	Accumulated Per Cent
Cost less than 12 c.	2	122,245,051	5.4	5
Cost between 12 and 13 c.	4	208,571,191	9.2	14
Cost between 13 and 14 c.	4	314,553,177	13.9	28
Cost between 14 and 15 c.	4	359,611,743	15.9	44
Cost between 15 and 16 c.	2	98,207,293	4.3	48
Cost between 16 and 17 c.	8	460,328,645	20.3	69
Cost between 17 and 18 c.	9	255,398,696	11.3	80
Cost between 18 and 19 c.	3	72,374,388	3.2	83
Cost between 19 and 20 c.	5	28,491,436	1.2	85
Cost between 20 and 21 c.	5	36,871,193	1.6	86
Cost between 21 and 22 c.	9	155,538,602	6.0	92
Cost between 22 and 23 c.	2	60,891,465	2.7	95
Cost between 23 and 24 c.	5	44,919,772	1.9	97
Cost between 24 and 25 c.	1	6,230,694	.2	97
Cost between 25 and 26 c.	3	7,695,224	.3	97
Cost over 26 c.	18	46,119,555	2.0	100
Total all companies reporting	85	2,258,234,125	100.0	
Approximate pounds duplicated		63,700,000		

(a) All costs show fractions of a cent.

The term "cost per pound" is indefinite. As used in this report it represents the cost per pound of copper at the Atlantic seaboard and includes all items of expenditure for labor, materials, supplies, and over-

their mineral land. This is one of the largest single factors accounting for the apparently large increase in the cost of producing copper in the last year or two.

The commission had considerable trouble in calculating costs on a uniform basis. The calculation of the charge for depletion of orebodies, which included a determination of the actual cost of the mineral land, and the quantity of ore in the ground, was particularly difficult.

The cost of the mineral land would appear to be easy to determine, but as interpreted by various companies it may or may not include items amounting to millions of dollars. As an illustration, Company A acquires its land and develops it by stripping the capping from the ore. The cost of this is charged to a deferred asset account, to be charged later to cost as the ore is removed. Company B, instead of charging development to a deferred account, makes the charge against its mineral land account, considering that until the mine is in actual operation, the capitalization of such expenditures is proper.

Development may also be accounted for in two distinct ways. One method, which is generally in use by the porphyry companies, is to set up as a deferred charge the entire cost of developing. This deferred-development account is credited and costs are debited periodically as the ore is removed. The other method, usually practiced by deep mines, is to charge the development to operations at the time incurred. This is often far less accurate than the preceding method, as during the past year or two the shortage

TABLE II. WEIGHTED AVERAGE COST OF PRODUCTION OF COPPER BY OPERATIONS AND BY GEOGRAPHICAL DIVISIONS FOR THE YEAR 1918

Operation	Arizona and New Mexico	Utah, Nevada, and California	Montana, Idaho, and Washington	Michigan	Other United States	Mexico, Cuba, and South America	Canada and Alaska	All Companies Reporting
	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.
Mining	\$0.056	\$0.042	\$0.108	\$0.106	\$0.064	\$0.055	\$0.061	\$0.069
Depletion of ore at cost	.006	.005	.012	.006	.003	.007	.009	.007
Purchases of ore	.010	.006	.016	.004	.004	.004	.004	.005
Transportation to reduction plant	.006	.017	.004	.007	.006	.004	.019	.008
Reduction	.022	.078	.051	.045	.109	.069	.055	.058
Transportation to refinery or seaboard	.007	.007	.007	.004	.005	.017	.006	.008
Refining	.011	.012	.012	.001	.011	.006	.013	.010
General and administrative	.008	.008	.004	.007	.017	.013	.010	.008
Selling expense	.001	.001	.001	.001	.001	.004	.002	.001
Credit for precious metals	.014	.012	.042	.002	.024	.023	.016	.017
Total cost	.151	.168	.174	.176	.199	.156	.162	.161

TABLE III. WEIGHTED AVERAGE COST OF PRODUCTION OF COPPER BY ELEMENTS OF EXPENSE AND GEOGRAPHICAL DIVISIONS FOR THE YEAR 1918

Item	Arizona and New Mexico	Utah, Nevada, and California	Montana, Idaho, and Washington	Michigan	Other United States	Mexico, Cuba, and South America	Canada and Alaska	Total
	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.	Cost per lb.
Labor	\$0.044	\$0.044	\$0.094	\$0.078	\$0.069	\$0.029	\$0.046	\$0.053
Materials and supplies	.032	.041	.042	.050	.065	.030	.043	.037
Overhead	.018	.014	.017	.010	.049	.048	.011	.021
Depreciation	.006	.006	.011	.012	.012	.012	.015	.009
Depletion	.006	.005	.012	.005	.003	.007	.009	.007
Tolls	.053	.063	.037	.020	.022	.053	.052	.049
Credits	.010	.012	.042	.002	.024	.023	.016	.017
Totals	.151	.168	.174	.176	.199	.156	.162	.161

head, but not interest or income and excess-profits taxes. Depreciation on plant and equipment are included as well as a charge for depletion of orebodies. Up to the year 1917, few companies reported depletion as a cost, whereas practically all companies now include such a charge, based on the valuation of

of labor has prevented most companies from doing a normal amount of development. If it had been done, the costs of production would have been somewhat higher.

The average cost of producing copper for the 85 companies reporting to the commission was 16c.

Table I shows how much copper was produced at various costs per pound and will prove interesting to those who wish to determine just what a low-cost or a high-cost producer is.

The division of these costs among the different operations and by geographical locations is brought out by Table II.

The costs in Arizona and New Mexico are low, on account of the fact that the majority of the low-cost porphyries as well as some high-grade mines are situated there. The high depletion shown in the Montana district is due principally to the comparatively high cost of mineral land of one of the companies. The high mining cost in the Montana and Michigan districts results from the extreme depth at which the ore is mined. Reduction costs are low in Michigan, because the metal occurs as native copper and after milling only needs to be melted out of the gangue.

Table III shows the same costs itemized by the elements of expense.

"Tolls" includes charges for smelting and refining of ores or concentrates paid by many companies, including most of the porphyries, and transportation to the Atlantic seaboard. The lowest cost for toll operations occurs in the Michigan district, as the copper is there produced as a finished product by the smelteries, which are generally owned by the producing or allied companies. The low labor cost for Mexico and South America is due partly to cheap labor and partly to the methods of reporting costs. The extremely high price of labor in the Montana district is partially offset by the credit for precious metals, whereas in Michigan the high labor cost is offset only by cheap reduction.

Table IV shows how the costs rise when low-grade ore is treated. This does not include the porphyry or Lake companies.

TABLE IV. COMPARISON OF THE PER CENT OF COPPER IN THE ORE WITH THE COST OF PRODUCTION OF COPPER FOR ALL COMPANIES, EXCEPT PORPHYRY AND LAKE, FOR THE YEAR 1918.

Companies other than porphyries and Lake	Number of Companies	Production	Per Cent of Production	Accumulative Per Cent of Production	Weighted Average Costs
Ore assaying below 2 per cent	9	121,431,566	9.69	9.69	\$0.205
Ore assaying between 2 and 3 per cent	16	178,742,438	14.26	23.95	.209
Ore assaying between 3 and 4 per cent	10	475,109,295	37.89	61.84	.168
Ore assaying between 4 and 5 per cent	8	130,474,902	10.41	72.25	.154
Ore assaying over 5 per cent	10	348,009,384	27.75	100.00	.134
Totals	53	1,253,767,585	100.00		.167

The aggregate investment was over \$672,000,000, which on the average for all companies was nearly 30c. per lb. of copper produced. In other words, copper producing companies on the average, need a profit of 3c. per lb. to net 10 per cent on the investment. The actual average rate of profit for the year was 28 per cent.

Rhodesia Gold Production in August, according to Financial America, was 49,621 fine oz., valued at £207,339. The production of gold in July was 51,176 fine oz., valued at £214,919.

Killing Off Our Enemies

Insidious Propaganda of the Shower-Bath Manufacturers and Tooth-Brush Makers, Spread by Dr. Darlington, Deserves Wider Publicity

BY MARK R. LAMB

"AT A meeting of the Mining and Metallurgical Society of America Dr. Thomas Darlington addressed the members. . . ."

It was a most interesting meeting. Dr. Darlington told his hearers many things which they did not know before. They were so important that it seems advisable to give them in more detail than has been done in most of the hitherto published reports.

His statement as to what makes people tired was at variance with the ideas of most of those present. Work does not do it. Though it is true that long



HYDRAULIC REGENERATION

hard work seems to precede a feeling of weariness, this is only in appearance or coincidental, and the way to be rid of the feeling is not to rest, but to take a shower bath,—and if one is not sufficient, take two. It will then be possible to go right back to the furnace and work another shift. If work is alternated with showers, there will be no opportunity to become tired. If those steel mill workers could be persuaded to take lots of shower baths, they would be so enthusiastic about their work that they would not want shorter days. It is up to the Steel Trust to put Dr. Darlington to work on that particular job.

He told all about blood counts and their importance, and it makes mine run cold to think of the terrible danger in which all those people are who do not know what a blood count of five million means! There are probably thousands of men in the Pitts-

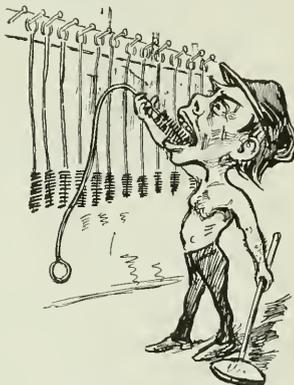
burgh district who never stop to count their blood! There may even be a few readers of the Journal who have not got clearly in mind just what a blood count is, though I hope not, for the sake of the standing of the profession!

And then the tooth brush! Heavens, to think how ignorant I was before Dr. Darlington began to talk! It was my custom, only one day before, to



PIE A LA MODE

use my brush only four or five times daily, and then merely as a habit. But it seems that all this time, during all my forty-six years (thank you, I know I don't look it) my life has been in constant danger from pneumonia! The Doctor told us that there are forty-eight varieties of bacteria in our mouths (Dr. Copeland says sixty, but a dozen more or less is of little importance), and he added that the beverages



ESOPHAGEAL ANTISEPSIS

in use before the late disaster had kept the number down. He now expects a great increase in variety and numbers. I know now that if I eat or breathe, with these bacteria in my mouth, some of them slip into my stomach and lungs and raise—trouble. For this reason it is best to fool them by brushing the teeth between bites.

Same with breaths. In spite of every precaution, some of them occasionally get past, but Dr. Darlington has provided even for that. As soon as one feels

a bacterium in his stomach, it is only necessary to use quickly Dr. Darlington's stomach brush, after first emptying the stomach. It is very simple, though at first, for lack of skill, the meals are long drawn out. And it looks funny, too. The brush has a long, flexible handle and tickles as it goes down, so it is best to practice alone. But think of the satisfaction of being immune to pneumonia and the flu! The lethal gas required to stop the bacterium which gets into the lung can be obtained from the War department.

I forgot the tonsils. They must, of course, come out first. And to think that the majority of the 600,000 people who died of the epidemic last year would be alive today had they brushed their teeth and stomachs thirteen times daily! Dr. Darlington says so. Copeland says twenty-three times.

The Doctor's story about little Adrenal is the best of the lot. What she did to those two soldiers was a plenty, but it was unfair of the Doctor not to tell how she could be employed in ordinary business affairs.

The Doctor seems to be an Irishman. The Journal published his remarks without a smile. It is difficult to understand why the members of the Mining and Metallurgical Society of America did not rise in their wrath (or amusement) and throw the Doctor out the window. It may be due to politeness, or hospitality, or habit, or simply to a lack of a sense of humor. Your mining engineer must under no circumstances display anything but complete, painful gravity, or he loses standing. A proof of this is that he cannot specialize successfully as a geologist unless he can grow a full beard.

The inventor among him will gravely shake up a few grams of hot silver ore in a test tube and announce a revolution in metallurgy, without planning the apparatus necessary for shaking up a thousand tons daily in like manner. If he had a sense of humor he would think of all those endless test tubes and laugh and drop the revolution.

It is no excuse to say that he is an ordinary human being, because he is not. He does not vote—he gets excused easily from jury duty, and he has never enjoyed a lawsuit. There is not one of him in Congress or the Senate, nor will there ever be.

The greatest joke of all is his innocent, flamboyant pride in Hoover. It reminds me of my ancestors. My uncle frequently found occasion to mention the illustrious members of our family and say how proud he was of them, but Dad would reply by wondering if the feeling were reciprocal. I am the original Hoover man for the next President, but when he is elected, I shudder to think how unbearably smug and self-satisfied your mining engineer will be.

The Best Time to Leave the United States on a trip to the Far East is the late summer, in time to arrive in China about the first of October, according to J. A. Fowler in Commerce Reports. April, May, and June are almost equally fine in most parts of northern Asia. December, January, and February are the comparatively cool months in the Philippine Islands.

Alaskan Railroad Makes Rich Country Accessible

Willow Creek and Broad Pass Districts of Great Promise as Producers of Both Precious and Base Metals—Much Prospecting Necessary—Government Railroad Now 80 Per Cent Complete

BY F. LE ROI THURMOND
Anchorage, Alaska

THE great territory of Alaska is today one of the few remaining storehouses of mineral wealth which has practically been untapped, and it offers a rare opportunity to the man with a lust for adventure and fortune. The mineral industry of the country is only in its infancy. In a territory one-fifth as large as the United States, in

silver mines of the Southwest having been formed at that time. It is highly probable that prospecting and exploration will prove another Goldfield or Tonopah to exist somewhere in this large area of granite and rhyolite.

On Iron creek, a tributary of the Talkeetna River, extensive copper prospects have been found in the form of contact, metamorphic deposits. A company headed by Joe Morris is preparing to drill this ground soon. Morris was the discoverer of the Le Roi mines, at Rosslyn, B. C., in the late '80s, which have produced \$70,000,000 in gold and copper.

Probably the most interesting and promising section of the highly mineralized Broad Pass territory is found among the headwaters of the Chulitna River. Here, on the west fork of the river, occur mineralized, acidic dikes, several hundred feet wide, the gold tenor of which is sufficiently high to indicate that they will very soon be explored. In the same vicinity are numerous outcrops of chalcopryite, most of which also contain gold and silver. This region was the scene of considerable excitement and activity in 1914 and 1915, when the railroad was projected through Broad Pass. About 200 men stampeded into the country, anxious to obtain claims on ground reputed to be enormously rich, but, as is usual in such cases, many of them were disappointed on finding that the precious metals did not grow on trees, and that the ores were complex and required the investment of much time and money to develop. Another factor of considerable weight was the un-



THE NEW MACHINE SHOP AND POWER PLANT OF THE GOVERNMENT RAILROAD AT ANCHORAGE

almost every part of which gold can be found, only thirty-one lode gold mines were operating in 1917. The difficulty has been one of transportation, and all of the lode mines so far developed are situated on, or close to, tidewater, or are naturally favored geographically, so as to render them accessible.

The government railroad now under construction inaugurates a new era in the history of Alaska. This railroad, with its terminus at Seward, a splendid year-round harbor, traverses and renders accessible a diversified region, with a wealth of mineral resources which offers great inducement to the prospector and investor.

One of the best-known districts along the railroad is that known as Willow Creek, where there are a number of mines and prospects in rich, free-milling gold ores. I recently made an important discovery in connection with this camp, the identification of the minerals nagyagite and calaverite, tellurides of gold, in specimens from one of the newer mines now being developed. This is highly significant as an indication of the continuity and persistence of the ore bodies, apart from the fact of exceptional richness. These mines are in the Talkeetna mountains, where the formations are largely of granite or other acidic, igneous rocks, of Jurassic to Tertiary age. The latter period was one of great gold deposition, some of the famous gold and

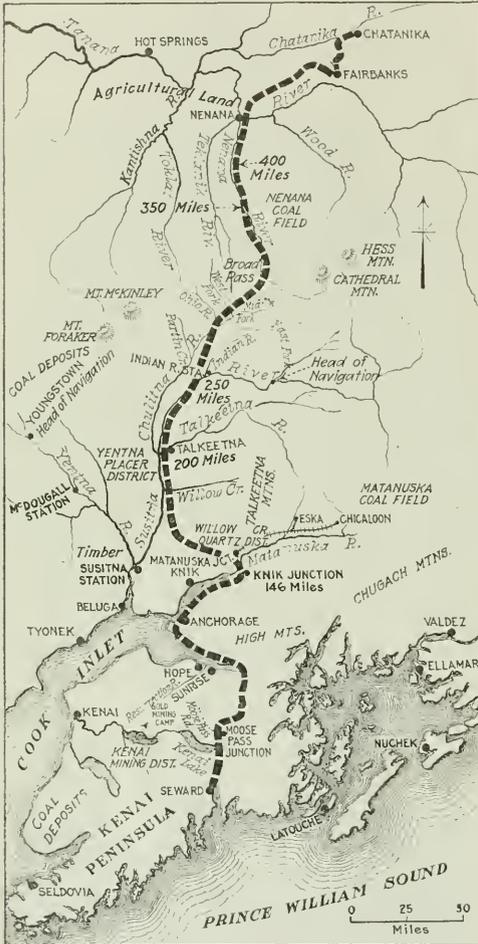


ANCHORAGE HARBOR, APRIL 22, 1919

certainly as to the time of completion of the Government railroad. A few of the more resolute and better informed have held their claims, and now, as the railroad nears completion, their reward is in sight.

On the Ohio River, fifteen miles from the west fork of the Chulitna, occur a number of veins outcropping on ground held by Dr. McCallie and associates, of Anchorage. I was commissioned to examine and report on these properties, and to obtain the necessary data made two trips to the region in 1918, one in the spring by dog team, and the other in August and September, going on foot

several ounces per ton. Copper and lead vary considerably, but I obtained 4 per cent copper over a width of 8 ft. where one of the veins outcropped. The ore, being complex and having the precious metals contained in the sulphides of the base metals, will require smelting, and the indications are that much of it will be rich enough to stand the long haul to the Tacoma smeltery without previous treatment.



MAP OF COUNTRY ALONG THE ALASKAN GOVERNMENT RAILROAD

with pack horses. The information gained on these expeditions was such as to warrant further work to determine the extent of the promising prospects.

The ores consist of sulphides of copper, lead, zinc, and iron, with high silver and gold content. Silver is associated with the lead sulphides, or carbonates where they have been formed by surface alteration, and the gold occurs with the copper. High assays of silver are common, and gold runs from a trace to



AT MILE 260 OF THE GOVERNMENT RAILROAD, MARCH 6, 1919

Still, large quantities will require enrichment by some of the standard concentration processes. Flotation probably will prove best adapted, as that process is fast displacing gravity methods on ores of a similar character.

On Partin Creek, ten miles from the Ohio River district, a large copper-silver-gold-bearing vein occurs in limestone. Not far from here, on Coal Creek, I discovered a granite-slate contact with a wide zone of massive pyrrhotite and sphalerite, carrying gold and silver.

I have mentioned only a few of the typical instances of mineralization which came under my own observation, but many other occurrences are known. Although little prospecting has been done, the mineralized area is known to extend about twenty-five miles from the headwater of the west fork to the head of Partin Creek, and almost no prospecting has been done outside of this area. Further and more thorough exploration which will follow the development of this region by the railroad, will undoubtedly uncover many more ore deposits. The number of prospectors in the region is ridiculously inadequate to the task in hand—about a dozen men on the whole southern flank of the Alaskan Range, west of Broad Pass.

The region is not a difficult one in which to work, there being no timber except along the larger streams. At elevations of 2,200 ft., only alder brush is found, and 500 ft. higher the mountains are bare. The rock formation consist of sedimentary beds, slates, cherts and limestones, which were tilted at

the time of the uplift of the Alaskan Range and intruded with granite and other acid eruptive rocks. These intrusions were of Jurassic age and are the cause of the mineralized veins found in the sedimentaries and along the contacts.

From the point of view of natural beauty the country is wonderfully attractive, containing inland seas, great rivers, glaciers, and mountains of unsurpassed grandeur. Mount McKinley, 20,300 ft. high, the loftiest peak in North America, is only thirty miles from some of the prospects named, and is visible from points 200 miles to the north or south. The



OUTCROP OF 15-FT. MINERALIZED VEIN NEAR HEAD OF OHIO RIVER

railroad, now 80 per cent complete, will render this region accessible to tourists and travelers, who will also be attracted by the big game which abounds on the slopes of the Alaskan Range, the big brown bear of the coastal regions, the moose, sheep, caribou, and goats in favored localities.

Following the prospector and miner, the tourist, and the hunter will come the tiller of the soil, the artisan, the home seeker. Industries will spring up, flourish, and cities be built in a day, and millions of people living and yet to live will find in this newer

land an inexhaustible supply of natural wealth, in return for faith and work.

"Long have I waited lonely, shunned as a thing accurst,
Monstrous, moody, pathetic—the last of the lands, and the first;

Visioning campfires at twilight, sad with a longing forlorn—
Feeling my womb o'er pregnant with the seed of cities unborn—
Wild and wide are my borders, stern as death is my sway;
And I wait for the men who will win me, and I will not be won in a day;

And I will not be won by weaklings, subtle, suave, and mild,
But by men with the hearts of Vikings and the simple faith of a child;

Desperate, strong, and resistless, unthrottled by fear or defeat,

Them will I gild with my treasure, them will I glut with my meat."
Robert M. Service.

Chilean Opinion Concerning the Nationalization of Mines*

Many have suggested the idea of nationalizing the mines, turning them over to the Treasury, with due respect, of course, to previously acquired rights, and, imitating the German and Prussian regime, to create a technical and administrative organization, as in the exploitation by the German State of the deposits of the Sarre Valley, the Hartz, and Upper Alsace. This system would be a complete failure in Chile, where politics controls everything.

Centuries will pass, perhaps, before the Chilean State will have acquired industrial capacity. It is enough to consider how many years the Railroad Administration has operated at a loss; and this is an enterprise that does not fail to yield profits in any part of the world. In Chile it leaves a deficit.

The better plan is to continue the working of the mines by private capital, without distinction to Chileans or strangers. Foreign capital, whether American, English, French, or of any other nationality, serves to increase the natural wealth in general, and although the greater part of the utilities are exported, in fact they remain in the country in salaries, freight charges, and the buying of national articles (coke, cement, and similar materials) in large quantities.

*Translated from the Bulletin of the National Mining Society of Chile, No. 243, p. 376.

Intercooling in Two-Stage Air Compression is particularly important, as on the efficiency of intercooling will depend the overall efficiency of the compressor and the equalization of the load between low-pressure and high-pressure cylinders. The intercooler should not only cool the air from the temperature at which it is delivered from the low-pressure cylinder, but it should also condense and remove the moisture from the air. The more efficient intercoolers will reduce the temperature of the air close to that of the cooling water with a minimum amount of cooling water. No intercooler should allow the cooling water in any part to become hot enough to precipitate scale. The air should be broken up into thin sheets in contact with the cooling surfaces. One square foot of cooling surface per six cubic feet of air passing through the intercooler per minute is given by one manufacturer as the ratio of cooling surface to air volume, and the same manufacturer claims that two and one-half gallons of cooling water per minute per 100 cu. ft. of air passing the intercooler will reduce the air temperature to within eight degrees of the cooling water if the intercoolers are properly constructed.

Standard Chutes for Metal Mines*

Several Factors Influence Selection of Those Used Underground for Loading Ore Into Tram Cars—Special Chute Doors Designed With Respect to Needs and Permanency of Chutes

BY CHARLES A. MITKE

CHUTES are used for the purpose of passing ore and waste to different levels in a mine. They are also utilized for storage, and frequently, when not necessary for ore or waste, are kept open entirely for ventilation purposes. In general, chutes are 100 ft. high (the usual distance between levels), although some are much longer, and others are shorter than this figure. When a raise is driven, it is customarily divided into two compartments, one for the manway and timberway, and the other (the chute), for the passage of ore or waste. Various types of raises which are in common use are as follows:

- Two-compartment raises (one for chute and the other for men and timber).
- Six-post, square-set raise, generally used in square-set stopes in medium ground.
- Four-post, square-set raise, occasionally used in caving methods. This raise is similar to the six-post raise, with the exception that the compartments are much smaller.
- Crib raise, used in square-set, top-slice, cut-and-fill, and shrinkage stopes in heavy or broken ground.
- Raw chute, usually oblong in shape, about 4 x 7 ft., with no timber except a partition between the chute and manway. Used only in hard ground mined by cut-and-fill, shrinkage, and to some extent by caving methods.
- One-compartment raises (chute only).
- Four-post raise, used in caving methods in medium ground.
- Crib raise, used in heavy ground mined by caving methods. In rare cases angle iron is used in its construction to prevent excessive wear.
- Raw chute, or "finger raise," circular, about three feet in diameter, no timber employed in its construction. Used only in medium or fairly hard ground.
- Rock-built chute. Constructed in the shape of a well, generally about six feet in diameter. This class of chute is built in loose ground.
- Concrete chute. For heavy ground. Usually circular. Used where there is a great deal of wear in the chute.

The requisites for a standard chute are as follows: Safety in situation and operation, efficiency in handling ore and waste, and economical construction and upkeep.

Formerly, chutes were placed in the center of drifts, to facilitate the dumping arrangements and permit the use of end-dump cars. Though this was a great convenience from the standpoint of haulage,

there was the constant danger of men falling into the chute. According to safety rules, boards were to be placed over these openings and to be removed only when cars were dumped but frequently miners would forget to replace them when the cars were empty with the result that many a man has lost his life by falling into the opening. In some states this practice is now prohibited, the law stating that the chute shall come up at the side instead of in the center of the drift.

The manway, adjacent to a chute, should be placed far enough from the haulage track so that the men climbing up and down the ladderway will not step directly in front of a moving train. One of the principal operating conditions to be avoided is the "hanging up" of a chute. It is usually a dangerous procedure for a chuteman to bring down a chute which has been choked or "hung up." Should the obstruction occur some distance up in the chute, say 80 to 100 ft., it may cause an air blast, which would break the chute and injure the trammer.

Sufficient Clearance Above Cars Is to Be Desired

The chute mouth should be high enough so that a man will not have his fingers caught between the chute and a car. This is sometimes difficult to arrange, as there are mines where five different kinds and sizes of cars are used, all being loaded from the same chute. Such a diversity in sizes of cars naturally results in insufficient clearance for the larger ones and too great a clearance for the small cars. This latter condition in itself creates a danger, as, when small cars are used, the ore, dropping from a distance at high speed, may injure the runner, especially when the car is nearly full and it is necessary for him to close the chute gate immediately.

In all average drifts provided with electric haulage, the trolley wire is immediately above the mouth of the chute. The larger drifts possess the advantage of an extra timber set above the trolley wire, upon which the chute runner works, there being a flooring between him and the wire, thus preventing his coming in contact with the electric current. Provision must always be made in the smaller drifts to protect the runner from the trolley wire. In some instances, the live wire is insulated and carried along the opposite side of the drift, the overhead wire being dead for a distance of about ten feet and acting merely as a guide for the trolley wheel. In other cases, the overhead live wire is boxed in with boards on the sides and has a hinged door beneath, which can be pulled up and hooked, in this way completely isolating the trolley wire. Another practice is to have a switch near the chute so that the current in this section of the wire can be turned off and on at will. In exceptional cases the trolley wire is cut

*From a paper, "Compilation of Chute Types for Loading Ore Into Tram Cars in Metal Mines," presented at the Eighth Annual Safety Congress of the National Safety Council, Cleveland, Ohio, Oct. 1 to 4, 1919.

about five feet on either side of the chute mouth, and may be detached and moved away bodily. This, however, involves considerable trouble.

Where Possible, Men Should Have Ample Working Room

A by-pass is frequently made by removing a half set of ground immediately opposite the chute, and a bench is provided upon which the runner stands. This should be high enough to enable him to reach across and tap the chute and also to use a pinch bar to advantage in loosening the large boulders which frequently clog up the mouth. The by-pass is an excellent safety provision as it gives the operator an opportunity to step out of the way in case there is an unexpected rush of ore out of the chute. In caving methods, where there are lines of chutes on both sides of the drift, a by-pass is impossible and the runner must load his cars by standing at the side of the particular chute from which he is drawing.

It is important that all chutes be properly situated with respect to the levels above and beneath the stope through which they pass. The convenience of the stopping arrangement depends on the placing of the chute as well as the tramping distance. A chute should be adapted to the particular needs of the orebody in question. In certain classes of ore large chutes are necessary, though in others smaller ones may be used to advantage. In some cases many thousand tons of ore must pass through before the chute is finally abandoned, and the tonnage grades down from this to but a few tons in other instances, consequently, the construction of the chute under the first-named condition must be stronger, more lasting, and naturally more expensive than the type of chute which would suffice in the second instance.

Unrestricted Flow of Ore Into Cars Is Desirable

The construction of a chute should also be such that the ore will flow readily into the cars. One of the difficulties with chutes that has not yet been overcome is the fact that all ore has a tendency to "hang up," or stick in the chute. A suggestion which has been made and tried is that of having a breaker staggered on each set throughout the chute. The ore, being dumped into the chute on the level above, strikes the first breaker and is thrown to the breaker on the other side, and from there zigzags down the entire length without stopping until it comes to rest near the chute mouth. These breakers impede the progress of the ore and prevent it from packing solid in the bottom of the chute, and naturally, the chute is less likely to "hang up." Good results were obtained from a trial of this chute, the only objection being the extra cost of construction in placing the breakers on the sides. The inclination of the chute mouth has considerable effect on its efficient operation, as certain classes of ore run more readily than others. The character of the ore, therefore, must be taken into account before adopting a standard chute and mouth.

The cost of constructing chutes should be kept at a minimum. It would be a waste of money to have

a chute constructed to last much longer than the life of the stope, while on the other hand, it would also be poor economy to build a chute of such light construction that it will need constant repairs long before that section of the stope has been abandoned.

Formerly chutes were provided with a wooden bottom and the ore was taken out immediately beneath the chute mouth. As a consequence, the ore dropping down the chute soon wore out the bottom and then filled in the sides of the drift. This practice is still continued in a number of districts, even though it involves an unnecessary expense to the company for upkeep and repairs, but it is obsolete in the most up-to-date mines. Wherever possible, the bottom of the chute should be in the solid ore or rock, which condition decreases the cost of upkeep, as ore striking on a wooden bottom would soon cut through.

After the size and character of the chute have been worked out with reference to the class of ore and decided upon, it is economical to have the timbers selected and cut to measure on surface, so that the total number of pieces necessary for its construction can be sent down at any time, and the chute mouth installed without any additional cutting underground.

General Types of Chutes Now Used

Fig. 1 illustrates a type of chute mouth used for loading small cars from stopes containing high-grade ore which are operated by the square-set method, or in stopes mined by caving methods where frequent blasting is done. The chute mouth is made of 3-in. boards, and the construction is such that the opening is given the proper inclination and a clearance of approximately 4 in. is allowed between the chute mouth and car. The door, which controls the flow, consists of three boards that operate in slots parallel to each other. The mouth of the chute is about 4½ ft. long, and the ore dropping down the raise strikes on the hard rock which has been left there for the purpose and then runs towards the car as the chute is drawn off. This type of chute mouth is generally used in small drifts ranging from 3 x 6 ft. up to 5 x 7 ft. in the clear.

In drifts where the ore is drawn from the square-set stopes the chute runner usually loads his car by standing on a bench opposite the chute mouth. Sufficient ground behind him has been taken out beyond the regular drift set so as to allow a certain amount of room for him to step aside in case of an unexpected run of ore from the chute. In caving methods, however, he loads his car by standing at the side of the chute instead of in front, for owing to the fact that the chutes are numerous, being generally placed opposite each other, there is no room for a bench. In loading, he uses a 5-ft. iron bar to pry up the three boards and allow the ore to run into the cars. In case a boulder should become stuck in the chute and hold up the ore, he uses his bar to dislodge it. Should he be unsuccessful, he must then get powder, tie it to the end of a stick and put it near the boulder. After the shot is fired, the boulder is usually broken and the ore

continues to run down the chute. When the car is full he uses the bar to strike each board in succession and cause them to drop, thus cutting off the flowing ore. In the event of one of the boards sticking fast and refusing to drop, enough of the chute mouth will be covered by the other two to stop the ore from running.

Another type of door is that shown in Fig. 2, which has an iron gate bolted to the sides of the chute. It is provided with a handle and can be raised by a man standing on the car or by the use of a bar operated when one is standing on the track. The gate has a bolt on each end and operates on hinges, and the result obtained is similar to that secured by use of the boards.

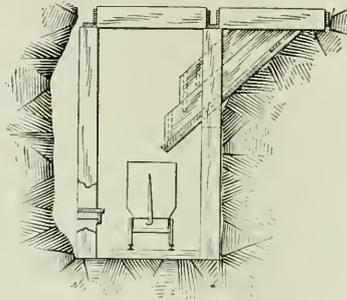
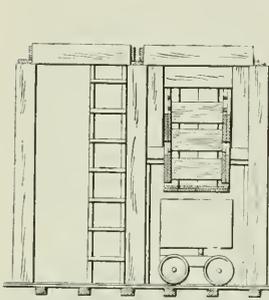


Fig. 1

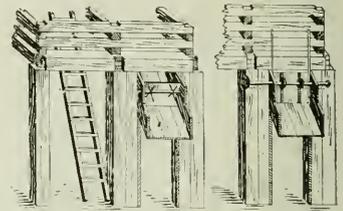


Fig. 3

Fig. 4

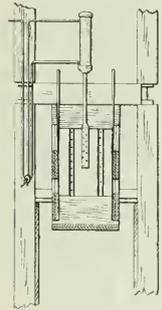


Fig. 5

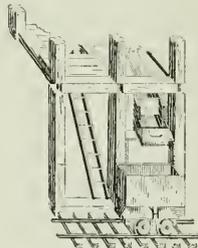


Fig. 2

GENERAL TYPES OF CHUTES IN METAL MINES

In drifts of this character, larger cars are used, the area of the drifts are larger than those of hand tramping and the chutes are either operated from the drift or from the extra pony set above the drift. The chute and chute mouth shown in Fig. 1 is frequently used in drifts of this character, being, of course, built in proportion to the size of the drift. Fig. 3 is the same kind of a chute and chute mouth as those shown in the preceding illustrations, but is provided with a different type of door. The door is built in the form of a sector, made of iron, and provided with a handle. A piece of iron pipe may be used on the handle in order to secure greater leverage. Built to a smaller scale this chute mouth and gate is occasionally used in hand tramping drifts in square set stopes, but more frequently in

the larger drifts, with, of course, proportionately greater dimensions. Such a door may be operated either from the level, in a hand tramping drift, or from the floor above, in a motor-haulage drift. In the latter case, the chute door is, of course, sufficiently high so that the operator can open it by standing in the pony set and also punch the chute from that floor. This class of door is in common use on main haulage drifts where block caving is the mining method employed. However, the chutes leading directly to the main haulage level are usually situated in ground that is not very heavy and will therefore not be subject to change.

Fig. 4 represents an iron door which is actuated by means of a slide and small gear wheels on the

ends. A large wheel, which may be operated from one side of the chute, serves to raise or lower the door.

The construction of the door shown in Fig. 5 is similar to that in Fig. 4, with the difference that it is operated by means of a compressed-air cylinder. The operator merely turns an air lever, which raises the slide and allows the ore to run through the chute. When the car is full and it is desired to close the chute, the air is turned off by reversing the lever. At the same time a second lever is turned on and air is forced into the rear end of the cylinder, closing the door. If a boulder should get caught it may then be necessary to open and close the door several times in order to dislodge the obstruction.

The principle used in the construction and operation of the chutes shown in Figs. 1 and 2, for use in hand tramping drifts, is practically the same. Both have rock bottoms, and the raises (which include chute and manway) are not immediately over the drift, but are placed at one side. Sufficient ground has been removed under the manway compartment so that the ladderway will be far enough from the drift to prevent a man from stepping out in front of a car. Fig. 1 illustrates the chute and door in use at most of the mines where block caving methods are used. Fig. 2 is used principally in top-slice stopes, and not so frequently in other caving methods, the reason being that the drifts in which Fig. 1 is used become heavy, and the chutes soon go out of shape and require a change made in the

size of the door, which can easily be done by cutting the wooden gates to suit the changes caused by crushing, whereas an iron door could not be so readily adapted. These represent two of the best types of chute mouths and gates for use in hand tramping drifts. They are economical, durable, and, if the bar is employed and the men use care, are comparatively safe.

Of the three iron doors shown in Figs. 3, 4, and 5, No. 5 is far superior to the two others and can be used in every instance where the others are employed. It is absolutely safe in operation and requires little repairing. The amount of compressed air used is also small. Its cost, as compared to the other doors is somewhat higher, but the expenditure is justified in places where a large amount of ore must be handled.

Clearance Dependent on Type and Height of Car

The matter of clearance for safety depends entirely on the type and height of car. As stated before, in one of the most up-to-date mines five different types and heights of cars are used, all loading from the same chute. In this instance it would be difficult to specify what amount of clearance between the chute and the car should be adopted as a standard. Therefore, before a standard clearance can be decided upon, it is first necessary to decide upon the standard size and height of car which is to be used on that particular level. The clearance between cars should be sufficient to permit of a man's passing between them.

Adoption of Standard Gage Underground

The discussion of a standard car raises at once the question of a standard gage. The 18-in. to 22-in. is still the practice and a standard gage of about 20-in. should be maintained in practically all metal mines. In deciding on a standard gage, the main consideration is that it must be suitable for the size of drift or tunnel which has been found to be the most practicable and economical for prospect work. The use of larger gage of from 24-in. to 30-in. is of advantage on main haulage drifts, where the ore has already been proved up and the expense of driving the large tunnel for the haulage train is absolutely justified. It would, however, be entirely out of the question to ask operators to drive large tunnels of this character for prospect work merely to standardize on the gage.

In general, a large number of companies use two gages, the 20-in. for all prospect and ordinary working drifts, and a larger gage, about 30-in. for the main extraction tunnels only. At the present time there are mines in the Southwest which have already standardized on the gage and type of car. In one particular mine, an 18-in. gage is used throughout the entire mine, with only two types of cars, both being the same height, which simplifies the matter of chutes and chute doors, the chute mouth shown in Fig. 1 being used throughout. It might well be said that this company has standardized on gage, cars, chute, chute door, and clearance.

The Mining Law

THE announcement that the Bureau of Mines will resume its efforts to draft a revised mining law—which work was set aside during the war period—will, it is believed, be received with general approval by the mining public. Whether or not Congress will see fit to act upon such suggestions as may eventually be made by the Bureau is another question.

In a country where it has become more or less customary to revise and amend laws and regulations relative to every phase of human endeavor, it is a matter of amazement when one realizes that the fundamental mining law, enacted in 1872, and inadequate and unsatisfactory in many ways since the day of its inception, has remained, year after year and Congress after Congress, unaltered and untouched by any hand, sacred or profane!

The mere miner or other layman unversed in the art of interpreting court decisions often stakes out his claim and starts to develop his ore, secure in the belief that his observance of the requirements of the law—as it appears to apply in his case—will give him ample protection and “make his title clear.” If his efforts remain uncrowned by success he will oftentimes proceed, unmolested, on his way. If not, however—if rich ore rewards his labors—fortunate, indeed, is he if “litigation” does not descend upon him and bind him hand, foot, and pocketbook.

This condition has long confronted the mining public. Thirty-five years ago that master engineer-humorist, Rossiter W. Raymond, offered a rhymed solution of the difficulties often attending the successful exploitation of a mining claim, which might still be apropos.

The surprising thing, from the 1919 standpoint, is the fact that Raymond's prospector had three friends! Whether the last remnant of the genus prospector, who was recently reported to have been seen at about Lat. 30 N., Lon. 40 W. from Washington, could muster a sufficient number of coadjutors to carry out the suggested plan remains a matter of grave doubt!

The bit of verse reads as follows:

THE LAW OF THE APEX

BY R. W. RAYMOND (1884)

There was a miner in the West, and truly wise was he;
His head it was the levellest that ever you did see.
Now he had found a silver ledge outcropping to the view;
And down he sat upon its edge, to muse what he should do.

This knotty question to decide, it was no joke, because
His reading had been deep and wide in all the mining laws.
The coast of his experience showed full many a gallant ship
Wrecked on those dangerous rocks, the Lode, the Apex, and
the Dip.

Quoth he unto himself, “Now, Jim, you ain't no saint, I fear;
But you just follow that old hymn, ‘an’ make your title
clear!”

Descending from the summit lone, he sought, that miner keen,
Three friends, Hans Breitmann, Mike Malone, and G. McClellan
Glean.

With them he shaped his wily plan; locations three they made;

And lo! the claim of every man across the rest was laid.
First, Breitmann claimed a mineral vein according to the strike;

But over this was spread again the placer claim of Mike.

And, pointing with a skillful aim to where the ore was seen,
Appeared the dangerous tunnel claim of G. McClellan Green.
Then in ejectment Mike brought suit to make Hans Breitmann quit

(And some revolvers they did shoot, but nobody was hit).

The lawyers they explained the law, the experts made the facts,

The judges they said "hum" and "haw," and quoted various acts.

The jury found against Malone, and he retired serene;
While Hans was left to pick a bone with G. McClellan Green.

This time the fight was harder yet; injunctions filled the air;
Old stakes were moved; new stakes were set; bold witnesses did swear.

A model for one side displayed the mine in minim size;
The other side a model made, which looked quite otherwise!

The experts brought their biggest books, to make the battle hotter—

Dana, Le Conte, De Beaumont, Jukes, Bischoff, Grimm,
Groddeck, Cotta,

Gaetzschmann, Pospny, Buratt, Lyell, Newberry, Whitney,
King,

Sandberger—and, in short, a pile of almost everything.

Stenographers took down the case, and made their talent felt
In jargon written out of place and proper names misspelt.
To try it without jury's aid both parties did agree;
Because a jury can't be paid with a contingent fee.

At last 'twas over; and the judge declared his final mind;
He thought the science mostly fudge; the models very blind;
He said that he had seldom heard such learned counsel speak.
(Though plaintiff's counsel was absurd, because his cause was weak.)

In short he gave to Hans the case; and surely ne'er was seen
A calmer man in his disgrace than G. McClellan Green.

With Mike and Hans that night he met their common partner
Jim.

"Old boy we've fixed it now, you bet," each partner said
to him.

"And when we want to stake OUR land, and own it without
fuss,

We'll come to you to take a hand and do as much for us."

Experts, and lawyers, paid in shares, soon looked exceeding
grim;

For Hans had made, all unawares, a previous deed to Jim.
So thus the prudent miner got a title without flaw,
In spite of every puzzling spot that marks the mining law.

True, when they came to work the claim, the ore soon petered
out,

And nothing but the silvery name showed silver was about.
But ere that time, the famous suit had brought the mine
renown—

Jim sold it to a Tenderfoot, and got his money down!

Unrest in Colorado

May I salute—"Hail the Chief!" and wish you a beaten trail, at the "New Discovery" (E. & M. J.)? May you always have a pay streak, as it is most discouraging to swing a Single Jack in barren rock. Be it "Silver Plum" granite on top the siliceous plate of your Mahogany.

It is because of profound respect, admiration of your teachings, that I have stepped into the limelight to offer my best wishes; though, as I write, its diffused rays hurt my eyes, since I am more used to the softer glow of carbide hanging at the tail end of the mine car as I muck down the pile. I have no alibi to offer for my rashness, since nothing has passed down my throat these many, long, weary days, but I suspect that while handling one of the Market Sheets sent out of late from your office, I must have contracted one of the unrest germs I read so much about. At this I am alarmed, and know not whither to turn for a remedy.

The doctors, I read, disagree in a diagnosis. The chief surgeon—a fellow named Woodrow Wilson, I am told—appears to be doing a lot of experimenting, by calling in a bunch of chronic belly-achers and dosing them with his nostrums (strictly private formulas) of five, six, seven and eight dollars per day, doses to be taken about every six hours, and each cautioned to as little exertion as possible.

A Swede came by the other day—before I contracted the germ. He was ailing; his head hurt; his muscles were tired, and his legs weary. I thought I could aid him with four Silver Dollars per day to lean on a shovel. But he told me a Prophet Divine by the name of Finlay, J. R., would give him a gold-cure receipt awful cheap, that would banish his ills and cover the patches on his seat. If that be the case, please send that receipt, for I've lots of gold but little to eat; and I beg of you to see Prophet Finlay and discover his wonderful remedy, since he would sell gold pills so cheap.

Yours very sincerely,

F. C. Grace.

Scotia Mine, Salena, Col., Oct. 22, 1919.

Will Co-ordinate Alloy Research Work

The Division of Industrial Research of the National Research Council is arranging for the formation of a co-operative association to plan and support fundamental researches in alloys. The office of the executive secretary is at 1201 Sixteenth St., Washington, D. C. Although much valuable work has been done in this field by scattered investigators, a well-planned and co-ordinated effort by a co-operative association working under the general guidance of the National Research Council, and composed of specialists representing both the manufacturers and the more extensive users of alloys, can produce additional results of great importance.

A special scientific staff is planned, composed of a director and assistant director of research and a group of technical experts who will give their whole time to the work.

PETROLEUM SECTION

Engineering Notes and Equipment Details
 Production Statistics — Progress
 in Important Fields

Controlling a Gas Well

Details of a Method by Means of Which the Flow of Gas From a Large Well Was Effectually Checked

BY SETH S. LANGLEY

IN THE Journal of July 12, 1919, there was described the method by which a large gas well in the Elks Hills oil district of California, which had caught fire, was extinguished. The steps then taken to secure the well and put it under control are described in the following: After allowing the earth to cool for a few days, a drag-line excavator removed enough material to expose the first collar of the casing. The greater portion of the first joint had

When in position, the clamp came $\frac{1}{2}$ in. above the casing collar. Hydraulic packing was wrapped around the collar and in the space between the halves of the clamp, which was then bolted tight. A similar clamp was bolted to another $12\frac{1}{2}$ -in. collar, and the two clamps hinged by the latch arm at one end. The remaining fittings were then made, all of $12\frac{1}{2}$ -in. casing type—a short nipple, one cross, $12\frac{1}{2}\times 12\frac{1}{2}$ by 4x4 in.; a short nipple, gate valve, and 10-ft. joint of casing. On the cross were connected two 4-in. nipples with 4-in. gate valves; cribbing supported the made-up fittings. From the outer end a cable was rove over the crown pulley of a nearby derrick and another cable carried back to a hand windlass (Fig. 2). The fittings were then raised, both cables kept in tension, and when in a vertical position a drift pin was driven through the second latch

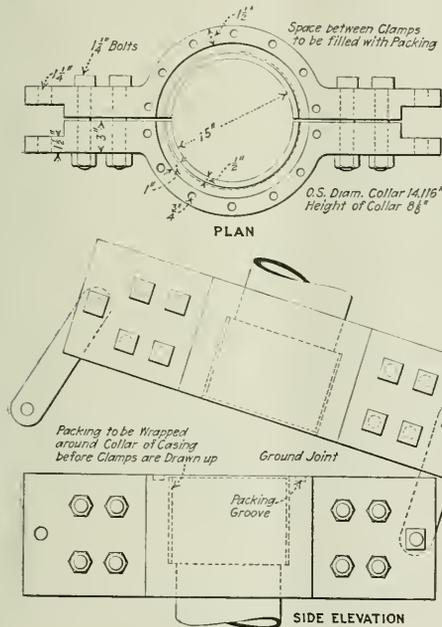


FIG. 1. PLAN AND ELEVATION OF CLAMP TO FIT $12\frac{1}{2}$ -IN. CASING COLLAR WITH LATCH FITTINGS

been worn away, but the lower collar was in good condition; the joint was broken at this point, leaving the collar on the second joint. A clamp was made in two parts to fit around the collar and with a shoulder to grip the casing below the collar; the collar served to hold the clamp from being torn off. On each end, the clamp was machined to take a latch arm, held with $1\frac{1}{4}$ -in. bolts, as shown in Fig. 1.

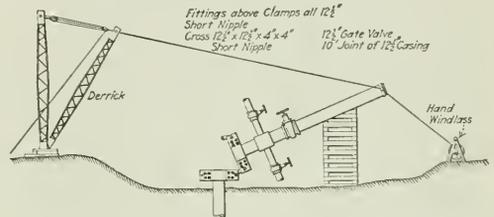


FIG. 2. METHOD OF RAISING FITTINGS INTO POSITION

arm and the $\frac{3}{4}$ -in. bolts were put in the clamps. Concrete was then poured in forms to make a block to come up over the clamps.

The well is gaged to be making 185,000,000 cu. ft. per day. This is considered to be the largest gaged gas well of which there is any knowledge.

Oil Struck in Montana

What is considered to be the most important discovery of oil in the history of the state of Montana was made recently by the S. Vandusen Oil Co. in Devil's Basin, twenty-seven miles north of Roundup. The bringing in of this well, with an estimated capacity of 500 bbl. per day, gives indication of substantial future production. The well so far has penetrated the oil sand for only a distance of several feet, and it is expected that an increased production will be obtained at greater depth. The sand has an estimated thickness of about 100 ft., according to indications found in the sand cut in Woman's Pocket field, twenty miles distant, where a well of 200 bbl. was brought in several months ago. It is expected by geologists that when the sand in the Devil's Basin district has been bored deeper, a possible capacity of 1,000 bbl. per day will be obtained.

Oil Operators and Workmen Reach an Agreement in California

Terms Governing Relations Between Producing Oil and Gas Pipe-line Companies and Oil Refineries Determined by President's Mediation Commission

AN INTERESTING memorandum of the terms governing the relations between producing pipe-line and refinery companies and their employees operating in California oil fields has just been agreed upon by the President's Mediation Commission, consisting of J. L. Spangler, E. P. Marsh, and Hugh L. Kerwin, and the operators' committee, consisting of A. L. Weil, chairman of the joint committee; L. J. King, C. A. Hively, E. S. Durwood, and F. F. Hill, of the field committee; A. F. L. Bell, E. I. Dyer, Lionel Barneson, and G. H. Van Senden, of the refinery committee, and R. E. Maynard, E. B. Part-ridge, F. A. Simms, and Max Dyer, of the pipe-line committee. The memorandum is made effective by the signature of individual operators. The general terms and Schedule A, together with general specifications applying to oil-producing companies, follow. Schedule B and C are omitted, as they apply to pipe-line and oil-refinery companies. The general terms of the memorandum are as follows:

I—That during the period ending at midnight, June 30, 1920, all matters of wages, working conditions, and any controversial matters which may arise between the operators and the workmen, shall be governed by the terms of this memorandum. There shall be no cessation of work through strikes or lockouts during said period of time.

II—The operators during said period shall pay to the workmen, as provided by the law of the State of California (until said law is changed, semi-monthly), the amount of wages for the various classes of workmen set out in the three schedules annexed hereto and marked Schedules A, B and C. Schedule A refers to oil fields, Schedule B refers to pipe lines, and Schedule C refers to refineries.

III—All workers covered in the attached schedules (not including unskilled laborers or skilled craftsmen who have been paid the prevailing locality rates for their crafts, or men employed in construction work, unless permanently employed) shall receive back pay of 50c a day for every day worked from Jan. 1, 1919, to June 30, 1919, both inclusive. Such payments shall be made by the employer or the employers of such men for the period of their employment; it being understood that where any employer has actually paid to any man an increased wage over the amount paid by such employer for like work on Dec. 31, 1918, such increase shall be credited on the amount of back pay. Each employee entitled to back pay must, on or before Dec. 31, 1919, make written application to each employer for whom he has worked during the period specified, for the back pay to which he is entitled, either by letter or on forms provided by the company, and any employee who fails to make such application within such time shall lose all right to such back pay.

IV—If the terms of this memorandum are fully and fairly lived up to by the men during the year ending June 30, 1920, the operators will, within forty-five days after June 30, 1920, pay to every man covered by the annexed schedules, who has been in the company's employ not less than thirty days during the period of this memorandum, 25c for every day worked by such man for the operator; provided, however, that such payments shall not be made to any man who leaves the company's employ through concerted action, or

under conditions that endanger the operator's operation, or who is discharged for willful misconduct. This does not cover men classed as roustabouts or men whose wage is determined by the Macy scale, or men who are paid 25c or more in excess of the wage stipulated for their class in the schedules. If any workman is paid more than the amount stipulated for his class in the annexed schedules, but less than 25c a day more than such stipulated wage, the excess so paid is to be credited to the operator on the additional pay referred to in this paragraph. The question as to whether the terms of the memorandum have been fully and fairly lived up to is to be conclusively determined by the present members of the President's Mediation Commission. In order to avoid any uncertainty, the classes which are to receive the additional pay referred to in this paragraph are specifically indicated in the schedules.

V—Eight hours' actual work at the plant or place of employment shall constitute the work day in the oil industry, subject to the provisions of the schedules hereto attached. Employees covered by any classification are expected to perform any duties to which they may be assigned. If work of a higher class is required of an employee he shall receive the wage of the position to which he has been assigned for as long a time as he occupies that position. If employees are temporarily shifted to any position paying a smaller wage, no reduction in wage will be made, but in case a man's services are no longer required in his class, instead of laying him off the management, with his consent, may transfer the man to any other position and rate the wage according to the position.

VI—Overtime shall be controlled by the regulations in the schedules hereto attached.

VII—Where boarding houses are maintained by the operators during the period of this memorandum, a flat charge not exceeding \$1.25 per day will be made for board. No rent shall be charged to the workmen for bunk-house or dormitory accommodations; but in the several oil-producing districts, on the pipe lines, at refineries and the allied branches of the industry, where cottages are provided, a reasonable rent may be charged therefor, not exceeding the amount now charged, except in case where no rental is now charged or where material improvements are made.

VIII—The wages specified in the schedules are minimum wages and are not to be considered as any restriction on either the operator giving or the workmen accepting any additional compensation either by way of a greater wage per diem, a bonus, a premium or a share of profits; but so long as the schedules are maintained, no increase in wages in one class or to the individual of a class shall necessitate a change in the wage of any other individual or class. Operators shall not, however, by reason of anything herein contained, be justified in reducing the wage of any individual below the amount now being received by him.

IX—Membership in any labor union affiliated with the American Federation of Labor shall not be a bar to employment, nor shall any man be discharged or discriminated against for membership in such labor union. No business between the union and any of the men shall be carried on at any time during a man's hours of employment except in matters of sickness or death. No intimidation or coercion of any kind shall be used for the purpose of inducing or compelling a man to join the union at any time.

X—The "adjuster" hereafter referred to shall be afforded every opportunity to familiarize himself with actual working conditions in the field. If, after such investigation, it appears to him that the classification as shown in the annexed schedules is inequitable in any particular, he shall call a meeting of the Operators' Committee and lay the matter before them, with his recommendations, and if it shall

appear to the Operators' Committee that the classification is inequitable in any particular, proper changes shall be made therein.

XI—Hywel Davies is hereby named as "adjuster." The duties of the adjuster shall be: First, to familiarize himself with operating conditions and from time to time make representations to the operators or to the men as to any matter which he deems should be changed for the welfare of the industry as a whole. Second, whenever in carrying out the provisions of this memorandum any controversies over questions of facts shall arise, and the individual workman or any group of workmen shall find himself or themselves aggrieved, after exhausting the remedies provided by the operator, the whole matter shall be submitted to the adjuster, who shall be given every assistance by both sides in the investigation of the matter. After hearing both sides, the adjuster shall make a written statement of his findings of fact on such controversy, and such findings of fact shall be conclusive on everybody concerned.

XII—This memorandum shall remain in full force and effect up to and including June 30, 1920.

XIII—Within sixty days of the expiration of this period the President's Mediation Commission, or, in the event of its incapacity to act, the Secretary of Labor, shall call a conference of operators and workmen in this district with a view to a renewal of this memorandum.

XIV—Each operator or operating company ratifying the action of the committee of operators as shown by the terms of this memorandum shall signify his assent by subscribing his name either personally or by his duly authorized officers.

Executed at Los Angeles, the 9th day of September, 1919.

Signed:

J. L. SPANGLER,

E. P. MARSH,

HUGH L. KERWIN,

President's Mediation Commission.

Signed:

A. L. WEIL,

For the Committee of Operators.

General Specifications—Schedule A

Employees not entitled to 25c contingent pay for the year ending June 30, 1920, under the general specifications in this memorandum: Roustabouts; teamsters (two-horse); truck drivers (up to and including one ton); stablemen; boiler washers (no chipping, employed continuously); tank-car loaders; electricians (journeymen). Also employees whose wage may be determined by the Macy scale; or men who are paid 25c or more in excess of the wage stipulated for their class in this schedule. If less than 25c in excess of the wage stipulated for their class in this schedule is paid, such amount shall be credited on the 25c payable as provided in this memorandum.

Roustabouts are defined as all semi-skilled laborers, not hereinbefore classified, and are not entitled to the 25c contingent pay.

Common labor (unskilled labor) is defined to be that labor employed in other lines of business, and not peculiar to the oil business; shall consist of the following classifications, and of such other classifications as have not been enumerated in the schedule of semi-skilled or skilled classifications, viz.: Gardeners; janitors; watchmen engaged at the usual watchman's duties, and not required to bleed or gage tanks; gatekeepers; swampers; auto and truck washers; water carriers; weed cutters; ditch diggers; pick-and-shovel men; clean-up men; yard laborers; tank, tank-car and pipe cleaners, scrapers and painters; men loading and unloading cars, trucks or other vehicles; men distributing material in warehouses, yards, storehouses, or about the fields or plants.

Working conditions to continue as heretofore determined by the Federal Oil Inspection Board, and as follows: (a) Drilling crews: All drilling crews to remain on duty until relieved by succeeding crew, and are expected to work eight full hours per day; i. e.: There must be no cessation of activities, but a period of one-half hour shall be allowed dur-

SCHEDULE A—CLASSIFICATION AND WAGE SCALE OF OIL-FIELD EMPLOYEES

Occupation—	Daily Wage Rate Effective July 1, 1919
Driller (cable tools).....	\$8.75
Tool dresser (cable tools).....	6.25
Circulator or third man.....	5.25
Driller (rotary tools).....	8.75
Bit dresser (only when bits are dressed in rig).....	6.75
Derrick man.....	6.25
Rotary helper (dressing bits in rig).....	5.75
Rotary helper (not dressing bits in rig).....	5.25
Head rig builder.....	8.75
Rig builders.....	7.75
Rig builders' helpers.....	6.75
Head well cleaner.....	6.75
Well cleaner helper.....	5.25
Head well puller.....	6.25
Well pullers.....	5.25
Engineers.....	5.00
Fremen, pumpers and oilers.....	5.00
Dehydrator Operators (employed continuously in operation of large retorts).....	5.50
Dehydrator operators (employed continuously in operation of large work; classified as pumpers).....	5.25
Head roustabout.....	6.00
Roustabouts (not entitled to 25c contingent pay).....	5.00

GASOLINE EXTRACTION PLANTS

First-class plants—	
First engineer.....	\$5.75
Second engineer.....	5.50
Large booster stations—	
Engineer.....	5.50
Small booster stations (checkers).....	5.00
Engineer (operating booster station with or without other work).....	5.25
Fremen, oilers, pumpmen, traptenders.....	5.00

FIELD EMPLOYEES

Teamsters (two-horse) (not entitled to 25c contingent pay).....	\$5.00
Teamsters (four-horse).....	5.00
Teamsters (six-horse and over).....	5.25
Light truck drivers (up to and including one ton) (not entitled to 25c contingent pay).....	5.00
Light truck drivers (over one ton and up to three tons).....	5.00
Heavy truck drivers (three tons and over).....	5.75
Stablemen (split time understood; eight hours' work within any 10½ consecutive hours) (not entitled to 25c contingent pay).....	5.00
Boiler washers (no chipping; employed continuously) (not entitled to 25c contingent pay).....	5.00
Boiler washers (where chipping is required, employed continuously).....	5.25
Warehouse yard men (checkers).....	5.00
Tank-car loaders (not entitled to 25c contingent pay).....	5.00
Head garage repair man.....	5.50
Garage repair men.....	6.00
Garage repair men's helpers.....	5.25
Electricians (journeymen) (not entitled to 25c contingent pay).....	7.00
Electricians' helpers.....	5.25

STEAM, GAS ENGINE, AND PUMP REPAIR MEN

Repair man No. 1.....	6.25
Repair Man No. 2.....	5.75
Repair man's helper.....	6.25

FIELD SHOPS

Acetylene welder.....	\$5.50
Heavy fire blacksmith (employed principally in tool manufacture and at heavy forge work).....	8.00
Light fire blacksmith.....	6.50
Other blacksmiths.....	6.00
Blacksmith helper (heavy fire).....	5.50
Blacksmith helper (light fire).....	5.25
Heavy hammer driver (2,500 lbs. or over).....	5.50
Light hammer driver (under 2,500 lbs.).....	5.25
Boilermaker.....	5.50
Boilermaker's helper.....	5.25
Machinist No. 1.....	6.75
Machinist No. 2.....	6.25
Pipe machinist (six inches and over).....	6.00
Pipe machinist (under six inches; at bolt machines, and other work).....	5.75
Shop helpers.....	5.25

ing which the workers will, in turn, be permitted to eat their lunch or intermediate meal. All shifts to rotate once each month, in order that equitable working conditions may obtain. Preparations for work, as well as for leaving work, to be made on employee's time. (b) Pumpers and oilers: Where three shifts are employed, the preceding suggestions will apply. Where operations are conducted by two shifts, each shift will work eight hours on such reasonable hourly schedules as will best suit pumping conditions, conforming, so far as may be, with the working schedules of other departments. Where one shift only is employed, and on small prop-

erties where daylight men are used, time may be divided to conform to most economical pumping operations and the securing of maximum production. (c) Field shops: All shop employees to work a full day of eight hours. (d) Daylight employees: All daylight men to work a full day of eight hours. Where work is situated at a considerable distance from the boarding house or other central station, daylight men will go to their work on company time, and return on their own time, with the proviso that loss of time to workers is not to exceed twenty minutes per day. (e) Stablenmen: Split time for stablenmen is permissible; it being understood, however, that no longer than eight hours' actual work shall be required within any ten and one-half consecutive hours. (f) Truck drivers and teamsters: Owing to the exigencies of the service, truck drivers and teamsters may be required to work such additional time over eight hours as may be necessary, and shall be paid therefor on a pro-rata hourly basis of the day's wage. (g) Eight hours will constitute a day's work for all workers, and longer hours of labor will not be permitted, even though the employer desires and the worker is willing to work additional time, except in cases of emergency when life or property are in danger, and except as herein otherwise specifically provided. In cases of emergency, overtime may be compensated for by the allowance of an equivalent amount of time at some subsequent date, unless otherwise mutually agreed upon.

Notes from the Texas Oil Fields

Pipe-line companies in Texas on Sept. 30 held in storage 16,917,989 bbl. of oil, according to the report of the Railroad Commission. Of this amount, 8,911,899 bbl. was owned by the pipe-line companies and 2,310,166 bbl. held for others. Unfilled storage capacity amounted to 5,695,932 bbl. Eight of the pipe-line companies reported.

The State of Texas has entered suit against the Texas Pacific Coal & Oil Co. for possession of 50.6 acres of land surrounded by producing wells situated in Eastland County. One-eighth royalty owned by the state is worth \$250,000. The state is also suing for \$500,000 damages for drainage of oil from under this land by the adjoining wells. Suit is based upon a question of mineral leases.

The bidding on one-half of the submerged oil leases to be sold at Goose Creek field by the State of Texas is finished. The highest price paid for any one tract was \$3,527, by the Texas Washington Oil Co., for tract No. 5, of five acres. Individuals and small companies did all the bidding; the big producing companies did not participate, which was contrary to expectations.

The Sinclair Consolidated Oil Corporation has acquired the Wrightman oil properties in the Bull Bayou fields. These were known as the Johnson, Polly, and Hollingsworth leases, and, in addition to previous holdings, give the Sinclair corporation a large percentage of the producing area of the field. It is proposed to build a 250-mile pipe line, with daily capacity of 20,000 bbl., from the Louisiana properties to the refinery on the Houston Ship Channel, near Houston, Tex.

The Rowe Oil Corporation, it is stated, is negotiating with E. F. Simms Oil Co. for the sale of its entire holdings to the latter company. The property consists of 1,200 acres in the Homer field, and a one-

half interest in the Shaw lease, now making 650 bbl. daily and with a gushing well capped awaiting pipeline facilities. The Rowe Oil Co. properties are owned jointly by the Western Oil Fields Corporation, of Denver, and W. H. Rowe, of Shreveport, La.

The White Oil Corporation has been recently incorporated under the laws of Delaware, with a capitalization of 1,000,000 shares, of no par value, of which 630,000 shares will be issued at once. Officers are: P. J. White, president, formerly senior partner of White & Sinclair; Thomas White, vice-president in charge of production, at present with the firm of White Bros.; Frank H. Bethel, vice-president in charge of finances, now first vice-president of the New York Telephone Co. Properties owned include 26,950 acres of oil and gas leases, two refineries, with daily capacity of 2,000 bbl. of gasoline, and 100,000 shares out of 160,000 shares of the Crown Oil & Refining Co. The latter company own leases on 87,500 acres of land, producing 5,000 bbl. daily of Gulf Coast crude oil; a 5,000-bbl. refinery on Houston ship channel, and a 1,000-bbl. refinery at Clarendon, Pa.

The board of directors of the Texas Company has recommended an increase in capitalization from \$85,000,000 to \$130,000,000; other recommendations made were that \$42,500,000 of the new stock be offered to the present stockholders at par; that \$2,500,000 of the new stock be sold to a trustee for allotment and sale at par to employees of the company; and that par value of the stock be reduced from \$100 to \$25 a share. The stockholders were asked to ratify these recommendations at a meeting held in Houston, Tex., Nov. 18, 1919.

The West Columbia field production for the fourth week in October averaged about 30,000 bbl. daily. The larger producing companies were the Gulf Production Co., 10,000 bbl.; Humble Oil & Refining Co., 10,000 bbl.; Texas Co., 7,000 bbl.; Crown Oil & Refining Co., 3,000 bbl.

The Freeport Sulphur Co. is making preparations to drill for oil on the McNeil tract, about ten miles west of Freeport near San Bernard River. The boarding house, bunk houses, and derricks are under construction.

The Texas Co. at West Columbia brought in No. 12 Hogg well recently, flowing over 5,000 bbl. a day.

The Sinclair Gulf Oil Co. has abandoned its No. 1 Norton well at Damon Mound at a depth reported to be over 4,200 ft.

The Humble Pipe Line Co. has nearly completed its new loading docks at Texas City. The tanker C. B. Ashe will take the first cargo of 90,000 bbl., on Nov. 1, destined for a New Jersey refinery. The oil to docks will be supplied from the company's tank farm at Webster, where fifteen tanks of 55,000-bbl. capacity each have been built.

The Terminal Oil Co. has had a temporary receiver appointed until after the court proceedings in which two notes of \$150,000 and \$75,000 are involved. The company owns properties at Humble field said to be worth \$300,000.

The Sinclair Consolidated Oil Corporation has begun operations at its new refinery, situated on the Houston Ship Channel. Expectations are that it will be operating at a daily capacity of 4,000 bbl. in the near future. Much Mexican crude oil, brought directly to the refinery in tank ships, will be refined.

The Walker Oil Co. has completed the first unit of its oil refinery at Morgans Point, where it owns twenty-five acres of ground. The Southern Pacific R. R. is installing switching facilities. The ultimate capacity of the refinery will be 5,000 bbl. daily.

The Hoffman Oil & Refining Co. is doubling the capacity of its oil refinery on Houston Ship Channel, making it 1,000 bbl. daily.

The Deep Water Oil Refineries Co. in Harris County has purchased twenty-seven acres at Harrisburg, on the Houston Ship Channel, at a reported price of \$1,500 per acre. The company will build loading, storage and trackage facilities here.

The Texas Co., in Jackson County, has leased a large acreage near La Ward from L. Ward, and has machinery on the ground to begin the drilling of oil test wells.

In Lampasas County, three new wells spudded in recently at Lampasas field. These are the White well, on Smith ranch; the Western Lampasas Oil Company's well, and the Waxa-Tex well of Waxahatchie Oil Co. Other wells being drilled are the Howell well, on the White ranch, 1,050 ft. deep; the Nelms-Marvin well, on McCrea ranch, 1,100 ft. deep; the Grooves well, 1,000 ft. deep; St. Mary's well, on Le Compté ranch, 900 ft. deep; and two wells of the New York Oil Syndicate, each about 1,300 ft. deep.

The Hull field production for the fourth week in October was about 3,800 bbl. daily. The major portion of production was made by the Gulf Production Co. and the Republican Production Co. The Empire Gas & Fuel Co. is doing deep drilling south of Dayton, where the No. 2 Jackson and No. 3 Welder wells are about 1,500 and 2,000 ft. deep, respectively.

Condition of the Petroleum Industry in Rumania.

Petroleum production in Rumania has reached about 80 per cent of its pre-war output, according to Lewis Van Norman, of the Bureau of Foreign and Domestic Commerce, who recently returned from an extended trip through that country. Some permanent damage was done to the petroleum deposits by the Germans, who, in their haste to secure maximum production, allowed the inundating of some of the deposits.

Dr. Van Norman found that during the term of German occupation, 1,500,000 metric tons of raw petroleum was taken from the Rumanian deposits by the Germans. During the period of occupation, the Germans did all in their power to provide for permanent German control of the Rumanian petroleum industry by a skillful organization of German enterprises, which already had more capital invested than did any other one of the foreign groups or the Rumanians themselves. After the armistice, however, the Rumanian government sequestered the

German plant and holdings, and it is now operating them as a state monopoly.

The extensive pipe lines, which were just being completed at the outbreak of the war, were not damaged seriously by the Germans, and soon can be placed in operation. The development of petroleum deposits in Persia, and the fact that petroleum must bear heavy taxation for many years to come, are certain to hamper the expansion of the oil industry in Rumania, Dr. Van Norman points out in his report.

Ownership of Petroleum Lands in Colombia

The supreme court of Colombia is likely to annul the recent decree of the president of that republic in which proprietorship of the subsoil, without exception, is assumed by the nation, according to a report received by the Department of Commerce. Publication of the decree has aroused a storm of protest from the land owners in all sections of the country, many of whom have contracts with American companies permitting petroleum exploration.

In a formal report to the department, the American Consul at Barranquilla reviews the legal question involved and shows why he believes it is scarcely possible for the Supreme Court to do other than annul it.

Much harm already has been done, both within and without the country, by the decree, the consul reports, as it has weakened confidence in the sanctity of property rights. The general sentiment in Colombia, he says, is that it is imperative for the Congress to legislate definitely on the question, so that confidence may be restored. He points out that though Colombia possesses much promise for the petroleum prospector, the successes thus far obtained are not sufficiently striking to attract capital if there is any question as to proprietorship of the subsoil.

Treatment Costs of Oil Shales

James Duce, oil inspector of Colorado, recently returned from St. Louis, Mo., where he was sent by Governor Shoup to report on the Wallace process for treating oil shales. Mr. Duce states that shale containing 1 bbl. of oil per ton of ore should be treated for \$1 a ton. The shale should not cost more than \$2.15 per ton, delivered to the retort. By this process 30 gal. of 56° Beaume oil was produced. Assuming a price of 15c. a gallon for this grade of oil, there is a profit of \$1.35 per ton, not including the byproducts obtained, such as lubricating oils and ammonium sulphate. He mentions that the technology of deriving lubricating and other byproducts from shale oil is as yet undeveloped, and that it is not justifiable to induce capital to invest in oil shales upon the assumption that these products are at present valuable. They have potential value, but the perfecting of their technology will be a slow process.

The Nipissing Mines Co., Ltd., of Cobalt, Ont., has an option on oil lands in Texas and has drilled to a depth of 1,500 ft., according to recent reports. It is planned to continue to a depth of 3,000 ft.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical
Industry Dealing With Pertinent
Subjects of Interest

The Domestic Production of Chrome Ore

The Washington correspondent of the Journal, in reporting Secretary Lane's conference on chromite, held last December, for the purpose of considering the chrome-ore situation, said that "All present recognized the objections that would be raised by Congress to a duty high enough to protect American producers of chrome ore." It was stated that such a duty would increase the cost of steel by 8 per cent over the pre-war price, and that this entire cost would be saddled upon the people of the United States, who, to avoid a possible loss of \$1,000,000 to the chrome producers of the country, would be called upon to pay \$17,000,000.

That this statement is inaccurate is apparent on a moment's thought. The total value of all the chrome ore used in the United States in any one year prior to the war was less than \$1,000,000. It is not the desire of the producer that the consumer should pay \$17,000,000, and if there is any likelihood of such being the case it might be a fit subject for Congressional investigation.

Because the distributor of chrome has been able to charge exorbitant prices for the mere reduction of the ferrochrome ore to the metallic state, it does not necessarily follow that a tariff will protect him in such a practice. A consideration of pre-war prices shows that the price paid for the chrome ore has little if any relationship to the prices charged for ferrochrome. It is likely that if Congress were to act, it would place such a duty upon the ore as would offset the increased cost of American production as compared to the cost of foreign ore. Such a policy would permit those manufacturers having a real preference for the foreign ore to continue to use it.

There seems to be an opinion that the chrome deposits of the United States could not supply our future market demands and that we should conserve our present supply by non-use and non-production. Although prior to the war such a contention might have been made without contradiction, our unprecedented development and production of chrome ore in the latter part of 1918 demonstrated to all who have taken the trouble to investigate the facts that, given a market for the ore which justifies the payment of a living wage to our American miners, they could and did meet the demands of our nation in the midst of war and at the same time piled up a reserve.

I do not mean to question the ability of our geologists to approximately estimate the tonnage of ore in any particular deposit when presented to them for

their examination; or their ability to compile data as to the possible future production of the United States of those minerals having a commercial value and for which we have for years past made diligent search, but I do not believe they should be called upon to report the maximum amount of chrome ore we can produce until they have themselves made a search for the mineral or until the prospectors and miners of our country have been given an opportunity to investigate and report their findings. Both before and after the war, high-grade chrome ore on the Pacific Coast sold for less than an equal weight of coal or coke. Our prospectors were trained not to investigate chrome deposits.

There is today four times as much undeveloped ore in sight in the United States as there was prior to our entry into the war, not to mention the supply of mined ore on hand not worth the price of transportation to market. The greater part of this ore was brought to light within six months after our Government announced a policy of restriction of imports and the introduction of legislation for mineral control. Neither of these were carried out as expected. While we were in the thick of our fight and the chrome miners hard at work developing chrome, and at the same time keeping the market supplied, foreign ore was brought into this country.

The other measure which appealed to the miners as an inducement to develop chrome was the "War-Minerals Bill." The Government, after the signing of the armistice, did not put this bill into effect and denied relief to the chrome miners on the grounds that under the requirements a shortage of the mineral to be protected must be declared to exist.

Protection should be given the American miner, that we may relieve the feeling he has today that our Government is being exploited in the interests of capitalists, and that he is powerless to obtain relief.

Prior to the war, the United States was entirely dependent upon the chrome deposits owned or controlled by England and France. In 1914 we imported 74,686 tons of crude ore and produced but 591 tons.

In 1915 at the time when we were endeavoring to maintain peaceful relations with Germany, and President Wilson was doing all in his power to urge neutrality in our thoughts and actions, England placed an embargo on chrome ore being supplied to the United States and forced us to guarantee not to ship or permit to be shipped any chrome ore, or chrome products to the then neutral powers. Although in this instance it was not difficult to square our acts with our conscience, are we to admit and permit other nations, when they get into wars among

themselves, to deny us the right to market our steel products because some of these products contain a small percentage of chromium? We should never permit ourselves to be placed in a predicament that will permit a European nation to say to whom we shall and shall not sell our products.

But far more vital than to whom we sell is the question of our own supply. That we might rightly consider the danger of depending upon a foreign supply of this material so essential for war purposes we should give thorough consideration to the location whence we are obtaining this supply.

All the largest deposits as well as the largest amount of chrome ore used by the world today comes from New Caledonia and the east coast of Africa. These countries, situated in the South Pacific Ocean, are, figuratively speaking, in the back yard of Japan. In the event of a war with this nation Japan would attempt to place an embargo upon this important war mineral leaving Rhodesia and New Caledonia for the United States; and unless we were strong enough to keep the Japanese fleet from these waters we would not be able to obtain the chrome ore necessary for munition purposes to successfully carry on the conflict.

The chrome producers desire that a tariff be placed upon the importation of chrome ore equal to the difference in the pre-war cost of producing and delivering foreign ore to our markets and the pre-war cost of producing and delivering domestic ore to the same market. A tariff of 50c. to 75c. a unit on the chromic oxide of a ton of chrome ore is equivalent to $3\frac{1}{2}$ c. and $5\frac{1}{2}$ c. per pound of chromium. The present quoted price of chromium as used by our steel interests in the form of ferrochrome varies from 30c. to 50c. per pound; consequently such a tariff should produce but a slight increase in the cost of chromium to the consumer, and, as the amount of chromium used for the production of chrome steel does not as a rule exceed 3 per cent, such a tariff as above suggested should temporarily increase the price of chrome steel by not more than 2 or 3 per cent.

The chrome producers ask for a tariff to protect an infant war and a peace industry. Have we a right to limit our efforts for the production and utilization of chromium? Today, the interests in control of the ferrochrome markets which supplies all our Government should come to the assistance of their metallurgists. If the market prices are a criterion of costs, there is abundant field for improvement in their metallurgical practice. Is there any reason why their costs should not be made public?

A domestic production of the raw ore would broaden the field of production and by the co-operation and competition of our American metallurgists not only lower the price of ferrochrome but lead to the development of hitherto unworkable deposits, and in the application of our increased knowledge, broaden the economic benefits derived from the ore.

W. P. Lass.

Berkeley, Cal., Sept. 9, 1919.

Minnesota State-Owned Mines

An article appears in the Journal of Sept. 6 which gives interesting information about Minnesota state-owned iron mines. Not the least of this is the table showing "state-owned mines now exhausted." These latter number eight, and they have made aggregate shipments amounting to 1,736,000 tons.

It may be assumed that these mines are not "exhausted" in the sense that all their now merchantable ore is gone, for some of them were operated during a period when less care was observed than now in the conservation of ore in the ground and when there was much waste. But the losses as a whole are not great, and one may estimate that these mines averaged a tonnage of less than 300,000 each. They were, therefore, very small mines, as iron ore mines go. Are the remaining thirty active mining properties of the state as small? By no means. Without particularizing, it may be stated that these thirty contain approximately 150,000,000 tons, or 5,000,000 tons each, of ore now merchantable. Some of them comprise two or three hundred thousand tons only, but such properties as Missabe Mountain, Hill Annex, or Scranton, each of which has more than twenty million tons in reserve, bring up the average.

Many of the state leases have run more than half their allotted fifty years, and must be mined at speed to exhaust the ore during the life of the lease. This is especially the case with Missabe Mountain. The law under which state mineral leases were granted has been rescinded so far as the taking out of leases is concerned, and when such law is once more operative it will be on a far different royalty than the 25c. a ton now paid for ore mined. Probably it will be under some sort of sliding scale, based on quality, or ease of mining, or both.

The article referred to says that the state "is the largest single fee owner of iron ore deposits in the United States." Great as are its holdings, I question this statement. On the Mesabi Range alone the Great Northern Iron Ore Properties holds in fee the following mines: Mahoning, mine and reserves; Utica, Stevenson, Harrison, Lamberton Annex, North and South Uno, Enterprise, Harold, Thorne, Wabigon, North Star; and a half interest in the fee of the following: Leetonia, East and West Stevenson, Sweeney, Ann, Patrick, North Harrison, Warren, Mace, Hill-Walker; and in addition there are several reserves not opened, some not yet leased to operators, and the entire tonnage of the above mines and of these reserves is doubtless somewhat more than that in the ownership of the state.

It is well known that the Tennessee Coal, Iron & Railway Co. owns in fee tonnages vastly greater than those of the State of Minnesota. My present recollection is that the holdings of the Woodward Iron Co. are at least as large as Minnesota's, though my memory may be at fault here; and the ores owned by Witherbee, Sherman & Co. rank above those of the state.

Dwight E. Woodbridge, E. M.
Duluth, Minn., Sept. 27, 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War-Minerals Relief

Slightly more than \$8,000,000 of the War-Minerals Relief Appropriation was unexpended on Oct. 31. Awards had been made to the extent of \$343,195.67, representing 26 per cent of the amounts claimed. Expenses of the commission to that date aggregate \$129,521.17.

The Chestatee award has been revised and increased by \$3,000, bringing the total to \$223,529.17, or 24 per cent of the amount asked. Other awards to date, with the class of claim and the percentage of the amount asked, are as follows: National Pyrites Chemical Co. (pyrites), \$33,067.49, or 18 per cent of claim; C. T. Pinson (chrome), \$212, or 12½ per cent of claim; Maryland Chrome Co. (chrome), \$37,585.36, or 68 per cent of claim; Tynor, Pittard & Sloane (manganese), \$186.40, or 9 per cent of claim; Oscar Reinhold (manganese), \$1,456.25, or 58 per cent of claim; White Horse Mine (manganese), \$468.97, which is 2 per cent of claim; Butte & Plutus Co. (manganese), \$3,952.39, or 18 per cent of claim; Herbert W. Smith (manganese), \$16,908.78, or 81 per cent of claim; Schafer, Atherton & Co. (chrome), \$407.11, or 58 per cent of claim; L. B. Payne & Co. (chrome), \$7,862.24, or 35 per cent of claim; Arata & Palmer (chrome), \$302.20, or 11 per cent of claim; Playter Bros. (manganese), \$1,046.43, or 17 per cent of claim.

Legislation to Liberalize Act

In view of an opinion rendered by the Secretary of the Interior in connection with proposed legislation to liberalize the War-Minerals Relief Act, the Committee on Mines and Mining of the House of Representatives probably will take no immediate action on the bill. In a letter to the House committee, Secretary Lane expressed himself as follows:

"It occurs to me that the most satisfactory way to treat this matter would be to wait until the work of the commission has progressed to a point where we can have definite information as to the claims which were rejected and the amounts to be paid under the existing law. If the matter were to be thrown wide open, and all claims considered, including requests for losses incurred through published reports, the appropriation of \$8,500,000 would not cover the award, so that all must necessarily be scaled. On the other hand, if the commission be permitted to complete its work under the present law, it appears that a substantial amount will remain unused. By that time we shall have a knowledge of the situation which will enable Congress, perhaps, to establish a more liberal rule of award than that now existing, under which many of the claims now ruled out can receive attention. Up to

this time, the War-Minerals Relief Commission has held hearings in 461 cases and has passed upon 347 claims out of 1,206 filed. If all the claims in which no direct request was made must be examined as to facts and questions involved, it will prolong the work of the commission very much and consequently delay the determination in those cases where a direct request was made."

The Position of Chief Engineer

The War-Minerals Relief Commission still is without a chief engineer. The position has been offered to several well-known mining engineers, but each has been forced by other considerations to decline the offer. W. R. Crane, of the staff of the Bureau of Mines, is filling the place temporarily, but it is the desire of the Bureau to place the engineering responsibility in the hands of an engineer who is not already in the Government service.

General Mineral-Leasing Bill

By vote of 169 to 39 the House of Representatives on Oct. 30 passed the General Mineral-Leasing Bill after four days of debate. The measure already had been passed by the Senate. The measure has been passed by the House four times, and twice by the Senate. Leasing legislation has been under active consideration in Congress for seven years. At the last session of Congress, when the measure was passed by both houses, six months was consumed before the conferees could reach an agreement. It was then near the close of the session, and the conference report was defeated in the Senate by Senator La Follette's filibustering tactics.

The measure is of the utmost importance, as it affects in a general way 700,000,000 acres of public land, and involves directly 6,500,000 acres of possible oil land, 70,000,000 acres of coal land, 2,700,000 acres of phosphate land, and 3,500,000 acres of oil-shale land.

An important feature of the bill is the unlocking of the resources of lands that have been withdrawn in California and Wyoming. In California, 40,000 acres of oil land were withdrawn, and in Wyoming about 10,000 acres of land were withdrawn after a considerable number of claims had been taken up. This resulted in extensive litigation, and as a result \$25,000,000 has been impounded from the returns for the oil produced from these lands. The leasing bill will enable the Secretary of the Interior to settle these litigations and permit increased production of oil.

The bill was taken up under a special rule. The House committee had struck out all of the bill passed by the Senate and inserted a substitute.

Though many of the sections were unchanged, the action of the committee had the effect of simplifying the controversy over sections 40 and 41 of the Senate bill. Section 40 of the Senate bill, it was feared, would undo the dissolution proceedings against the Standard Oil Co. of New Jersey, and would have the effect of reassembling the dissolved units into single control. Section 41 provides that corporations engaged in producing or refining petroleum shall maintain the same price for their products where the stockholders of any such corporations own or control 25 per cent or more of the stock of any other such corporation. The opinion of the House committee was that the section is capable of great abuse and is loosely drawn. The two sections, it may be added, were attached to the bill in the Senate as a rider and were not considered by the Committee on Public Lands.

The bill as reported to the House provided that 10 per cent of the fund accruing from the leases is to be turned in to the Treasury of the United States to offset the expense of administering the act. The remaining 90 per cent is divided equally between the Reclamation Fund and the state in which the lands are leased. The 45 per cent for the states was intended to compensate them for their losses in tax values. This provision of the bill was changed on the floor of the House, however, so that 70 per cent of any moneys that may be paid on account of past production goes to the Reclamation Fund, 10 per cent to the Government, and 20 per cent to the state. Returns from future production are divided so that 60 per cent goes to the Reclamation Fund, 30 per cent to the state and 10 per cent to the Government. It is probable that these percentages will be changed in the conference. Many of the details of the changes made in the House are not presented in this article, owing to the certainty that additional changes will be made by the conferees.

The House left in the bill the provision of its committee that all helium gas is to be reserved for the Government. Representative Mondell dissented from this, saying, "We have become so hysterical about such matters that we are going to the extreme of over-protection. A certain amount of helium gas is necessary and important, but it is perfectly absurd to reserve the helium gas in all of the lands which would be affected by this bill."

Representative Sinnott, the chairman of the committee, pointed out, however, that experts had advised him it will be easy to separate helium from natural gas without in any way jeopardizing oil operations. The extraction of that gas is beneficial, it is claimed, as it results in a more inflammable natural gas.

Opening of Indian Lands

Location of mining claims on certain Indian reservations, and the leasing of those which may be found to contain deposits of metalliferous minerals, as provided in the last Indian appropriation act, was permissible after 12 o'clock noon on Nov. 1. The Secretary of the Interior has promulgated regula-

tions to govern the prospecting and leasing. The Indian lands which will be subject to exploration under this act are included in the following reservations:

Arizona—Moqui Indian Reservation, Salt River Reservation, San Carlos Reservation, Walapai Reservation, Colorado River Reservation, Fort Apache Reservation, Western Navajo Reservation.

Arizona and New Mexico—San Juan Reservation, Navajo Reservation.

California—Hoopa Valley Reservation, Tule River Reservation, Fort Yuma Reservation, Morongo Reservation, Idaho Reservation, Fort Hall Reservation, Nez Perce Reservation.

Montana—Rocky Boy Reservation, Tongue River Reservation.

Nevada—Pyramid Lake Reservation, Western Shoshone Reservation.

New Mexico—Mescalero Reservation, Pueblo Bonita Reservation.

Oregon—Warm Springs Reservation.

Washington—Yakima Reservation, Neah Bay Reservation.

In laying out the original Indian reservations, not much was left to the Indians in the way of mineral resources. Since that time various sections have been detached from the reservations in order that such promising mineral supplies as existed could be exploited. As a result, the mineral wealth of the reservations included under the present act is not great. All of the reservations named have been covered by geologists of the U. S. Geological Survey.

Some gold occurs in the Moqui Reservation, but, perhaps, not in economic quantities. The San Carlos Reservation is in a copper region, but it is doubted if important deposits exist on the reservation itself. Some occurrence of asbestos is reported on the Fort Apache Reservation. Gold-bearing veins of no particular promise are reported on the Fort Hall Reservation. The Pyramid Lake Reservation offers some inducement to prospectors for copper.

The law providing for the leasing of these mines does not apply to oil, coal, potash, or phosphates. Coal deposits occur on a number of reservations, and though they are not leasable, they would be available as sources of fuel for mining operations.

Copper-Mining Bill

Representative Carl Hayden, of Arizona, has introduced a bill (H. R. 10433) to provide for the disposal of public lands in Arizona, New Mexico, and Utah containing copper at depth. The legislation proposed by the Hayden bill is designed to meet and deal with a condition to which the existing Federal mining laws are not, from the practical standpoint, applicable.

Many of the important copper deposits in the states mentioned do not occur as regular veins or lodes, but in extensive low-grade bodies, often underlying a heavy overburden of wash, conglomerate, or other non-mineral-bearing formation. To discover such underlying deposits deep and expensive drilling or shaft sinking is necessary, requiring months, and even years, for its accomplishment. Under existing law a discovery in such a drill hole or shaft could serve to validate, and vest possessory title to, only one claim, 1,500 by 1,600 ft., or an area of only about twenty acres, which is absurdly insufficient to justify the great outlay involved.

In the past the mining communities have attempted to meet the conditions by locating claims and doing annual assessment work in the overburden. Such claims, in most instances unsupported by any semblance of discovery, have been recognized by the communities as property, and bought and sold as such.

In many instances meager surface showings, not connected with the underlying deposits, have been claimed as discoveries and even made the basis of patent proceedings. In the early days the Land Department did not critically examine into the matter of discovery unless the question was raised by protest or contest, and large numbers of such claims were patented. This was the case at Bisbee, Ariz., where the ore formation occurs at a depth of 1,000 ft. or more. In later years the department has established the practice of requiring a detailed showing as to the character and quality of discovery claimed, and has made, through the field service, an investigation on the ground. As a result, the department has been confronted with the question as to whether inconsequential mineral showings in the overburden could be accepted as sufficient to constitute discovery, as in the case of the Rough Rider and other claims which were finally patented because it was felt that the previous patenting of similar claims had established a rule of property.

But, generally speaking, lands of the character contemplated by the proposed legislation cannot now be patented under the existing mining laws unless discoveries are made by deep drilling or shaft sinking. On the other hand, large areas of such land were in the early days patented under the non-mineral laws, under the rule which then prevailed that land could not be classified as mineral in character, or patented as a mining claim, unless mineral had been actually disclosed. In recent years, however, the department has adopted the rule that, through geological deduction as to underlying deposits, land may be classified as known mineral in character, and now declines to patent such lands under the non-mineral laws.

There are thus large areas of land in the four states mentioned which the Land Department recognizes, or would recognize, as being mineral in character, but which remain undeveloped because title thereto cannot, as a practical proposition, be acquired under the present mining law.

To justify the great expense of exploration by drilling or sinking shafts to a great depth, as well as the great outlay in working shafts, machinery, and equipment for actual mining operations, it is necessary that a reasonably large acreage be acquired or controlled.

The proposed legislation is designed to encourage the exploration and development of such lands by giving to any one who will undertake deep exploration work the right to control and acquire an area of not to exceed 1,280 acres (which is about the minimum area now held by any of the large porphyry copper mining companies), upon conditions carefully designed to prevent abuse of the privilege.

Mining Costs and the Federal Trade Commission*

The Wages of Capital Should Be Included in Costs of Production as Well as the Amount Paid to Labor

A TRUE diagnosis of the financial condition of our industry involves bookkeeping that states the real economic symptoms. In mining, as in all other productive business, production costs should express all the facts, but I am convinced that we have not yet reached that stage in our accounting methods. The annual reports of our largest mining corporations and the studies by the Federal Trade Commission alike fail to tell the whole story in their statement of production costs, which are made to include the wages of labor but not the wages of capital employed. The Federal Trade Commission, in its definition of cost, specifically excludes interest on investment, but can we do that in the world of realities? Does not the cost of a pound of copper just as truly include its share of the interest due on the bonds and the dividend due on the capital stock actually paid in—that is, wages paid to capital—as it includes the wages paid to the mine worker or the man in the smelter? Of course, neither payroll should be padded. Do not regard the definition of profit as simply an academic question for college professors to discuss: It is more a matter of fundamental concern to the men who are trying to build up the industry.

In the first place, such terms as "net earnings," "profit," "net income," "surplus," or "balance to surplus account," which appear on your financial sheets, are too optimistic in tone when the operating costs do not include any charge on account of the investment. The inference is too easily drawn that this surplus is available for profit-sharing between labor and capital. For example, the Federal Trade Commission report on copper is quoted in newspaper headlines as showing "28 per cent profit in copper," yet in this report the wage to labor is set forth as the first and largest item among the elements of cost, this item alone averaging 5 1-3c. a pound in 1918, but cost of capital is not included. The report, however, shows that the eighty-five copper companies discussed would require an average of 3c. a pound to pay 10 per cent on their actual investment, yet this 3c. does not appear in the 16c. of average cost, but instead it forms a part of the 8c. of so-called "net profit," which the unwary may regard as the actual difference between price and cost.

In the second place, I fear lest accounting which does not count all the costs may lead us to fail to appreciate the results of American engineering. Our mining engineers, backed up by red-blooded capitalists, are constantly lowering labor costs by increasing the investment in improved mine equipment. This means replacing the hardest part of labor with machinery—working dollars instead of men—so that your cost-keeping conceals the true state of things.

*Extract from an address to be delivered by Dr. George Otis Smith, Director U. S. G. S., before the American Mining Congress, Nov. 18, 1919.

Rapid Determination of Silver in Cyanide Solutions

BY J. E. CLENNELL

The following method, which I devised for the rapid determination of silver in cyanide solutions, has been checked both against the fire assay (usual method of precipitation with zinc dust, lead acetate, and hydrochloric acid, with cupellation of the resulting lead sponge), and against Clevenger's method (filtration under vacuum through a bed of zinc dust, the solution being delivered slowly from a dispensing burette, finally dissolving the precipitate in nitric acid and titrating with thiocyanate). The results obtained were, in general, higher than those given by the fire assay, and identical with those of Clevenger's method.

Reagents required:

1. Lead acetate (saturated solution).
2. Zinc dust as commonly used in cyanide plants.
3. Sulphuric acid, 50 per cent by volume.
4. Nitric acid, 50 per cent by volume.
5. Indicator for the final titration, being a concentrated solution of ferric nitrate, ferric sulphate or ferric alum.

Standard solutions required:

1. Silver nitrate. This may be the regular solution used in titrating cyanide at the plant, or may be adjusted so that 1 c.c. equals a round number of ounces of silver per ton (or other desired unit) in the measured volume of solution used for the test. In the tests in which the method was checked, the solution contained 3.2617 gm. AgNO_3 per liter, so that 1 c.c. = 2.07 gm. Ag.

2. Potassium thiocyanate (sulphocyanide). This cannot be prepared by weighing an exact quantity of thiocyanate, but is easily adjusted to the required strength by blank titrations with the standard silver nitrate and diluted as required. In the experiments a solution was made, containing about 2.5 gm. KCNS per liter, and diluted to correspond with the standard silver nitrate.

Method (for poor solutions): Take 500 c.c. of the solution to be tested (if desired, 20 a.t. or 583 1/3 c.c. may be taken). Add 10 c.c. saturated lead acetate, 5 gm. zinc dust, and 25 c.c. sulphuric acid. Boil, settle, decant, and wash three times by decantation with hot water, without filtering. Dissolve the residue in 25 to 50 c.c. of nitric acid. Heat to boiling to expel red fumes. Cool. Dilute with about 100 c.c. of water. Titrate with standard thiocyanate and ferric indicator.

Remarks: For richer solutions 10 a.t. (291 2/3 c.c.), or even less, will suffice, the other reagents being reduced in proportion. The exact end point may sometimes be ascertained rather more accurately than by direct titration, if a slight excess of the KCNS be added and the excess cautiously removed by back titration with standard AgNO_3 till the trace of red color is no longer observed after agitation and

settling. Where the precipitate is bulky it is an advantage to allow it to settle and decant the bulk of the supernatant liquid into another vessel before making the black titration.

Advantages: This method has the advantage of not requiring any filtration whatever. On the other hand, a rather large volume of solution must be heated, whereas Clevenger's method avoids the necessity of artificial heat, at least in the preliminary or precipitating stage. Notwithstanding this, the new method proved the more rapid. In general, the sponge settles so rapidly that the process of washing by decantation occupies only a few minutes. Sulphuric acid is used instead of hydrochloric, to avoid the possible introduction of chlorides in the final solution, which would interfere with the thiocyanate titration.

Specifications for Reagents

Those who have experienced difficulties in operation attributable to impure chemical reagents are invited to write to W. D. Collins, Bureau of Chemistry, Washington, D. C., stating their experience, giving the use to which the reagents have been put, and suggesting, if possible, methods which would be satisfactory in determining the presence and amount of objectionable impurities. The American Chemical Society recently appointed a committee, of which Mr. Collins is secretary, to collect data regarding the quality of the reagents now on the market, and to draw up specifications. Insufficient knowledge on the part of the producer, both as to requirements and acceptable methods of testing, has been one source of the dissatisfaction heretofore experienced.

Indian Gold Production

The output of the Indian gold mines in September, 1919, amounted to 36,813 oz., the lowest monthly yield since May, 1902. The accompanying table, republished from "Financial Times," shows the monthly output in fine ounces since the beginning of 1915:

	1915	1916	1917	1918	1919
January	47,354	45,214	44,718	41,420	38,184
February	46,117	43,121	42,566	40,787	36,834
March	45,736	43,702	44,617	41,719	38,317
April	46,033	44,797	43,726	41,504	38,243
May	46,835	45,055	42,911	40,889	38,608
June	46,307	44,842	42,924	41,264	38,359
July	46,189	45,146	42,273	40,229	38,549
August	46,586	45,361	42,591	40,496	37,850
September	45,076	45,255	43,207	40,038	36,813
October	45,943	45,061	43,941	39,472	—
November	45,346	45,247	42,915	36,984	—
December	45,020	48,276	44,883	40,149	—
Totals	556,596	541,077	520,362	485,236	341,762

In September, 1919, the Mysore company made the largest production (12,502 fine oz.), followed by Goregum (7,373), Champion Reef (6,848) and Nundydroog (6,263 fine oz.).

New South Wales Gold Yield for September, 1919, was 3,000 oz., valued at £13,000, as compared with 8,000 oz. valued at £32,000, in September last year, according to a report in Financial Times. The production for the nine months of this year amounts to 40,000 oz., valued at £170,000, as compared with 63,000 oz., valued at £268,000, for the corresponding period last year.

BY THE WAY

Hands Across the Sea

A shortage of British technical experts, or some equally valid reason, has induced the S. Pearson Oil Co. to send five American geologists to Trinidad to explore and prospect some 200,000 acres of oil lands, according to the May issue of *Petroleum*. Development work is to cost about \$250,000 a year and it may be presumed that the money will be judiciously expended.

New Fuel for Stubborn Fires

A Red Cross man, in Rumania, discovered a new kind of fuel recently, when his wits were put to the test of making low-grade lignite burn under his soup kitchens.

Wood and coal have been very scarce in Rumania since the German and Austro-Hungarian invasion and the traveling soup kitchen men, "goulash cannon operators," are sometimes hard put to it, to keep the pot a-boiling. John H. Nolan of Alpena, Michigan, Red Cross worker near Buzeu, found some of the rivers thickly encrusted with oil scum. One day a brilliant idea came to him.

Mr. Nolan and some of his assistants skimmed the oil off twenty or thirty square yards of the surface of a stagnant pool near their food station and then dropped the lignite briquettes into the oil. After the briquettes had soaked for two hours they were taken out and set afire. The lignite burned with a cheerful roar and now all other goulash experts working for the Red Cross are following the same method.

Civil But No Engineer

The following is excerpted from a bona-fide report on a lead property recently submitted in all seriousness to the American Metal Co. by a "civil and mining engineer":

The vein is a well-developed rift, subtending between genuine wall rocks, in a northerly and southerly course, in strict conformity with the direction of the primitive formation of the country, which is always necessary to constitute a true and genuine vein. There is a gallery or tunnel following longitudinally and horizontally for 700 ft. upon this vein . . . and there is no reason why the tunnel may not be continued northerly upon the vein to the company's north line about 5,000 ft. These facts are supported by prospect shafts, showing up the well-defined primitive formation of the country, as well as an extraordinary large vein having an average width of nearly or quite 40 in. Twenty-four in. in width in our western mines constitute a fine-sized lode vein, while 1,500 ft. is the limit of its length by law in Colorado, and other states and territories.

The main shaft in this mine passes down through the tunnel mentioned and subtends to a depth of 225 ft. below said tunnel. At this point the gangue material of the vein appears to change, as should be expected at such a depth. Flint with a small fissure of talc appears. These with other blue-stained materials, give tolerably good indications of the vein running in silver. This flint is little else than silica, tempered with alumin and altogether gives the materials a slight appear-

ance of silver ore. Yet the whole may prove to be simply silicified flint, or dike, interjected at this point in the vein. . . .

It is accepted as true that metallic veins grow stronger as we go deeper. Then it follows that this 220-ft. level must have a heavier percentage of lead than the 83 ft. above it, which with numerous side fissures must average at least 24 in. in width of vein matter in sight. Growing schists caused many of those small side fissures which join the main vein further below. Calculated upon all the above facts which have been reasonably proved, this vein practically in sight must contain about 513,333 tons of ore.

After this ore has been taken out the mine will be increased in value beyond reasonable calculations that can be made at this stage of the work. No one has ever found the bottom of genuine lode vein. Generations will have passed away before it is exhausted. Gold lode veins are now being worked for profit that have only 15 to 20 in. width and not one of them will be abandoned so long as it produces \$12 to \$15 per ton, certainly not if it produces \$20.

Cinderella Manitoba

"Manitoba is the Cinderella of the Canadian sisterhood, so far as the Geological Survey is concerned," writes "C. A. B." in the "Manitoba Free Press." "The survey seems to have a fixed idea that British Columbia is the land of promise, and to that favored province go geologists in gangs, while we get but a stray one. Of course, B. C. is attractive; the climate is in most parts delightful, the scenery grand in the extreme; possibly science there finds its surroundings more conducive to the correct attitude of mind for the unraveling of complicated stratigraphical problems. No doubt, no doubt. Yet poor old Manitoba is trying to tell the world that as regards mineral wealth she can do her bit, and more than her bit, if given a chance, and we should be so thankful if the powers that be would send us a nice flock of experts next season. Please do!

"In Ontario the dominion and provincial authorities seem to take delight in duplicating one another's work. P. C. Hopkins examines Larder Lake for the Ontario Bureau of Mines; soon after, Dr. H. C. Cooke hastens there to read its riddles for the dominion survey. A. G. Barrows reports on the Matachewan area, for Toronto, and forthwith Ottawa sends Dr. Cooke to investigate what is in the same map sheet. To those that have much shall be given.

"As for B. C. she is the petted darling of the G. S., if not its first love, certainly its latest. Eight parties have been assigned to the province during the summer, and a ninth took over the Mayo country, Y. T. J. J. O'Neill has been in charge of the party studying Salmon Arm, Portland Canal; B. R. McKay has investigated the placers of Cariboo; L. Reinecke passed weeks estimating the value of the soda lake between Clinton and Quesnel; the Slocan attracted M. F. Bancroft; the wild west coast of Vancouver Island yielded a wealth of information to V. Dolmage; S. J. Schofield seems to have discovered a new mining property which the Review calls "Brittania," S. C. McCann accumulated material for a map of the Bridge River country; and, lastly, Charles Camsell, the O. C. of the brigade, paid particular attention to the Coquilla section."

PERSONALS

F. W. Bradley has returned to San Francisco from Alaska and Idaho.

John W. Mercer returned from Europe during the latter part of September.

C. A. Burdick was in Ashland, Clay County, Ala., during September and October on professional business.

Alan M. Bateman, professor of economic geology in Yale University, has returned from a professional trip to Alaska.

Frank Williams, president, and W. A. Chesterton, director, of the Victoria Gold Mining Co., have returned to Boston after visiting the mine in Michigan.

S. S. Sorensen, general manager of the Braden Copper Co. at Sewell, Chile, who was in New York the latter part of October, sailed for Chile on Nov. 3.

S. Skowronski was in charge of the Anaconda Copper Mining Co.'s exhibit at the Fifth National Exposition of Chemical Industries held in Chicago during September.

Colonel U. G. Lyons, of the Cowango Refining Co., Warren, Pa., was elected president of the National Petroleum Association at the annual convention held at Atlantic City, N. J.

Carl O. Lindberg, mining engineer, with offices in New York and Los Angeles, representing an English company, recently visited the Coeur d'Alene district, seeking zinc property.

Donald H. Fairchild, mining and metallurgical engineer, returned to Denver from a professional trip to San Francisco and to the Kingman, Ariz., district, where he examined properties.

Ernest N. Patty, mining engineer for the Washington State Geologic Survey, has completed a geologic reconnaissance along the route of the proposed Methow-Okanogan tunnel, Okanogan County, Wash.

F. L. Estep, of the firm of Perin & Marshall, consulting engineers, New York, sailed on Oct. 2 for England, on the "Mauretania." S. M. Marshall, of this firm, intended to leave England for India about Nov. 1.

Fred Searls, Jr., of San Francisco, is in Wallace, Idaho. Mr. Searls' services have been secured by the Hecla Mining company in connection with the impending apex litigation with the Marsh Mines Consolidated.

J. Gordon Hardy, formerly consulting engineer of the American Smelting and Refining Co., has resigned his position to return to Mexico, where he

was engaged in private work prior to the revolutionary troubles.

A. E. Ring, who had charge of the operations of the American Smelting and Refining Co. at Creede, Col., has been transferred to Leadville, where he is at present on the staff of the Yak, a subsidiary of the company.

Hugh A. Stewart, general manager of the Chiksan Mines, Chiksan, Korea, has returned to the United States because operations have been suspended at the property. Mr. Stewart will spend the winter in Denver.

Joseph Daniels has returned to the faculty of the University of Washington College of Mines as associate professor of mining and metallurgy. For the last year Mr. Daniels has been connected with the Sydney Junkins Engineering Co., Vancouver, B. C.



Harris & Ewing
A. G. WHITE

A. G. White, who has served for a number of years as the economist for the Bureau of Mines, has resigned to accept a professorship with the University of Pennsylvania. He will serve as an instructor in economics as applied to business.

Joseph P. Connolly, of Villa Beach, Cleveland, has been appointed professor of mineralogy in the South Dakota School of Mines. Professor Connolly has been lecturing on economic geology at the University of Missouri since his discharge from the Army in January.

Leon J. Pepperberg, Frank W. Reeves, and Carlton Meredith, geologists and engineers, announce the removal of their offices from Mineral Wells, Tex., to Great Southern Life Building, Dallas, Tex., and Mrs. Dan Waggoner Building, Fort Worth, Tex.

M. H. Merriss resigned from his position with the Raritan Copper

Works in September and is now with the Nicols Copper Co. E. J. David succeeds Mr. Merriss as head of electrolytic department, and M. H. Mosher has been placed in charge of the silver refinery.

J. Leonard Replogle, former Steel Director of the War Industries Board, was decorated with the Belgian Order of the Crown at the order of King Albert in recognition of his work during the war. The decoration was delivered by a Belgian Vice-Consul for Baron de Cartier, the Belgian Ambassador.

J. B. Tyrrell, of Toronto, Canada, arrived in Winnipeg on Oct. 30 from a professional trip in Manitoba, after being delayed for a week by the freezing over of several streams and lakes. The Aero Club of Winnipeg sent out an airplane piloted by Captain Thompson and carrying J. D. Perrin, an official of the Gold Pan Mines, Ltd., to bring Mr. Tyrrell back, but he arrived in Winnipeg on the same day the plane departed.

C. K. Brown, of Kingwood, West Virginia, and J. A. Graft have been named instructors in the mining extension bureau of West Virginia University. Mr. Brown will have headquarters at Wellsburg, Brook County, and Mr. Graft at Beckley, Raleigh County. A. C. Callen, head of the department of mining, superintended the opening of the extension office at Beckley, and R. Z. Virgin, assistant director, left for Wellsburg to superintend the opening at that place.

SOCIETIES

Inter-Professional Conference will be held in Detroit, Nov. 28 and 29. Representatives of the engineering, legal, educational and medical professions will be present. The organizing committee consists of Calvin W. Rice, secretary, American Society of Mechanical Engineers; Arthur D. Little, chemist, Cambridge, Mass.; E. J. Mehren, "Engineering News Record," New York, and Henry W. Hodge, bridge engineer, New York. The office of the committee is at 56 West Forty-fifth St., New York. The meeting will be held in Detroit at the Hotel Statler.

American Society of Mechanical Engineers will hold a joint meeting with the American Society of Heating and Ventilating Engineers on Dec. 11, at which the following paper will be presented: "Oil as a Fuel," by Henry Thomas, combustion engineer, Sun Co.,

and E. H. Peabody, vice-president, Babcock & Wilcox Co., and on Jan. 8 a paper, "Air Cleaning by the Cottrell Electrical Precipitation Process," by P. E. Landolt, Research Corporation, New York, will be presented.

National Research Council, division of industrial research, is arranging for the formation of a co-operative association to plan and support fundamental researches in alloys. It is believed that a co-ordinated effort under the general guidance of the council of specialists representing both the manufacturers and users of alloys can produce results of great importance. The success of the National Cannery Association and the Malleable Iron Manufacturers are examples in other industries. It is planned to create a special scientific staff composed of a director and assistant director of research and a group of scientific investigators and technical experts who shall give their whole time to the work. To finance the organization each member of the co-operative association will pay \$1,000 a year, and all contributing members, who may be either manufacturing or using individuals, firms or companies are to benefit alike by the results of the researches.

OBITUARY

W. D. Weaver, one of the charter members of the American Electrochemical Society, died at his home in Charlottesville, Va., on Nov. 2, 1919, aged 62. Mr. Weaver was among those who started "Electrochemical Industry" in 1902, being one of the five original stockholders. He was editor of the "Electrical World" for fifteen years, and exercised considerable influence upon the development of electrochemistry by the prominent place he gave to it in that journal.

INDUSTRIAL NEWS

Albert P. Hill Co., Inc., announces the removal of its offices from the Peoples Bank Building.

Federal Motor Co., Detroit, Mich., recently published an issue of "Traffic News" containing information relative to motor vehicles and costs of operation.

The Chicago Pneumatic Tool Co. has removed its Birmingham office from 801 Brown Marx Building to 1925 Fifth

Ave., North, where a service station with a stock of pneumatic tools, electric tools, air compressors, oil engines, rock drills, and repair parts will be maintained.

Horace G. Cooke announces the organization of Horace G. Cooke, Incorporated, to design and market for the National Marine Engine Works, Inc., a complete line of rotary compressors, gas exhausters, and pumps. Mr. Cooke also announces his withdrawal from the Connersville Blower Co., after twenty years as Eastern representative.

The Electric Furnace Co., Alliance, Ohio, has recently issued three pamphlets. The first, 7 B, describes the company's standard 105-kw. brass melting furnace; the second, 17 B, gives details of a special furnace for rolling mills, designed to allow pouring the metal directly into the molds; and the third, 13 B, is a discussion of various electric non-ferrous metal furnaces, which was delivered at the Boston meeting of the American Institute of Chemical Engineers.

TRADE CATALOGS

Davis Bournoville Co., Jersey City, N. J., has issued a circular describing a decarbonizing outfit for burning out carbon deposits in gas engine cylinders.

Magnetic Pulleys and Separators. Magnetic Manufacturing Co., Milwaukee, Wis. Bulletin P.; 6 x 10; 10 pp., illus. Describes high-duty ventilated magnetic pulleys for use in crushing plants and foundries.

Boiler Room Records. Yarnall Waring Co., Philadelphia, Pa. Catalog; 6 x 9, 22 pp., illus. Describes the Yarrow Lea meter for measuring feed water, which is a continuous self-recording instrument showing fluctuation in steam output as it occurs.

Modern Rock Crushing Plants. Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Bulletin 1141; 8 x 10½, 44 pp., illus. Describes the machinery and appliances used in the equipment of a rock-crushing plant, including rock and ore breakers, screens, and elevators.

Drop Forgings. Page Storms Drop Forge Co., Chicopee, Mass. Catalog, 17th Edition; 5 x 8; 80 pp.; illus. Describes numerous types of wrenches and various processes and machines used in the manufacture of the material. Tables of prices and dimensions are also included. Crank handles, thumbscrews, bolts and similar special drop forgings are also described.

NEW PATENTS

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

Alkali Metals—Process of Producing Alkali Metals From Their Chlorides. Horace Freeman, assignor to American Cyanamid Co. (1,319,148; Oct. 21, 1919.)

Aluminum Alloys—Method for Manufacturing. Arrigo Tedesco. (1,318,702; Oct. 14, 1919.)

Blast Furnaces—Apparatus for Charging Blast Furnaces. Tokuji Kawai. (1,319,005; Oct. 14, 1919.)

Cable Attachment. Charles J. Kienzle, assignor to Jeffrey Manufacturing Co. (1,315,969; Sept. 16, 1919.)

Concentrator Table. Albert E. Fish. (1,319,383; Oct. 21, 1919.)

Copper—Process of Extracting Copper from Ore. Robert Seaver Edwards. (1,319,858; Oct. 28, 1919.)

Crushers and Pulverizers—Feeder For. Paul S. Knittel, assignor to American Pulverizer Co. (1,318,389; Oct. 14, 1919.)

Drill—Power Drill. John M. Robertson. (1,315,422; Sept. 9, 1919.)

Drill—Rock Drill. William A. Smith, assignor to the Denver Rock Drill Manufacturing Co. (1,318,617; Oct. 14, 1919.)

Drill Bit—Mining-Drill Bit and Coupling. David J. Williams. (1,318,940; Oct. 14, 1919.)

Drilling—Rock-Drilling Apparatus. Sten Rudberg. (1,319,968; Oct. 28, 1919.)

Drilling Apparatus. William A. Smith, assignor to The Denver Rock Drill Manufacturing Co. (1,318,618; Oct. 14, 1919; 1,319,975; Oct. 28, 1919.)

Electric Furnace. Carlo Masera. (1,320,884; Nov. 4, 1919.)

Ferrosilicon—Process of Making Ferrosilicon and By-Products. Joseph E. Johnson Jr., deceased. (1,318,763; Oct. 14, 1919.)

Fuel—Distributor for Comminuted or Pulverulent Fuel. Daniel Goff. (1,318,375; Oct. 14, 1919.)

Fuel—Feeding Apparatus for Pulverized Coal. Charles Willis Kinter. (1,319,348; Oct. 21, 1919.)

Fuel—Feeding Device for Pulverulent Fuel. Karl Hjalmar Vilhelm von Porat. (1,319,193; Oct. 21, 1919.)

Fuel—Plant for Feeding Pulverized Coal to Furnaces. Joseph E. Kennedy. (1,320,367; Oct. 28, 1919.)

Furnaces—Shield or Auxiliary Wall for Furnaces. John O. Griggs. (1,320,386; Nov. 4, 1919.)

Iron Alloys—Process for Producing Iron Alloys. J. E. Johnson, Jr., deceased. (1,318,764; Oct. 14, 1919.)

THE MINING NEWS

New York, November 8, 1919

Utah Consolidated-Utah Apex Suit Opened

The apex suit brought by the Utah Consolidated Mining Co. against the Utah Apex Mining Co., both with properties at Bingham Canyon, Utah, opened in Salt Lake City, on Nov. 3, in the U. S. District Court, before Judge Tillman D. Johnson. Prominent geologists and engineers have been retained by both sides. Among these are Waldemar Lindgren, H. V. Winchell, James Furman Kemp, and Albert Burch. Both sides have been preparing the case for a number of months. A large amount of unproductive underground work has been done by both parties to the issue, to demonstrate the various points to be debated. Judge Curtis H. Lindley, of San Francisco, author of "Lindley on Mines," is asso-

ciated with former judge John A. Marshall and William E. Colby, of San Francisco, for the defense.

by the Railroad Administration. It is now expected that this essential work will be completed in the near future, when operation will begin.

The company expects to draw ore from Johnson, Patagonia, Helvetia, and other districts. It has an old slag dump of good fluxing material which it considers a valuable asset. The plant is shown in the accompanying photograph. The stack in the background was raised into its present position in a rather interesting manner, an account of which is given in the "Journal" of July 19 last, under the title of "Solving a Stack-Raising Problem."

International Ore Co. Reorganized in Liege, Belgium

The reorganization of the International Ore Co. was effected in Liege,

workmen, specialists in making zinc, arrived at Saltillo, Chi., in September, and operations have been fully resumed at the new smeltery. This will soon begin the work of producing zinc ingots.

For some time the company has been engaged in erecting two Belgian distilling furnaces of 300 retorts each, which will be fired with petroleum. It has also completed an eight-grate furnace to make zinc oxide direct from ore. The equipment also includes a 30-retort distilling furnace, said to be the first zinc-distilling furnace in Latin America.

Daniel Guggenheim Discusses Industrial Unrest

In a recent interview published in the "New York Times" Daniel Guggenheim made the following suggestions toward solving the problem of industrial unrest:

Congressional legislation chartering both employers' and employees' organizations involved in interstate business.

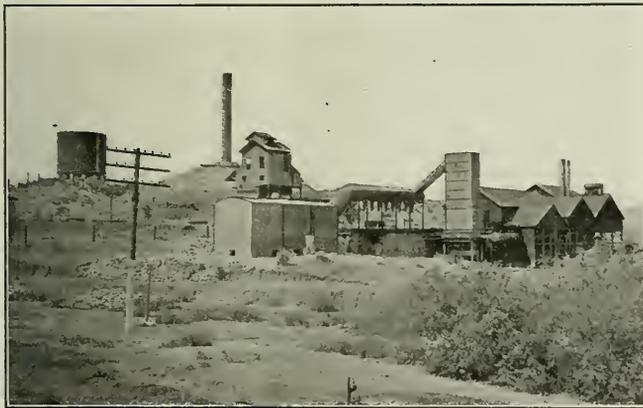
Passage of a law preventing strikes or lockouts without full investigation and report.

Laws making decent working conditions and hours of labor, which have been voluntarily put into effect by some employers, to be made compulsory.

The use of moral suasion to force arbitration; employers and employees to be compelled to respect their agreements, and the appointment of a commission to carry out this program.

"I suggest that Congress pass legislation along the following lines," said Mr. Guggenheim: "First, charter both the employer engaged in interstate business and organizations of employees involved in such business, and that at the same time those measures for decent working conditions and hours of labor which have been put into effect voluntarily by some employers be translated into laws and be made compulsory; that a law be passed against strikes or lockouts without full investigation and report; that all moral suasion be used in forcing arbitration in the case of industrial disputes, and that both the employer and employee be compelled to respect their agreements

"I believe the best way to carry out this program would be for Congress to appoint a commission with wide powers, this commission to consist of an equal number of representatives of employers



PLANT OF ARIZONA SMELTING & POWER CO., BENSON, ARIZ.

New Furnace at Benson, Ariz., Ready to Blow In

The Arizona Smelting & Power Co. was organized late in 1918 for the purpose of taking over an old smelting plant at Benson, Ariz., which included a never-used 250-ton copper blast furnace. Charles E. Goetz is president of the company and Martin Fishback, general manager. The plant has been thoroughly overhauled and is now practically ready to blow in. The company has experienced much delay in having its railroad spurs and switches approved

Belgium, on Aug. 12 last. The new company is known as the International Ore & Smelting Co., its address being Apartado 136, Saltillo, Coahuila, Mexico. It is announced at the same time by F. E. Salas, general manager, that the new company has arranged with the Compagnie Metallurgique Franco-Belge de Mortagne, S. A., and with the Societe Royale Austrienne des Mines to establish a steamship service between Tampico and Amberes. The latter companies have agreed to buy in Mexico with the technical supervision of the International Ore & Smelting Co. the zinc ores, carbonate and sulphide, that they need for their plants in France and Belgium. A group of engineers and

and employees, and that the employers' representatives be appointed by Congress upon recommendation made by such semi-official bodies as the United States Chamber of Commerce.

"This commission should have power to revoke licenses given to industrial concerns or to labor organizations, and provide for investigations before strikes or lockouts, and to bring pressure to bear to permit it to arbitrate differences. This commission should be non-political, and the members should be appointed to continue in office for life, subject to certain limitations, similar to those affecting the duties of our Supreme Court.

"They should have all necessary authority and should be strengthened in every way possible, and they should have ample funds to carry on their work of investigation, to employ experts and to make recommendations to Congress on industrial matters. The members of the commission should receive salaries sufficient to permit obtaining the highest possible grade of men, and everything should be done to build up its authority and influence.

"I believe it is of the utmost importance to provide for our taking, in some such way, a middle-of-the-road progressive policy in dealing with industrial problems so that we will be able to stabilize industry, encourage initiative and enterprise, and at the same time build up a self-respecting, healthy and happy class of employees, all of whom will feel that their rights are carefully safeguarded, and that the avenues of opportunity for betterment of their financial condition are not closed, but that every one has an opportunity of reaching a level commensurate with his own ability, and that at no time will any one who is willing to do an honest day's work be unable to earn a decent living for himself and family.

"My views in this regard cannot be better expressed than in the words of Premier Lloyd George of England in commenting on their recent railroad strike: 'The strike proved that this is a really democratic country where public opinion must prevail. . . Prussianism in the industrial and economic world must not prevail. . . The nation means to be strong, firm, and just, but always master.'"

Quincy Company, of Michigan, to Re-work Old Sands

The Quincy Mining Co., of Michigan, plans to spend \$500,000 on a plant for recovering copper from the old Pewabic and Quincy sands on the shores of Portage Lake. Work will begin in 1920, according to an announcement made by

the company to the business association of Hancock. This is a substantial endorsement of the operations which the Calumet & Hecla Mining Co. has conducted for a number of years at the Lake Linden plant. The original Quincy smeltery stood on the shore of Portage Lake. It is known that the Quincy company has refused to renew leases that were made to a number of business houses using the water front. It is also planned to regrind the sands at Mason.

The Birmingham Situation

The end of October found the Birmingham district no more affected by the steel strike than at its beginning. In fact, some companies report an increase in production in October compared with any of the summer months. Labor seems to be contented, and the attendance at union meetings has decreased rather than increased. No prediction is made, however, as to how long this condition will prevail. Practically all of the large iron mining companies in this district own their own coal mines and are dependent upon them for domestic coal for their camps as well as that used in their steam and power plants. The coal miners of the district are well organized, and although the men of some companies have voluntarily stated they would not strike, it is expected that, if the coal strike does take place on Nov. 1, as announced, the majority of the coal mines in the district will be closed down. As a result the various iron mines and furnaces will shut down as their reserve stocks of fuel and coke become exhausted. Some mines and some furnaces have good supplies of reserve coal and coke that will carry them through the strike, which it is believed cannot be of long duration.

Interest in the Premier Bought by Guggenheims

The Guggenheim interests have purchased a two-fifth interest in the Premier mine, in the Salmon River district of British Columbia. This is the property that was bonded by H. R. Plate and associates, of New York, who, after driving 1,600 ft. of shafts and tunnels, abandoned the option. The property was then bonded by R. K. Neill, of Spokane, and W. R. Wilson, manager of the Crow's Nest Pass Coal Co.; A. B. Trites, and W. Wood, of Fernie, B. C., who found ore in the second round of shots exploded. From that time they have had one continuous round of successes. It is estimated that over 1,000,000 tons of ore assaying on an average \$30 per ton in gold and silver has been proved above the bottom level, where

the vein is stronger and richer than at any other point developed.

The following are the officers of the new Premier company: R. W. N. Wood, Fernie, B. C., president; H. A. Gues, New York, vice-president; Minor Keith, New York, second vice-president; W. E. Norris, New York, secretary; and L. A. Chaplin, New York, treasurer. During the coming winter six specially designed tractors will be employed to draw the ore over the snow from the mine to tide-water.

Goldfield Development's Plans

The Goldfield Development Co. plans to put its 1,000-ton mill on an operating basis of 2,000 tons a day, according to A. I. d'Arcy, general manager. Work on mill repair and construction has already begun. The mill is 85 per cent complete at present for handling 650 tons; completion of the remaining 15 per cent requires thirty days. Approximately \$27,000 has already been spent on this work. The cost of increasing the capacity from 1,000 to 2,000 tons and changing to a simple cyaniding process is estimated at \$205,000, to secure which the company has been refinanced. It is proposed to increase the capitalization from 2,500,000 to 4,000,000 shares.

The company holds under a five-year lease all properties of the Goldfield Consolidated Mines Co., consisting of all mining properties in the district and the latter company's mill. It is planned to decrease operating costs by working the deposits on a large scale for low-grade ore. Careful sampling of the Combination and Red Top mines showed 1,500,000 to 2,000,000 tons of \$5.60 ore available down to the 380 level. A caving system will be used in place of square setting. The ore will be drawn off through raises to the 380 level and hauled by electric locomotives to a shaft 300 ft. east of the vein. Thus a reduction in operating costs of about \$2 per ton is anticipated. It is estimated that mining and milling will cost \$3.15 per ton as against \$5.17 spent in 1917 by Goldfield Consolidated.

President Names Delegates to American Mining Congress

Ten delegates at large to the American Mining Congress, to be held in St. Louis, Nov. 17 to 21, were appointed on Nov. 1 by President Wilson. Officials of the Congress announced that an industrial conference would be held in connection with the meeting in an effort to work out solutions of the labor problems confronting the country. The delegates named by the President were: Emmet D. Boyle, Governor of Nevada;

Albert E. Carlton, of Cripple Creek, Col.; Jerome J. Day, of Wallace, Idaho; Alva C. Dinkey and Daniel B. Wentz, of Philadelphia; Van H. Manning, Director of the U. S. Bureau of Mines, and George Otis Smith, Director of the U. S. Geological Survey; W. A. McCutcheon, of Pittsburgh; Francis S. Peabody, of Chicago, and F. B. Richards, of Cleveland.

Utah Basin, Utah, to Be Tapped by New Railroad

Work on the projected railroad into the Uintah Basin of Utah is planned to begin in the early spring. The basin is rich in various hydro-carbons, including elaterite, gilsonite, and ozocerite, having produced more of this material than any other part of the country. A large sum of money will be needed for the project, which is endorsed by Governor Bamberger and the Commercial Club of Salt Lake City. Salt Lake will furnish most of the money required; Utah County, and Uintah and Duchesne counties will also contribute.

Hopp-Ward Litigation Settled

Cable advice from England states that the Privy Council has given a verdict in favor of R. T. Ward, of California, in the case of Hopp vs. Ward, which involved the ownership of the Bullion mine, near Quesnel Forks, B. C. The property, consisting of 1,200 acres of placer land, was originally taken up by C. P. R. officials, who spent \$3,500,000 in development and equipment and recovered \$1,500,000 in gold, and then sold to the Guggenheims who formed the Cariboo Gold Mining Co. The company spent an additional \$500,000 and sold to Ward. Hopp, a local man, "jumped" the property in 1913 on a technicality, and the case has been before the Executive Council and the Supreme Court, both of which favored Hopp, and the Court of Appeals and the Privy Council, both of which also favored Hopp. The litigation has cost Ward \$15,000, only a small part of which he expects to recover from the Hopp interests, the Quesnel Forks Gold Mining Co.

Smoke-Nuisance Investigation

Data regarding the smoke nuisance recurring with the winter months in Salt Lake City are being collected with a view to its control. The work is being done by Osborn Monnett, of Chicago, in co-operation with the local station of the U. S. Bureau of Mines and the engineering department of the University of Utah. The territory to be covered has been divided into districts and facts gathered will be recorded on Ringleman charts, to afford

a basis for calculations as to tons of soot deposited per annum for each district. The investigation will be completed in May or June next, and a bulletin published giving the data collected, including suggestions regarding an effective smoke ordinance and the establishing of a smoke inspection department.

Utah Potash Company Extending Holdings in Tooele County

The Utah Salduro Co., which is understood to be a subsidiary of the Solvay Process Co., has applied for patent on 1,543 placer claims at and near Salduro, in Tooele County, 112 miles west of Salt Lake City. The area for which patent is sought embraces 30,657 acres. Since August, 1916, when the first ground was located, this company has been operating a plant for producing potassium and magnesium chlorides from brines of the great salt beds of western Utah. The brines are collected in trenches, evaporated in solar vats, and later refined.

The acreage of salt lands applied for is the largest for which patent has ever been applied in Utah. About 125 miles of trenches have been dug. In the last three years the company has produced over 11,000 tons of 80 per cent potassium chloride. The present capacity of the plant is given as fifteen tons daily of potassium chloride of the same grade.

Further Action in Case of Ross vs. Burrage

The motion filed by Louis Ross to amend his bill of equity against A. C. Burrage was heard in Boston, Oct. 27, by Justice Jenney, of the Supreme Court, with Thomas W. Proctor as master to hear additional evidence. Ross wishes to show that when Burrage induced him to sign the agreement of May 6, 1912, a modification of the agreement made in 1910, relative to the investigation of mining properties in Chile, Burrage had already parted with his rights and interest in the mine by assigning the same to Daniel Guggenheim. He alleges that the profits received by Burrage from Guggenheim amounted to \$25,000,000. He contends that he is entitled to be paid 5 per cent of the profits under original agreement, amounting to \$1,200,000. Ross was recently awarded \$100,000 in settlement of his claim against Burrage.

New Company Organized to Work Mexican Mines

The Sonora Mexican Silver Mines, Ltd., has been organized in London to acquire and work silver mines at Minas Nuevas, Sonora, Mexico, including a

thirty-stamp mill. The property is 330 miles south of Nogales, Ariz., and consists of about 125 acres of land held under the following titles: La Purisima Concepcion, Mina Zambona, Continuation Zambona, San Antonio, Fortuna, and Zambona No. 3. The capital of the new company is £85,000 in £1 shares.

Development at Hampton Plains, Western Australia

The original discovery of gold which was made during September last at Hampton Plains, twenty-two miles south of Kalgoorlie, in Western Australia, was made in Block 50, now known as the Celebration lease. This lease is under option to a syndicate consisting of the following: J. McDermott, general manager of the Ivanhoe mine, Kalgoorlie; R. Hamilton, general manager of the Great Boulder mine, Kalgoorlie; J. W. Sutherland, general manager of the Golden Horsehoe mine, Kalgoorlie; P. Fitzgerald, general manager of the Oroya Links mine, Kalgoorlie; and A. Francis, attorney for the Hampton Plains Co. The lease cost \$125,000 and is being vigorously prospected. A shaft has been sunk 100 ft. and a crosscut at 50 ft. showed the lode to be 25 ft. wide and worth \$38.40 per long ton. At the bottom of the shaft the ore is worth \$24 per ton. North of this find, there is a lease which stands under option to an Adelaide (South Australia) investor where good values have been discovered in a lode near the surface, but no further prospecting appears to have been done. Six miles south of the find on Block 50, several parties have found gold on Block 48, and Slavin & Eivers, who have called their lease the Lily of the Valley, have a large sulphide formation stated to assay 1 oz. per ton. Large numbers of leases have been pegged, and options are being freely taken, but further action is waiting the publication of fuller details of the values, in the Celebration lease.

At Broad Arrow, which is north of Kalgoorlie, some rich ore has been found at Borland and Rundd's Oversight mine, which is under option to D. L. Doolette, of Melbourne, Vic. The present owners have received \$77,750 from 450 tons, and from the Tara lease, which adjoins it on the north, \$100,000 has been won from 500 tons.

Bendigo Amalgamated Goldfields Production

The reported output of the Bendigo Amalgamated Goldfields for the four weeks ended Sept. 9 was 8,554 tons for a yield of 5,097 oz. The highest grade ore was from the Constellation mine, 1,295 tons averaging 144s.

PROGRESS OF MINING OPERATIONS

Important Events of Interest
Condensed and Classified
for Easy Reference

ALASKA

OPERATIONS IN VALLEY OF KUSKOKWIM RIVER

The first gold dredge on the Kuskokwim River has been installed on Candle Creek, and after delays incident to the erection of new machinery, has averaged about \$6,000 a day during July and August. The dredge is owned by the Kuskokwim Gold Mining & Dredging Co. of Aniak, Alaska, and was placed on the upper end of the creek to work down-stream.

W. Y. Fisher, of Aniak, and associates are prospecting a group of placer claims on Marvel Creek, a tributary of the Aniak River, with a view to installing dredging machinery if the results justify. The prospecting is being done with a gasoline drill. E. W. Parks, of Georgetown, Alaska, has a crew of men at work erecting a furnace on his group of cinnabar claims. These are situated fifteen miles up-stream from Georgetown. Two tunnels have been driven into the orebody just above the level of the Kuskokwim. Another crew under H. W. Reeth, of Bethel, Alaska, is at work installing a hydraulic outfit at Golden Gate Falls, on the Riglagolic River, a tributary of the Kuskokwim on the left limit. The plant will be in operation some time in 1920.

Last season a discovery of placer gold was made in the gravels of Watermouse Creek, in the Goodnews Bay district, near the mouth of the Kuskokwim. The gravels average about 4 ft. thick, and yield \$4 per sq. ft. A rich strike has been reported near the mouth of the South Fork of the Kuskokwim River, known locally as the Nixon Fork. The ground is being prospected with a power drill with a view of installing machinery later.

Prospecting is being vigorously prosecuted on the Holitna River, a tributary of the Kuskokwim, which comes in thirty miles above Georgetown, and is yielding encouraging results. The gravels are reported to average from 7 to 9 ft. deep, and will average 50c. per foot, 200 ft. wide and 7 miles long. A machine outfit was installed last season on the placer ground on Crooked Creek, but has not been used this season, but a gang of men has been employed to shovel-in. The ground averages \$30 a day to the man.

Prospecting and mining on the Kuskokwim is rendered difficult and ex-

pensive because of the lack of ocean transportation, and the bringing in of machinery and supplies is accomplished with great difficulty.

Juneau—Alaska Gold Mines Co. in October milled 206,200 tons of ore averaging 80.1c. per ton. Percentage of extraction was 81.88; tailings loss 16.1c. per ton.

ARIZONA

U. V. EXTENSION BUYS HAYNES GROUP

Jerome—The United Verde Extension Copper Co. has added eight patented claims to its group by the purchase of the property of the West United Verde Copper Co., better known as the Haynes group. The new property has a 1,200-ft. shaft, 2,500 ft. of

orebody. It is from 40 to 100 ft. wide and has been opened for 900 ft.

orebody. It is from 40 to 100 ft. wide and has been opened for 900 ft. The Jerome-Verde Copper Co. will have its annual meeting in Phoenix Nov. 10. For submission to the stockholders, H. P. Henderson, consulting engineer, has prepared a statement of progress for the last year. The production has been 4,709 tons, averaging 9.6 per cent copper and returning in cash \$108,359. Development work has aggregated 2,283 ft., and 3,106 ft. of diamond drilling has been done. It is believed that the Main Top orebody, which has been the main producing section, is in a shear zone that continues to the United Verde Extension



UNITED VERDE EXTENSION COPPER CO.'S PLANT, JEROME, ARIZ.
DOUGLAS RESIDENCE IN CENTER

development on the 700 level, and 300 ft. on the 1,200. George Kingdon, general manager, stated his opinion that "it is good ground, well worth developing, and its purchase was in line with the policy of the Extension company not to rest content with one mine."

Ore trains will be operating by Nov. 15 between the ore pockets of the United Verde Extension mine and the smeltery at Verde, through the 12,000-ft. tunnel, now nearing completion. The tunnel headings were completed last March, but much remained to be done in concreting sections and installing railroad and electric equipment. The railroad is now complete more than half way from the portal. Ore will be handled in 30-ton cars, hauled by electric locomotives. Operation of the tun-

nel will materially decrease costs. Only one furnace will be operated for the present, turning out about 3,500,000 lb. a month.

OCTOBER COPPER PRODUCTION

New Cornelia Copper Co., Ajo, produced 3,878,000 lb. of copper in October, compared with 3,898,000 in September.

Calumet & Arizona Mining Co., Bisbee, produced 4,244,000 lb. of copper in October, compared with 3,318,000 in September.

Old Dominion Copper Mining & Smelting Co., Globe, produced 2,365,000 lb. of copper in October, compared with 2,460,000 in September.

CALIFORNIA

THE MOTHER LODE—SAN JOSE
Grass Valley—Unwatering the vertical shaft of the Idaho-Maryland mine to a depth of 240 ft. has been

accomplished by compressed air. The method is so satisfactory that the management expects to clear 1,000 ft. of shaft without resorting to pumps. A temporary hoist has been erected over one shaft compartment, and the shaft is being repaired as rapidly as water is lowered. The hoisting plant is being assembled.

Amador City—The Keystone mill, which was shut down several weeks for repairs, is again closed down on account of an overflow of sand at the stone dam across Amador Creek. The dam is to be raised 20 ft. higher, which will give an added capacity to the impounding basin of 1,500,000 tons.

San Jose—Suit has been filed in San Jose by the California Industrial Accident Commission in the Superior Court, to close the Guadalupe quicksilver mine, on the ground that it was dangerous and a menace to the lives of the miners.

IDAHO

COEUR D'ALENE DISTRICT

Wallace—Practically all stock in the Albany company has been purchased by August Paulsen for \$15,000. John H. Nordquist and John Dunphy are the chief stockholders. The company owns eleven claims joining the Omaha group, of which Paulsen is owner and upon which he has done a large amount of development. The Albany will be developed from Omaha workings. The property has two veins, one of which shows lead near surface. Paulsen is one-fourth owner of the Hercules mine.

Adair—The Richmond Mining & Milling Co. has closed down. It has been employing thirty-five men during summer and has been shipping ore. Unsatisfactory treatment charges for the low-grade copper are given as reason for suspension. Failure to find the orebody on the 600 level and unsatisfactory showing on 500 level are believed to have had much to do with the closing down. J. E. Codd, of Spokane, is president.

Mullan—Local stockholders in the National mine, dissatisfied with the action of directors in closing down the property several weeks ago, are considering calling a meeting of stockholders to urge further prospecting. They believe that the main orebody has never been found. There is a large vein near the surface carrying galena and lead carbonate, but deep workings show nothing but low-grade copper. The company has \$50,000 in treasury, and the stockholders favor using some of it to prospect with the diamond drill.

MICHIGAN

THE COPPER DISTRICT

Calumet—The Seneca Mining Co.'s shaft is down 1,930 ft. having complet-

ed the curve and is two-thirds of the way to the third level station. The raise from the second level has held through furnishing a pocket. The lateral faces on the second level are the only openings in the Kearsage lode contributing to the stockpile. No ore has been shipped yet for a mill test.

Rockland—At the Michigan mine grading has been completed for 4,500 ft. of railway spur for the C. M. & St. P. Ry. Rails are hard to get and will not be laid for sixty days. Machine drills total twenty-two. The physical showing is maintained.

MINNESOTA VERMILION RANGE

Ely—The north section of the Chandler mine has resumed with full force, and the south section with about twenty men. Other mines in the district are still down, because of the local strike. Three leaders have been arrested for attempted violence.

MONTANA

Anaconda Copper Mining Co. produced 15,000,000 lb. of copper in October, compared with 12,780,000 lb. in September.

East Butte Copper Mining Co. produced 2,027,340 lb. of copper in October, compared with 2,093,780 lb. in September.

NEVADA

DIVIDE DISTRICT

Divide—On recommendation of George H. Garrey, consulting geologist, the shaft of the Tonopah Divide mine will be sunk from its present depth of 585 ft. to 800 ft, where he believes the water level and sulphide zone will be reached. At the Revert Divide property, John G. Huntington has recently had numerous assays made of ore from the lease owned by himself and partners, the majority of which show ore of shipping grade. A new vein of commercial ore has been opened up on the Belcher Extension. E. Roberts is the engineer in charge. At the Butte Divide, the ore is said to be improving as drifting on the veins proceeds on the 150 level. George Reading is manager.

ELY DISTRICT

Kimberly—The Consolidated Coppermines Co. has started to deepen the Alpha shaft from 1,440 ft. to 1,880 ft. It was expected to start this work last summer, but labor troubles, which affected most of the Nevada mining districts, made it inadvisable to undertake new work at that time. Diamond drilling from the 1,300 level is still going on and will be continued until definite information is obtained as to the depth at which sulphides occur. The present hole, which is the third one

drilled, passed through 48 ft. of oxidized ore that averaged 8.5 per cent copper, and for an additional distance of 90 ft. the copper contents averaged over 2 per cent. Ore production has been resumed and will be continued on a limited scale. Shipments from the Alpha mine are at the rate of about 100 tons per day. Considerable ore is also going forward from the Liberty pit, where the Nevada Consolidated Copper Co. is mining ore from Coppermines ground and concentrating it at the Steptoe works under the existing contract between the two companies. E. P. Matthewson, recently consulting metallurgist with the American Smelting & Refining Co., has been engaged as consulting engineer. Under his direction plans will be immediately prepared for the reduction works at Kimberly, which have been under consideration for some time.

DAYTON—AUSTIN—LORING—PIOCHE

Dayton—The Carson River Mills 200-ton cyanide plant, erected to treat an immense pile of tailings from Comstock ores, is operating successfully, according to A. H. Jones, in charge of the Salt Lake City office of Charles Butters & Co., Ltd. Mr. Jones was formerly mill superintendent of the Tonopah Belmont Development Co. The Gold Canyon Dredging Co., which is controlled and managed by Bulkeley Wells, will probably have to defer starting operations until Jan. 1, owing to delay in shipment of equipment resulting from labor troubles in San Francisco. The company has 1,000 acres of placer ground under lease. G. F. Hutton is in charge.

Austin—The Cahill Lode Mining Co., controlled by Jack Cahill, the original discoverer of Birch Creek, is getting ready for operation. The mineralized zone at Birch Creek is about 300 ft. wide, and good pannings are secured at various points across the entire width.

Loring—W. H. Shewan has opened up the cross fissure known as the Silver vein at 200 ft. in the tunnel on the Tennessee claim. This vein carries gold also. Assays will not be made till the whole vein is exposed. On the Banker's Dream property, the Jose Davis Co. has 40 tons of good ore on the dump. The shaft is down 50 ft., and the vein is four ft. wide at the bottom.

Pioche—Ore shipments from Pioche for the week ended Oct. 23 were: Prince Consolidated, 1,500 tons; Virginia Louise, 350; Black Metals, 300; Combined Metals, 50; Ida May, 50, Bristol, 50.

OKLAHOMA

JOPLIN-MIAMI DISTRICT

Petosi (Douthat)—Taken over by R. P. Sharpe, of Miami, who will operate

this plant, which has been idle several months. Was fair producer in 1918.

St. Regis M. & S. (Douthat)—Moving old mill from Joplin to new lease at Picher. Expect to finish by January 1, 1920. Tom Shelton superintendent.

Skelton L. & Z. (Douthat)—Recently took over Lucky Kid mine and mill and are sinking new shaft. Company now has eight mines equipped with concentrators. Frank Childress, Galena, Kan., manager.

Texas (Joplin)—Holman Bros., of Wetumtka, Okla., have started up Texas mine south of Hockerville, after overhauling and improving mill. W. L. Owen, Joplin, manager.

Underwriters (Joplin)—Have contributed six-inch two-stage American pump to Quapaw Drainage Co. for its fight against heavy water. Pump placed in Lucky Extension Co. shaft.

Cedar Bluff (Lincolnville)—Sinking shaft on tract adjoining Mission lease. Company composed of engineers from San Francisco.

Blue Bonnet (Miami)—Has started sinking new field shaft 500 ft. south of mill. Shaft expected to be completed to 250 level in forty days. W. H. Logan, manager.

Reliance (Neck City)—Lead and zinc mill being remodeled; to be completed November 15. J. E. Smith manager.

Big Chief (Picher)—Purchased by R. P. Sharpe and others, of Miami, Okla. Lies just north of Eagle Picher Lead Co.'s Netta property. Sharpe also owns Vantage and Petosi.

Cortez (Picher)—Oberman-Carson re-erecting on Commonwealth lease old True Blue mill from Quapaw; to be completed December 15. M. Lichliter superintendent.

Kitty (Picher)—Operating new shaft recently completed west of mill shaft.

Pittsburgh Miami (Picher)—Purchased by L. V. Rice, of Chicago, who will operate property. H. L. Jones, of Robert W. Hunt Co., superintendent. Plant idle several months.

St. Joe (Picher)—Sludge mill under construction.

Whitebird Addition (Picher)—Larsh-Benentendi lease purchased by E. R. McClelland, of Kansas City, and associates. Shaft in ore will develop property and build mill. Thelst Shelton, Carterville, Mo., manager.

Alamo Lead and Zinc (Quapaw)—Has closed down operations at Lucky Bob mine and will deepen shaft.

Aurora (Quapaw)—Have started Sunnyside mill after shutdown of several months.

Lone Star (Quapaw)—Taken over by A. G. Kelley, who is drilling out tract.

Waxahatchie (Quapaw)—Has begun operating old Wilson mine, southwest of town. Will sink to deeper level, now made possible through draining by Quapaw Drainage Co.

SOUTH DAKOTA

At the Homestake mine at Lead, S. D., the fire which broke out on Sept. 25 is still burning on the 700 level with continued efforts being made to extinguish it. The water used in flooding the workings has reached the 1,250 level, and it will be some time before it reaches the fire. Two deaths have resulted to date as a result of the fire. On Oct. 13, two men employed in removing forms from concrete bulkheads on the 700 level were overcome and died. The company announced on Oct. 16 that declarations of dividends would be suspended for the present.

UTAH

TINTIC DISTRICT

Eureka—The Tintic Standard Mining Co. is installing a large compressor. Two smaller compressors now in use are to be kept in reserve. New ore opened on the 1,350 level southeast of the shaft will afford a large stope. A station is being cut at the 1,450 level, the present bottom of the shaft, and drifting will be started to get under the ore.

The Chief Consolidated Mining Co. is employing about 450. The new three-compartment concrete-lined shaft is down 800 ft. and at 1,000 ft. will be connected with old workings. Ore is being mined throughout the property and from below water level. The pumping capacity has recently been doubled. Surface work and drilling are being done in the eastern section of the camp.

The new wagon road into east Tintic will be completed within a few weeks. It will especially benefit the Eureka Lilly, Eureka Bullion, Big Hill, East Tintic Coalition, and Tintic Standard properties. Later the road may be extended south of the Tintic Standard to reach the Apex Standard, Iron King, Zuma, Eureka Standard, and other properties.

WASHINGTON

Republic—Mines of this district continue shut down owing to the strike that began Oct. 9. The demands made by the workmen were for an increase in pay from \$4.50 and \$5.00 per day to \$5.50 and \$6.00—an increase of \$1—and also that two men be put on each Leyner drill instead of one.

CANADA

NORTHERN ONTARIO

Port Arthur—The Nicholls Chemical Co., of New York, is about to begin

construction of an ore dock on the Mission River, at Fort William, for the purpose of handling pyrites from the Northern Pyrites mine, at North Pines, Ont., and also from its pyrites property at Mokoman, about 30 miles west of Port Arthur. This dock will cost \$100,000 and be ready for operation on the opening of navigation in the spring of 1920. It will afford facilities for the shipment of local iron ore.

The syndicate that owns the Ozone Siding zinc property, situated about 70 miles east of Port Arthur, on the line of the Canadian Pacific Ry., is conducting negotiations for the sale of the property. The orebody has been traced for more than a mile. It consists of from 2 to 3 ft. of specular zinc blende, with from 10 to 12 ft. of lower grade ore. The owners are Messrs. Lawrence and Rochon, of Fort William, and Dr. R. J. Manion, of Fort William.

MEXICO

SONORA

El Tigre—Mining conditions at El Tigre are reported to be favorable. The earnings on this property during 1919 have exceeded those of any previous year, and, although no new veins have been discovered, ore has been found at greater depth than ever before. Net earnings for September were \$155,000. Political conditions in the vicinity of El Tigre are favorable, and labor is reasonably plentiful. The Lucky Tiger-Combination Gold Mining Co., operating in the district, also owns zinc property in Oklahoma that has been worked to advantage in spite of the low price of zinc during the last year.

NEW SOUTH WALES

Broken Hill—During the six months ended June 30, 1919, North Broken Hill Ltd., of Broken Hill, New South Wales, hoisted 55,072 tons of ore, as compared with 75,155 tons for the previous half year. The falling off was due to the strike which occurred in May, having been caused in the first place by inter-union disputes. All productive work ceased at the North mine on May 8. The low output, combined with the heavy expenditure during the period of suspension, forced working costs up to \$8.80 per ton, as against \$5.92 for the corresponding period of 1918. The milling plant treated 53,984 tons of crude ore. Working costs were as follows: Mining, \$5.95; development, 0.58; and milling, \$2.27; total, \$8.80 per ton. The company formerly sold its zinc tailings to the Amalgamated Zinc Co., but has completed its contract with the latter, and is now erecting a flotation plant capable of treating the whole output of tailings.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Oct. Nov.	Sterling Exchange	Silver		Nov.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
30	416 $\frac{1}{8}$	123 $\frac{3}{8}$	66 $\frac{1}{2}$	3	416	123 $\frac{3}{8}$	66
31	416	121 $\frac{3}{8}$	65 $\frac{1}{2}$	4			67
1	416	121 $\frac{3}{8}$	65 $\frac{1}{2}$	5	416 $\frac{1}{4}$	123 $\frac{3}{8}$	66 $\frac{3}{4}$

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.

Daily Prices of Metals in New York

Oct. Nov.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
30	21 $\frac{1}{8}$ @21 $\frac{1}{4}$	54 $\frac{1}{2}$	6.75@6.85	6 $\frac{1}{2}$	7.45@7.50			
31	21 @21 $\frac{1}{8}$	54 $\frac{1}{2}$	6.75@6.85	6 $\frac{1}{2}$	7.40@7.45			
1	21 @21 $\frac{1}{8}$	54 $\frac{1}{2}$	6.75@6.85	6.55@6.60	7.50@7.65			
3	20 $\frac{7}{8}$ @21 $\frac{1}{8}$	54 $\frac{1}{4}$	6.75@6.85	6.60	7.60@7.70			
4								
5	20 $\frac{3}{4}$ @21	54@5 $\frac{1}{4}$	6.75@6.85	6.60	7.50@7.75			

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Oct. Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
30	100 $\frac{5}{8}$	101 $\frac{3}{8}$	114	277 $\frac{1}{4}$	278	30 $\frac{3}{4}$	31	43 $\frac{1}{2}$	44
31	100 $\frac{3}{8}$	101 $\frac{3}{8}$	114	275	275 $\frac{1}{2}$	31 $\frac{1}{8}$	31 $\frac{3}{8}$	44 $\frac{1}{2}$	45
2									
3	99 $\frac{3}{4}$	100 $\frac{1}{4}$	114	273 $\frac{3}{4}$	273 $\frac{1}{2}$	32	32 $\frac{3}{8}$	44 $\frac{1}{2}$	45
4	99 $\frac{1}{2}$	100 $\frac{1}{4}$	114	273 $\frac{3}{4}$	274 $\frac{1}{4}$	32 $\frac{1}{2}$	32 $\frac{3}{4}$	44 $\frac{3}{4}$	45 $\frac{1}{4}$
5	100 $\frac{3}{8}$	101 $\frac{1}{4}$	113	277	27 $\frac{3}{4}$	33	33 $\frac{3}{4}$	45	45 $\frac{1}{2}$

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

Monthly Average Prices

	September	October
Copper:		
Electrolytic, N. Y.	21.755c.	21.534c.
Standard, London	£100.787	£103.418
Lead:		
New York	6.10Sc.	6.487c.
St. Louis	5.853c.	6.249c.
London	£ 25.330	£28.473
Silver:		
New York	114.540c.	119.192c.
London	61.668d.	64.049d.
Tin:		
New York	54.482c.	54.377c.
London	£280.102	£279.239
Zinc:		
New York	7.510c.	7.823c.
St. Louis	7.160c.	7.473c.
London	£ 40.955	£43.630
Pig Iron:		
Bessemer, Pittsburgh	\$29.35	\$ 29.35
Basic, Pittsburgh	27.15	27.15
No. 2 foundry, Pittsburgh	28.15	28.30

Metal Markets

New York—Nov. 5, 1919

The markets were extremely dull this week. Copper was soft, while lead continued firm. Zinc experienced a further reaction and then a sharp rally.

Transatlantic freights are nominally unchanged. The longshoremen's strike is ended and vessels are being loaded again. The rate from San Francisco to Hongkong and Kobe declined to \$15.

Frederick Wallace, general manager of the Waelark Wire Co., died suddenly of double pneumonia Oct. 29. He was a prominent figure in the copper industry, not only as a buyer of copper and a manufacturer of it, but also as a seller, the disposition of the product of the United Verde Copper Co. passing through his hands. He was an extraordinarily hard worker, and without any doubt overworked himself.

Copper

The market was extremely dull, buyers being conspicuous by their absence in all quarters. The small amount of business that was done by producers was at the expense of prices. Wire drawers report continued good business, but apparently they are well supplied with copper for the moment.

Copper Sheets—32 $\frac{1}{2}$ c. per lb. Wire 24 $\frac{1}{2}$ c., weak. Domestic buying dull.

Tin

Business was pretty good, but in view of the approaching release of supplies from the docks, prices became a little easier. Singapore quoted c.i.f. London as follows: £287 $\frac{1}{2}$ on Oct. 30; £282 on Oct. 31; £272 $\frac{1}{2}$ on Nov. 3; and £278 $\frac{1}{2}$ on Nov. 4 and 5.

Lead

The market was quiet and firm. Independent producers appeared to have no difficulty in realizing a premium of 10 points over the price of the A. S. & R. Co.

Zinc

The reaction that was already in course at the end of our last week continued. There was a similar reaction in the London market. New York cabled to London asking explanation, and London cabled New York with similar inquiry. The whole thing was nothing but a bear raid. When the selling by weak hands was ended, the larger producers being in no wise frightened, a

sharp rally ensued, and today the market closed firmly at 6%*c.* Right through the week higher prices were asked for futures than for prompt metal. Business, both domestic and foreign, was light, but today considerable inquiry from galvanizers appeared in the market.

The demand for zinc from the brass makers has been relatively small for a long time, and many smelters have discontinued the production of the "brass special" grade of zinc, letting all the draws from the distilling furnace go together. If anybody wants to buy "brass special," he can easily get it at a premium over Prime Western corresponding merely with the extra cost of production, say 5*c.* to 10*c.* per 100 lb. The differential between Prime Western and high-grade zincs is not very easy to determine, for the former is sold generally on the basis of St. Louis, while the latter is sold on terms including delivery to the consumer. As a generalization, the present premium for high-grade, reduced to a common marketing point, may be generalized at $\frac{1}{4}$ *c.* to $\frac{1}{2}$ *c.* per lb.

Zinc Sheets—\$10.50 per 100 lb.

Silver—Owing to short London supplies, price has advanced in that market to 67*d.*, under date of Nov. 3. Supplies in New York are moderate, with the East as the destination. No London shipments the last week.

Mexican dollars at New York: Oct. 30, 97; Oct. 31, 92 $\frac{3}{4}$; Nov. 1, 92 $\frac{3}{4}$; Nov. 3, 94 $\frac{1}{2}$; Nov. 4, holiday; Nov. 5, 96 $\frac{1}{2}$.

Platinum—Stronger. We quote refined ingot at \$135.

Palladium—Unchanged at \$120.

Aluminum—33*c.* per lb.

Antimony—We quote spot at 8%*@* 8%*c.*, and futures at 8.90*@*9*c.*, duty paid.

Bismuth—Unchanged at \$2.96.

Cadmium—\$1.40*@*1.50.

Nickel—Ingot, 42*c.*; shot, 43*c.*; electrolytic, 45*c.*

Quicksilver—Quicksilver to arrive was quoted at \$80*@*85, while small lots of spot sold at \$90*@*100. San Francisco telegraphs \$82.50, firm.

Tungsten Ore—In general the situation is unchanged. Some high-grade Bolivian ore was reported sold at \$10 per unit, while Chinese ore was quoted at \$7.

Molybdenum Ore—Unchanged at 75*c.* per lb. of molybdenum sulphide, but this is merely a nominal quotation.

Manganese Ore—Quoted at about 50*c.* per unit.

Chrome Ore—Quoted nominally at about \$25 per ton, f.o.b. California.

Sulphur—Prices remained unchanged at \$18 per ton for domestic and \$20

per ton for export at mines, Freeport, Tex., and Sulphur Mine, La. Strike of dock workers in New York is interfering with domestic shipments. Numerous inquiries are being received for export business.

Pyrites—Spanish pyrites is quoted at 17 $\frac{1}{2}$ *c.* per unit for furnace-size ore, free from fines, c.i.f. New York or other Atlantic ports. Market unsettled.

Fluorspar—Quotations have been made at about \$25 a ton f.o.b. mines in Kentucky and Illinois for washed-gravel grade and \$16 per ton at mines at Tonouco, N. M., for lump grade. Analyses of these grades show about 85 per cent calcium fluoride and about 5 per cent silica.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 1.—Zinc blende per ton, high, \$48; basis, 60 per cent zinc, premium, \$48*@*46; Prime Western, \$45; fines and slimes, \$42.50*@*40; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$46.17; calamine, \$33.64; all zinc ores, \$45.75.

Lead, high, \$86.70; basis 80 per cent lead, \$85; average settling prices, all grades of lead, \$86 per ton.

Shipments the week: Blende, 7,816; calamine, 275; lead, 1,810 tons. Value, all ores the week, \$525,700.

The effort to cut prices to \$45 basis met with stubborn resistance from sellers, and at a late hour very little ore is sold, sellers still expecting buyers to meet last week's price level tonight. As buyers report light or no orders, the market appears closed.

The lead smeltery of the Ontario Smelting Co. is reported idle, ostensibly from lack of ore.

Platteville, Wis., Nov. 1.—Blende, basis 60 per cent zinc, base price of Prime Western grade lowered \$48*@*47, with still lower offerings at the week end. Exclusive buyers of premium grade blende not in the market. Lead ore, basis 80 per cent lead, \$80 per ton. Shipments, curtailed because of car shortage, are as follows: 2,170 tons blende, 186 tons galena, and 341 tons sulphur ore. For the year to date the totals are 84,453 tons blende, 5,524 tons galena, and 16,798 tons sulphur ore. During the week 2,751 tons blende was shipped to separating plants.

Pittsburgh—Nov. 4, 1919

Though the iron and steel strike, now in its seventh week, continues to lose ground, it is still receding more slowly than might have been expected, although more rapidly than in the earlier weeks. Good gains in operation have been made in the Mahoning Valley, where production, only recently resumed, is now about 20 per cent of normal, and about the same statement ap-

plies to Cleveland. The Chicago-Gary district situation has improved materially, and production there is perhaps 50 per cent of normal. The Wheeling district remains closed tight. In Western Pennsylvania some vestiges of the strike remain, chiefly in the upper Monongahela Valley region and at one point in the Allegheny Valley. Production of steel in the United States is now 60 to 65 per cent of the rate just before the strike, and is gaining approximately 3 per cent a week. Production of finished material has been at a slightly greater rate than production of steel, as stocks have been drawn upon.

In the last week interest in the iron and steel strike has been overshadowed by the coal strike, as a coal strike such as planned would in the course of from two to four weeks close nearly all the iron and steel plants from lack of fuel. Owing to the attitude of the United States Government and the state and local authorities, intimidation of workers in the non-union fields is forestalled, and the Connellsville region is running full, together with the non-union districts scattered in western Pennsylvania and in West Virginia. It is generally believed now that through the activity of the Government the union miners will soon return to work, without the steel industry having suffered severely from lack of coal. Shipments of coal to steel mills and byproduct ovens are shut off at the moment by the priority system. Collapse of the coal strike may hasten the end of the steel strike, but the latter has little organization, and those who produced it may be unable to call it off, even if willing; so the strike may have to die a natural death.

It is to be presumed that finished steel products are scarce, but there is little evidence of scarcity among manufacturing consumers, and it is possible that they were stocked before the strike to a greater extent than was generally known. Jobbers' stocks, on the other hand, show signs of growing ragged.

A little business is being done in prompt deliveries of steel, at premiums. Large producers, who make a practice of contracting with customers, continue to book business, though in reserved manner, and of course at Mar. 21 prices, as the Steel Corporation is strongly opposed to advances, and the Corporation now has a considerable following in that course.

Pig Iron—The local market has stiffened sharply, but is not clearly defined, for the reason that large advances are obtainable on prompt shipment of foundry and malleable iron, and for 1920 deliveries buyers are unwilling to take hold, and there is scarcely any demand

for basic or bessemer, either prompt or forward. Claims are made that small lots of prompt foundry have brought \$30 to \$33, furnace, whereas basic is not quotable above the old price of \$25.75, and the market could not stand such a spread, as furnaces would shift from basic to bessemer. For forward delivery we quote foundry up \$2 a ton, making the market as follows: Bessemer, \$27.95; basic, \$25.75; malleable, \$28.75; foundry, \$28.75; forge, \$27.75. At Valley furnaces, with \$1.40 freight to Pittsburgh.

Ferromanganese—One or two sales of English ferromanganese are reported at \$100, c.i.f., but with the iron and steel strike and the longshoremen's strike there is practically no activity, and \$100 is not an open quotation on English. Domestic producers still quote \$110, delivered. Spiegeleisen is \$33@35, furnace.

Steel—Sheet bars are in demand, with scarcely any offerings, and would probably bring \$45, Pittsburgh, for prompt. Billets are said to have sold in the East at \$5 above Mar. 21 prices, which are: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; rods, \$52.

Coke—Furnaces as a rule are out of the market, but occasionally a furnace will pay an exceptional price, and no furnace coke is offered at ordinary prices. Sales of Connellsville furnace coke occurred this morning at \$5.75. Foundry coke is in good demand, as coal is being shut off from some byproduct ovens making foundry grade. We quote Connellsville foundry coke at \$7@7.25 per net ton at ovens.

Metal Markets

New York—Nov. 12, 1919

Several of the important metals exhibited peculiar features this week. All of the markets were manifestly influenced by the severe break in the stock market, the advance in the rate for money, and the declared intention of the Federal Reserve Board to check speculation.

With the settlement of the longshoremen's strike in New York, transatlantic freights became easier, as was anticipated. To British ports \$12@12.50 could be obtained; to Havre, \$12.50; to Hamburg, \$12; and to Rotterdam, \$10. The rate from San Francisco to Hongkong and Kobe remained at \$15.

Stock of metals in the hands of the War Department, Oct. 30, 1919, were reported as follows: Brass, 70-30, 47, 326 tons; brass, 60-40, 15,281 tons; lead, miscellaneous scrap, 2,140 tons; zinc, 7,284 tons.

Silver and Sterling Exchange

Nov.	Sterling Exchange	Silver		Nov.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
6	415 ³ / ₄	123 ⁵ / ₈	66 ³ / ₄	10	413 ³ / ₈	127	65 ⁷ / ₈
7	415 ³ / ₄	123 ⁵ / ₈	66 ³ / ₄	11	412	126 ¹ / ₂	65 ⁷ / ₈
8	414	123 ⁵ / ₈	67	12	411	126 ¹ / ₂	67

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

Daily Prices of Metals in New York

Nov.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
6	20 ³ / ₄ @21	54	6.75@6.85	6.60	7.75			
7	20 ³ / ₄ @21	54	6.75@6.85	6.60	7.75			
8	20 ³ / ₄ @21	53 ⁷ / ₈	6.75@6.85	6.60	7.75			
10	20 ³ / ₄ @20 ³ / ₄	53 ¹ / ₂	6.75@6.90	6.60@6.70	7.75@7.85			
11	20 ¹ / ₂ @20 ¹ / ₂	53 ¹ / ₄ @53 ³ / ₈	6.75@6.95	6.60@6.70	7.80@8.00			
12	20 ¹ / ₂ @20 ³ / ₄	53 ¹ / ₄ @53 ³ / ₈	6.75@6.95	6.65@6.75	7.80@8.05			

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
6	100 ³ / ₄	102	113	279	279	33 ¹ / ₄	33 ¹ / ₂	44 ¹ / ₂	45 ¹ / ₄
7	100 ³ / ₄	101 ¹ / ₂	113	278 ¹ / ₂	278 ³ / ₄	33 ¹ / ₂	33 ³ / ₄	44 ³ / ₄	45 ¹ / ₂
8	100 ³ / ₄	101 ¹ / ₄	112	279 ¹ / ₄	279 ¹ / ₂	33 ⁵ / ₈	33 ⁷ / ₈	44 ³ / ₄	45 ³ / ₄
10	100 ³ / ₄	102	112	278 ¹ / ₂	279	33 ³ / ₄	34 ¹ / ₈	46 ³ / ₄	46 ³ / ₄
12	100 ³ / ₄	102	112	281 ³ / ₄	282 ³ / ₄	34 ⁵ / ₈	3 ³ / ₄	47 ¹ / ₂	48 ¹ / ₄

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

Copper

All of the producers were seeking business this week and fishing for what they could get, without being too particular as to prices. There was very little comparing of notes. The result was a highly irregular market, and the circulation of rumors which had varying degrees of foundation. Everybody did a little business, but nobody did much, and the aggregate of all did not amount to much. Manufacturers, both wire-drawers and brass-makers, reported continuance of good business, but at the same time disclaimed much necessity for taking in more copper right away. A small amount of export business was done during the week.

Up to Monday prices held pretty firmly on an average basis of 20³/₄c., f.o.b. New York refineries, but during Monday copper became easily obtainable from large producers on the basis of 20³/₄c., and later that price could be shaded. The bulk of the business of the week seems to have been done at 20³/₄c. The banking position undoubtedly had an important effect on the market.

Copper Sheets—31¹/₂c. per lb. Wire 24¹/₂c., weak. Domestic buying dull.

Tin

The market became easier through the release of some of the large supply of metal that had previously been tied up on the docks. Throughout the week there was a good deal of irregularity. On one day electrolytic sold at 55c. and Straits at 54¹/₂c. at the same time. Later Straits declined to 53¹/₂c. Tin of 99 per cent grade declined from the beginning to the end.

Singapore quoted c.i.f. London, £279¹/₂ on Nov. 6 and £282 on Nov. 11 and 12. The cables were not received for the other days.

Lead

A fair amount of business was done, but it was limited by the supplies available. There were two conflicting factors in the market, one being producers who were willing to promote a further advance and the other, producers who desired to keep on the brakes. The latter would sell to none but consumers and accepted prices lower than they might otherwise have obtained. These conditions explain variations in prices.

The St. Louis market continued to be the truest index.

Some small export business to France was booked, and further inquiries from that quarter are pending. The price for bonded lead advanced to 6½c., New York.

Zinc

The market continued firm at 7.75c. until Monday, when there developed an urgent demand, which was apparently of speculative character and looked like the covering of contracts that had previously been sold for export. This resulted in curious conditions, the market being bid up sharply on zinc originating west of the Mississippi River, while producers east of the river who had determined to sell only to consumers offered zinc, St. Louis basis, at much lower prices than would be received by producers in Kansas and Oklahoma. Today business was reported done at 8.05c. for zinc west of the river, while consumers could buy it from works east of the river on the basis of 7.80c.

Of consumers' buying there was little during the week, but toward the close there were more inquiries, especially from galvanizers.

Zinc Sheets—\$10.50 per 100 lb. less 8 per cent on carload lots.

Silver—Operations have been on an advancing market. London has been seeking silver at higher prices, owing to the scarcity of supplies in that market. It must, however, be said that more free offerings of the metal in London would have the effect of lowering the price for China, as the Eastern banks base their figures on London quotations as well as on the exchange quotation from the Orient on London. Shipments to Europe from New York for the week ended Nov. 6 were very small—only \$2,000 oz.

Mexican dollars at New York: Nov. 6, 96½; Nov. 7, 96½; Nov. 8, 96½; Nov. 10, 99; Nov. 11, 98¾; Nov. 12, 99½.

Platinum—Refined ingot unchanged at \$135.

Palladium—Unchanged at \$120.

Aluminum—33c. per lb.

Antimony—The market was stronger, reflecting the effects of higher prices for silver, and also the increasing scarcity of metal in China. We quote spot at 9c., and futures at the same figure.

Bismuth—Unchanged at \$2.96.

Cadmium—\$1.40@1.50.

Nickel—Ingot, 42c.; shot, 43c., electrolytic, 45c.

Quicksilver—The market continued firm, with spot quoted at \$90@95, and metal to arrive at \$80@85. San Francisco telegraphed \$82.50, steady.

Tungsten Ore—No business was re-

ported. Chinese wolframite was quoted nominally at \$7, high-grade wolframite at \$10, and scheelite at \$15, f.o.b. mines.

Molybdenum Ore—No business reported.

Chromite Ore—Charles Hardy reports that a fair tonnage of New Caledonia ore was sold at 80c. per unit.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace-size ore, free from fines, c.i.f. New York, or other Atlantic ports. Market unsettled.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 8.—Zinc blende, per ton, high, \$48.40; basis 60 per cent zinc, premium, \$48.50; price Western, \$47.50; fines and slimes, \$45@42.50; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$45.81; calamine, \$33; all zinc ores, \$45.67.

Lead; high, \$87.10; basis 80 per cent lead, \$85@88; average settling price, all grades of lead, \$86.26 per ton.

Shipments the week: Blende, 7,718; calamine, 156; lead, 1,551 tons. Value all ores the week, \$493,410.

The \$88 basis price of lead came about by spirited competition between two buyers for a choice lot of ore.

Sellers holding firm for \$50 basis this week succeeded in advancing the market \$2.50 per ton to \$47.50, and sold freely on this market. Buying was largely increased over last week, and it is estimated 7,500 to 9,000 tons were purchased.

Platteville, Wis., Nov. 8.—Blende, basis 60 per cent zinc, \$50 per ton for Prime Western grade. Lead ore, basis 80 per cent lead, \$82 per ton. Shipments for week are 2,268 tons blende, 136 tons galena, and 313 tons sulphur ore. For the year to date the totals are 86,721 tons blende, 5,660 tons galena, and 17,111 tons sulphur ore. Shipped to separating plants during week, 2,696 tons blende.

Iron Trade Review

Pittsburgh—Nov. 11

The Steel Corporation's unfilled obligations increased by 188,030 tons during October, this being about 14 per cent of the month's capacity. Shipments just before the strike were at the rate of about 85 per cent of capacity, and shipments in October were about 60 per cent as great, or at about 51 per cent of capacity. Thus the October bookings were about 65 per cent of capacity. These bookings were confined almost entirely to contract tonnage with regular customers, many customers being allotted less tonnage than they desired. The Corporation being already sold far ahead, the bookings were necessarily for 1920, and practical proof is fur-

nished of the Corporation's now well-known intention to maintain March 21 prices without change, despite the scarcity of steel and the desire of many independent producers that there be advances. Many leading independents, if not all the large ones, will follow the Corporation's policy.

In this the eighth week of the iron and steel strike, production and shipments of steel are about 70 per cent of the pre-strike rate. Wherever the strike remains it is losing ground, except in the case of the Wheeling district, and at a more rapid rate than formerly. The strike as a strike will soon be over, but afterward production will be restricted by the disorganization of working forces, which will be repaired only slowly. There will be an extension of the eight-hour day, adding to the difficulty of building up full working forces. With the railroads about to enter the market to a greater or less extent, steel promises to be in scant supply for a long time, and this in itself is one reason for large interests being opposed to the relation between demand and offerings being allowed to dictate the market price.

Pig Iron—Foundry and malleable grades have been bringing fancy prices for early shipment, up to \$32 or \$33, Valley, and furnaces have been refraining from selling for extended delivery, whereby some of them evidently hope to develop an extended delivery market on the basis of the prompt market. Some makers of bessemer and basic are opposed to there being large advances from the March 21 schedule. Basic and bessemer have sold as substitutes for foundry and malleable at prices above what they would bring for their regular purposes, and conservative interests regard as the actual market the prices that have been obtained for these grades when sold for regular purposes, latest sales of this description being at \$27.25 for basic and \$28.50 for bessemer, Valley. We quote the market at \$28.50 for bessemer, \$27.25 for basic, and \$30@33 for malleable and foundry, f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40.

Steel—Despite the great curtailment in production of billets and sheet bars, there is no heavy demand. Leading producers continue to regard the market at March 21 prices: Billets, \$38.50; sheet bars and small billets, \$42; slabs, \$41; rods, \$52. Some prompt lots of billets and sheet bars have been sold at premiums of \$3 to \$5.

Finished Steel—Basis prices for finished steel products continue to be at the March 21 schedule, but prompt lots of merchant bars have sold at \$3 premium, or 2.50c.

CURRENT PRICES—MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large		Small		New York	
	Pittsburgh	St. Louis	Chi.	San Fran.	Cur.	One
No. 10	4.55	4.64	4.64	4.50	4.82	5.52
No. 12	4.55	4.69	4.62	4.57	4.87	5.52
No. 14	3.65	4.74	4.67	5.90	4.92	5.62
Black						
Nos. 18 and 20	4.15	5.24	5.42	6.75	5.90	6.32
Nos. 22 and 24	4.20	5.29	5.47	6.80	5.85	6.37
No. 26	4.25	5.34	5.52	6.95	5.90	6.42
No. 28	4.35	5.67	5.92	7.05	6.00	6.52
Galvanized						
No. 10	4.70	5.79	5.97	7.20	6.15	6.97
No. 12	4.80	5.89	6.07	7.30	6.20	6.92
No. 14	4.80	5.89	6.07	7.30	6.25	6.97
Nos. 18 and 20	6.10	6.19	6.37	7.60	6.55	7.27
Nos. 22 and 24	5.25	6.34	6.52	7.75	6.70	7.32
No. 26	5.40	6.49	6.67	7.90	6.85	7.47
No. 28	5.70	7.04	6.97	8.20	7.95	7.77

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots \$5 per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard beamer rails, \$45.00	\$55.00		\$45.00	\$65.00
Standard openhearer rails, \$47.00			47.00	67.00
Standard openhearer rails, 8 to 10 lb.	2.58 1/2*	3.36*	2.58 1/2*	3.85*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.54*	3.09*
Light rails, 25 to 45 lb.	2.45*	3.00*	2.45*	3.00*

*Per 100 lb.

IRON SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago		St. Louis		San Fran.	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Standard railroad spikes, 9/16 in. and larger	\$3.35	\$3.90	\$4.27	\$4.44	\$5.65		\$65.00	
Track bolts	4.35	4.90	5.17	Premium	6.65			
Standard section angle bars, 3.00	3.25	4.22	Premium	4.60				

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh		Chicago		St. Louis		San Fran.	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Beams, 3 to 15 in.	\$2.45	\$3.47	\$4.245	\$3.54	\$5.47			
Channels, 3 to 15 in.	2.45	3.47	4.245	3.54	5.47			
Angles, 3 to 6 in., 1/4 in. thick	2.45	3.47	4.245	3.54	3.47			
Tees, 3 in. and larger	2.45	3.52	4.245	3.54	3.47			
Plates	2.67	3.67	4.495	3.54	5.67			

STEEL SHEET—The following prices are base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$2.65	\$2.65	\$4.5

RIVETS—The following quotations are per 100 lb.:

	Pittsburgh		Chicago		St. Louis		San Fran.	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
3/4 in. & larger	\$4.20	\$5.00	\$4.62	\$4.79	\$6.65	\$7.50		
3/4 in. & larger	4.30	5.10	5.75	4.82	4.89	6.15	7.50	
1/2 & 9/16	4.70	5.90	6.25	5.32	5.29	6.65	7.50	

Lengths shorter than 1 in. take an extra of 50¢. Lengths between 1 in. and 2 in. take an extra of 25¢.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Fran.
Hercules red strand, all constructions	20%			
Patent flattened strand special & cast steel	20%			
Patent flattened strand iron rope	5%			
Flow steel round strand rope	25%			
Special steel round strand rope	30%			
Cast steel round strand rope	22 1/2%			
Iron strand and iron tiller	5%			
Galvanized iron rigging and guy rope	+12%			
San Francisco: galvanized, less 5¢, bright, less 25¢.				
Chicago, +5 on galvanized, 50-2 1/2 off on bright.				

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Street	\$5.75	\$7.50	\$6.50	\$7.25	\$8.15	\$7.75
Assorted	7.50	6.50	7.00	8.40	7.00	7.00
San Fran. and Steel	per 100 lb. to large buyers at mill, Pittsburgh					
Iron Bars	\$3.00					\$2.50

COAL BIT STEEL—Warehouse price per pound is as follows:

	New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
\$0.10	\$0.10 1/2	\$0.10	\$0.11	\$0.10 1/2	\$0.15	\$0.15

DRILL STEEL—Warehouse price per round:

	New York	St. Louis	Birmingham	Denver
Solid	10-14 1/2	13 1/2	15 1/2	15 1/2
Hollow	17 1/2	.....	.....	22 1/2

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card of National Tube Co. for steel pipe, Cardy A. W. Eyer's for iron, both dated Mar. 31, 1919.

Inches	Steel		Galvanized		Iron	
	Black	PerCent	Black	PerCent	Black	Galvanized
2 1/2 to 5	50 1/2	38	1 1/4	.....	24 1/2	9 1/2
7 to 12	50 1/2	37	2	.....	32 1/2	18 1/2
13 and 14	41	..	7 to 12	.....	34 1/2	21 1/2
15	38 1/2	..	9 to 12	.....	31 1/2	18 1/2
1 1/8, 1 1/4, 1 1/2, 1 3/8, 1 1/2	51 1/2	39	1 1/2	.....	33 1/2	20 1/2
3/4 to 1 1/2	55 1/2	45	3/4 to 1 1/2	.....	39 1/2	24 1/2
2 to 3	56 1/2	44				

From rehousers at the places named the following discounts hold for steel pipe:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
3/4 to 3 in. butt welded	47%	1 1/2%	45 1/2%	57 1/2%
3 1/2 to 6 in. lap welded	42%	45 1/2%	53 1/2%	
3/4 to 3 in. butt welded	31%	34 1/2%	44%	
3 1/2 to 6 in. lap welded	27%	30 1/2%	41%	

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Hot pressed square	List \$2.50	\$2.25	\$1.20	\$1.85
Hot pressed hexagon	List 2.50	2.25	1.00	1.85
Cold punched square	List 2.50	2.25	1.75	1.30
Cold unched hexagon	List 2.50	2.25	.75	1.30

Semi-finished cuts sell at the following discounts from list price:

New York	70-55	50%
Chicago	80-100	50%
Cleveland	60-10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Chicago	St. Louis
3/8 by 4 in. and smaller	40%	50%	50-5%
Larger and longer up to 1 in. by 30 in.	30%	40%	40-5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:			
New York	\$1.25	Cleveland	\$3.75
Chicago	50%	Chicago	\$3.00
For cast-iron washers the base price per 100 lb. is as follows:			
New York	\$7.00	Cleveland	\$3.75
Chicago	.....	Chicago	\$4.25

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Tar felt (14 lb. per square of 100 sq. ft.)	\$60.50	\$61.50	\$61.00	\$61.50
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrele)	34.00	34.00	37.50	37.50
Asphalt felt	65.00	63.00	67.50	67.50

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply		2-Ply		3-Ply	
	1 c. 1.	1 c. 1.	1 c. 1.	1 c. 1.	1 c. 1.	1 c. 1.
No. 1 grade	\$1.50	\$1.75	\$1.90	\$2.15	\$2.30	\$2.55
No. 2 grade	1.55	1.60	1.70	1.95	2.05	2.30

Asbestos asphalt-saturated felt (14 lb. per square) costs \$1.50 per ton (State-surfaced roofing (red and green) in rolls of 109 sq. ft. costs \$2.25 per roll to carload lots and \$2.50 for smaller quantities. Shingles, red and green, slate finish, cost \$6.00 per square in carloads, \$6.25 in smaller quantities, in Philadelphia.

FOLLOW TILE

Table with columns for location (St. Paul, Los Angeles, New Orleans, Cincinnati, Birmingham, St. Louis) and prices for 4x12x12 and 8x12x12 tiles.

*P. o. b. factory, 4, 8 and 10 in.

LUMBER—Price per M in carload lots

Table showing lumber prices for 8-in. x 20 ft. and under, and 12x12-in. x 20 ft. and under, with columns for location and price.

1-lc. Rough, 10 in. x 16 ft. 2-lc. T. and G. 10in. x 16ft.

Table showing lumber prices for 2-lc. T. and G. 10in. x 16ft. with columns for location and price.

Notes—Charge for base is generally 15% each, 60¢ per bbl.

MAILS—The following quotations are per keg from warehouse:

Table showing mail prices for Will, St., Dallas, Chicago, and San Francisco.

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

Table showing Portland cement prices for New York, Jersey City, Boston, Chicago, Pittsburgh, Cleveland, and Denver.

Notes—Charge for base is generally 15% each, 60¢ per bbl.

LIME—Warehouse prices

Table showing lime prices for Hydrated per Ton and Lump per 200-Lb. Barrel, with columns for location and price.

*300-lb. barrels. †Per 180-lb. barrel.

LINSEED OIL—These prices are per gallon:

Table showing linseed oil prices for New York, Cleveland, and Chicago, with columns for current and year ago prices.

RAW per barrel (5 bbl. lots) \$1.75 \$1.90 \$2.50 \$2.40 \$1.92 \$2.05

5-gal. cans—15.00 16.50 2.75 2.25 2.07 2.25

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

Table showing lead prices for White and Red, with columns for current and year ago prices.

MINING AND MILLING SUPPLIES

Table showing mining and milling supplies prices for HOS-B, Underwriters, and 2 1/2-in. and larger, in 1200-ft. coils.

Table showing mining and milling supplies prices for First Grade, Second Grade, and Third Grade.

STEAM—50% Second Grade—40% Third Grade—45%

LEATHER BELTING—Present discounts from list in the following cities are as follows.

Table showing leather belting prices for New York, St. Louis, Chicago, Birmingham, Denver, and Cincinnati.

RAHWIDE LACING—50% off for out; \$0.82 per sq. ft. for side lacing.

MARLEA ROPS for rope smaller than 5/8-in. the price is 1/2 to 3/2¢ extra; while for quantities amounting to less than 600 ft. there is an extra charge of \$0.01.

Table showing Marlea Rops prices for Boston, New York, Cincinnati, Chicago, St. Paul, and San Francisco.

PACKING—Prices per pound:

Table showing packing prices for Rubber and duck for low-pressure steam, Asbestos for high-pressure steam, Flex, regular, Flex, waterproofed, Compressed asbestos sheet, Wire insertion asbestos sheet, Rubber sheet, size insertion, Rubber sheet, duck insertion, Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes, Asbestos wick, 1/2-and 1 lb. balls.

REFRACTORIES—Following prices are f. o. b. works:

Table showing refractory prices for Chrome cement, Chrome cement, Clay brick, 1st quality fireclay 1030, Clay brick, 2nd quality, Magnesite, dead burned, Magnesite brick, Silica brick, Standard size fire brick, St. Louis-Fire Clay, Birmingham-Fire Clay, S&S; chrome, Chicago-Second quality, Denver-Silica.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Table showing railway tie prices for Chicago, San Francisco, San Francisco, Douglas Fir-Creosoted, Prices per tie at Missouri mills, Untreated A Grade White Oak.

Table showing railway tie prices for No. 1, No. 2, No. 3, No. 4, 7x3x8 white oak, 7x3x8 red oak.

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbl.

Table showing flotation oil prices for Pure steam-distilled pine oil, Pure destructively distilled pine oil, Pine tar oil, Crude turpentine, Hardwood creosote, 0.96-0.99.

COTTON WASTE—The following prices are in cents per pound:

Table showing cotton waste prices for White, Colored mixed, 9.00 to 12.00, 8.50-12.00, 11.00, 9.50 to 12.00.

LAPPING CLUTCHES—Jobbers' price per 1000 is as follows:

Table showing lapping clutch prices for Cleveland, Chicago.

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

Table showing explosive prices for Low Freezing, Gelatin, New York, Boston, Kansas City, New Orleans, Seattle, Chicago, St. Paul, St. Louis, Denver, Dallas.

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Denver, 37c.; Chicago, 31 1/2 c.; St. Louis, 31c

SODIUM SULPHIDE—New York price per pound is .05c. for concentrated, 3c. for crystals. Denver price is 7 1/2c. for crystals. Chicago, 5c. for concentrated, 3c. for crystals. Concentrated comes in 500-lb. drums, crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 10c. per lb.; Chicago, 12c Denver, 22c. St. Louis, 15c.

ALUMINUM DUST—Chicago price is \$1.10 per lb.

WINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

Table showing Winers' Lamp Carbide prices for Union, Cameo, Union, 100-Lb. Drums, 100-Lb. Drums, 25-Lb. Per Ton, Per Ton.

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The Armenian Mandate

"Then up spoke brave Horatius,
The Captain of the Gate:
To every man upon this earth
Death cometh soon or late;
And how can man die better
Than facing fearful odds
For the ashes of his fathers
And the temples of his gods?"

The Turkish Empire has long been known to contain considerable undeveloped mineral resources. Although it is one of the most ancient seats of civilization, modern mining and industry have not touched it. The Greek heroes smelted copper for their shields and helmets out of the small deposits which they found in the islands and near the bays round the Ægean Sea; and slaves worked gold-bearing gravels in Macedonia for Alexander the Great, to win metal for coinage which bears his effigy. In modern times Turkey has mined chiefly those mineral treasures which could be dug out without much skill and marketed without much preparation. Chromite produced around the Ægean Sea for long supplied the world and is still exported; and magnesite as well. Meerschau has been principally produced from Asia Minor. A few silver-lead mines have been worked.

Judging from all reports the most considerable mine in Turkey is at Argana, near Diarbekr, where high-grade copper ore has been mined for many decades, smelted in charcoal furnaces, and freighted by camel to Alexandretta, to furnish the usual copper cooking utensils of the empire. Copper mines of less importance are known near the Black Sea coast, in Turkish Asia Minor, and in Armenia. Many plans have been formulated by the miners of our Western civilization to develop these ore deposits on a modern scale, and American enterprise has tried to solve the problem, but has been unable to make way against Turkish caution and the blocking strategy of European influence at Constantinople.

The situation has been changed as the result of the war. The German plot of a Pan-Islamic crusade to include India and give victorious Germany control of Western and Southern Asia was answered by England with the campaign of General Allenby up through Syria and Palestine, which resulted in the spectacular fall of Jerusalem. The French landed, after the war, at Alexandretta, at the northern end

of Syria, and have established themselves thence in the Cilician rearland and beyond, well toward, if not up to the famous Argana mines. The Italians have seized the south and southwest coast of Asia Minor (Anatolia) as far northwest as Smyrna. North from the Italian holdings the Greeks have possessed themselves of the strip along the east coast of the Ægean Sea (Cydonia) northward to the region of the Dardanelles, and the Sea of Marmora, Constantinople, and the Bosphorus, which is held jointly by the Allied forces.

England recently made arrangements with Persia which establish a de facto British protectorate, guarding the great oil reserves of Persia and Mesopotamia, in the exploitation of which the British Government, itself, is the controlling partner. The French-held territory in Cilicia, to the west of the British-held territory, controls strategically the Argana copper deposits; and the Italian and Greek-held territories contain various deposits of chrome, magnesite, emery and other minerals.

Inland and to the north is the mountainous Anatolian plateau, peopled by Turks, and in the east inhabited by various semi-civilized Mohammedan hill tribes. In the northeast part of this territory lies Armenia, with part of the Black Sea coast, and Trebizond as the principal port. The Armenian territory is bordered on the south by regions populated by Turks and Kurds, on the west also by Turkish territory, on the east by the new-born and chaotic Mohammedan republic of Azerbaijan, and on the north by the similar republics of Daghestan and Georgia, both Mohammedan. In other words, a Christian population is entirely surrounded by Mohammedans of an especially turbulent character. The Armenians of this region are, themselves, largely hill dwellers, and by no means of universally peaceful proclivities, and within Armenia are many Mohammedan villages, inhabited by Turks or Kurds. Part of the Armenian territory is now held by the so-called Armenian republic, a new state as wild and undisciplined as the neighboring Mohammedan republics, and with the same bolshevist tendencies. North of this group of four little republics lies the Caucasus, and beyond is that part of Russia held by Denikine's Cossack republic.

England has, up to now, held Batoum, and has occupied the mountainous rearland between Batoum and the Caspian Sea with about twenty-five thousand scattered troops which covered, in the Caucasus section, the territory of the Georgian and Azerbaijan

republics. This territory she now finds it impossible to hold, and is withdrawing her troops, although it is not to be anticipated that she will definitely abandon the rich oil fields of Baku and the great manganese deposits of the region, unless through dire necessity. The principal manganese deposits are in the Georgian republic, formerly Russian territory; and lesser deposits in Armenia. In Armenia, also, is some copper, especially in the district of Zanghezur, where the principal deposits are reported to be British owned.

The territories now held by the various European powers to the south of Armenia and along the easily accessible portions of the Mediterranean coast will doubtless be retained indefinitely under a mandate by the nations now occupying them, if they are not formally annexed. The British newspapers speak of the Mesopotamian fields as theirs "by right of conquest," and both the French and English conceptions of the meaning of a mandate is that it is the equivalent of a strong protectorate. The Armenian territory is thus isolated, cut off from the Mediterranean and the Ægean by a Turkish no-man's land, which lies between it and the territory held by the European powers, and surrounded by a medley of swash-buckling Mohammedan races.

It has been seen that England finds the turbulent mountainous country of the Armenian republic and the wild republics between it and Russia impossible to hold, and she is very urgent that America take up her share of the white man's burden and assume the mandate over the Armenian territory. As may be surmised from the foregoing description, the region over which it is proposed that America accept the mandate offers another Balkan situation and is even more inaccessible and difficult. It must be held safely against the Turks, Circassians, Kurds and Georgians if the fair mineral and agricultural lands to the south, which have been seized by England, France, Italy, and Greece, are to be safeguarded. It is a true buffer state, moreover, between Russia on the north and British territory on the south. If England cannot police a portion of it with twenty-five thousand men, we may assume that it would require a considerable standing army of Americans. With America responsible for the holdings of this gateway between Russia and British-controlled Mesopotamia and Persia, she must become a party to every European difficulty, whether it involves England, France, Germany, Italy, Greece, Russia, Rumania, Bulgaria or Turkey.

The strategic desirability, as seen by the inveterate European diplomatists of having America hold this pass of Thermopolæ, is at once apparent. Moreover, let us consider England's great Mohammedan empire, now including India, Persia, Egypt, and Arabia. For England to be forever taking the part of Christian Armenia against the surrounding Mohammedan peoples would not make her control of this Mohammedan empire any easier; and the British Government would be the subject of constant attack from the church element at home. Should outrages against the Armenians take place under

British domination, in what an unpleasant light would the government be placed! Nothing of that sort, of course, could happen under an American regime.

The plea for protection of the Armenian people is one that should be heard; but why, of all the Christian powers, only the United States can protect Armenia, is not clear; nor why the forces of the greatest fighting nation of the world should be withdrawn, pending the dispatch thither of our own boys. The situation is clearly nothing less than the result of a diplomatic move made by France and England—England, who as a result of this war has extended her flag over German Africa, Persia, Palestine and Mesopotamia, and much besides.

That our missionaries should second the propaganda of these powers simply bespeaks the guilelessness of these good people. If American interests in mining or other industries are also behind this movement, they are not fully appraised of the delicacy of the situation. Economic reasons underlie most territorial problems, the solutions of which are advocated on sentimental grounds, as witness Alsace-Lorraine and Silesia. Our Allies have most excellent economic reasons for nominating Uncle Sam to the heroic position assumed by the Captain of the Gate, Horatius, when he undertook to keep the bridge to Rome against all comers; but no adequate reason, economic or diplomatic, appears why Uncle Sam should accept this distinction.

Armenia, both in a physical and diplomatic sense, is a trap, and the situation is not changed by the proposition to extend the American mandate over all that portion of Turkey (including Armenia) not already occupied by one of our Allies. With the United States the mandatory of this whole territory, we would be the responsible keepers (for the benefit of the European powers, and at our own expense) of the gateway between Western Europe and Asia and Africa, as well as guardian of the buffer state between Russian and British territory. Not only would we be involved in the mad complexities of the Caucasian situation as above described, but the interminable quarrels of the European Balkans would be ours as well. It would be our duty to settle the fights between Greek, Bulgarian, Serbian, Bosnian, Rumanian, Turk, Albanian, Ukrainian and Russian, on the one hand, and of all the tribes of Western Asia on the other.

The guardianship of Armenia and of Turkey belongs to the European powers at most liberal estimate, to the Allies jointly. Drawn into such an agreement, we should be a party to the quarrels of the world no less than the British, but without the corresponding territorial and commercial rewards. In such a position, moreover, our Monroe Doctrine would appear untenable. The Monroe Doctrine of the keeping away of European nations from the Western Hemisphere has always been associated with the principle of the United States keeping clear from European and Asiatic territorial entanglements; with the one gone it would be difficult to argue the other.

The Mining Congress at St. Louis

THE twenty-seventh annual meeting of the Mining Congress at St. Louis was noteworthy and successful. Efficient activity on the part of the management, and hospitality by the local authorities and residents, combined toward this result. Many addresses were delivered that were all worth traveling far to hear.

Primarily, the activities of the congress are devoted toward influencing legislation in Washington to protect the rights and further the interests of the mining industry. In its unreserved loyalty to the producing end of this industry, the congress might modify and adopt the inspiring sentiment attributed to Decatur: "Our country! May she always be right; but our country, right or wrong."

Broader questions and policies connected with the mining industry received especial consideration at this session, particularly the problem of radicalism, the relations of employer and employee, the railroad problem, taxation, and the coal strike. The League of Nations was tabooed as a purely political subject. And elevated and virile Americanism was conspicuous in the addresses and the spirit of the audiences. Radicalism in any form met no tolerance. There was manifested the fervor of 1776 and 1917. With the observer was left the comfortable feeling that here was a group of strong and representative men from all states and all walks of life who would stand as immovably in the way of the Russian-German tyranny called bolshevism as in 1917 they did against the Prussian tyranny of militarism, or as was done in 1776 against the bungling petty tyranny of the German-born king that sat on the throne of England.

Among many notable addresses was that of Governor Roberts of Tennessee, whose utterances were those of a strong, balanced, and just executive. He has cleaned bolshevism out of Tennessee, and calls on other states and municipalities to clean house similarly. The address of Charles A. Piez on the labor problem was fearless and sound, and deserves the wide publicity which we understand the congress will give it. He dissected dispassionately the attempted tyranny of labor unions; called for laws to compel the submission of grievances to a properly constituted tribunal, instead of striking; and offered the constructive suggestion that, as it was impracticable to force labor unions to incorporate against their will, a law should be passed to make any organization legally liable, whether organized or not, and so hold unions responsible for the immense losses they create in their present system of predatory economic warfare. We wonder if Congress can take its eye off the voter and re-election long enough to pass such patently equitable measures, or whether its members will continue their record of weak sisters in this regard, creating a favorite class so exempted from the law that it has not hesitated finally to defy the Government.

A most important function of the congress is that of the resolutions committee, composed of single representatives from each state represented at the

congress. To this committee are referred resolutions introduced before the congress. The committee may kill these resolutions or may pass them as they stand, or in modified form, and such resolutions as it indorses are usually afterward indorsed by the delegates as a whole when submitted to them in one of the final gatherings.

The congress is not an exclusive organization. It represents a fair cross-section of the American people or of the mining (producing) industry, which is much the same thing. Here one may meet the mining engineer, owner, operator, and promoter, of all degrees; the superintendent or mine captain, the journalist, the stockbroker, the college professor, and the Government official, and not a few of the husky or horny-handed variety whom we love best. The inveterate collector will even find specimens of the common "mining shark and the shining mark." It is this wide representation that gives color, interest, and strength to the organization, and makes it democratic. Under an impeccable leadership, with an enthusiastic and attractive staff, this organization is equipped to have great influence, especially in Congress, and to get results. The presence of many eminent mining engineers, as well as the heads of the Geological Survey and the Bureau of Mines, was a recognition of the useful and strong position which the congress occupies; and we bespeak for it still greater attention and support. We may not always agree with the conclusions of the congress, or the views of its staff; but we like it and them.

One of the things on which we differ is in regard to what we understand to be the congress' present attitude in respect to Federal blue-sky legislation, designed to prevent the operations of dishonest promoters and peddlers of stocks. This session of the Mining Congress failed to pass a resolution which had been submitted favoring such legislation. Of the twenty-two resolutions which were finally adopted, however, we believe that most will meet the approval of the whole mining industry; and the rest will crystallize live topics into subjects for debate.

The Man Hoover

AT THE recent dinner of the Rocky Mountain Club in New York, many distinguished men sat on the elevated platform which at once enabled them to view the other diners and the diners to observe them. It was well worth a man's time to study this living picture, as they sat, reflective and genuinely sorrowful, at the birthday anniversary of their great compatriot—Roosevelt. On faces seasoned by years could be read the frank and adventurous spirit of John Hays Hammond, the benign and solid manhood of Judge Alton B. Parker, the saddened philanthropy and optimism of Ambassador Jusserand, and many others. Two personalities stood out most plainly—the commanding and active mentality of Roosevelt's Secretary of State, Elihu B. Root, and the impassive presence of the mining engineer, Herbert Hoover.

"The first citizen of New York" lived in the past, his mind brooding, his eyes snapping, his features

mobile as he followed the course of the dinner proceedings, or, on his feet, with concentrated effort, sought to make his audience sense his own feelings regarding his beloved chief. On Hoover's face, quiet to stoicism, was graven the same shadows as those on the countenance of Jusserand—the sadness of men who have lived with and striven in behalf of a horribly wronged humanity, whose pain they could only slightly alleviate, and whose call has reduced their measure of their own personalities to the stature in which the Maker views them. It was with Hoover the spirit of the present and the future, brooding, thoughtful, and determined. Hoover's speech, read from notes, had the quality of a carefully reasoned mining report, and was delivered in the same conscientious and unrhetoical spirit.

A most trying time for those Americans who have performed a conspicuous public service is the applause, hand shaking, and seven-day glorification of them as heroes and supermen. Worthy and great men have foundered or been damaged on these rocks. It is our impression that Hoover has not experienced to any great degree the natural pleasure of standing in this warm though transitory sunshine, nor expanded in response.

A just appreciation of a man is difficult for his contemporaries. We have seen an autograph letter of Horace Greeley's, written during the Civil War, in which he lamented to a friend the weakness and inadequacy of Abraham Lincoln. Today no orator hesitates to group Lincoln with Washington. The tendency of the age is to complete the group as a trio, and various third members have been proposed. At the Roosevelt dinner the dead President was so rated, and none will deny the place in history of that simple and heroic figure, whose part in the Great War was limited "malgre lui," as he pathetically wrote to Jusserand. As to the active personalities of the war, history and posterity will decide; but no figure in America stands out to our imagination like that of the mining engineer Hoover, a man neither elected nor appointed to his mission, who rose above the sea of obstacles and opportunities by his own strength and natural buoyancy, who handled matters of business and state of world importance—and held his peace about the rest.

The rest of us, who are eternally busying ourselves about other people's shortcomings and duties, are wondering, among other things, "What will Hoover do?" The obvious and usual thing will be for him to accept the presidency of some great corporation, become a power in Big Business, a captain of industry, and so pass on. Our guess and belief is that he will not do this. Having given so much of his vital force to America and the world without the ordinary recompense, he must give the rest. Abilities such as his are not private property, but belong to the commonwealth.

There is much talk of Hoover as President, and there is no one we can think of that we would rather see in the Executive chair; but the position of this, in view of all the machinery of party and politics, seems very doubtful. In making his decision doubt-

less there will occur to our miner the example of Roosevelt himself, who, when he had once dedicated himself to public work, took up with energy whatever labor of that type came to him, whether it were small or large.

Power for Prospecting Plants

THOUGH the use of hand methods for drilling in the work of prospecting, as well as the hand windlass for hoisting, will continue indefinitely as convenient and simple, requiring the minimum of equipment, modern prospecting often makes use of power for these two important operations. Compressed air is invariably used in drilling where it is obtainable. It can also be used for hoisting, and for this operation air hoists of convenient size and adaptability are afforded by the machinery market. If electric power is available from hydro-electric lines, or from a central power plant, electricity is in most instances the most convenient power agent to use for driving the compressor. It is also used for hoisting, and is more economical than a compressed air driven hoist.

If it is necessary to generate power, there is considerable latitude of selection. Steam power for hoisting and air compression is simple and effective, and results in a compact plant. Fuel is the vital question. With cheap and easily procured fuel the steam plant is a good arrangement. In the absence of fuel or where fuel costs are high, the internal-combustion engine is the next possibility. The advantage of this form of primary power is the relatively small consumption of gasoline, distillate, or fuel oil per power unit generated. This important fact is vital in transportation and storage. Gasoline and distillate engines have been used for prospecting plants, both for hoist operation and for driving air compressors. It is doubtful whether they have been entirely satisfactory.

The semi-Diesel engine is less complicated and is successful to a high degree. We believe that it is deserving of greater attention from the mining field and that it is well worth the attention of engineers who have the selection of mechanical equipment for prospecting plants. In this issue we present a short descriptive article on a tandem type of semi-Diesel driven air compressor which indicates the progress made in manufacturing power machinery suitable for the small mine and prospect.

THE growth of the Journal calls for an expansion of its staff, which is already so adequate that it has been divided between New York and San Francisco without interfering with efficiency at either end. We should like applications for the position of an editor to take especial charge of our petroleum section and another to take special charge of the non-metallic mining section, which we purpose introducing as soon as present mechanical difficulties have been passed. Applications should be addressed to the New York office.



SUMMIT OF FAMOUS POTOSI HILL; CITY OF POTOSI BELOW

Photographs From the Field

FAMOUS POTOSI HILL, POTOSI, BOLIVIA. ALTITUDE, 16,001 FT.



Ore Contracts—Part I.

The Terms Under Which Ore is Bought and Sold Should Be Clearly Expressed in Plain Language, So As to Avoid Subsequent Misunderstandings—
Provisions Should Be Legal and Friendly

BY C. A. GRABILL

THIS article is not intended to be a legal disquisition on the law of contracts. I am not a lawyer, and do not intend to discuss the matter from the legal standpoint. A great deal has been written about the subject, from the business standpoint, and there have even been several legislative investigations, notably one in Colorado a couple of years ago; but it seems to me that something may still be said that is both relevant and material to the subject.

The first question is: What is an ore contract? To my mind it should be a memorandum of friendly agreement setting forth as plainly as possible, and as simply, the terms under which one of the parties signing will buy and the other sell the ore which is the subject matter of the agreement, the terms being allowable under the statutes and legally stated in accordance therewith in such manner as to avoid subsequent dispute as far as may be. Unfortunately, these agreements are not always friendly, and sometimes one party tries to slip something over on the other; and they are not always clearly stated, and the unforeseen happens—hence the disagreements and lawsuits.

With reference to one of the latter, I was once told by an authority that no contract was ever written that did not contain loopholes big enough to drive a team of horses through. This is stating the matter in somewhat stronger fashion than I think it deserves; nevertheless, one of the most important points of any contract is the character and integrity of the signers. Still, it is also well to know the reason for, and the meaning of, the various clauses, and also of those clauses which for one reason or another have not been put in writing, for there invariably are such, the interpretation of which subsequently will depend on custom, argument, or the court.

The complaints usually made against ore contracts are that they are too complex. This applies not only to the long and complete contracts covering large amounts for a term of years, but also to the comparatively simple schedules issued by various companies for the purchase of ore in the open market without definite contract. The latter, however, contain such statements as "as usual," or "in accordance with the custom," or similar phrases, that really cover large parts of the more formal contracts, and are accepted by the sellers, usually without question though sometimes with more or less grumbling. I am not referring here to some of the lead schedules such as are reported by the Colorado Commission, which are not only complex but foolishly and indefensibly so.

In this article I shall attempt to point out most of the subjects to be covered in a fairly complete contract and typical schedule, with an explanation of the more important. The full contract form is much longer than many of those in general use. In fact, one company on the Pacific Coast does not make any contracts, but simply issues a schedule of prices subject to change on notice. On the other hand, another company endeavors to tie up all shippers by a definite formal contract as far as they have desirable ores, buying only the small and more or less undesirable lots on open prices.

All this brings up the second question: Why any contract at all? There are two very different classes of reasons: the first is concerned with matters of policy and the second merely with the setting forth of the terms in a way to avoid later disagreements or trouble.

One of the reasons of the first class may be that the buyer is willing to offer a rate so favorable to the seller that the former will make no immediate profit, expecting to recoup through the development of more or better ore in the seller's property. In this case his only protection is a long-term contract which will prevent the sale of the better ore to competitors when found. The same thing will apply if the buyer wishes to aid the development of a property by a loan. Another, and perhaps the most important of all, is that the buyer is assured of a steady supply of ore of more or less definite character on which he can base his operations, and from time to time he can take advantages of opportunities to contract other ores complementing the first and extending his operations under terms more favorable to himself, or to the shipper, as the case may warrant, than if buying in the open market from hand to mouth.

Smelting companies, and especially commission agents (who are gradually disappearing), are not charitable associations, and the buyer may wish to take advantage of the temporary condition of the market to make a contract for a term of years at better than the average price, or to take advantage of the temporary or immediate lack of competition to tie up the ore supplies so that competitors can not enter the field, or merely to grab everything in sight.

Conversely I have never seen any shippers that were willing to contribute to the welfare of the buyer any more than was absolutely necessary, and they frequently take advantage of similar conditions in their favor. Generally, however, the important factor in their case is the same as in the buyer's; that is, the possession of a constant market with

conditions as fixed as possible on which operations may be based.

The seller has nothing to limit his efforts to beat down the smelter tariffs, but the buyer—smelter, mill, or agency—is always faced by the goose-and-golden egg proposition; that is, the lower the amount paid for ore, the less tonnage available, or the greater the profits per ton, the less tons on which to profit. This is a very real limitation and constitutes a reason for the frequent aid extended to shippers in the way of advances, and also for many of the terms and complexities of the schedules, as will be seen later.

Now comes the question: Why the complexity? The authority previously quoted also said that the shorter and simpler a contract is, the better it is. Though not approving the complex schedules previously referred to, I do not agree with this statement, unless the shorter form covers the same points as the other, and even then I have my doubts. If it is true, a flat rate and simple statement of sale would be all that is required. The use of the Jackson Price in Chile was an attempt to do this, but the results are not satisfactory, and a great many things are done "in accordance with the custom" that subsequently cause dispute or trouble.

Anyone who has had the patience to read this article is probably a potential shipper. For the sake of argument let us assume that you are a buyer and that I wish to sell you some ore from Timbuctoo, or from an undeveloped mine. Do you wish to purchase it at a flat price? I think not! First we must ascertain how much valuable metal it contains, and how much of each metal, if more than one, and agree on a method of determining the price in these days of violent fluctuations, and a treatment charge to cover your expenses, and deductions for what you expect to lose, and all the rest of the things that make up the schedule. Omitting consideration of all these details, and assuming that the schedule is agreed upon, are we all right? Far from it. Where is the ore to be when the price is paid? Presumably at the buyer's plant, but not necessarily so. If so, and delivery is by railroad, who pays for the unloading? Supposing you are asked for an advance, to be protected by the ore in transit, and it is lost in transit. Who loses? Who loses if the advance is protected by a bill of sale and the shipper fails to take out insurance or send advice of shipment in time to permit it to be done? If the shipper pays for unloading, who pays for demurrage? Taxes? Who pays them, and what about new taxies levied during the period of liquidation or treatment of the ore?

There are about a thousand of these questions, most of which can be answered definitely by a well-written contract form. Of course, many of them are answered by the statutes covering the case, or by the common law, but many are not, and a well-written form will save much annoyance, not to say grief, later.

It may appear to the reader that there are too many of these questions to be answered, but it must

be remembered that most of them are important only if left unanswered. It makes little difference whether the shipper pays the freight or the buyer does it. The freight has to be paid, and if the buyer pays it he will simply put it in the treatment charge or as a deduction, probably with a little additional charge for his trouble.

In general, little argument need be wasted on the preliminaries, only noting them and their effect on the schedule, which is the main question at issue, and to which real study should be given, not only as a means of determining how much the seller is to receive for his ore but to see that it is so arranged as to encourage the production of that grade and class of ore which will result in the greatest profit to both parties. This is a most important part, frequently neglected. I refer to this again when discussing the schedule.

The comparatively minor importance of the preliminaries, except in a few special cases, accounts for the blank forms used by some companies, but they frequently omit important things, though rarely intentionally, and often from oversight. A contract form prepared by a buyer or association of buyers will not ordinarily give special attention to the protection of the seller's interests. But if the form is complete the seller has ample opportunity to study its effect on the main question before settling that.

In the British shipping industry the forms have crystallized into the well-known "charter parties," with their ancient phraseology, each clause of which has been clearly defined by court decisions for many years. In the United States the preliminary and final clauses usually follow a fixed form of words, for the same reason. In Spanish America the civil codes prescribe certain requirements for a contract and certain civil attributes that the contracting parties must possess. The former, such as the date, place, signers' names, and language, simply appear as part of the contract, but it is customary to set forth the latter in the opening paragraph. This is not always essential, but if not done, proof that both parties had the necessary qualifications becomes the first thing in any subsequent court procedure, and it is probably best to follow the customary form.

All these matters of form being cleared away, most of the points to be covered may be grouped under the following headings:

1. Date of contract and time element.
2. Source of the ore.
3. Character and classification of the ore.
4. Tonnage involved.
5. Place of delivery.
6. Shipping expenses and responsibilities.
7. Weights.
8. Sampling.
9. Moisture.
10. Assaying.
11. Comparison of assays and splitting limits.
12. Umpires.

13. Shipper's representative.
14. Schedule of payments and deductions.
15. Quotations.
16. Exchange.
17. Taxes.
18. Advances.
19. Liquidations and settlements.
20. Manner and place of payments.
21. Deleterious substances—see schedule.
22. No payments to be made for things not provided for.
23. Force majeure.
24. Penalties, special clauses, etc.

This forms a fairly good list, but several of the items, particularly 3, 6, and 14, are capable of considerable expansion, though most are simple and nearly all are capable of being covered by standard forms. Omitting consideration of No. 14 until the last, they will be taken up in order as follows:

1. Date of Contract

This clause should state the date of the beginning of the contract, and, if possible, the time of its duration or termination. If there is no definite period of duration, the method of termination should be given. Contracts are of two types: time contracts, for a definite period or until cancelled by one or the other of the contracting parties, and tonnage contracts, for the sale of a definite number of tons. In the case of tonnage contracts, time limits are often inserted. Frequently contracts are made for short or trial periods, with the option of extension, on due notice or before a certain date. Care should be taken that the time and manner of giving this notice is clearly stated, and similarly if cancellation is provided for. Mines are not like quarries, and if a miner contracts to deliver 100,000 tons of ore, and conditions change, it is just as well to be sure that the contract provides some method for its cancellation if he finds that he can produce only 1,000 tons per year; otherwise his grandchildren may have a whack at it.

2. Source of the Ore

It is customary to specify from what mine, or group, ore may be taken for sale under the contract. If this is not done, a contract may be offered to the owner of a mine producing ore of a kind particularly desired by the buyer, and the owner may subsequently acquire another property producing similar ore but lacking the characteristics which made the other desirable, or the owner may have been offered an extremely favorable rate in order to induce development of a new low-grade deposit, and later acquire an old high-grade shipper, expecting in perfect good faith to dispose of the ore under his favorable contract. Two ores of similar composition chemically may be of such different structure physically that they will yield entirely different results on treatment. It behooves both parties to the contract to understand clearly its limits as to the intended source of the ore.

3. Classification of the Ore

Similarly, the contract should specify whether the ores receivable under it are run-of-mine, coarse, or fine, screenings, concentrates, dump ore, or other product alone or mixed. This may seem at first sight unnecessary, but it is difficult to make a schedule cover everything. The shipper may be calculating his expenses, on the basis that he can screen his dump, obtain a product profitable under the terms of the contract, mix it with the mine ore, and profit by the reduced "overhead." The smelter refuses to receive the screenings, on the ground that they are not ore, and the shipper finds himself "stuck." Or the smelter may have offered a schedule with a 10 per cent free limit for zinc, on the understanding that the mine ore averaged 5 per cent Zn, varying from 2 to 10 per cent. The shipper finds that he can work the dump and obtain a high zinc product previously rejected. By mixing it with the mine ore he obtains a product within the terms of the contract but containing 10 per cent Zn, thus defeating the intent of the contract.

The contract should also specify what classes of ore are intended to be included in the agreement, that is, silver, gold, copper, lead, sulphide, oxide, or other, and define their limits. A recent failure to do this came to my attention. An ore buyer had offered a contract for the product of a certain mine known to produce copper ore, with little gold and silver. The treatment charge was made nominal, it being the intention to take the profits in the form of deductions from the price paid for copper. The miner, considering the low treatment, found that he could work a silver vein on the property previously unworkable, and proceeded to ship a carload of the ore under the contract. There were no copper deductions, and the ore could be treated only at a loss. If the two were mixed when did the copper ore cease to become copper ore? If it was copper ore at 2 per cent, was it at 1 per cent or at one-half of 1 per cent? Classes should be defined and limited, for the protection of both parties, or else the schedule should be arranged to cover the whole thing, which can be done but is not always convenient. In this case, if the limit is made 2 per cent, is there any reason why the shipper should not mix his 5 per cent ore with the silver ore until the combined product is about 2.1 per cent or go to a neighbor and buy a little copper ore if necessary? Not unless there is an understanding to the contrary, and understandings are poor things. It is better to write it into the contract.

In this case things could have been arranged in several ways. One would have been by making a nominal deduction from the copper price and increasing the treatment charge. The objection was twofold. To make the profit proportional to the money invested would have required a sliding treatment charge, which would have been more complicated and was particularly not desired. The expense of treating this ore was high, and the psychological effect of the high charge would have been to induce the seller to go to a competitor, even under equal conditions. Another method would have been to

leave the terms as they were and to provide for the payment of a correspondingly low portion of the silver, say 75 per cent, instead of the customary amount. Then, no matter in what proportion the silver ore might be mixed with the copper ore, the result would be the same. The objection is again partly real and partly psychological. The first is that occurrence of silver in the copper was quite possible and would have resulted in unjustifiable profits by the buyer and complaint by the shipper. The second was that the mining world has become so accustomed to expect a payment of 95 per cent or thereabouts that the payment of the lower percentage would have caused the shipper to think an attempt was being made to rob him, and he would have sought a competing buyer, even on more unfavorable terms, which were not evidently so.

4. Tonnage

The contract should state whether the total production of the mine is to be delivered, or only a limited tonnage, and if a limited tonnage, how much, and at what rate of delivery. Thus it may cover the whole output for five years, with a minimum and maximum per month, or a total of, say, one hundred thousand tons, but not to exceed three thousand tons per month, with the proviso that should the shipments be less than "x" tons per month for "y" consecutive months, the buyer may cancel, or a penalty may be attached. (N. B. There is a legal technicality to be watched.) In either case provision should be made to permit the shipper to dispose of his excess or low-grade tonnage in such manner as he may desire. Provision is frequently made to give the buyer first chance to buy it, terms being equal.

The limit is placed to prevent overwhelming of the small plants in times of high prices and also to prevent speculation in metal prices at the buyers' expense. Owing to the effect of high prices in increasing ore deliveries, falling off of shipments in times of low prices, and the inelasticity of smelting plants, reduction works frequently fail to receive as much for their metals as they pay. This is referred to again in connection with the deductions from the price of copper in discussing the schedule.

5. Delivery

It would seem that a simple statement that the ore should be delivered to the buyer's place of business would be sufficient. Sometimes the buyer shuts down a plant or has a surplus of ore, or for some other reason wishes to divert the ore to another plant and transfer his contract. For this reason the contract contains a clause to the effect that the buyer may demand delivery at some other point than that specified, on condition that any increased expense of shipment is for the buyer's account.

6. Freight

It would also seem as if the case of shipments from points near at hand would not require any statement other than that of the delivery place, but there is still the question as to who will pay unloading charges, demurrage at the buyer's plant for

which the buyer may or may not be responsible, routing and releasing to fixed valuations, insurance and penalties for violations of railroad regulations, and diversion to other delivery points, all of which may have considerable importance if advances are made before, or on advice of, shipment, or if the ore is bought at some intermediate place. And if the shipment is from some such place as Bolivia to New York, via Antofagasta, Chile, New York prices and weights to govern, and advances, consular invoices, customs dues, lighterage, port charges, exchange, interest, commissions, sacking and resacking, losses in transit, differences in weights, all in two languages, and two systems of weights and measures and three or four currencies enter into the question, then the bookkeeper is in for a busy afternoon.

7. Weights

The weights that govern are usually the buyer's receiving weights taken in the presence of the shipper's representative, but sometimes vice versa. If outside of the United States, it should be stated whether metric or other systems of weights are intended, and, particularly, the ton should be defined. I recall one contract that used four different kinds of tons. They were the metric ton, the ordinary short avoirdupois ton of 2,000 lb., the long ton of 2,240 lb., and a special arbitrary ton of 1,030 kilos. I think it a good plan to always spell the word "tonne" when referring to 1,000 kilos.

8. Sampling

The clause covering this usually reads "in accordance with the usual practice," or something similar, and it ought to be more definite. In the case of large shippers it is not practicable to hold the whole lot for resample in case of disagreement, and provision should be made for cutting a first sample by hand or machine which can be held for resample if desired. There must be enough sealed pulps (samples for final assay). The buyer requires one, the shipper one and sometimes two, and then there are the control, umpire, and one or two reserves in case of damage or loss to the others—six or eight in all. An intermediate sample is frequently cut, sacked, and sealed for reference or use in case of accident or error in the final sample. The presence of the buyer or his representative at all sampling operations is always provided for.

Excepting a few irresponsible ore buyers, it is fairly safe to assume that the buyer is going to try for an accurate sample, but in the case of smelters treating the ore in blast furnaces, there is a clashing of interests in the buyer's own domain. Good sampling requires fine crushing. Good blast-furnace operation requires coarse ore. It may therefore be seen that the smelter who treats the ore in blast furnaces will not crush the ore any more than is necessary, and, in order to keep down costs, may even be willing to take a chance on the self-correction in a number of errors. Now, the values in an ore are not usually the same in both coarse and fines, but may be greater in either one. In either case it is

necessary to watch that sample and reject carry their due proportion of both. There is no doubt that the sample taken from well-mixed fine ore will be better than that from coarse ore, no matter how taken.

Handbooks give the limits to which the different classes of ore should be crushed before cutting in each step of the process, but they are often neglected. They are based on the effect that one extra particle of maximum size will have on the sample if it should consist of the richest ore in the lot, and the tables can readily be calculated if not at hand. In the case of ore containing free gold, the figures are rather startling to the uninitiated.

9. Moisture

The moisture determination is, I believe, the most unsatisfactory detail of the whole business. In most contracts the clause referring to moisture merely says that there will be a minimum deduction of 1 per cent for moisture. This is supposed to cover the dusting loss in dry ores, and I believe it to be fair. In Chile operators used to have a custom of making no moisture determination at all. The sample was cut down, bucked, and assayed without more ado and supposed to represent the ore pile without further question. This was all very well around Antofagasta, where it rains once in ten years, or at Iquique, where it never rains at all, but when it comes to ores from Concepcion, where it rains all the time, the matter bore quite a different aspect, because the process of bucking the sample will partially dry it; in fact, the ore will not pass the screen until fairly well dried, and the sample then indicated more value in the ore than it actually contained.

But how is the moisture to be determined? It is the custom to take a small sample at the time of weighing the ore, weigh out from one to three pounds and dry them in a steam room until no further loss of weight takes place, usually from twenty-four to thirty-six hours. But in the case of a carload consisting of fine ore and boulders of from 10 to 400 pounds each, no one can tell me that the sample is accurate. Furthermore, in climates like Arizona there may be a thin layer of dry ore on the surface and a wet interior, or in the rainy season conditions may be reversed, and I have known of one enterprising shipper, who observing that the smelter people were in the habit of opening up the middle of the carload and excavating a short way towards the ends until a representative face was opened up, and then taking the moisture sample there, conceived the bright idea of turning the hose on the ore in the ends of the car while loading. I hate to tell what the moisture was on the sample taken from the next car after this appeared, but I believe the practice stopped.

It is not practicable to wait until the car is unloaded and crushed to take the sample, as it may dry out appreciably, and the same thing happens if a large sample is taken and put through a crusher. A small sample will dry on its way to the testing room if not placed in a non-absorbent and covered

container; otherwise, a tin pail. The moisture is usually in the fines to a greater extent than in the coarse material, and the tendency is always to take too great a portion of fines. But if the ore comes from a wet mine in a dry climate the fines may dry out in shipping and the interior of the large pieces remain wet. The best thing that can be done practically is to take a fairly large sample, breaking up a few of the larger lumps with a hammer and dry about ten pounds on steam plates or coils in a steam room with constant circulation of air. Steam-heated air baths, with constant circulation of heated air, held at a fixed temperature are better, though rather more expensive to install.

There is one kind of ore that should be watched for as it invariably causes disagreement. This is ore containing combined water such as the zeolites, gypsum, and like materials. They are not uncommon in the Southwest and may contain as much as 14 per cent of water and still be dry and dusty. These ores will sometimes reabsorb water after drying on the steam bath. In this case the samples for assay should be dried under the same conditions as the moisture sample and sealed in glass bottles, or else the sample packet should be marked "This sample is hygroscopic and should be dried at 105 deg. C. (or whatever temperature is used) before assaying." Otherwise there may be a substantial deduction from the weight of the ore without a corresponding increase in the assay. Even though the sample packet is properly dried, it may absorb moisture before reaching the shipper, or, in case of difference, before reaching the umpire, and if the umpire fails to dry it, or dries at the wrong temperature, injustice will be done. Roasted ore high in iron sometimes has the same property.

Some ores, such as those containing gypsum, will dehydrate to different extent, depending on the drying temperature. It is ordinarily assumed that it does not make any difference what temperature is used in drying a sample provided that it is below the ignition point, and that the moisture sample and assay sample are dried at the same temperature. However, if the treatment charge is based on the dry weight, or there is a sliding scale, it may have considerable influence in case of the zeolites previously mentioned.

10. Assaying

It is customary to specify that the silver shall be determined by scorification and the gold by crucible methods, the supposition being that these are the best methods, respectively. This is not always true, as some silver ores give higher results by scorification, and others by the crucible method, and the same holds with gold ores. Fulton says that the scorification method is not to be trusted for silver ores containing much zinc or tellurium.

The fire assay will reproduce its results very closely if repeated under the same conditions, but if "uncorrected," as is the custom, it is only a close approximation to the true result. Fortunately, the richer the ore the greater the accuracy in per cent,

and the variation is not large. This is again referred to in considering the silver deduction in the schedule.

Lead should be determined by wet methods, of course, and if the dry assay is used in the schedule as a base for prices, a statement should be inserted that it is to be determined by deducting from the wet assay from $\frac{3}{4}$ per cent to 2 per cent, as the case may be. There is only one use for the fire assay for lead under modern conditions, and that is to obscure something, but it still persists from force of habit.

Wet methods are not subject to the losses of fire methods; therefore I do not consider it wise to specify what particular wet method is to be used, and the chemist should be asked for accuracy of results, not methods. This increased need for accuracy has driven out the cyanide method for copper except for a few limited purposes.

The one important exception to the above statement is the determination of the "insoluble." It is in almost as bad a position as the moisture question. On some ores it gives results that are really of value, but in many cases it does not determine anything except the buyer's determination to pick up a few stray cents. It is supposed to give the silica plus alumina, but does not, and the result may be high or low. In cases of garnets or other complex silicates it will yield almost any results wanted, within a range of several per cent, depending on the kind and amount of acid added, the manner of adding it, the time of digestion, the number of times evaporated to dryness, and helps keep the umpire assayer in pocket money even in times of H. C. L. It is a cheap and simple assay to make, and that is all that recommends it to the shipper. It is likely to err on the high side, and that is no insuperable objection to the buyer. It brings in the business, and that recommends it to the umpire.

In some of the cases the shipper will weigh out a portion in the beaker, carefully avoiding the small ones, fill up the beaker with suitable acid, leave it on the stove over night, filter sometime next day, and report an insoluble that is satisfactory from his standpoint. (N. B. Silica is materially soluble in acids under certain conditions.) In the meantime the buyer picks a beaker, a small one, adds as little acid as his conscience will permit, evaporates to dryness, filters promptly, and the poorer guesser pays the umpire \$3 to tell them that they are both wrong. Barium sulphate is insoluble and does not have the properties of either silica or alumina, and silver ores frequently contain large amounts.

11. Comparison of Assays

The contract should give the time and manner of comparing assays, preferably by the simultaneous presentation of certificates of assay covering the shipment in question, buyer's assay to govern; but if the seller is not satisfied with the buyer's assay, then the sample is to be umpired, with the understanding that the result, either buyer's or seller's, whichever is closer to the umpire assay, shall govern, and the loser pay the bill. Let the shipper who thinks that it is not fair to let the buyer's assay

govern compare this method with the one he is now using and consider what would happen. The effect would be enhanced if there were a more substantial penalty attached than the bill for the umpire assay.

If splitting is authorized by the contract, there is more carelessness about the results, as each side feels that its figures are not final anyway. Of course the knowledge that any carelessness of magnitude by one party will be taken advantage of by the other, either to split or refer to umpire, has a wholesome effect, but still causes much umpiring. In the Colorado investigation one witness testified that he umpired everything. In such cases considerable trouble and expense would be avoided by referring the original sample directly to the umpire, but they are entirely unnecessary.

Occasionally splitting limits are provided in the contract. I do not believe in them at all. In about twenty years' experience I cannot see any particular improvement in the analytical work as actually carried out in ore buying, and I believe it to be due largely to the use of wide splitting limits. The ordinary limits are 1 unit (per cent of the ore) on silica, iron, lime, and sulphur; .5 unit of copper, and .5 oz. silver. The ordinary error of determination on silica, iron, lime, and sulphur is, or ought to be, within .3 per cent, and on copper from .03 on low-grade to .1 on high-grade ores. Owing to dust, impurities in the chemicals, material dissolved from the containers, and other causes there is a tendency for all results to be high. The assayer for the buyer knows this, and in trying to avoid it is likely to overdo the matter slightly. Similarly, the shipper's assayer is going to be sure that he gets all the metal in the ore. The result is a difference, not of .3 but .6. Knowing that there is a compulsory splitting limit, each one, in perfect good faith, will think that the other is trying to "slip one over." Unless stopped, the final result will be two spoiled assayers and inability to get results on a simple determination that will check within reasonable limits. Anything that permits such a state of affairs should not be allowed.

Imagine this condition: A contract with compulsory splitting limits as quoted, an unscrupulous but able shipper (I have seen them), a narrow margin of profit—say, \$1 per ton. What would you do if you were the buyer and your assayer returned absolutely correct results, and on comparison you found the shipper reporting .4 high on Cu, .8 low on insoluble and Zn, .8 high on lime and iron, and copper was worth 20c. per lb., lime and iron worth 10c. per unit, insoluble penalized at 15c. and Zn at 25c. per unit? And vice versa, suppose you are the shipper and the buyer is reporting low?

I repeat, compulsory fixed splitting limits should not be tolerated, unless they are made within the error of determination, say .1 for copper, .4 for silica, iron, and lime. Then if a substantial penalty were added for failure to come within the limits, or to have subsequent confirmation by the umpire, such a penalty would be of value.

If the buyer's assay governs, many shippers overlook the effect of the curve of probable error. In any group of assays there is always a slight variation above and below the true assay. Now, on comparison, if the buyer is high and the shipper is low (that is, if that particular assay in the buyer's group has been one of his high ones and it has been one of the seller's unlucky days), the shipper will accept the result and not umpire. If both are high or both low the shipper will also accept the results, but when the turn comes around for one of the buyer's low results to fall with a shipper's high one, the shipper will umpire. Now, the umpire will also have high and low results within the limits of error, and it is therefore to be seen that one-half of the buyer's lowest group are cut out and replaced by the umpire's or shipper's, at least half of which are higher. Thus there is a margin against the buyer.

12. Umpires

The contract should contain a list of umpires to be used in rotation, and provision made for striking out or adding more as desired. It is wise to watch the umpire work carefully and select suitable ones. They frequently receive a great deal of undeserved blame, but it is not all undeserved, and there is always the personal factor. I recall that a number of years ago we obtained excellent comparative results on copper from a well-known New York assayer, the results checking our own to within .1 per cent on 60 per cent material, and another New York firm returned results agreeing wonderfully well, but uniformly about .06 per cent higher. I consider both high class workmen, but my choice as an umpire would depend on whether I were buying or selling. On the other hand, neither one reported concordant results on gold and silver. At the same time we were able to obtain settlements on a gold ore that required close agreement between three assayers, one in Denver, one in San Francisco, and one in Arizona. But the Denver man fell down on the coppers. This was all quite natural. Denver did very little business in copper, and was a gold and silver center. New York did very little fine work, but its analytical standards are high. That holds true today. There are only a few assayers in the West to whom I would care to send work requiring great accuracy in arsenic, antimony, and bismuth, because there is little or no call for that class of work.

The assaying of ordinary gold and silver ores is fairly well standardized and presents few difficulties, but how about the few unusual ores that require special treatment? How far should the umpire go, or be instructed to go, in the effort to determine the actual contents? The cupellation loss on low-grade ores is greater in percentage than on high-grade. Should the umpire combine lead buttons by scorification for cupellation in order to reduce this loss, or not? The answers to many such questions are left unmade. When required they should appear in the contract. In their absence the umpire staggers along and does the best he can with occasional kicks from both parties.

At present anyone, honest and competent or otherwise, may open an assay office and solicit trade. The smelters offer lists of names of men known to be suitable for selection as umpire by the sellers, and will usually add new ones to be tried out if so requested. I believe that the suggestion that public assayers be examined and licensed by the state is an excellent one. Licensing on the basis of a simple fee and registration is of no value, but if done on the basis of a real examination or some form of civil service competition much good might result.

As a class the assayers rank high in integrity, but I have known of several fakers who have lived for many years on the fees of the gullible and who were a source of injury to the rest of the fraternity. Their usual claim is that they can obtain more gold or silver by their methods than can the regulars, and they cause considerable discontent among the inexperienced.

13. Shipper's Representative

Provision is always made for the presence of the shipper or his representative at the weighing and sampling. This is as much for the buyer's protection as the other's. Caesar said "Men are prone to believe that which they earnestly desire," and the miner still retains that characteristic. He usually believes that his ore contains more than it actually does, and if he or his representative is not present at the sampling, there is often a howl when the returns are in.

14. The Schedule will be considered later.

15. Quotations

The contract should specify what quotations are to be used and where they are to be obtained. They are, variously, those of the date of receipt, date of sampling, average of the week of receipt, or thirty or ninety days after receipt, the last to throw the speculative element on the shipper or to avoid loss to the buyer during the time required for treatment of the ore in periods of falling prices. The contract should also state what is to be done if the date falls on a holiday, or quotations are suspended for one cause or another. Copper quotations are usually for electrolytic copper, and for either wire bars or cathodes, the latter being the lower. If London prices are used, "Standard" is the base though "electrolytic" is quoted and formerly "Chile Bars" and "Best Selected" were used. "Standard" is not as high a grade as "electrolytic," and consequently is lower in price. It is always quoted in sterling per long ton. The most extensively used quotations are those of the Engineering and Mining Journal. Lead quotations are those of New York, though formerly London for soft Spanish lead were much used.

16. Exchange

Exchange applies only to contracts involving foreign countries, and the local conditions must be carefully considered. As with quotations, care should be used to specify the time and source, and also whether buyer's or seller's or average exchange

should be used. In Chile, for example, preparation must be made for three exchanges.

17. Taxes

The contract usually says "All taxes are for the account of the seller." Quite simple and clear! The last few years have taught several lessons in this line. Supposing that you are mining in Mexico, and you sell your ore on the basis of quotations ninety days after delivery, and you have delivered your ore, and the government then puts a 10 per cent production tax on the metal contents to be collected on export. Who gets stuck and how much? Quite so!

It is advisable for the shipper to allow the insertion of a very complete clause covering this point, because the smelting is usually on a comparatively narrow margin, and if not protected in that way the company will protect itself elsewhere in the contract, with a good broad margin to cover the risk involved. Agreements frequently specify "all taxes in force at the time of delivery of the ore or within ninety days thereafter," to allow time for treatment. During the war, in countries like Chile, import taxes in the countries to which the ore or its products were shipped for refining were included.

18. Advances

Most shippers, in common with every one else, are chronically short of funds, and want advances. The terms under which they may be obtained, if at all, and the method of liquidation, should be included. The smelter may advance on receipt of the ore, or on advice of shipment, and may require provisional bills of sale, insurance of the ore in transit, or some other method of protection.

19. Settlements

Liquidations and settlements may be made immediately on comparison of assays, on receipt of umpire returns, or monthly. The time and manner depend much on the method of bookkeeping by the two companies. Usually provisional liquidations are made at the time of comparison of assays, and final settlements on acceptance of the final assays by the shipper, or on receipt of the final quotations when these are of some deferred date.

20. Payments

Time, manner, and means of payment should be specified. The contract should state whether settlement for all shipments is to be made on the first of each month, or whether settlement of each lot is to be made separately; whether settlements are to be made by cash payment to the owners of the product shipped, or to the owner's representative; whether payment is to be made by check or by draft; on what city exchange is to be drawn; and, if settlement is to be made in foreign countries, in what currency payment is to be made.

21. Deleterious Substances

These are occasionally prohibited above certain limits. Chlorine is believed to cause substantial losses of silver and copper. In lead smelting, arsenic and antimony cause the production of speiss and poisonous fumes; in copper smelting they cause

poisonous fumes only. The time is approaching when they will be valuable elements, though there is now more than the market can absorb. They can be easily recovered by baghouses or Cottrell plants, but the cost is still equal to the returns in the limited market.

22. No Payment

Some companies insert in the contract a clause that no payment will be made for any substance for which payment is not specifically provided. Many ores contain minute amounts of cadmium, bismuth, nickel, and other substances, in amounts so small that the cost of determination would be more than their value. They are later recovered as byproducts, and the clause is simply intended to forestall argument.

23. Force Majeure

Both parties should be relieved of the burden of the contract in case of force majeure, acts of God or nature. But what is force majeure and how is it determined? War undoubtedly might constitute a case of it, and so might insurrection. Would riots, strikes, lockouts, or simply shortage of labor be so regarded? Would the closing of the mine, mill, or smelter constitute proof of it, or might such action simply be construed as an attempt to break the contract? Would increase of cost of essential materials, sufficient to cause a loss in operating, be force majeure? In case of a suspension of operations due to this cause, does the contract terminate, is it simply suspended, or is it extended for a term equal to that lost? The contract should as far as possible answer these questions, although the very phrase used, "acts of God," indicates the impossibility of foreseeing all of them.

24. Special

These cover provisions for the transfer of the contract, or any unusual condition. There is often an article providing for reference of all disputes to arbitrators instead of to court proceedings. What should be done about shipment of ore which contained less value than the charges against it? Should the shipper be expected to pay the difference or not? The answer, of course, depends on the local conditions.

All the above subjects might come up in connection with the ordinary ore contract, the simple agreement of purchase and sale. They may not be written, and many are simply accepted as a matter of course, or, as the Chileno puts it, "Por la razon o por la fuerza." It does seem complex, and we have not touched the real meat of the coconut, the schedule, but it is not as bad as it seems, and three or four typewritten pages will cover the whole thing so as to answer ninety or more per cent of all the questions that may arise. That is the reason for the forms in common use. They are not to "slip one over," but to avoid all possible disagreement and bad feeling, and only exceptionally contain a "nigger in the woodpile."

[To be continued]

American Mining Congress Meets at St. Louis

Problems of Mine Taxation, Gold Situation, and War Minerals Relief Considered in Special Conferences—Protective Tariff Session Draws Small Audience—
Exposition of Mines and Mining a Success

THE convention of the American Mining Congress that was held in St. Louis, Mo., on Nov. 17 to 21 can be recorded as a profitable experience by the delegate or visitor who was fortunate enough to be able to attend it—and actually did so. A most valuable feature of any convention is the opportunity it affords to meet others, in this case from all parts of the country, who are engaged in similar lines of work and are troubled with the same problems. This feature together with the fact that some of the most vexing questions of the day were scheduled for discussion at the St. Louis convention should have brought together a much larger number of men representative of the American mining industry than were actually seen at the various gatherings and sessions during the week.

The attendance, it may be said, was not bad, but it should have been better. The convention was well advertised. The official call sent forth by the Congress well in advance of the event was responded to by the appointment of delegates of all degree, many of whom were not much in evidence in St. Louis, at least in the neighborhood of the Planter's Hotel or the convention halls. St. Louis, its Chamber of Commerce announces, is at the cross roads of the country. This in itself is, perhaps, as much of an inducement to the new arrival to continue his journey on, as it is an inducement to remain. At any rate, some of the delegates evidently went absent without leave but enough appeared to make the convention a success.

It may here be remarked, without any attempt to flatter, that the importance of the American Mining Congress to the mining industry of the United States was well demonstrated at St. Louis. The Congress styles itself "the fighting organization of the mining industry." It is the vehicle through which this industry can reach the legislative bodies at Washington as a concrete and organized force. An organization such as this is needed. It is needed especially in view of the fact that in many states the mining industry is forced to bear an unjust burden of taxation to the advantage of other lines of industry. For example, it may be cited without further comment, that the mining industry in Utah is now confronted with the necessity of paying seven different kinds of state and Federal taxes.

In giving publicity, as it does, to new developments in mining legislation, both through its bulletins and through the Mining Congress Journal, and in acting as a medium of expression on legislative matters for the industry, the American Mining Congress performs a function carried out by no other body in the country. The St. Louis convention debated many topics of current importance and before

it adjourned expressed its opinions and recommendations in the form of resolutions, some of which are to be brought to the attention of the national Congress at Washington. The questions of mine taxation, of remedying the present situation of gold producers, of obtaining more liberal legislation for the relief of war mineral producers, as well as those of wiping out bolshevism and promoting better relations between capital and labor were among the subjects that received the attention of the convention.

Program Covers Wide Range of Subjects

It was physically impossible for a delegate to have attended all the sessions of the convention. The lengthy program and the limited time made it necessary to hold simultaneous sessions of which the delegate was free to take his choice. In all, there was the National Gold Conference, the War-Minerals Conference, the Tariff Conference, and a session on mine taxation. The program also included the National Conference of Schools of Mines, the first of its kind to be held in the country, the National Oil Shale Conference, two sessions on subjects relating to the coal industry and one on safety and welfare work, to say nothing of two informal dinners. And poured round all, like the ocean in Bryant's "Thanatopsis," was the National Exposition of Mines and Mining, at which about 150 exhibits were shown. To get into the main convention hall it was necessary to pass a great display of mining machinery and mineral products, so that no effort was required if one desired to visit the Exposition.

Bulkeley Wells Points Out Task of Congress

Preliminary conferences of the committee on standardization of mining equipment took place at the convention headquarters at the Planter's Hotel on Saturday and Sunday, but the Congress, and the Exposition as well, were not formally opened until Monday afternoon, Nov. 17. This occurred when, after speeches of welcome on behalf of various St. Louis organizations, Bulkeley Wells, of Denver, president of the American Mining Congress, made response in his opening address. Mr. Wells stated that the chief task of the Congress was to develop a plan for readjusting industrial relations that will be satisfactory to employer and employee.

"There are no sound objections to collective bargaining, provided the conditions surrounding it are sound," said Mr. Wells. "Indeed, it furnishes the only practical method of dealing with large numbers of men. But the parties to such a discussion of wages and conditions of employment must, actually and with duly conferred authority, represent at least a majority of those concerned, and must be firmly and equally bound in their final agreement.

"Labor organizations should be compelled by law to incorporate and thus become as legally and financially responsible for the observance of their contracts as are employers. The power of organized labor to do good and to do harm is amply proven, but the responsibility for harm and injustice done is too often evaded.



BULKELEY WELLS
President of American Mining Congress

"As proof of the sincerity of the words of its leaders, organized labor should emphatically deny the assertions that its purpose in demanding shorter hours of employment is to limit production. Most reasoning employers will no longer oppose an eight-hour day. Eight hours' work, with eight hours' recreation and eight hours for sleep, can hardly justify complaint on the part of labor. Fewer hours of employment will inevitably increase the cost of all production and develop indolence and extravagance on the part of labor. The one fundamental cure for the high cost of living is, naturally, increased production."

Following Mr. Wells came Van H. Manning, director of the U. S. Bureau of Mines, who as personal representative of the Secretary of the Interior, formally declared the Exposition open. Dr. Manning in his speech drew attention to some of the principal problems confronting the mining industry. He referred to the coal strike and, while avoiding mention of the merits of either side, said he felt it his duty to discuss a problem that has concerned both miners and operators in the past, namely the frequent periods in which the bituminous mines, especially in the spring and summer months, are not at work from causes not under the control of either the operator or the miner.

"In the five-year period, 1912 to 1916, the time worked in the bituminous mines ranged from 195 to 232 days of a possible 310 working days," said Dr. Manning. "In 1917 the mines worked 243 days,

and in 1918, under abnormal war conditions, 249 days. In round figures, the mines are idle for one-third to one-fourth of the time in ordinary years. The reason is well known to you that: bituminous mines are opened and manned on the basis of the maximum or winter output, which in large part arises because consumers reduce their purchase of coal in the spring and summer months.

"Although some bituminous coal does not stock well, yet there are ways and means by which this can be done, but it requires careful storage, and the storing and rehandling costs money. The trouble is that the consumer does not perceive the cost of this to himself. He thinks to himself, it is all right for Mr. Jones to buy his coal early and in this way help out the miners, but it is going to be inconvenient for me to tie up my money so far in advance, and so does not order coal early in the season. It must, therefore, be made worth while to the consumer from a money standpoint.

"Since Congress has prevented by law agreement among operators as to price, it becomes impossible for them to take care of this situation by agreeing to sell their coal for materially less in summer and making it up in winter. It has been suggested that this could be taken care of through the Government establishing summer and winter rates on coal, so fixed that there would be no loss of net revenue at the end of the year; or, still better, establishing a sliding scale that would produce an equalization of coal purchases and shipments through all the months of the year.



VAN H. MANNING
Director, Bureau of Mines

"The effect of this would be that the miners would have steady work and there would be readjustment by which fewer mines could furnish the total amount of coal needed. This would not necessarily mean the shutting down of mines, for coal production in 1918 was 113,000,000 tons, or 20 per cent greater than in 1913, and if new mines were

not opened for awhile productive capacity would quickly become adjusted to consumption. Fewer miners would be required, and we would have the advantageous condition in this country which prevailed in Europe before the war, where the miners worked practically every working day in the year, and the operators were able to count on a regular output.

"The coal industry of the country will be greatly benefited by a good export business. We have never had a large export coal business before because Great Britain, through its dominant position in shipping, had the lion's share of the business. But England has, temporarily at least, lost the larger part of its coal export business through the curtailment of production, resulting from reduction in the hours of labor of the mines. The United States coal export trade should be placed by its own great shipping facilities on a firm basis where it can compete on even or better terms because of our more easily and cheaply mined coal. It is probable that the Mediterranean and South American regions will look to the United States for their coal supplies.

"The Government has wisely put into the hands of the operators, through the Webb-Pomerene Act, an opportunity for handling export business through a corporation by means of which operators who export coal can dispose of their coal to the best advantage."

Committee on Resolutions Appointed

The opening session was followed by the appointment of the Committee on Resolutions. Each state delegation selected one of its number to serve on this committee. Thus, it was thought, the resolutions to be adopted would be more representative of the wishes of the convention and of the mining industry at large. The value of this method, however, depends largely on how representative the so-called state delegations are in the first place. If, by any chance, but one member was present from any particular state, as happened in the case of Alaska, that member became forthwith a member of the committee on resolutions. It may therefore happen, unless the state delegations are carefully selected, that men not qualified to serve may find themselves on this very important committee on resolutions.

The importance of this committee was increased by the fact that the convention worked under the rule that all resolutions introduced to it must be referred to the committee on resolutions without debate. This procedure saved much time that might otherwise have been lost in prolonged debate on the convention floor.

The evening session was enlivened by what turned out to be a joint discussion of the railroad problem. Alba B. Johnson, president of the Railway Business Association and formerly president of the Baldwin Locomotive Works, maintained that state and federal regulation was strangling the railroads, while Clifford Thorne, of Chicago and formerly a member of the Interstate Commerce Commission, stated that the railroads during the three-year period ending June 30, 1917, showed a greater net return upon

their investment than ever before in their history, except 1907.

Mr. Johnson advocated the passage of the Cummins bill or legislation embodying its general features with some modification. He urged the creation of a federal board of transportation to pass upon railroad security issues and to determine the amount of money the roads must have from rates and to make surveys of needed railroad facilities. He urged that Congress guarantee the roads adequate rates so as to re-establish their credit and attract new capital. He recommended the substitution of federal for state regulation of the carriers.

On the other hand, Thorne characterized the provisions of the Cummins and the Esch bills as revolutionary in character and calculated to result in injustice to the shippers. He attacked the accuracy of literature and statistics now being circulated on behalf of proposed railroad legislation and rate increases, and said that a sweeping increase in freight rates would be deplorable.

"Let us have no more changes in rates, rules or regulations causing disturbance in present conditions, rate relationships," said Thorne, "or causing increased charges on traffic as a whole or increased operating burdens on individual industries, without a full, open public hearing by a disinterested tribunal where both parties are heard and know what the other side is presenting. Let us abandon all revolutionary changes which would disturb existing commercial conditions."

Samuel O. Dunn, editor of "Railway Age," declared that unless the railroads get \$6,000,000,000 of new capital during the next three years, they will be unable to cope with the growth of traffic and that increased production would do little good.

Whatever be the merits of the foregoing arguments on the railroad problem, it was to be noted that Mr. Johnson's remarks went practically unapplauded, whereas Mr. Thorne was interrupted by frequent demonstrations.

Greater Production the Need of Today

George Otis Smith, director of the U. S. Geological Survey, in addressing the convention on the following day, made a plea for greater production. He described the work of American mining engineers, backed up by capital, in constantly lowering labor costs by increasing the investment in improved mine equipment. Said Mr. Smith: "The great strides in advancing our mining industry have come through large investments in plants, and we must in fairness include a living wage for capital as well as for labor when we figure the cost of winning this or that metal from the lowgrade ores, metal which a few years ago not all the labor in the world could have won for the use of mankind.

"As the railroad's largest customer," Mr. Smith continued, "the mining industry is largely concerned in the solution of the transportation problem now so prominently before the American public. It is plain that adequate service and low rates mean much to the health if not to the very life of our industry.

yet even as large buyers of transportation we should not seek preferential rates at the expense of the rest of the public, any more than as sellers of fuel and metal we should be willing to let the Railroad Administration procure its supplies from our mines

freight rates to be determined by facts of transportation cost, rather than by what we claim to be exigencies of our own business. Even a legislature can not impose rates, however they may seem calculated to serve public interest, that would deny to the rail-



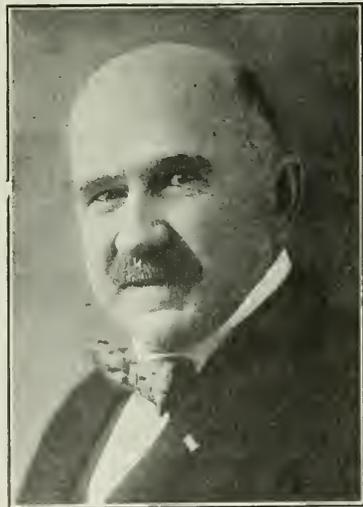
J. F. CALLBREATH
Secretary, American Mining Congress



JOHN T. BURNS
Assistant Secretary



WALTER DOUGLAS
Executive Committee



E. P. MATHEWSON
Executive Committee

and furnaces and mills at prices so related to bare cost that the public must make up the difference. You coal operators know too well how that style of shoe pinches to wish the same kind of narrow policy on the reorganized railroad system. We must allow

road the reasonable reward necessary for its financial and physical upkeep. The Supreme Court has ruled that a state law can not force a railroad to haul coal at a loss on the supposition that the profits in the wheat traffic will recoup the carrier. So it is

that in a spirit of fairness the mining industry ought to help in the adjustment of rates on a basis adequate to revive healthy conditions on our railroads.

"In its relation to the mining industry the Government needs to be fair, whether the relation is that of mineral landlord or of business investigator or of tax collector or of purchaser of fuel and metals. Disregard of established equities, ill-advised charges of bad faith, threats of commandeering, or offers of confiscatory terms are no longer warranted in these days when the Government's necessities are no greater than those of other consumers. Indeed, the principle laid down by President Wilson during the war that the Government rate should be the same as the rate to the public should have been followed by every one down the line, whatever his title or insignia of office. Now that we have had time to regain our poise, I think the public servant generally wishes to serve rather than to commandeer.

"In my opening words I suggested that welfare rather than wealth be the dominating note of our industry. But wealth may be defined as provision for future welfare, inasmuch as it is the surplus beyond present needs. To the present-day problem of industrial unrest, then, what is the answer, except to create a larger surplus? As I analyze the economic situation, surplus of production over consumption can come through decreased consumption or increased production or both, but it can not come through restricted production or increased consumption or both, and the shortened day of labor surely means both less produced and more consumed. Whether among individuals or among nations, the old-fashioned ideas of industry and thrift come nearer the natural law than the new proposition of a five-day week and a six-hour day. No protective tariff can safeguard the home market for industries based on a 30-hour week, nor can our industries expect to win or hold a place in foreign markets on any part-time program, unless there is some international agreement making for universal indolence, and even then we may discover that there can be no return to Garden of Eden conditions of consumption without productive industry. I believe the earliest precedent was a continuing injunction for a six-day week, and no lower court has since ordered any better rule of action or reversed that Divine injunction."

Delegates Dinner an Event

Two informal dinners for delegates marked the program of the convention. At the first, the present industrial situation was briefly discussed. The second, however, was an occasion to be remembered, informal as it was. A program of entertainment had been arranged that made one forget he had come for such a gross purpose as dining. The toastmaster was Robert E. Lee, of St. Louis, the very active vice-chairman of the Exposition Committee, who can be serious on occasion. As a raconteur, Mr. Lee is unexcelled. One of his stories was absolutely unprintable, being delivered in near-Chinese, a language not heard in the Far East.

Chief among the speakers was Governor Frederick D. Gardner of Missouri, Bulkeley Wells, and Rev. Charles W. Gordon. Dr. Gordon, who had spoken the day before on the Winnipeg strike, now addressed those present on the present industrial situation in Great Britain, whence he had just returned. A speech was also made by Fedor F. Foss, chairman of the Russian Mining Commission. The dinner was one to be remembered.

War Mineral Producers Confer

Since the signing of the Armistice, in fact, since the bottom fell out of the chrome market before the Armistice, much has been heard about relief for the producers of war minerals, oftentimes with bitter expressions from the producers. It was therefore expected that these same producers would be present in numbers at the sessions of the War Minerals Conference, or at least strongly represented. Such was not the case. At the most important session less than fifty people were present and when the opportunity was given for producers to air their views, Victor Rakowsky, of Joplin, Mo., was practically the only one to respond.

Mr. Rakowsky complained that the War Minerals Relief Commission had in some cases acted on questions involved on its own interpretation. He stated that all over the United States there was a feeling that the Relief Act was not being administered properly and that something was wrong. On the other hand, he stated that personally he felt that the Commission had done the best it could. Formation of a War Minerals Section of the American Mining Congress was proposed by Mr. Rakowsky in concluding.

Previous to this, James F. Callbreath, secretary of the American Mining Congress, had outlined the history of the campaign to increase the production of war minerals and had stated that Congress at Washington should further instruct the War Minerals Relief Commission to relieve the producers. Following Mr. Callbreath, Herbert W. Smith, chief of the war minerals division of the Mining Congress, said that the position of the organization with respect to claims for relief was well understood—that it stands for the rights of the claimants as a whole.

The chief speaker at this conference was ex-Senator Shafroth, of Colorado, a member of the Commission. Mr. Shafroth recounted the history of the passage of the present Relief Act through Congress. He recalled and emphasized the sentiment of the public, especially of the farmer, against it, and pointed out how this sentiment was reflected in the House. The limitations put on relief in the Act had been inserted deliberately, he said, for without them the Senate never could have obtained the consent of the House to the passage of any relief measure at all. Senator Shafroth further said that where the Commission had found it necessary to interpret the Act it had been as liberal as possible. It has also avoided technical features wherever possible. It has taken the position that where a man was sent out to stimulate production and this was interpreted as a request, the Commission should construe this as a

request though actually no request had been made. The Commission, said Senator Shafroth, had construed a request made by any agent of the U. S.

tungsten in sufficient quantities. The Commission has held that where a mine is not of commercial importance, if the Government has made a personal



FREDERICK GARDNER
Governor of Missouri



ROBERT E. LEE
Vice-Chairman of Exposition Committee



H. N. LAWRIE
Chief of Precious and Rare Metals Division



HERBERT W. SMITH
Chief of War Minerals Division

Bureau of Mines as coming from the Director of the Bureau. Some cases, he said, had been decided on questions of commercial importance. Production was not sought from prospectors without property. The law prescribed, he continued, that no claim shall be allowed or paid unless expenditures were made for properties of chrome, manganese, pyrites or

request, it is estopped from later claiming that the property is not of commercial importance.

Following Mr. Shafroth, Philip N. Moore, past president of the A. I. M. E. and also a member of the Commission, supplemented his colleague's remarks by talking on "The Commission's Viewpoint." He defined a deposit of commercial importance as

one carrying ore of sufficient quantity and richness to permit of being worked at a profit for a reasonable period of the war at the time when operation was undertaken. This reasonable period, he said, was taken as being two years. In concluding, he said, "You came to tell your troubles, but we got to ours first. We are rejecting some righteous claims—can't help it. We are allowing some unrighteous claims."

Without doubt, any grievances held against the Commission by members present must have largely been dissipated by the frank statements of the Commissioners. At any rate, so few attended the next session of the War Minerals Conference on the following day that it was called off. This was to be regretted, as addresses by Dr. R. B. Moore and Dr. Dorsey A. Lyon had to be cancelled. Dr. Moore, chief chemist of the U. S. Bureau of Mines, had for his subject "The Development of Commercial Helium," and Dr. Lyon, who is chief metallurgist and supervisor of stations of the Bureau, had planned to talk on "Increased Production by the Use of By-products."

On Thursday afternoon, the Tariff Conference engaged the attention of the war mineral men. E. C. Voorheis, of the Atolia Mining Co., California, spoke on the need of a tariff on tungsten. Fletcher Hamilton, state mineralogist of California, outlined the American quicksilver situation. Dorsey A. Lyon read part of a paper on the "Utilization of American Graphite and American Clay in Ceramics." An attempt was made by a member from Alabama, who was interested in graphite, to get into the record the statement that Alabama graphite made better crucibles than the imported variety. Evidence of this, however, was lacking at the moment. The chief address of this session was made by E. P. Costigan, of the U. S. Tariff Commission, who talked on the work of the Commission. The meeting was poorly attended, the delegates thus evincing little interest in a protective tariff on war minerals.

On Tuesday afternoon, Nov. 18, the first meeting was held of the National Gold Conference at the Statler Hotel with H. W. Seaman, president of the Trojan Mining Co., of South Dakota, presiding. A short and interesting address was made by George M. Taylor, president and general manager of the Portland Gold Mining Co., of Cripple Creek, Col. Mr. Taylor pointed out the fact that the gold mining industry had declined and would shortly disappear with the continuance of the present conditions.

H. N. Lawrie, chief of the precious and rare metals division of the Mining Congress, then presented a paper illustrated by charts which were of great interest. These charts showed, among other things, that the gold produced in the United States was only to a very small extent derived as a by-product of other metals, and came almost entirely from gold mining proper and mainly from lode mining. The very rapid decline in the production of gold since 1915 was also shown. An interesting fact in this connection is that the use of gold in manufacture

has increased above normal as rapidly as gold production has decreased, so that in 1919 the consumption for this purpose (outside of coinage) exceeds the total production and there will be no gold left for coinage purposes.

A resolution following Mr. Lawrie's suggestions was finally drafted for presentation to the Committee on Resolutions, making the following recommendation:

That the Congress of the United States be and it is hereby earnestly petitioned to pass such speedy and remedial legislation as shall provide for a period of five years from and after the passing of such legislation, there shall be paid to every person producing gold from the mines within the United States and its possessions, under such terms and conditions as may properly be provided, a premium of \$10 per fine oz. of such gold so hereafter produced, such payments to be made out of funds to be provided by an excise of \$10 per oz. on the use, manufacture or sale of gold in the United States for other than coinage or monetary purposes and from other funds in the Treasury of the United States, not required for specific purposes, and,

It is further recommended that after five years from the passage of such legislation the premium and excise so to be provided shall be adjudged in accordance with the rise and fall in commodity prices as compared with the average for the five-year period herein referred to; this readjustment and excise to be made each year and until such time as the premium and excise can be abandoned on account of the restoration of a price level which will satisfactorily maintain the normal production of new gold in the United States to meet all industrial requirements of the arts and trades.

When this resolution later came before the Congress for acceptance, it was adopted after substituting the word "suggested" for "recommended" and making other minor changes in the wording. Objection to the resolution in its original form came from E. P. Mathewson and Edward Ludlow.

Taxation Session Marked by Interesting Addresses

The meeting of the Mines Taxation Section was held on Thursday, Nov. 20, at the Planter's Hotel, under the chairmanship of Dr. R. C. Allen, vice-president of the Lake Superior Iron Ore Association, was of especial interest and a number of papers were presented. The first paper was on "Mine Accounting in Relation to Federal Taxation," by Wade Kurtz, consulting accountant, Kansas City, Mo., and was followed by an address on "Income Taxes as Applied to Mines," by A. P. Ramstedt, comptroller of the Hercules Mining Co., of Wallace, Ida. A notable paper was presented by T. O. McGrath, auditor of the Shattuck-Arizona Copper Co., Bisbee, Ariz., on "Protection Against Unjust Taxation." Mr. McGrath called attention to the fact that in a modern mining enterprise it took several years and several hundred thousands of dollars before the mine could be put on a paying basis, yet the first year that profits were declared, all profits above 8 per cent were subject to heavy taxation. Mr. McGrath claimed that the preceding years, in which no return was obtained upon the capital invested, should be taken into consideration; in other words, that an 8 per cent return should be allowed out of the first profits on the invested capital during all the preceding years before

the taxable surplus should be arrived at. George E. Holmes, the author of "Holmes on Federal Taxation," of New York City, also read a paper on "Taxation of Income from Mining," and there were contributions to the discussion of the general subject by several other experts. All these papers will be submitted to the Income Tax Unit of the Natural Resources Division of the Bureau of Internal Revenue.

The annual meeting of the American Mining Congress was held at the Planter's Hotel on Nov. 20. The minutes of the preceding meeting were adopted as read by the secretary, James F. Callbreath. Mr. Callbreath outlined the work of the past year in vigorous fashion and recommended that a capable freight man be added to the official staff of the organization at Washington. The following officers were declared elected for the ensuing year: Bulkeley Wells, president; Harry L. Day, first vice president; Col. D. B. Wentz, second vice president; E. L. Doheny, third vice president; and James F. Callbreath, secretary. E. P. Mathewson and Walter Douglas were appointed members of an executive committee, including the president, which shall have power to act between directors' meetings. Four directors were elected for a term of three years as follows: R. C. Allen, Cleveland, Ohio; Col. D. B. Wentz, Philadelphia; T. T. Brewster, St. Louis; and John C. Howard, of Salt Lake City. The meeting then adjourned.

In all twenty resolutions were introduced to the convention, of which two were killed. The first introduced by Walter Douglas, president of the Phelps Dodge Corporation, was a protest against the inadequate policy of this Government in Mexico. It was worded as follows:

Be it resolved, that the American Mining Congress, assembled in annual convention at St. Louis, Mo., hereby protests to the Department of State of the United States against the continuance of policies by the American Government that make inadequate provision for the safety of American mining engineers, operatives and employees in the practice of their profession and in caring for the business interests entrusted to them, and be it further resolved that this Congress urges that the Government of the United States demand full and immediate reparation for losses and injuries suffered by American mining engineers, operators and employees in the lawful exercise of their duties in foreign countries and that the Government of the United States take such steps as will insure that the constitutional rights of American citizens shall protect them on our borders and throughout the world, and be it further resolved that a copy of these resolutions be forwarded to the President of the United States through the Vice President and Speaker of the House of Representatives.

This resolution was adopted in spite of the objection of the Mexican consul at St. Louis, who was a delegate to the convention. Another resolution was adopted aimed at Great Britain's present policy of excluding aliens from ownership or control of oil property within the borders of the British Empire and demanding that similar action be taken by this country in case the British stand were maintained.

Aid for gold producers was suggested in a resolution, the text of which has already been given. The

convention also voted in favor of a resolution recommending that destruction of gold and silver coinage be prohibited by law.

Antistrike railroad legislation was asked in a resolution which stated that the mining industry furnishes more tons of freight than all other industries combined. This resolution ran as follows:

First, in any railroad legislation ample provisions shall be made for such regulation of railroad rates as shall produce such rates of return upon capital invested in railroad securities as to make an investment in such securities sufficiently attractive to insure capital for railroad betterment and extension.

Second, that in any railway legislation provision be made to prevent strikes upon railroads until the matters which may be the subject of controversy shall have been submitted to investigation and arbitration by some tribunal on which the public is represented.

The convention put itself on record as opposed to "red" doctrine of any kind and in favor of enforcing existing laws against anarchy and of passing further laws. It further announced its belief in the right of labor to organize and in the right of the workman to work where he pleases. It was also proposed that the Mining Congress appoint a committee to make a survey of the industrial situation with the idea of determining what laws should be passed to bring about industrial peace.

War Minerals Committee Suggested

Appointment of a war minerals committee was recommended which should work with the president of the American Mining Congress in any effort to secure further relief for war mineral producers. Development of Alaska's mineral resources through further railroad construction and powersite work was also urged. Another resolution asked for legislation to authorize the mining of oil shale upon public lands.

Other resolutions were passed, one of them bearing on the existing situation in the coal industry and recommending that an attempt be made to adjust the price of coal according to the season, so as more nearly to equalize its production throughout the year.

Many Interesting Speeches at Other Sessions

There were various other sessions of general interest throughout the week. The Oil Shale Conference resulted in the organization of a permanent oil shale section of the Congress.

At the evening meeting of Tuesday, Nov. 18, George W. Simmons, vice president and general manager of the Simmons Hardware Co., of St. Louis, who has recently traveled in Russia on Red Cross work, gave a vivid first hand discussion on "The Russian Radical as I Found Him," describing the condition of Bolshevik Russia at the present time as criminal and anarchistic to the last degree. Allen Walker, manager of the foreign department of the Guaranty Trust Co. of New York, delivered an interesting and scholarly address on "What Is the Matter with America," referring to the present tendencies of labor to ask more pay for less work. Mr. Walker exclaimed: "I myself am a wage earner and

always have been that, yet I am not fool enough to accept a raise in wages for doing less work than formerly and of a punker kind."

An exceedingly interesting speaker at this session was Rev. Charles W. Gordon, of Winnipeg, Man., better known as the author "Ralph Connor." Dr. Gordon had for his topic "The Red Menace," and described the general strike that occurred at Winnipeg last spring and how it was broken by the citizens themselves with the aid of the Northwest Mounted Police.

On Friday morning a general session of the Congress in the convention hall was marked by two very notable addresses, that of John Leitch on "Industrial Democracy," and Charles Piez, president of the Link Belt Co., of Chicago, on "Labor and Its Responsibilities." Mr. Piez' address was especially noted for its firmness as regards the present labor situation. Mr. Piez pointed out that it was impossible to compel labor unions to incorporate so as to make them liable under the law for their acts and proposed the enactment of a law which would make unincorporated organizations legally responsible, a suggestion which is a very valuable one and which is especially recommended to consideration of the public and of the Congress in Washington. Mr. Piez' speech will be published and distributed.

A very patriotic, anti-radical spirit permeated the whole Congress and was evidenced in many of the speeches which were of a notable character. An address by Governor Roberts of Tennessee, describing how bolshevism was being combated in that state, was enthusiastically received by the convention, as were those of Dr. Gordon and Mr. Piez.

Efforts to Popularize Exposition Succeed

A session on safety and welfare was held on Wednesday, Nov. 19, under the direction of the U. S. Bureau of Mines, Morton F. Leopold presiding. Mr. Leopold took occasion to object to the nominal admission fee of 25c. charged for the Exposition of Mines and Mining. Apparently his protest was heeded and the doors thrown open to the public, for the small boy was very much in evidence during the last few days. Exhibitors who had been complaining of the poor attendance now had to watch their exhibits and "literature" more carefully. The addition of a band in the evening did much to popularize the Exposition. It is a debatable question whether a sparse attendance of interested persons is of more value to such an exposition than a large attendance of people who do not comprehend what they see.

At the welfare session referred to above a very interesting talk was given by C. W. Seiberling, vice president of the Goodyear Tire & Rubber Co. Mr. Seiberling discussed how his company had grown since its incorporation and attributed it to the admirable organization and teamwork of their employees in their recreation as well as in their work at Akron. An address entitled "Does 'Safety First' Mean Increased Dividends," was delivered by W. D. Ryan, Commissioner of Safety of the Bureau of Mines.

Mineral Statistics and the League of Nations

Reference has been made in the Engineering and Mining Journal (July 26, 1919, p. 152) to the importance of having better statistical information of international scope and the suggestion that an organization be formed within the League of Nations to collect and distribute such data.

The Economic and Finance Section of the League of Nations held a conference on the subject in August, 1919, and its report has now been published in London. The "Economist" of Nov. 1, 1919, gives the following brief summary of the more important conclusions, which, although not having the character of binding decisions, met general support:

A. That the institution of a Central Advisory Council on Statistics, to meet normally at the seat of the League, is desirable; this council being constituted partly of members of the separate statistical bodies referred to below, and partly of statisticians and other persons nominated by the League.

B. That, in principle, there should be a separation of the main classes of statistics, and that these should be entrusted to several different bodies or institutions working in conjunction with the League.

C. That these bodies should be, in the case of agricultural statistics, the International Institute of Agriculture at Rome; in the case of labor statistics, the International Labor Office; and, for the time being, in the case of demographic statistics, the Permanent Bureau of the International Institute, at the Hague.

D. That a committee be appointed to consider the definite distribution of statistical work between the various bodies connected with, or proposed to be connected with, the League of Nations, and to make suggestions for the establishment of other bodies than those already referred to.

E. That the appointment of such a committee, if thought advisable, should be undertaken by the Secretary-General of the League of Nations.

"The Armenian Mandate"

Your leading article in the current issue of the Journal on "The Armenian Mandate" is most timely and illuminating, and for that reason it seems worth while to point out an error, even though that error in no wise invalidates your main contention.

You say "The Armenian territory is bordered . . . on the north by the similar republics of Daghestan and Georgia, both Mohammedan." Georgia is not Mohammedan. Like Armenia, it is Christian, and its church is autonomous, or was so until about the year 1900, when the Russian government seized the ecclesiastical income and otherwise assumed more or less control over the Armenian Church. To be sure, there are on the fringes of the ancient kingdom districts inhabited by Georgians forcibly converted to Islam by the sword, and it was to escape further inroads by the Turk that the kingdom finally sought Russian protection a century ago.

H. H. Knox.

New York, Nov. 11, 1919.

Laying a Pipe Line in Frozen Ground

Details of Method Used in British Columbia, Where Deep Snows and a 45 Per Cent Grade Were Encountered

BY WILLIAM W. ELMER,
Mining Engineer, Portland, Ore.

INSTALLING a 10-in. pipe line on a 45 per cent grade in the Selkirk Mountains of British Columbia in the middle of winter, with from two to seven feet of snow on the frozen ground, was not always a pleasant job. The illustrations give some idea of the conditions met; yet no especial discomfort was suffered except while connecting the steel pipe flanges in zero weather. The details of the work and the costs should prove interesting to those who may have similar work to do.

length of pipe (see Fig. 1), the other end being supported in a similar manner. All of the pipe was hauled along the right of way by this method except about 400 ft., which it was necessary to haul up a grade steeper than 45 per cent, by single block and tackle. The time required was $14\frac{1}{2}$ days for two teams and three to four men. The total cost of the distribution of the pipe along the right of way was \$309, or 15c. per lineal foot.

Because of the solid flange connection, the pipe could be bent but little to conform to the contour of the ground, and it was necessary to dig a trench, as deep as 10 ft. in some places, for a total length of 640 ft. The method followed was to excavate 35 ft. of trench, then to connect a length of pipe and cover it with soil excavated from the next section. Grade was determined by a carpenter's level



FIG. 1. HAULING 10-IN. PIPE UP 45 PER CENT GRADE.



FIG. 2. LOWERING PIPE INTO A TUNNEL.



FIG. 3. LAYING PIPE ON A TRESTLE.

The pipe line was part of a hydro-electric development, and carried water 2,088 ft. to the generating station, where a static head of 833 ft. was obtained. The first 960 ft. of pipe was laid at an angle of 23 degrees 45 minutes, or a grade of 44 per cent. The next 730 ft. was laid on a grade of 42.9 per cent, and the remainder, connecting with the penstock, on a 45.6 per cent grade.

The first 960 ft. was of spiral riveted pipe with forged steel A.S.N.E. standard flanges. Of this, 390 ft. was 9-in., 12-gage pipe, weighing 420 lb. per 30-ft. section. The next 300 ft. was 10-in., 12 gage, weighing 450 lb. per section, and the remainder was 10-in., 14 gage, weighing 330 lb. per 30-ft. length. Following this came 10 and 12 in. wire-wound, wood stave pipe, averaging 240 lb. per section.

The pipe was moved up the hill by two teams hitched to a 2-ft. sled, which carried one end of a

and a wooden triangle. When it was necessary to make the trench more than 7 ft. deep, occasional tunnels were dug to avoid shoveling snow and breaking through the frozen moss and soil. On account of the steepness of the grade, throwing the dirt out of these tunnels over the preceding length of pipe was easy. Fig 2 shows a length of pipe being lowered into one of these tunnels. The stove is made of a 100-lb. carbide can and was very successful for burning chips and trash. Before lowering the pipe, one end was connected with the chimney of the stove for about three minutes, which sufficed to melt adhering ice and snow which otherwise would have interfered with flange connections. The total excavation necessary was 361 cu. yd., which cost \$868, or \$2.40 a yard. In the summer time the work could have been done by contract at 96c. a yd. The material excavated was a cemented glacial wash with very few boulders larger than one-man size.

Approximately 1,100 ft. of trestle from 1 ft. to 16 ft. high was constructed, using 18,320 ft., b. m., of round timbers, cut and hewed, when required, on the ground. All posts were round timbers, with sills and caps hewed on two sides. The bents were set in 10-ft. centers and, on account of almost continuous snowfall, the pipe was laid as soon as two or three had been constructed. No timbers had to be carried over 80 ft. The cost of trestle construction was \$568, or \$3.64 per 1,000 ft. of timber, this including cutting and hewing of timbers and construction of bents. The cost of laying the entire line was \$298, or about 14c. per foot. Wages were \$5 a day and board, for all men except the foreman, who received \$6.

Details and Cost of a Mine Model

Materials Needed—Drafting and Construction—Line-Tracing and the Preparation and Application of Colors—Wiring and Lighting Arrangement

BY VOLNEY AVERILL,
Mining Engineer, Tonopah, Nev.

THE glass mine model recently constructed for the Tonopah Extension Mining Co. has received much favorable comment for its practical value, neat appearance, and low cost. The model is of the plan type, showing the geologic plans of twenty levels on sheets of glass placed one above the other at the proper vertical distances according to the scale of the drawing. It is viewed from the top through a glass cover. No attempt was made to show vertical sections by means of strips between the levels, because this makes the removal of glass for additions difficult, and detracts from, rather than adds to, the clearness of the completed model. The whole is in a practically dustproof case, so arranged that any sheet of glass can be removed in an instant for making additions. The illumination comes from below. The total cost of materials and labor was approximately \$400. A detailed description of the construction follows:

Frame and Case

The size of the glass used is 30 x 36 in. and the scale is 80 ft. to 1 in. The total height of the frame is 48 in. This allows a 3-in. base, 8 in. for lights, 2 in. for the top caps of the frame, and leaves room for showing a vertical depth of workings of 2,800 ft. on the scale used. The width is $36\frac{1}{8}$ in. inside the posts, leaving a play of 1-16 in. on each side of the glass. The length is 6 ft. 3 in. The reason for the great length is that after the ninth level is reached, each sheet of glass is moved forward $1\frac{1}{4}$ in., so as to follow approximately the dip of the veins. If desirable, two sheets of glass can be used to show one level.

The frame is constructed somewhat on the plan of a mine square-set, with four sets of posts, sills, and caps, all of 2 x 4 in. material. The frame of the base is of 2 x 4 in. pieces laid flat and covered with a floor of 1-in. boards. The frame is put together entirely with screws, and is arranged so that, by removing the four cross caps on top and a few of the main screws in the base, the remainder of the frame will

come apart in three large sections: first the base, consisting of the floor and the four cross-sills; second and third, the two sides, each consisting of four posts, a long sill and a long cap. This feature is for disassembling for transportation. The frame was completed as far as described and then painted with two priming coats and two coats of white paint.

The runners for the glass are of $\frac{1}{4}$ in., square, cold-rolled steel 2 in. shorter than the frame, to allow for the insertion of panels in the ends of the frame. They are drilled with $\frac{1}{8}$ -in. holes in such a way that the holes in alternate bars come opposite each other, those of the other set being about $\frac{1}{2}$ in. to one side—this is to allow for countersinking the nuts on the opposite side of the posts where levels are close together. The posts were first carefully marked at the proper intervals with the help of a long steel straight-edge, then the bars were each in turn clamped to the posts at the marks; holes were drilled through the posts through the holes already in the bars and countersunk on the opposite side of the posts, and the bars bolted in place. The small bolts for this purpose were made in the machine shop, the nuts were purchased, and washers from copper rivets were used. The carpenter would have preferred to use wood screws to hold the bars in place, but I do not think that this would give as rigid construction, or that they could have been put in place with as much accuracy. The holes in the posts containing the nuts and washers were covered with beveled strips. I have seen models in which the glass is supported in notches sawed in the posts, but this is very unsatisfactory, because the wood between notches splits out; also, the glass is more likely to be broken in handling.

After the twenty pairs of bars were in place, together with an extra pair for a glass over the lights, 8 in. above the floor, the sides and ends of the case were closed with wooden panels of 1-in. material, which had previously been painted like the frame. The side panels were placed tightly against the runner bars and serve to guide the glass. They are held in place by means of small moulding and round-head screws. The end panels are provided with brass knobs and small iron turn-buttons to make them readily removable. The latter were not put in place until the final coat of paint had been applied to the outside of the completed case. The top openings were provided with mouldings placed so that a pane of glass cut to fit would lie just flush with the top of the side and cross caps. The carpenter wanted to tongue and groove the side panels all round and glue them into the frame. This would have been a great mistake, because even the best seasoned lumber is subject to great shrinkage in this climate, and, if the edges of the panels had been held fast, they would, in the course of a few months, have split from top to bottom. The shrinkage is taken up at the edges in the present arrangement and is covered by the moulding.

The plans on the glass show the geology in detail, the veins, faults, and rock formations being in colors. The veins are shown in red, the faults in blue, and

the rock formations in various colors, purple, yellow, green, brown, and orange. On the lower sheets of glass the yellow and brown look a great deal alike, because of the superimposed color of the many thicknesses of glass. Small black crosses are placed on the yellow on all levels to overcome this difficulty. Conventional signs such as crosses, dots, circles, and like markings, could probably be used with as good results as colors to represent the different rocks. In either case the band of color or signs should be made as narrow as possible, so that the details on the lower levels will not be obscured.

The glass used is "double-strength" or "picture" glass, and is about $\frac{1}{8}$ in. thick. Plate glass is thicker and stronger, but it would absorb too much light and would not allow of the close spacing of levels. Ordinary window glass is so thin that, in large sheets such as are used, it is likely to break in the handling necessary to make additions to the model. The glass used is slightly curved, due to the fact that it is blown as a cylinder and allowed to flatten while hot. The convex side should be turned up so that the weight of the glass will tend to correct the curvature and make the sheet more nearly flat.

Before starting work on the glass it is washed perfectly clean and free from grease, allowing a coat of the cleansing preparation to dry and then rubbing it off. It is very important to have the glass free from all traces of grease. Then the glass is placed in the proper position over a map of the level and the lines and geology are traced through. The property lines are first traced through for each level with a heavy line, made by setting the pen for a finer line, drawing several fine lines close together, and then joining them. Each glass is allowed to dry again after the property lines have been placed on it. The posts are represented by small circles drawn with an ordinary swivel pen. This is difficult to manipulate on the glass at first, but care in holding it vertically overcomes the difficulty. Next the levels are outlined on each glass with an ordinary pen, and it is allowed to dry again. The faults are represented by blue pen lines, and the colors for the rocks put on with a brush, a period for drying being allowed after each color is applied.

The colors are all made up from oil tube paints mixed with Japan dryer. With this type of color, when dry, the maps may be washed if necessary. This is a distinct advantage over inks if the model ever becomes dusty or dirty. Another thing to consider in the use of inks is the fact that the hand is likely to rub off one part of the map while working on another, even after the ink is dry. Gold size may be used for mixing the colors, but it darkens the colors and does not dry as quickly as the Japan drier. The colors are mixed very thin, so that the shade is soft and they are nearly or quite transparent when applied to the glass. Some colors give better satisfaction in this respect than others, for example, the color magenta may be mixed so thin that it is transparent, and it will still give an excellent shade. The time for drying varies from about twelve hours for the black to half an hour for the

blue. The difference is probably due to the difference in the proportions of the tube color and the Japan drier used to give the desired results. A large proportion of the black must be used to give a satisfactory color, whereas a very small proportion of Prussian blue is necessary. No oil or turpentine is used. Turpentine may be used, but the drier gives better results when used alone. However, turpentine is very useful for cleaning off the pen, when difficulty is found in making the mixtures run off freely.

Lights and Costs

The wiring for the lights is carried under the floor to sockets of the sign-board type setting almost flush with the floor. Eight lights are used in the present model, some 100-watt nitrogen, and some 60-watt tungsten. The number of each may be varied to give the proper intensity of illumination. Eight inches above the floor is a sheet of glass covering the entire area of the floor. This glass is coated with a mixture of flake white and gold size. The light through the coated glass is soft and pleasing. Ground glass might give a still better effect, but the coated glass is cheaper and is satisfactory. Costs were approximately as follows: Designing and work on glass, \$200; carpenter and painter, \$60; steel bars, \$8; machine shop, \$13; electrician, \$6; lumber, \$8; glass, \$50.

I have no figures on paints and lights, but these would bring the total to a little over \$400. This has been considered low for the satisfactory results obtained.

Debris Dams on North Yuba River, California

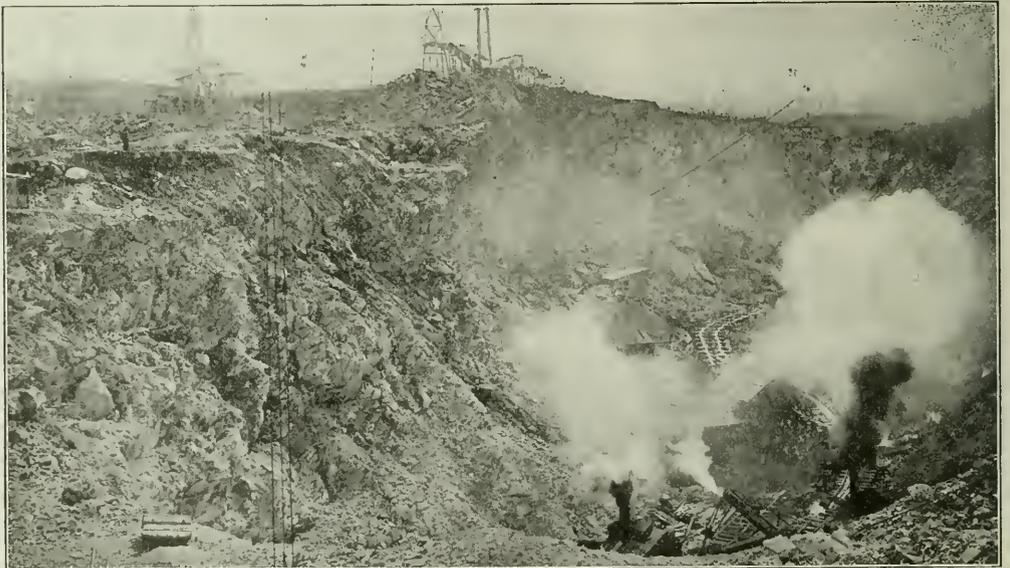
A concrete dam on the North Yuba River at Bullard's Bar, northwest of Nevada City, Cal., was completed early in October, having been constructed for the purpose of impounding debris from hydraulic mining operations. The dam, which is of the "constant-angle arch" type, was designed by L. R. Jorgensen, of San Francisco, and is 160 ft. long and 33 ft. high. It is a permanent structure, capable of permitting a 20-ft. flood stream to pass over its crest, and will prevent the debris bed which settles above it from being washed farther down the river. The storage capacity is computed to be 1,000,000 cu. yd. The cost of the structure was \$30,000, or an expense of 3c. per cu. yd. of gravel.

As a result of the construction of the dam already mentioned, a second dam, 5,900 ft. below the other and above the Colgate power house of the Pacific Gas & Electric Co., will be started soon. This second dam, which will be 170 ft. high and will have a storage capacity of 50,000,000 cu. yd. of gravel, will allow additional hydraulic mines on the North Yuba watershed to operate within the provisions imposed by the California Debris Commission. The construction cost is estimated to be about \$600,000. The power rights of this dam have been acquired by the Pacific Gas & Electric Co. At a later date it is possible that a third dam farther up the river, with the same storage capacity as the second, will be constructed.

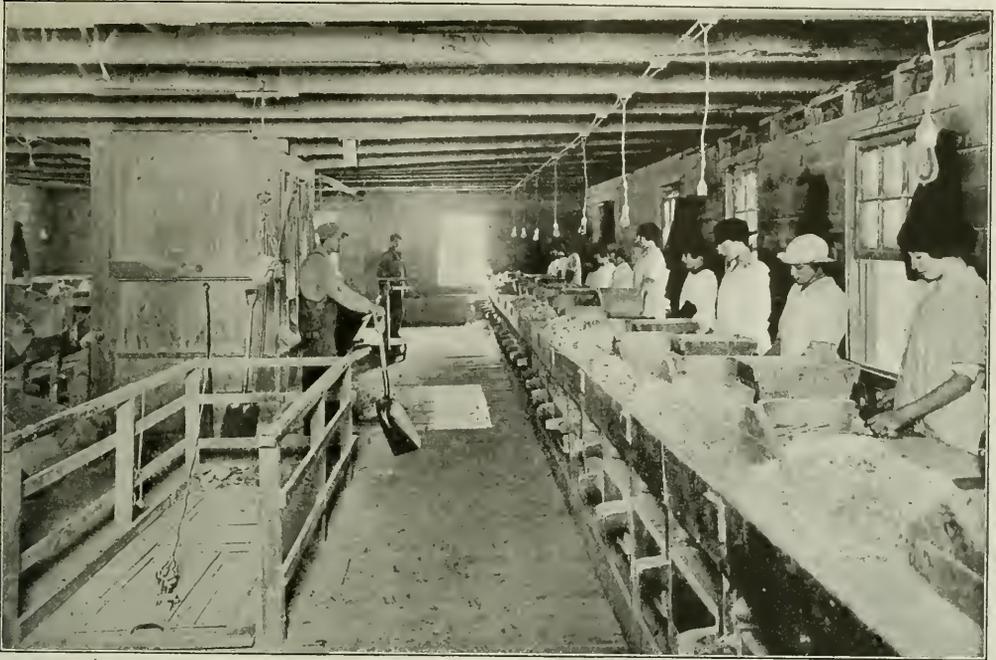
Asbestos Mining at Thetford Mines, Quebec



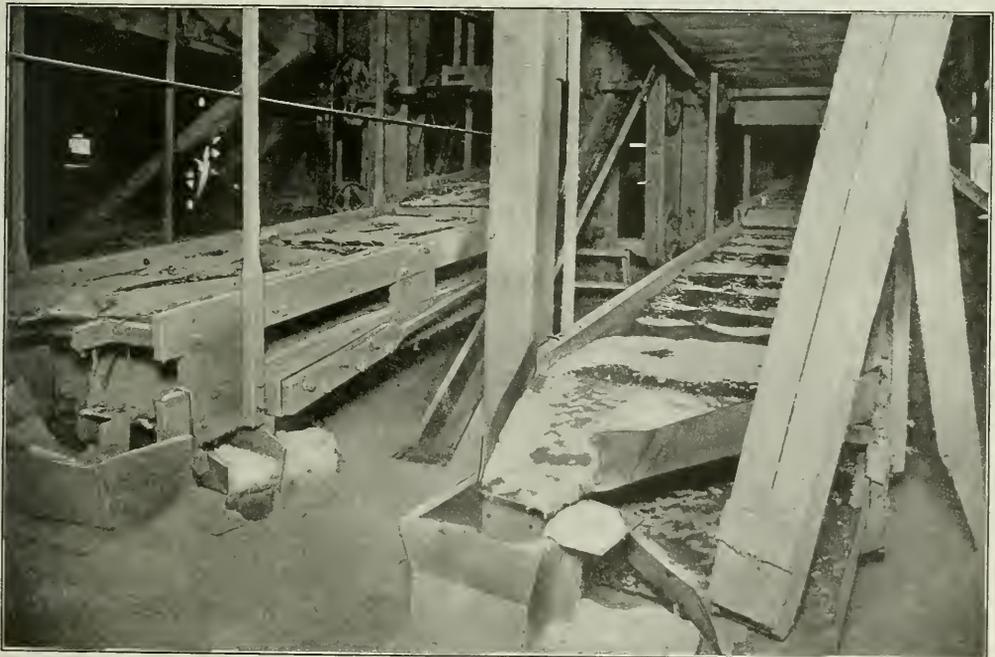
VIEW OF THE MINING PIT OR GLORY HOLE. THIS PIT IS ABOUT 300 FT. DEEP. SOME IDEA OF THE DEPTH CAN BE JUDGED BY THE SIZE OF THE MAN AT THE BOTTOM.



A VIEW OF ONE OF THE PITS, SHOWING THE SHOVELS AT WORK



WHEN THE ROCK COMES FROM THE BREAKERS THE BETTER PART IS HAND PICKED, AND THE BEST QUALITY THEREBY OBTAINED. THIS PROCESS IS CALLED "COBBING."



THE SIFTING PROCESS, SHOWING THE ASBESTOS BEING SIFTED OVER SCREEN.

Franz Fohr

(A BIOGRAPHICAL SKETCH BY W. R. INGALLS)

ON JULY 27, 1919, there passed away a simple, unassuming gentleman, who through his life allowed his intense modesty to keep him in the background and during his later years effaced himself so thoroughly that few of his old acquaintances knew aught of him. Yet he was one of our accomplished metallurgists, who did good work in the practice of his profession, and lived an upright life, and it will be a pleasure to his old friends to have a record of him in the annals of the mining and metallurgical industry. Now that he is no longer with us, Franz Fohr cannot plead to be overlooked, and those who fondly remember him will be gratified by his receiving his due.



FRANZ FOHR

Franz Fohr was born on Sept. 7, 1838, in Mannheim, Germany. Of his ancestry, education, and early career we know scarcely anything. We do not even know just when he came to America, or what led him hither. The first record of his professional work in this country, found among his papers, shows that from July, 1870, to Jan. 1, 1872, he was superintendent of the Newark Smelting and Refining Works, then owned by Edward Balbach & Son. At that time the Balbach works at Newark, established in 1850, and the Selby works at San Francisco, established about 1866, were the only important silver-lead refineries in the United States. Mr. Fohr may have been associated with the Balbachs for some time before he became superintendent of their plant, or he may have come from Germany only a short time previously. At all events,

it is certain that he was at that time an experienced and accomplished metallurgist, for after leaving Newark and going to San Francisco he soon formed some kind of a connection with Thomas H. Selby & Co. Early in 1874 the Selby firm sent him to New York to procure information respecting the manufacture of white lead. His engagement in New York terminated on Jan. 31, 1875.

During 1875 Mr. Fohr spent some time at Silver Islet and in the Lake Superior copper region, but of his work there no record remains. In the latter part of 1875 or early in 1876 he associated himself as metallurgist with the Boston Silver Co., operating at Saint John's, Summit County, in which William L. Candler, of Boston, was the moving spirit. That company was developing its mine in 1875. At the end of that year it "had about 800 tons of ore on hand, about three-fourths of which is dressing ore, to be concentrated in its very systematic establishment and to be smelted into pig-lead." Evidently Mr. Fohr was engaged for the latter purpose. Henry A. Vezin, erudite and painstaking, was the mechanical engineer for the company. In the fall of 1876 Anton Eilers took his family for the first time so far west as Denver, and Mr. Fohr went with them. I do not think that Mr. Eilers had any connection with the Boston Silver Co., save possibly in a consulting capacity, but he visited Saint John's, and the enduring friendship among Eilers, Fohr, and Vezin, which terminated only with their deaths, dated from that time.

I ought to know more about the association at Saint John's for only a few years later I was under the tutelage of the distinguished and lamented Vezin, who never tired of relating the history of that famous if not very successful enterprise, and also I knew Mr. Fohr from 1886 onward, but memory is an evanescent thing. My recollection is that a lot of excellent engineering and metallurgical work was done there without there being any great foundation for it. At all events, Mr. Fohr remained with this company nearly three years and then went to take charge of the smelting operations of the Horn Silver Mining Co. at Frisco, Utah, which he conducted from Aug. 1, 1878, to Aug. 1, 1879. This was the time of the height of the boom at Leadville, and it was but natural that Mr. Fohr moved promptly to the greatest silver-lead mining and smelting district. He became part owner in the Malta Smelting Co., below California Gulch, and had charge of its plant. In 1881 he became superintendent of the Harrison Reduction Works of the St. Louis Smelting and Refining Co., and retained that position until his retirement from active work. I do not remember just when his retirement took place, but my recollection is that it was during the '90s. He then moved to New York and kept a little office here, in company with Faber du Faur, one of his early friends. Mr. Fohr went religiously to his office every day, spending a few hours there, reading and absorbing the

general information for which all his life he was so greedy.

On his seventy-fifth birthday, which he celebrated with the Eilers family at Sea Cliff, Mr. Fohr told them that in early life he had made up his mind to divide his years of life, twenty-five years to study, twenty-five to accumulating money, and twenty-five to enjoyment. He then remarked that, having passed seventy-five, he was free to do anything he liked. I do not think that he conformed exactly to that schedule, but he was methodical enough in his habits to develop such a plan and follow it generally.

Mr. Fohr was a tireless student, both in his professional work and outside of it. Indeed, with his calm philosophy he was able to dismiss the affairs of the works when he left them for the day. He had them so well organized that he felt no concern about them ever. I sat at the same table at mess with him for two years, perhaps, and do not recall his ever talking "shop." He preferred to talk about politics—in the broad sense—art, music, literature, and history.

His knowledge was profound, his memory wonderfully accurate, and woe to any one who challenged his statement of facts. So careful was he in discriminating between wheat and chaff, that we used to say laughingly that he would not accept anything as being truly news of the day until he had the authority of the London "Times," the weekly edition of which he read religiously.

In the latter portion of his life it had been his custom for many years to go to Sea Cliff every Sunday, spending the day alternately at the houses of Anton and Karl. It was at the latter's that he died, July 27. He had reached a ripe old age, and had outlived nearly all of his early associates of his own generation. Of that famous galaxy of metallurgists that created the art of silver-lead smelting in this country between 1870 and 1885 he was practically the last. The seniors of the present time do not hark back to the pioneering stage, but belong to the early part of the engineering stage which followed.

Mr. Fohr's modesty and his disinclination to form a wide circle of friends prevented him from attaining the fame that might easily have been his if he had cared for it. Rather, he chose to have only a few friends, but to them he was one of the closest and most loyal they ever had, and to their children he soon became and always remained "Uncle Fohr."

Oil-Well Activity in California.—Reports filed with the State Oil and Gas Supervisor of the California State Mining Bureau during the week ended Sept. 13, 1919, show seventeen new wells, making a total of 454 reported since the first of the year. Eighteen wells were reported ready for test of water shut-off and seventeen deepening or redrilling. Six abandonments were reported. For the week ended Sept. 20, 1919, there were twelve new wells, making a total of 466 reported since the first of the year. Twenty-five wells were reported ready for test of water shut-off, and thirteen deepening or redrilling. Five abandonments were reported.

Chino Copper Company

The thirty-second quarterly report of the Chino Copper Co., covering the third quarter of 1919, states that the gross production of copper contained in the concentrate from milling operations for the quarter was 10,427,395 lb., or an average monthly production of 3,475,798 lb. The total amount of ore treated for the three months was 425,350 tons, equivalent to an average of 4,623 tons per day. This daily average is 216 tons more than that milled for the second quarter of 1919. The average assay in copper of the ore treated for the third quarter was 1.9024 per cent, compared with 1.8327 per cent for the second quarter of 1919. The ore milled during the third quarter was less favorable to concentration than the ore treated during the second quarter, on account of its high carbonate and silicate content. The recovery per ton of ore milled for the third quarter was 24.515 lb. of copper, as compared with 26.28 lb. of copper for the second quarter of 1919. There were produced 28,094 dry tons of concentrate, averaging 18.553 per cent copper, compared with 26,830 dry tons of concentrate, averaging 19.645 per cent copper, for the second quarter.

The cost per lb. of net copper produced from milling operations for the third quarter, after allowing for smelter deductions and including depreciation, was 15.70c., compared with 14.16c. for the second quarter of 1919. The increase is due largely to wage advances which became effective near the beginning of the quarter. The cost figures shown do not include any charge for Federal income or excess-profits taxes, nor do these costs take into consideration miscellaneous income. Gold and silver to the amount of \$3,701.55 was paid for during the third quarter.

The financial results of the company's operations for the third quarter are as follows:

Net income from copper production (only).....	\$677,961.93
Miscellaneous income, including payments for precious metals....	24,422.66
Total	\$702,384.59
Distribution to stockholders.....	652,455.00
Surplus after distribution to stockholders.....	\$ 49,899.59

The above figures are based on a carrying price for copper of 22.478c. per lb. for the third quarter, calculated in the usual manner by inventorying unsold copper at 13½c. per lb. The figures for the second quarter of 1919 were based on a price for copper of 14.599c. per lb.

During the third quarter there was removed by steam shovels at the Santa Rita mine a total of 1,166,389 cu. yd. of material, equivalent to an average of 388,796 cu. yd. per month, compared with a total of 1,084,668 cu. yd. of material during the second quarter of 1919, or an average of 361,556 cu. yd. per month. Of the total material removed during the third quarter, 893,353 cu. yd. were stripping, the remainder being equivalent to 541,889 tons of ore of an average grade of 1.746 per cent copper, according to mine sampling and assaying. The difference between the tonnage mined and the tonnage milled during the third quarter is due to oxidized and partially oxidized ore which was sent to the mine stockpiles.

Small Compressors Driven by Oil Engines Becoming Popular in the West

BY GEORGE J. YOUNG

A single-stage air compressor driven by an oil engine of the semi-Diesel, valveless, two-cycle type, in tandem with the air cylinder, has become popular in several mines in Nevada, even where electric power is available. Four machines of this type are in use in the Tonopah district, three of them at the Midway mine and one at the Gypsy Queen. The initial installation at the former superseded a steam-driven compressor, and the oil-driven unit was so satisfactory that two more were installed at another shaft.

One of these compressors, supplying air for four jackhammers, consumes 35 to 40 gal. of oil per eight-hour shift, which, at 8 to 9c. per gal., amounts to from \$2.80 to \$3.60. The repairs on a machine which has been in use for four or five years have been moderate, the principal ones being reboring of the combustion cylinder and replacing the Diesel piston. Adjustment of the cooling water and lubricating oil for both cylinders is the principal operating detail which requires attention. After heating the ignition apparatus with a blow torch, the machine is easily started with compressed air from a small auxiliary gasoline-driven compressor.

An idea of the construction and cost of the machines may be obtained from the accompanying table, made up from data given in a manufacturer's catalog.

Piston Displacement, Cu. Ft.	SEMI-DIESEL			TANDEM-TYPE AIR			COMPRESSORS		
	Devel-oped HP.	Piston Displacement, Lb.	Approx. Cu. Ft. Displ.	Sq. Ft. Floor Space	Fuel Oil Hr., Gal.	Lubricat. Oil For Cyl. Per Hr.	Water Supply		
133	19.5	41	\$15	0.30	2.8	1	1.2		
192	27	46	14	0.25	3.3	3/4-1	to		
309	47	43	13	0.25	4.5	3/4-1	1.5		
370	57	50	15	0.27	5.2	1-1/4	gal.		
507	77	66	18	0.25	7.0	1 1/4-1 1/2	per hp.		(a)

(a) For both compressor and Diesel cylinders.

One engineer states that, from his experience, the repair cost is excessive and that a good mechanic must be available. Others report that the repairs are not prohibitive and that if proper attention is given, and adjustments are intelligently made, the unit will operate satisfactorily. Operators are, however, somewhat difficult to secure, and a man who understands the gasoline engine is not always satisfactory. A substantial foundation is almost a necessity to prevent excessive vibration.

Machines of this type are suitable for the initial development of prospects, but in larger operations their economical use is open to question. No other power would be required on a small property if a hoist operated by compressed air were installed. When a compressor supplies air for both hoisting and drilling, an extra large receiver is, of course, desirable.

Ray Consolidated Copper Co.

The thirty-third quarterly report of the Ray Consolidated Copper Co., covering third quarter of 1919, states that the gross production of copper contained in concentrates for this quarter is 11,534,747 lb., or

an average monthly production of 3,844,916 lb. In addition to the copper derived from concentrating ores, a total of 136,222 lb. of copper was contained in ores sent direct to the smeltery. This, combined with the copper contained in concentrates, brings the total gross production from both sources for the quarter up to 11,670,969 lb., as compared with 11,667,701 lb. for the previous quarter. During the quarter there was milled 392,800 dry tons, averaging 1.828 per cent copper. This tonnage corresponds to a daily average of 4,270 tons, as compared with 4,302 tons for the previous quarter.

The mill extraction for the quarter was 80.33 per cent of the total copper contained in the concentrating ores, as compared with 79.06 per cent for the previous quarter. The underground development for the quarter was 2,606 ft., making the total development to date 694,671 ft. The milling cost for the quarter was \$1.33 per ton, as compared with \$1.23 for the previous quarter, both exclusive of income and excess-profits taxes. The average mining cost of ore milled for the quarter was \$1.83 per ton, of which 6.46c. was the cost of coarse crushing, leaving the net mining cost \$1.76 per ton, as compared with \$1.58 for the previous quarter, both exclusive of income and excess-profits taxes. The average cost per lb. of all net copper produced for the quarter was 15.53c. This figure does not take into account credits for the value of gold and silver, or for miscellaneous income, and compares with a cost of 14.64c. for the previous quarter.

The costs detailed include a charge of 15c. per ton of ore treated for the retirement of mine-development expense, but are exclusive of estimate of Federal income and excess-profits taxes. The higher cost per lb. of copper produced is due to a wage increase of 75c. per shift for all classes of employees, which was put into effect July 16, 1919. Miscellaneous income for the quarter, including net receipts from gold and silver produced, amounted to 1.999c. per lb. The financial results of operation for the quarter are as follows:

Net operating profit.....	\$706,070.59
Miscellaneous income.....	226,076.44
Total	\$932,147.03
Disbursements to stockholders.....	788,559.50
Net surplus for quarter	\$143,587.53

The average carrying price for the quarter was 21.77c., as compared with 14.80c. for the previous quarter. The output for the quarter was approximately 50 per cent of normal, and is practically identical with the production of the second quarter. The upkeep of mine and mill has been properly attended to, and both plants stand ready to operate at full production on short notice.

Carmen Nol Gusher was brought in by the Standard Oil Co. in the Elks Hills district, section 36, about ten miles northeast of Taft, Cal., on Oct. 7. The oil goes 30 to 40 ft. above the derrick, flowing from ten thousand to fifteen thousand barrels daily. The company has been drilling for six months, using a 6-in. drill casing and 10-in. mouth casing. The crown was not disturbed by the blow-off. The gusher lies one mile east of the gasser brought in last June. The oil is of high gravity.

PETROLEUM SECTION

Engineering Notes and Equipment Details
Production Statistics—Progress
in Important Fields

Southern Pacific Loses California Oil Lands

U. S. Supreme Court Reverses Finding of the Circuit Court and Orders 6,000 Acres Returned to the Government

THE U. S. Supreme Court in Washington handed down a decision on Nov. 17 cancelling the patents for 6,000 acres of California oil lands, valued at \$10,000, which were alleged to have been obtained through fraud by the Southern Pacific Co. The decision reverses the decree of the Federal Court, which dismissed proceedings instituted by the Government to have the land, which is situated within naval oil reserve No. 1, returned to the Government. The contention of the Government was that the company, at the time the patents were issued, in 1904, under a railroad land grant which reserved mineral lands, was aware of the fact that the lands were valuable for oil, although alleged false affidavits to the contrary were filed. The Federal District Court, in ruling on the suit, held that though there had been no actual discovery of oil on the lands, the surrounding conditions indicated that it was valuable for oil, which in turn was reversed by the Circuit Court of Appeals, which body is now finally reversed by the Supreme Court.

In rendering the opinion, Justice Van Devanter said the officials of the railroad company were not acting in good faith, and were "attempting to obtain the patent by representing that the lands were not mineral when they believed the fact was otherwise." Continuing, the Justice said: "After considering all the evidence, we think it is adequately shown that the lands were known to be valuable for oil when the patent was sought and obtained, and by this we mean that the known conditions at that time were such as reasonably to engender the belief that the lands contained oil of such quality and in such quantity as would render its extraction profitable and justify expenditures to that end."

The company introduced evidence to the effect that a general land office agent examined the lands and reported them as non-mineral. The court said that this report was made in another connection, and was not considered by the Government in approving the company's selection. The decision states: "It did not relieve the company from showing that the lands selected were not mineral, nor did the company understand that it had any such effect. Besides, if the report could be considered here it would be without any real evidential value, for it appears from testimony given by the agent at the hearing that he was not a geologist or familiar with oil mining, and

that his examination of the lands was at best only superficial."

The area involved amounts to about 6,000 acres, situated in the Elk Hills region of Kern County, near the town of McKittrick. The lands are declared to be part of a grant made by the Government to predecessors in interest of the Southern Pacific Co. in 1866, in return for the promised development of the region. The patents to the lands were not perfected until Dec. 12, 1904. The suit for the return of the lands to the Government was started in 1910, when it was determined that the lands were partly mineral, on the basis that the original grant covered non-mineral lands only. Government geologists came to the conclusion that the lands were in the Taft Presidential withdrawal order of 1912, and they were thereby added to the naval reserve. It is maintained by experts for the company that the lands have little present or potential mineral value, and the oil content has only been proved within the last year. The Government experts oppose this opinion and hold that the lands have a high potential value.

Oil Fields of England, Limited

First British Company Licensed by the Government to Bore for Oil in England. To Develop 5,000 Acres in Nottingham

THE first or statutory general meeting of the members of Oil Fields of England, Ltd., held on Oct. 30 and reported in the "Financial Times," London, contained an interesting review of the present status of the development work being done in England. The chairman, William Ivey, said that this company was the first British company formed in Great Britain to bore for oil in Great Britain itself. There have been plenty of oil companies, and millions of dollars have been raised in Great Britain for the development of oil fields, but up to the present all of that money had been subscribed for development work abroad. In this instance, the money had been subscribed with the definite object of proving whether oil existed in commercial quantities on the Kelham estate in Nottinghamshire. This company holds the first British license granted by the British government for that purpose. Lord Cowdray and his staff, who have already been drilling for oil in several counties, do not represent a British company, but have been acting as an advisory staff to assist the government in proving whether oil existed in commercial quantities.

In regard to the prospects of the company, the chairman stated that the company's future was speculative, but only in regard to the amount of oil

that would be found. The existence of oil has been proved on the Kelham estate. In regard to obtaining oil in commercial quantities, nothing more is known at the present than was not apparent three months ago. The capital of the company amounts to \$250,000, and the area about 5,000 acres. The chairman also stated that it is intended to proceed without delay in drilling down to the oil strata. Therefore, some of the material necessary had been ordered in America, owing to the fact that delivery of the entire equipment could not be obtained in Great Britain.

Anglo-American Oil Company to Build Refinery in England

According to advices received from London and printed in the "Boston News Bureau," the Anglo-American Oil Co. is to build a refinery in England. If this step is to be taken, it is because present British laws exempt from certain taxation gasoline made in England. The construction of a refinery at Swansea by the Anglo-Persian Oil Co., 65 per cent of which is said to be owned by the British government, the capacity of which, when completed, is estimated will be 30,000 bbl. of crude oil a day, has resulted in forcing other oil companies to refine oil in England.

The Anglo-Persian development was followed by E. L. Doheny, who organized the British-Mexican Oil Co., in conjunction with the prominent British industrial and shipping interests. The British-Mexican Co. is to build a refinery on the Manchester Ship Canal in conjunction with its activity in distributing oil products throughout Great Britain and Continental Europe. It has been reported that a considerable amount of stock of the Anglo-American company has been purchased for English account. English industries realize that control of oil means control of shipping, and, therefore, appreciate the great extent to which oil companies will be in a position to share in the marine fuel-oil business.

Petroleum Possibilities in British India

According to an article in "Indian Engineering," and reprinted in the "Board of Trade Journal," London, Oct. 16, 1919, a theory is being discussed in British India that oil beds exist continuously along a belt stretching from Burma in the east to Rumania in the west. Should the fact be eventually established, a discovery of the highest importance will have been made, for the belt will lie wholly on the Indian side of the Himalayas.

At present, however, only uncertain indications have been found, the latest of which have been discovered by Mr. Middlemiss, who is now superintendent of the Mineral Surveys of Kashmir. He has not so far actually found oil in Jammu Province, but has located geological conditions pointing to the existence of a natural reservoir of a type giving good promise of a store of oil, being in all respects similar to oil-yielding structures in the neighboring Rawal Pindi Plateau. In the latter region oil had long been known to be present, but efforts to obtain it in quantity were unsuccessful till the Khaur oil field near Pindigheb was at last located.

Discussing the general question of the occurrence of oil beds along the sub-Himalayas, Mr. Middlemiss says: "The whole of the belt of stratified rocks in Jammu embraces a section of the sub-Himalayan rocks of Tertiary age from Eocene upward, which are identical in composition, age, and lithological characters with those of the petroliferous series in the neighboring Rawal Pindi district. They are also identical in age with, but differ in some particulars lithologically from, the petroliferous series in Assam and in Burma, and also in the newly-discovered fields in Persia. In fact, they form with these known petroleum-bearing areas what is really one continuous but intricately winding belt of deposits belonging to one comprehensive geological epoch, that stretches from Persia on the one hand to the extreme south of Burma on the other. It is also equally true that in general characteristics and in age these rocks exposed in Jammu agree with those of a great proportion of the more distant successful oil fields of the world, notably with those of California, Peru, Russia, Rumania, Galacia, and Sumatra."

Notes From the Texas and Louisiana Oil Fields

Taxes paid by oil companies for last quarter will be over \$500,000 on gross receipts. Some of the largest taxpayers are: Texas Co., \$81,866 on sales of \$5,457,747; Gulf Production Co., of Houston, \$74,876 on sales of \$4,991,755; Magnolia Co., of Dallas, \$60,542 on \$4,036,170; Humble Oil & Refining Co., of Houston, \$45,569 on \$3,037,920; Texas Pacific Oil & Coal Co., of Ferber, \$33,106 on \$2,270,083; Prairie Oil & Gas Co., of Dallas, \$21,292 on \$1,419,518.

The oil and gas department of the Railroad Commission is endeavoring to standardize its records, in order to make few changes necessary, and make it easier for pipe-line companies to conform to the requirements. In carrying out this plan the following ruling has been drafted, to go into effect on Dec. 6: "All maps or sketches of any kind of any tract or tracts of land filed with the oil and gas department of the Railroad Commission must be drawn on a scale of 500 ft. to 1 in., unless the area involved is less than two acres, when the scale must be 50 ft. to 1 in."

The Prime Oil & Refining Co., of Dallas, was recently incorporated with a capital stock of \$500,000. The incorporators are: C. E. Lang, Wichita Falls; Mills Bennett, Houston; and Howard Paschal, Asbury Park, N. J. The Texas Oil Corporation, of Dallas, was incorporated with a capital stock of \$150,000. The incorporators are: J. J. Simmons, C. C. Quillan, W. S. Blair, and H. E. Halaby, all of Dallas.

The Yount Lee Oil Co., of Sourlake, Tex., has filed suit against Land Commissioner, J. T. Robinson, to test the constitutionality of the Texas Oil and Gas Permit Law and to attack the validity of a permit recently granted to W. M. Fleres and M. K. Fletcher, of Beaumont, on oil land in Liberty County. This

is the first of several suits. The land in controversy is valued at \$3,000,000.

The Homer field, in Claiborne Parish, La., is showing great activity. Among the largest wells are the Swan No. 3, of the Rowe Oil Corporation, which flowed unchecked at the rate of 15,000 bbl. daily from 2,100 ft., when first drilled in; and the Oaks Farm well, of the Standard Oil Co., which gaged 12,000 bbl. per day when first brought in.

An injunction, asked for by Isadore Leon against A. S. Moss, N. E. Burke, and J. E. Pitts, trustees for the unincorporated joint-stock association called the M. & P. Burk Oil Co., has been granted by Judge Ewing Boyd, of the 55th District Court, Houston, Tex. The plaintiff claims the agreement was entered into by the terms of which the defendants were to deliver to him 700 shares of stock of this company for \$478,333, but which they now refuse to do. The plaintiff further claims that the stock is now worth \$750,000, and is suing for the stock or the difference in value, about \$270,000. The stock is held in the City National Bank, of Wichita Falls, and the court has granted a temporary injunction restraining the defendants from transferring the stock to others, and the bank from making delivery to the defendants.

In Brazoria County, Tex., the West Columbia field production for the first week in November was about 20,000 bbl. daily. The larger producing companies were: Humble Oil & Refining Co., 7,500 bbl.; Texas Co., 6,000 bbl.; Crown Oil & Refining Co., 3,500 bbl.; Gulf Production Co., 3,000 bbl. New wells being tested are Texas Co.'s Hogg Nos. 18 and 28; Gulf Production Co.'s Hogg No. 1; Sun Co.'s No. 2 Robinson.

The Sinclair Consolidated Co.'s No. 9 Jackson well, on Damon Mound, was recently completed and is now producing 150 bbl. daily. The Humble Oil & Refining Co., at Stratton Ridge, is drilling at 2,500 ft. depth. Other work in this district is being done by the Texas Co., Freeport Sulphur Co., and Castell Oil Co. The Freeport company is sidetracking a well at 1,100 ft. In Coleman County, Tex., the Texas Best Oil & Refining Co. will build a refinery at Santa Anna, with a capacity to be 2,000 bbl. daily.

Harris and Jackson Counties

A new refinery on the Houston Ship Canal will be constructed immediately after Jan. 1 by the Maryland Refining Co., of Ponca, Okla. A tract of 1,830 acres on the channel, eight siles south of Houston, has been secured at a price stated to be \$525,000. The site has exceptional transportation advantages, both by rail and water, and is 30 ft. above tide water.

The case of Adolph Golman vs. Invincible Oil Co. and twenty-eight others was to be heard on Nov. 10, in the 18th District Court, before Judge J. D. Harvey. The suit is over 160 acres in the Landslide tract of the Humble oil field, from which oil previously taken out is said to be worth \$45,000,000. Golman claims the title on the ground that he received a land grant from the state. The defendants claim this grant was cancelled and that they bought the land from the late George H. Hermann.

Drilling in the vicinity of Edna, in Jackson County, is now under way. The Texas Co. is drilling in the La Ward section; the Vanderbilt Petroleum Co. is rigged up and ready to drill on Coop farm, twelve miles south of Edna, and the Coastline Oil Co. is now down over 500 ft. in a well on W. A. Calhoun tract, two miles south of Edna.

Developments in Other Fields

The Gulf Refining Co., in Jefferson County, announced through the local manager that oil shipments from here during October totaled 2,305,163 bbl. by water; of this 803,028 bbl. was foreign, and the rest coastwise. This breaks all previous records. In Nelms-Marvin well on the McCrea ranch is 1,100 ft. deep; the Waxa-Tex Co. is 600 ft. deep; the Groves well cased to 1,000 ft., is making a good showing of both oil and gas; St. Mary well, on Le Compte ranch, is now 900 ft. deep; the New York Syndicate has gas indications in two wells, and work at the Key well will be resumed.

In Liberty County the Texas Co. had a gas blow-out while drilling Palmer well No. 2 on Nov. 5. The gas coming in contact with the firebox of a boiler on the nearby Palmer No. 2 well of the Humble Co., was ignited, and a severe explosion resulted. One man was fatally burned, twenty other men barely escaped, and the derricks and rigs at both wells were damaged.

The Houston Oil Co. is testing No. 1 well at 1,980 ft. Other tests in the vicinity are temporarily suspended on account of high water.

In Mills County, Tex., new wells contracted for in the vicinity of Goldthwaithe are: Simms Oil Co., of Houston, two wells on school land northwest of Mullin, to be not less than 3,300 ft. if oil is not discovered sooner; L. H. Armstrong, of Huntsville, Ala., 4,000-ft. well on Armstrong survey west of Mullin, the work to begin by Dec. 15; the Mill Oil Co. well on the Cryer tract. In Wichita County, Tex., Waggoner City was destroyed by fire on the morning of Nov. 9. This place was also known as "New Town," and is in the heart of the northwest extension of the Burkburnett field. The fire originated by nighting striking a battery of steel storage tanks, and a river of fire flowed through the town, igniting everything with which it came in contact. It is stated that fifty steel tanks and 200 derricks were destroyed, and it is estimated that 1,000 people are homeless. The total damage will amount well over \$1,000,000. One life is known to have been lost.

The Western Oil Corporation, of Wichita Falls, has given the oil and gas division of the Railroad Commission notice of its acceptance of the act of 1919 regulating pipe lines, and agrees to become a common carrier. The company operates a pipe line between the northwest extension of the Burkburnett field and Burkburnett station.

During October, 157 wells were completed in the Burkburnett field. This is a considerable reduction in number compared to September and August. The wells are now making a smaller average production than those first drilled.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Tariff Legislation

A subcommittee of the Senate Committee on Finance, composed of Senators Watson, of Indiana; Thomas, of Colorado; and McCumber, of North Dakota, has listened to testimony regarding the need for tariff legislation on tungsten from Representative Timberlake, of Colorado; Roy C. McKena, of Latrobe, Pa.; and Frank N. Franklin, of Denver. The hearing was held largely to accommodate the witnesses, who wished to submit testimony before returning to their homes. It continues to be the view of the majority of the Senate Finance Committee that tariff legislation should be general and not piecemeal. That view has prevented the advancement of the various tariff measures which were passed earlier in the extra session by the House.

Atmospheric Nitrogen

The formation of the United States Fixed-Nitrogen Corporation, to produce and develop the products of atmospheric nitrogen, is proposed in a bill, drafted in the War Department, and introduced in their respective houses by the chairmen of the committees on Military Affairs. The organization of the corporation is to be undertaken, the bill provides, by a committee of five persons appointed by the Secretary of War. Once formed, the corporation is to be conducted under the supervision and control of the board of directors, which is to consist of not less than three nor more than eleven members, and is to work along lines usually followed by directors of private corporations. The members are to be appointed by the Secretary of War and are to hold office at his pleasure.

The corporation is to take over nitrate-fixation plants No. 1 and 2, situated, respectively, at Sheffield and Muscle Shoals, Ala., and in addition, the fixed-nitrogen research laboratory at Washington, the Waco limestone quarry, the electric-power unit at the Warrior River Station of the Alabama Power Co., and any other plants or equipment owned by the Government which will be helpful to the general project.

The corporation is charged with the completion and operation of the hydro-electric power plant now being constructed at Muscle Shoals. It is also to acquire United States or foreign patents and processes. It is to be allowed to export its products only when there is a surplus in addition to that purchased by the Government or by private interests within the United States.

There is to be common and preferred stock. The common stock is to be without par value, and is to be delivered by the corporation to the Government. The corporation also is empowered to issue preferred

stock when necessary and sell it in any amount not to exceed \$12,500,000. The bill has been referred to the committees on Agriculture.

Suspension of Assessment Work

With only two votes against it, Representative Garland's resolution providing for the suspension of assessment work on all mining claims for the year 1919 was passed by the House. It was then promptly considered and passed in the Senate. On becoming a law it will supersede the House resolution, which limited the suspension to those holding five claims or fewer. The language providing that those holding more than five claims must do assessment work is ambiguous and likely to lead to litigation. That fact, together with the prevailing high prices, the difficulty of procuring labor, and the lateness of the season, is the principal reason given for changing the existing statute. The bill as reported includes Alaska within its provision.

The Secretary of the Interior in his recommendation to the committee urged that the new resolution be given favorable consideration, as he believes that the five-claim proviso in the existing law is likely to be productive of controversy and confusion, in view of the fact that fractional interests in mining claims are held by many citizens. He thinks it will be almost impossible to interpret and apply the limitations.

Mine Inspectors Wanted by the Government

The U. S. Civil Service Commission announces an open competitive examination for mine inspector to fill a vacancy in the Indian Service, Seneca Agency, Okla., at \$2,000 a year, and vacancies in positions requiring similar qualifications, at entrance salaries ranging from \$2,000 to 3,500 a year. Competitors will not be required to report for examination at any place, but will be rated on the following subjects: Education and preliminary experience, 30; responsible experience and fitness, 70.

The duties of the position consist of the inspection of mines, mills, smelting works, oil, ore, and quarry operations, with respect to their safe and proper development. Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C. Applications must be filed prior to the hour of closing business on Dec. 30, 1919.

Physicists Needed by the Government

The U. S. Civil Service Commission announces an open competitive examination for associate physicist qualified in physical metallurgy, for men only, at salaries ranging from \$2,000 to 2,800 a year; and

assistant physicist qualified in physical metallurgy, for both men and women, at salaries ranging from \$1,400 to \$1,800 a year, to fill vacancies in the Bureau of Standards, Department of Commerce, for duty in Washington, D. C., or elsewhere, and in positions requiring similar qualifications in other branches of the service.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which have the relative weights indicated: Education in general physics, chemistry, and mathematics, 40; special education and experience in physical metallurgy, 60. On account of the needs of the service, applications will be received until further notice. Applicants should at once apply for form 1312, stating title of examination desired, to the U. S. Civil Service Commission, Washington, D. C.

Select Committee on Expenditures in the War Department

Representative Graham, of Illinois, as the chairman of the Select Committee on Expenditures in the War Department, expects to sum up his conclusions of the extended hearings conducted by his committee in an address before the House in the near future. In asking the House to vote favorably on the resolution requesting the Secretary of War to make a review of certain settlements for war materials, Mr. Graham makes the following reference to the purchase of surplus copper by the United Metals Selling Co.: "Immense profits were made by the producers of copper by virtue of a combination of the low-price copper producers, which combination was aided and encouraged by the Government, although in violation of the law of the land."

Mr. Graham's committee recommends "that if it be found that sums of money are due the Government on account of such settlements being fraudulent, or not according to the tenor of the law, proceedings be instituted by the Secretary of War to recover the sums of money due the Government."

General Leasing Bill

Failure of the conferees on the mineral leasing bill to reach an agreement during the extra session of Congress is not indicative of any unusual delay of this measure in conference. The conferees met only for two short sessions. It was evident that the matter could not be disposed of during the short time before adjournment, and it was agreed not to take up the bill in detail until the beginning of the regular session.

The President, on Nov. 13, signed the bill suspending all assessment work on mining claims for the year 1919. The measure is now a law, and those holding five or more claims are released from the assessment work requirements as the holders of a smaller number of claims have been released by an earlier act. To obtain the benefit of this suspension, claimants must file a notice of their desire in the office where the location or certificate is recorded on or before Dec. 31, 1919.

Testing of Mine and Track Scales

Work by the Bureau of Standards in connection with mine and track scales has been continued in different sections of the country, and six men are now employed in this field. The mine scale trucks have operated in the states of Tennessee, West Virginia, and Kentucky, and track-scale testing equipments have covered the states of Kentucky, Michigan, Minnesota, North Dakota, Montana, and Washington.

A member of the Bureau's staff recently attended a meeting with representatives of the American Railroad Association and the scale department of the Pennsylvania R. R., in order to discuss the subject of track specifications. As a result of this conference, it has been proposed to add to the committee of the American Railroad Association a representative of the Bureau of Standards. It is hoped that when this committee is organized, it will form a means whereby progress in the securing of accurate weights on railroads will be expedited and all railroads will be induced to adopt types of scales and weighing rules which will result in first-class weights.

President Calls New Industrial Congress

According to an announcement on Nov. 20, the President has issued invitations to a new conference of former Federal and state officials, business men, and economists, to meet in Washington, on Dec. 1. Guided by the experience of the last conference, the President has thought it advisable that in the new body there should be no recognition of distinctive groups, but, instead, action in the interest of the people as a whole.

The personnel of the new conference, which does not include any of the men who served in the previous conference, is as follows: W. B. Wilson, Secretary of Labor; Thomas W. Gregory and George W. Wickersham, former United States Attorney-Generals; Herbert Hoover; Oscar Straus, former Secretary of Commerce; Henry M. Robinson, of Pasadena, Cal.; Frank W. Taussig, former chairman of the Tariff Commission; Samuel W. McCall, Martin H. Glynn, and Henry C. Stuart, former governors of Massachusetts, New York, and Virginia, respectively; W. O. Thompson, of Ohio State University; Richard Hooker, of Springfield, Mass.; George T. Slade, of St. Paul; Julius Rosenwald, of Chicago; Owen D. Young, of New York City; H. J. Waters, of Manhattan, Kan., and Stanley King, of Boston.

Prospecting for Potash

Despite the rather gloomy future of the domestic potash industry, a considerable number of prospecting permits are being issued, the total of such permits now exceeding 200. Most of the permits issued cover areas in southern California, Nevada, and Utah, but some are being issued in New Mexico, Colorado, and Arizona. As two years are allowed for prospecting, no one has yet applied for a patent.

All of the lake bed proper at Searles Lake, Cal., is covered by leases. Ten leases have been issued covering that area, only three of which are being

operated. Information reaching the General Land Office, which is in charge of potash leasing, is to the effect that active work is in progress on the plant being erected on the leucite deposit in Sweetwater County, Wyo. A number of operations are in progress on the Salt Lake desert. Applications have been made for patent on several claims in that region which were taken up prior to the potash-leasing law.

Several holders of leases have been granted an extension of one year in which to begin operations, but the Secretary of the Interior has announced that no extension beyond one year will be granted.

Exports of Mining Machinery

The exports of mining machinery from the United States during September, 1919, according to the Bureau of Foreign and Domestic Commerce, were as follows:

Countries	Oil Well	All Other
Belgium.....		\$ 7,564
France.....		152,766
Netherlands.....		1,766
Rumania.....	\$ 31,622	4,520
Sweden.....		6,100
England.....		142,621
Canada.....	7,045	54,463
Costa Rica.....		326
Guatemala.....	1,054	
Honduras.....		1,676
Nicaragua.....		8,501
Panama.....		1,514
Mexico.....	41,780	145,769
Barbados.....		771
Trinidad and Tobago.....		34
Cuba.....		3
Dominican Republic.....		515
Argentina.....	11,441	
Bolivia.....		1,925
Brazil.....	10,658	
Chile.....		45,319
Colombia.....		8,197
Ecuador.....	3,740	
Dutch Guiana.....		4,517
Peru.....	923	30,590
Uruguay.....		169
Venezuela.....		1,765
British India.....	12,671	
Dutch East Indies.....	377	894
Japan.....	1,840	44,620
Russia in Asia.....		848
Australia.....		2,657
New Zealand.....		3,512
Philippine Islands.....	24,951	50
Belgian Congo.....		145
British West Africa.....	1,057	250
British South Africa.....		46,676
Portuguese Africa.....		198
Egypt.....	121	
Totals.....	\$151,300	\$723,008

High Prices for Silver

For the first time in nearly fifty years silver went under the 16 to 1 ratio to gold on Nov. 10, when bullion sold in the New York market at \$1,305 per oz., according to the Guaranty Trust Co., of New York. This was the highest price since 1872, when silver brought \$1,325 per oz. Though this price for bullion would yield a profit to those melting down silver dollars, the silver in which is worth \$1 when the price of bullion silver is at \$1.2929, it is doubtful whether such melting will take place to any great extent unless the present high prices for bullion are maintained for a considerable period.

The rise in the price of silver is attributed to the heavy demand for the metal by England, Canada, India, Hongkong, and China. Stocks, in China especially, were reduced by the embargo on exports which was maintained from the summer of 1918 until last May. Since the lifting of this embargo China has been taking more silver than all other countries

combined. In August, China took \$10,911,987 in silver, and since then her agents have been in the market for even larger quantities.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, are reported by the Department of Commerce, for September, 1919, and the figures for September, 1918, as finally revised, as as follows:

	IMPORTS FOR SEPTEMBER (In pounds unless otherwise stated)	
	Sept. 1918	Sept. 1919
Antimony ore, contents.....	Nil	28
Antimony matte, regulus or metal.....	6,201,579	393,070
Copper:		
Ore, contents.....	4,253,028	3,712,966
Concentrates, contents.....	4,936,050	2,789,346
Matte, regulus, etc., contents.....	1,639,732	6,445,780
Imported from (in part):		
Canada.....	2,168,703	2,194,122
Mexico.....	4,892,799	9,399,950
Cuba.....	2,736,544	87,392
Chile.....	768,970	891,200
Peru.....	35,744	55,893
Unrefined black, blister, etc.....	37,570,650	22,686,470
Refined in ingots, plates, etc.....	1,472,454	869,157
Old, etc., for remanufacture.....	103,516	199,324
Composition metal, copper chief value.....	16,548	1,896
Lead:		
Ore contents.....	5,202,110	1,414,137
Bullion, contents.....	17,905,345	21,476,353
Imported from (in part):		
Canada.....	5,475,372	1,531,828
Mexico.....	17,622,551	21,359,162
Pigs, bars and old.....	13,163	2,622,636
Pyrites, long tons.....	50,651	28,658
Imported from (in part):		
Spain, long tons.....	4,349	20,583
Canada, long tons.....	43,623	8,061
Tin ore, long tons.....	683	4,036
Tin bars, blocks, pigs, etc.....	10,928,098	11,087,403
Imported from (in part):		
United Kingdom.....	627,262	5,412,168
Straits Settlements.....	5,482,436	4,730,489
Dutch East Indies.....	2,949,120	743,324
Hongkong.....	1,016,299	10,822
Zinc:		
Ore, contents.....	4,030,201	1,910,486
Imported from (in part):		
Canada.....	538,800	424,258
Mexico.....	3,481,401	1,486,228
Blocks, or pigs, and old.....	7,762	34,477
Manganese ore, long tons.....	72,635	19,901
Imported from (in part):		
Cuba.....	12,664	275
British India.....	2,775	500
Brazil.....	50,414	16,786
Tungsten ore, long tons.....	1,164	818

	EXPORTS OF COPPER, LEAD AND ZINC (In pounds)	
	Sept. 1918	Sept. 1919
Copper:		
Ore, contents.....	132,242	3,000
Concentrates, contents.....	42,716	52,460
Unrefined, black, blister, etc.....	Nil	811
Refined, in ingots, bars, etc.....	73,302,985	62,341,191
Exported to (in part):		
France.....	8,938,231	8,317,911
Italy.....	15,561,737	13,051,699
United Kingdom.....	45,973,753	2,814,973
Canada.....	2,663,470	2,581,539
Composition metal, copper chief value.....	3,548	10,928
Old and scrap.....	Nil	201
Pipes and tubes.....	327,325	641,448
Plates and sheets.....	1,166,832	307,742
Wire, except insulated.....	665,332	2,523,049
Lead:		
Pigs, bars, etc., produced from domestic ore.....	8,062,118	1,976,815
Produced from foreign ore.....	9,389,476	7,416,828
Exported to (in part):		
United Kingdom.....	11,061,754	224,000
Canada.....	3,010,633	149,701
Brazil.....	358,400	112,000
Japan.....	2,351,316	7,375,295
Zinc:		
Dross.....	2,366,669	110,613
Zinc produced from domestic ore.....	10,511,200	19,034,689
Zinc produced from foreign ore.....	3,794,068	1,456,337
Exported to (in part):		
France.....	3,287,303	160,137
Italy.....	1,908,298	None
United Kingdom.....	5,661,518	5,320,504
Canada.....	338,167	68,149
Mexico.....	502	400
Japan.....	3,009,924	14,794,410
In sheets, strips, etc.....	1,895,099	3,432,428

The New Oil Field at Colony, Creek County, Wyo., was first entered by the Roxana Oil Co. and several of the larger oil companies have since secured leases. The field is twenty-five miles west of Belle Fourche, in Butte County, where a standard oil rig had arrived recently on its way to the new oil field. Drilling was expected to begin about the first part of November.

BY THE WAY

Tungsten and Tombstone

Two years ago it was reported that tombstones were being used for location monuments in the district near Sodaville, Nev., where a "rich ledge of tungsten ore" was discovered. One miner located the village cemetery, and, as there were no rocks near, he used some of the best looking tombstones to mark the boundaries of his claim. Others followed suit, and soon it was difficult to recognize one claim from another. There are those today who will say that there is something fittingly symbolical about a tombstone as far as tungsten is concerned.

Leadville Reformed

Leadville in boom days was the gambler's paradise. But there the day of the gilded den has passed. By a court order this fall much elaborate paraphernalia seized in several establishments was destroyed. Roulette wheels and other devices were the food for a spectacular bonfire. One roulette wheel, valued at \$2,500, is said to have been one of the finest "wheels" in the West. It was a "crooked" wheel, with a "squeeze" that could be controlled by the operative or from another room than that in which the "play" was being conducted. More fortunes were won and lost in Leadville than in any other Colorado camp.

The Curfew Law in Chemistry

The American Chemical Society in announcing its regular meeting for December makes the statement that the usual informal dinner will be held before the meeting at the clubhouse in New York. It then goes on to say that "house rules of the Chemists' Club make no provision for the entertainment of ladies in the club proper after 4 p. m. We are forced, therefore, to exclude our lady members from this dinner invitation."—Why, we ask, on behalf of our friends among the fair sex, is the line drawn at 4 p. m.? Has not even a chemist noticed that the lady fair is even fairer after this time than before? But perhaps the lonely worker of the laboratory is more susceptible to the lure of the ladies than most people by reason of the very seclusion in which he generally hides himself. Self-defense is one of the first laws of nature, and here, perhaps, may be found an explanation of the odd rule in effect at the Chemists' Club.

Whither Are We Drifting?

An editorial writer in September "Industrial Management" seizes upon "The Parable of the Laborers," Matthew XX, and applies his interpretation to present-day problems with a right good will and, also, with most lofty spirit. The parable tells us that, when pay day came, each laborer received a penny—even those engaged at the eleventh hour; the said hour of the calling of "Time" indicating that the

basic eight-hour-day had not, in St. Matthew's era, been made an article of faith. Our contemporary argues that the parable must be interpreted as sanctioning and confirming the justice of the demand for a living wage, irrespective of the hours worked! This is good news indeed—for some! Does the one-hour day—Saturday half-holiday—impend? We are further told by the journal quoted: "The bond of so-called natural, economic, and judicial laws is crumbling, and, whether we will or not, labor will come into its own." We should say so! If the interpretation be prophetic, labor will soon come into everybody's own. We imagine organized labor will be compelled blushing to admit, "This is 2 mutch."

Another Children's Crusade

Under the heading "School Children Demand the Metric System," the World Trade Club of San Francisco has issued another bulletin advocating the use of the metric system. The appeal contained is worded as follows:

The World Trade Club is daily receiving evidence as to the growing strength of public opinion thruout Britannia in favor of metric standardization. Just the other day word came from one of their co-workers in England of an interesting episode that took place during one of his lecture tours.

At Kingsbridge he spoke before a gathering of enthusiastic schoolboys from the local grammar school, telling them of what adoption of the metric units of measurement would mean to the school children of the world,—how easy metrics are to learn, how simple to apply—in short, that it would lessen the necessary time spent on arithmetic by three years.

At the close of his talk, the boys unanimously adopted a resolution urging other schoolboys to go on strike with them against the British weights and measures, and demanding that only metrics be taught in the schools. These English youngsters realized the increase in efficiency, and the immense saving of time and labor obtainable through the meter-liter-gram.

In a previous bulletin the club chronicled the fact that Henry Ford had taken up arms in behalf of the metric system. That may be accepted in all seriousness. Mr. Ford has enough money to do many things, and is doing them sometimes. However, when the World Trade Club holds up the action of children as a pattern for adults to follow, for this is what the bulletin referred to really means, it must expect to have its utterances taken as a joke. This criticism is not to be considered as for or against the metric system—much is to be said for both sides of the controversy. If this were not so, there would not be any controversy. But unless the World Trade Club can do better than this, it had better fire its press agent or else be listed among the amusements of the day.

Exit the Ball Mill

The following interesting communication from E. W. Lawler has been crowded out of our "Correspondence and Discussion" section, but we are publishing it here in order to get it before our readers at the earliest moment. We have been hoping for a solution of the ball-mill controversy for some time, but had not before thought it would be settled by

the total elimination of such mills from the flow sheet, as will follow the general introduction of the following process, the devilish ingenuity of which is at once apparent.

Manufacturers of pottery and china, it is said, require that large chunks of enamel be broken up into small pieces without the admixture of iron, which would interfere with the color. In order to do this, the enamel, in molten condition, is poured into water, a process known as "water-cracking," and somewhat similar to the method of granulating slag.

The idea has now, it seems, been applied to ore reduction and successfully used at one of the largest gold mines on the Hawaiian Islands. Melting the ore was found to be expensive, so the ore is merely heated to redness and the requisite temperature drop obtained by plunging the hot ore into cracked ice instead of water. The flow sheet is something as follows: The ore, crushed to about 1 or 2-in. size by any economical or other means, is delivered on a conveying belt made of "ass-best-toes." (These belts are made from the front toes of the best burros in the pack train. Whenever a burro dies, his feet are saved; in this way, cheap material for repairs is always available.) An ass-best-toes belt is necessary on account of the extreme heat through which the belt must pass. The ore is conveyed between two electrodes and the current passing through it heats the rock to the proper temperature. The latter, of course, depends upon the fineness of reduction desired.

Immediately after passing through the electrodes, the ore is mixed with cracked ice, which is furnished by a refrigerating machine of a new type, based on the principle of hail. This refrigerating machine, instead of making ice in blocks which would necessitate the use of ice crackers and the consumption of power, simply pumps the brine through pipes, and the rain (this process is only adapted to rainy countries) coming through the chilled pipes turns into hail, or ice. This makes a cheap method of obtaining cracked ice.

The addition of the ice to the red-hot ore causes the latter to crack up to any fineness necessary. This has only been tried on free-milling gold ore, and as the reports indicate that the metal is not at all broken up, the separation of the ore from the metal is easy.

The finely decrepitated rock is sucked away by means of a current of air caused by the sudden cooling of the atmosphere in the vicinity of the refrigerator pipes. This air is so guided by means of proper deflecting vanes as to cause the gangue to be deposited in one place, while the metal, or gold, being heavier, remains on the traveling belt and is carried to a bullion safe at the end, equipped with a trap door.

In dry countries, where rain is not available, it is proposed to deflect some of the air so that it will carry the steam arising from mixing the cracked ice with the hot ore, over the refrigerating pipes to again be turned into cracked ice. Such a regenerative process would, of course, save water.

NEW PUBLICATIONS

Documentos Relacionados con la Legislación Petrolera Mexicana. Paper, 8 x 10; pp. 700. Secretaria de Industria, Comercio y Trabajo, Mexico City, Mexico, 1919.

A List of Books on Foreign Countries. Compiled by Miss M. L. Prevost for the U. S. Shipping Board. Paper, 6 x 9; pp. 25. Government Printing Office, Washington, D. C., 1918.

Iron-Depositing Bacteria and Their Geologic Relations. By Edmund Cecil Harder. Paper, 9 x 11; pp. 89, illus. Professional Paper 113, U. S. Geological Survey, Washington, D. C., 1919.

Techno-Chemical Receipt Book. By William T. Brannt and William H. Wahl. New Enlarged Edition. Cloth, 5 x 7½; pp. 516, illus. Henry Carey Baird & Co., Inc., New York, 1919.

Clays and Shales of Minnesota. By Frank F. Grout, with contributions by E. K. Soper. Paper, 6 x 9; pp. 259, illus. Bull. 678, U. S. Geological Survey, Washington, D. C., 1919.

Deposits of Manganese Ore in New Mexico. By Edward L. Jones, Jr. Paper, 6 x 9; 24 pp., one map. Bulletin 710-B, U. S. Geological Survey. Contributions to economic geology, 1919, Part 1, pp. 37 to 60.

The history and geologic relations of manganese deposits in the state. The orebodies are small and costs of mining and transportation high so that it is doubtful if profitable extraction can be made, at least at pre-war prices. Descriptions of deposits and operations, including exploration, development, and production, in Dona Ana, Grant, Sierra, and Socorro counties are given.

Manganese Deposits of the West Foot of the Blue Ridge, Virginia. By G. W. Stose, H. D. Miser, F. J. Katz, and D. F. Hewett. Paper, 7 x 10; pp. 166, illus. Bulletin 17, Virginia Geological Survey, Charlottesville, Va.

The report covers in a complete manner the work which has been done jointly by the Virginia Geological Survey and the U. S. Geological Survey in this section, and is an excellent example of the scope that should be included in studies and investigations of other mineral-bearing districts. The information is well arranged, and the bulletin constitutes a most valuable work on the subject of manganese deposits.

Mineral Resources of Georgia and Caucasia, with a Chapter on the Manganese Industry of Georgia. By D. Gham-bashidze. Cloth, 5½ x 8½; pp. 182, illus. George Allen & Unwin, Ltd., London; The MacMillan Co., New York, 1919.

Of no little interest to the reader is the introduction to this book in which the author presents a number of pertinent facts regarding the country of which he writes and concerning which many of us know but little. The neglect of Russia to develop the natural resources and her prevention of outside capital from entering this field have served to retard the development of the mineral potentialities of Georgia. Already well recognized as one of the three great manganese producers of the world, the district is rich in other minerals which await development. With some exceptions mining has not been carried on by extensive operations, but this has been due, in great measure, to unsettled conditions. Under the present government and a well directed mining board, the possibilities of financial return from mining in Georgia hold considerable promise to investors of foreign capital.

PERSONALS

Walter M. Stephen is now residing at 15 Central Ave., Staten Island, New York City.

Donald G. Campbell, of Seattle, is in Alaska for the winter, investigating properties north of Nome.

A. J. Wyly has left Leborg, Tandai, and is now at Leborg Donok, Mocara Aman, Sumatra, Dutch East Indies.

S. M. Levy, manager of the Calaveras Copper Co., Copperopolis, Cal., spent a few days in New York recently.

Edel Moldenke has returned to Wat-chung, N. J., after spending two years in Burma with the Burma Mines, Ltd., as mining engineer.

John Ogden has closed his laboratory in Philadelphia and is associated with the United Reduction & Metal Co., Denver, Col., as chief chemist.

P. G. Beckett has been appointed general manager of Phelps Dodge Corporation, with headquarters at Douglas, Ariz., effective Jan. 1, 1920.

Theodore W. Richards, professor of chemistry at Harvard University, has been elected president of the American Academy of Arts and Sciences.

A. J. Crowley, superintendent of Nevada Sulphur Co., has returned to the mines near Winnemucca, after spending several weeks in San Francisco.

G. M. Colvocoresses, general manager of the Consolidated Arizona Smelting Co., Humboldt, Ariz., is in New York City for two or three weeks.

Scott H. Sherman, manager for a number of years of the Gila Copper Sulphide Co., at Christmas, Ariz., has resigned. He will reside in Phoenix, Ariz.

L. D. Adams has returned to San Francisco after spending several months visiting various properties in eastern Canada in which he is interested.

W. J. Elmendorf, of Campbell, Wells & Elmendorf, Seattle, is now at Sandon, B. C., in operating charge of the Mercury, Charleston and Gault silver-lead mines.

Albert H. Low, senior member of Von Schulz & Low, assayers and chemists, of Denver, was appointed professor of chemistry at the Colorado School of Mines on Oct. 1.

William Crosley, who went to Burma in May, 1917, to engage in the production of tungsten, is making preparations to return, and expects to be in London in December.

A. T. Thomson, assistant to the President, Phelps Dodge Corporation,

who has had his headquarters in Douglas, Ariz., will return to the New York office on Jan. 1, 1920.

F. A. Goodale, of Colfax, Cal., has gone to Australia to make an extensive examination of a placer property containing gold and sapphires. He will be gone about four months.

Fletcher Hamilton, W. J. Loring and L. D. Gordon, of California, attended the St. Louis meeting of the American Mining Congress to advocate a protective tariff on quicksilver.

N. O. Lawton, formerly mine superintendent of the Miami Copper Co., has been carrying on some successful diamond drilling at Pilley's Island, Newfoundland, for the Blast Furnace Products Co., of New York.

George R. Fawcett, mining engineer of the Arizona State Bureau of Mines, is lecturing throughout Arizona on "Practical Mineralogy for the Prospector," to aid in the discovery and development of valuable mineral deposits.

H. W. Kitson, formerly on the staff of the Engineering and Mining Journal, has gone to Tampico, Mex., to examine oil lands, and will be absent about a month. Mr. Kitson recently established headquarters at 1209 Mills Bldg., El Paso, Tex.

Lindsay Duncan, formerly chief mechanical engineer of the Nevada Consolidated Copper Co., and Curtis Lindley, Jr., mining and construction engineer, have formed a partnership under the name of Duncan & Lindley. Their address is Room 649, Mills Bldg., San Francisco.

W. G. Miller, provincial geologist of Ontario, has returned to Toronto from a six months' stay in Europe, where he was engaged in completing the organization work of the Imperial Mineral Resource Bureau. While abroad Doctor Miller visited the battlefields of France and Belgium.

J. Parke Channing was the guest at a recent banquet in Miami, Ariz., of the Globe-Miami Chapter of the American Association of Engineers. In his address Mr. Channing dwelt upon the conservation of water and the work of the National Engineering Council, of which he is a member.

T. H. O'Brien has been appointed manager of the Industrial and Public Relations Department of Phelps Dodge Corporation, and consulting engineer of the Stag Canyon Branch, with headquarters at Douglas, Ariz. Mr. O'Brien has been manager of the Stag Canyon Branch, but resigned that position and will be succeeded by W. D. Brennan.

Charles Eugene Schneider, the French steelmaster, and head of the Creusot Iron Works, who has been touring this country, has received the honorary de-

gree of Doctor of Science from Western Reserve University, the honorary degree of Doctor of Engineering from Stevens Institute of Technology, and the honorary degree of Doctor of Science from the University of Pittsburgh. In Pittsburgh M. Schneider was extended the freedom of the city and was presented with its flag. On Nov. 23 M. Schneider addressed a mass meeting of Alsatians, Lorrainers and Czecho-Slovaks in New York and was presented with a gold medal, on which was inscribed "Noble Son of Lorraine," from the Association of Alsatians and Lorrainers.

OBITUARY

Henry Laurence Gantt, an industrial engineer of national reputation, died on Nov. 23 at his home in Montclair, N. J. Mr. Gantt studied at Johns Hopkins University and Stevens Institute of Technology. In association with the late Frederick W. Taylor, he helped to install modern methods of manufacture at the plant of the Midvale Steel Co. and at other large industrial establishments. Mr. Gantt was the author of "Work, Wages and Profits," "Industrial Leadership" and "Organizing War Work," as well as a number of articles in technical journals.

SOCIETIES

Institution of Petroleum Technologists held its first meeting of the session on Oct. 31, with the president, Sir Frederick W. Black, in the chair. A paper on "Some Laboratory Tests on Mineral Oils" was read by Arnold Philip.

American Institute of Chemical Engineers will hold its twelfth annual meeting at the Hotel De Sota, Savannah, Ga., Dec. 3-6, 1919. The meeting will be devoted largely to Southern chemical industries, and a number of inspection trips have been arranged. Among the papers to be presented is one by J. G. Bailey on "Acid Electric Furnace Ferrotungsten."

American Welding Society—Realizing the necessity of publishing its proceedings regularly, the "Journal of the American Welding Society" has been started by the American Welding Society, and its first issue, dated October, 1919, has been published. The size adopted is 8½x11 in., and printing and illustrations are excellent. The first issue contains 64 pages, including the

cover, of which 36 are advertising. The address of the American Welding Society is 33 W. 39 St., New York City.

American Electrochemical Society—Arrangements are being made for the spring meeting to be held in Boston, Apr. 8, 9, and 10, 1920. On Apr. 9, there will be joint meeting with the American Institute of Electrical Engineers, and it is proposed to have two symposiums on that date, on "Electrically Produced Alloys" and on "Power for Electrochemical Purposes." On Apr. 8, there will be a symposium on "Colloids."

The New York Section recently elected the following new officers: W. S. Landis, chairman; W. A. Cowan, vice-chairman; H. B. Coho, secretary-treasurer.

American Association of Engineers announces that effective with the January number its official publication, "The Monad," will be published under the name of "Professional Engineer." At the same time the size of the publication will be increased to 9x12 in. The magazine will remain a monthly.

The American Association of Engineers has recently organized chapters or clubs in the following cities: Globe-Miami, Arizona; Terre Haute, Indiana; Phoenix, Arizona; San Antonio, Texas; Tulsa, Oklahoma; Joliet, Illinois; Butte, Montana; Davenport, Iowa; Rock Island, Illinois; Moline, Illinois; Morgantown, West Virginia; Pocatello, Idaho; El Reno, Oklahoma; Arkansas City, Arkansas; Akron, Ohio; Springfield, Illinois; New Orleans, Louisiana; Newell, South Dakota; also at University of Minnesota, University of Arizona, University of Michigan.

INDUSTRIAL NEWS

James A. Lannon, formerly general superintendent of the Atlas Mining & Milling Co., Ouray, Col., has associated himself with the Denver Engineering Works Co., the Aldrich Pump Co., and the Victor M. Braschi Machinery Co., of Mexico City, as their representative, and will have headquarters in Mexico City with the Braschi Machinery Co.

Wisconsin Bridge & Iron Co., North Milwaukee, Wis., announce that E. P. Rankin, Jr., will represent them in the Southwest, with headquarters at El Paso, Tex. Mr. Rankin's address will be P. O. Box 692, El Paso.

Russell W. Stovel, who recently returned from France, where, as Lieutenant-Colonel of Engineers, he served as Chief of the Terminal Facilities Division of the Army Transport Service, has been appointed a consulting engi-

neer of Westinghouse, Church, Kerr & Co., Inc., and, as a member of that organization, will devote his entire time to the company's electrical and mechanical work.

Goodyear Tire & Rubber Co., of Akron, Ohio, has created the position of sales manager, and appointed L. C. Rockhill to that position.

Lincoln Electric Co., of Cleveland, Ohio, announces that Paul M. Lincoln, for many years commercial engineer of The Westinghouse Co., has resigned from that organization, effective Nov. 1, to enter the consulting engineering field, and in that capacity will have active charge of motor application engineering for the Lincoln Electric Co.

Black & Decker Manufacturing Co. has opened an additional office on the Pacific Coast, at 201 Maynard Bldg., Seattle, Wash., in charge of A. E. Nordwall, who will have charge of the distribution of Black & Decker products in the state of Washington, working under the direction of the main Pacific Coast office, 918 Hearst Bldg., San Francisco, Cal.

TRADE CATALOGS

Centrifugal Pumps. The Goulds Manufacturing Co., Seneca Falls, N. Y. Bulletin No. 122, entitled "Centrifugal Pump Sales Service Data"; 8x10; 36 pp.; illus. Contains data on the theory, design, testing, and similar information on centrifugal pumps, including curves and formulae.

Heat Insulations. The Franklin Manufacturing Co., Franklin, Pa. Catalog F. C. 7-19; 8¼x11¼; 77 pp., illustrated. Describes the insulating products of the company (magnesia and asbestos) and gives the usual sales data and suggestions for the proper type of insulation for certain purposes.

Centrifugal Pumps and Pumping Units. Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Bulletin; 8x10½; 52 pp.; illus. Describes various types of centrifugal pumps and their particular uses with different kinds of drives. Data in tabular form giving relations between H.P., R.P.M. efficiencies, and capacities, as well as efficiency curves, are included.

Steam, Water and Air Specialties. The McAlear Manufacturing Co., Chicago. Catalog No. 25, describing modern steam, water, and air specialties for high- and low-pressure heating and power plants, and devices for plumbing installations. Catalog entitled "25 Years of Know How," covering vacuum, vapor, and air-line heating specialties, is ready for distribution.

NEW PATENTS

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

Iron and Steel—Metallurgical Process. Joel Lund. (1,320,483; Nov. 4, 1919.)

Iron-Ore Treatment—Process of Extracting Iron From Its Ore. Charles Colcock Jones. (1,319,589; Oct. 21, 1919.)

Iron Oxides—Method of Separating the Oxides of Iron and Other Metals Occurring in Compound Ores. James Claude Adell. (1,318,431; Oct. 14, 1919.)

Lamp—Miner's Hand-Lamp. John Lawrence Conway. (1,319,758; Oct. 28, 1919.)

Manganese—Process of Preparing Highly Oxidized Manganese Compounds. James C. Adell. (1,318,432; Oct. 14, 1919.)

Molybdenum Bronze. Seiko Shigetani. (1,319,537; Oct. 21, 1919.)

Oil Wells—Packer For. Shelton T. Cameron and Edward R. Inman. (1,318,352; Oct. 14, 1919.)

Open-Hearth Furnace. John O. Griggs. (1,320,387; Nov. 4, 1919.)

Ore-Treating Kila. William Winkelman. (1,319,939; Oct. 28, 1919.)

Potash—Extraction and Recovery of Potassium or Potassium Salts From Potassium-Bearing Materials. Edgar Arthur Ashcroft. (1,320,193; Oct. 28, 1919.)

Potash—Process of Extracting Potassium Salts. Robert S. Edwards. (1,320,211; Oct. 28, 1919.)

Refractory Materials and Method of Making the Same. Bernard Enright. (1,319,056; Oct. 21, 1919.)

Separating or Concentrating Ores—Apparatus For. David Cole. (1,319,208; Oct. 21, 1919.)

Separation—Apparatus for Separating Minerals. Erastus B. Bennett. (1,320,526; Nov. 4, 1919.)

Separation—Machine for Separating Minerals From Ore-Bearing Materials. Richard P. Park. (1,319,790; Oct. 28, 1919.)

Separator—Mineral Separator. Charles W. Eccleston. (1,319,646; Oct. 21, 1919.)

Slags—Process of Treating Slags. Ulysses A. Garred. (1,319,061; Oct. 21, 1919.)

Steel—Apparatus for the Production of Steel Directly From Pig Iron. Alfred Nielsen. (1,318,906; Oct. 14, 1919.)

Tuyeres—Process and Apparatus for Molding Tuyeres and the Like. Benjamin F. Caffey. (1,321,008; Nov. 4, 1919.)

THE MINING NEWS

New York, November 22 and 29, 1919

Iron Formation Cut at Escanaba, Michigan

An iron formation has been cut at a depth of 550 ft. on lands being drilled by E. J. Longyear Co. five miles from Escanaba, Mich. No ore has ever been found in this vicinity, and even at present only an iron formation has been discovered. The work is being done by the Escanaba Iron Range Exploration Co., which was organized by Escanaba people to prospect the lands that are under option. The fact that the

The Pas, Manitoba, on the Hudson Bay Ry. to Mile 43 on the railway. From this point to the vicinity of the new gold find it is about forty-five miles northwest, the trail going over numerous lakes, with portages between. An engineer from the Department of Public Works of Manitoba is in The Pas at the time this is being written, and it is expected that he will proceed to Mile 43 on Nov. 19 and make reconnaissance of the country for a winter sleigh road from the railroad to Copper Lake. Much interest will be taken in the de-

there is no evidence that the dike contains sufficient pitchblende to permit of its being worked for that mineral. The uranium is distributed sparingly, and from the material already broken one would have difficulty in picking out more than an ounce in an hour. The deposit has been reported on by C. W. Knight, of the Ontario Bureau of Mines.

The Utah Apex Suit

Testimony Taken on Both Sides—Many Prominent Geologists on Both Sides as Witnesses

In the suit now in progress between the Utah Apex and Utah Consolidated mining companies before Judge Tillman A. Johnson in the U. S. District Court in Salt Lake City, the witnesses for the latter company were heard first. Utah Consolidated is seeking to prove that the extralateral rights in dispute center in the Highland Boy limestone as the highest point of mineralization in the two properties and not in the fissuring. Its witnesses gave much testimony in regard to geological conditions and ore deposition. Mine models were brought in as evidence, as well as a large number of maps. Among the witnesses first heard were R. N. Hunt, geologist for the company; Professor J. F. Kemp, Reno H. Sales, geologist for the Anaconda Copper Mining Co.; Professor C. K. Leith, and A. S. Wintner, mine superintendent at the Utah Consolidated property.

Prof. Kemp gave a general description of the geology of the camp of Bingham, correlating the Highland Boy limestone with the Jordan limestone, and the Commercial limestone with the Yampa. He said that the limestone beds were the lodes and what the miners prospected in search of ore. In the Utah Consolidated on the 1,300 level a 2,000-ft. drift had been driven under the claims of the Utah Apex, in which a large orebody was opened up. The apex of this body, R. N. Hunt stated, is in the Utah Consolidated grounds. Reno H. Sales, following Professor Kemp, described the mineralizing solutions in coming in as traveling principally along the limestone beds and principally along the Highland Boy lode, declaring that the fissuring had little effect on the mineralization. Professor Leith's testimony followed similar lines.

The Utah Consolidated company finished presenting its side early in the morning session of the court on Nov. 14. Judge John A. Marshall followed,



PIT ON GOLD PROSPECT, COPPER LAKE, NORTHERN MANITOBA

formation is present in that vicinity bears out geological reports made some years ago regarding the extension of the Menominee Range formation to Little Bay de Noc, Lake Michigan. The formation lies under 500 to 600 ft. of sandstone and limestone, not far from Lake Michigan. One well known mining man of the district stated that it would be a difficult task to get ore out from under Paleozoic rocks, his contention being that Lake Michigan is too close by and that water would cause much trouble.

Development Work at Copper Lake, Manitoba

J. P. Gordon, owner of the new gold discovery at Copper Lake, in northern Manitoba, has gone to the property to begin development work, on which it is understood \$50,000 will be spent. This property will be remembered as the one which attracted so much attention a few months ago. The district is reached in winter by going north of

development of this property, because of the spectacular surface showing of free gold in the quartz and vein matter. There are much larger gold-bearing orebodies in close proximity to this high-grade vein, but their gold content has not been determined. The future of this camp will depend on the results of further underground development, although much may yet be learned from surface trenching and sampling.

Radium Found in Ontario

Much interest has been aroused by the discovery of pitchblende in the township of Butt, east of Georgian Bay, Ontario, and as a consequence a number of mining claims have been staked. The pitchblende occurs in a coarse pegmatite dike, which was being mined for mica. The width of the dike has not been exposed, but it has been proved by an open cut for a length of 40 feet. The uranium mineral is found associated with red feldspar and occurs in grains about the size of a pea. So far

opening the case for the Utah Apex with an outline of the argument to be followed, and making an introductory statement that all of the orebodies in dispute were in the Utah Apex property, and that they belonged to the Utah Apex company unless it could be proved beyond question that they were on veins that apexed in other properties. He stated that the Utah Apex company was in reality the plaintiff, and that it would be shown that the Utah Consolidated had gone into Utah Apex ground and extracted a large tonnage of ore, an accounting for which the Utah Apex would ask. Bodies opened through the 1,300 level drift, mentioned frequently in the testimony, are claimed by the Utah Consolidated as apexing in its ground in the Highland Boy limestone, which this company holds to be the lode.

Judge Marshall stated that it would be shown that there was a difference of opinion as to what the Highland Boy vein constituted, and that the 1,300 level drift was not run to develop the Highland Boy limestone, but for the purpose of developing the Leadville orebody, and that it was in reality a straight level run through the barren limestone of the Highland Boy, as the result of an examination of Utah Apex underground workings which Utah Consolidated officials were permitted to make a few years ago. He also stated that the lead ore would be shown to be closely associated with the 1,312 level fault.

Witnesses for the Utah Apex company already examined (Nov. 19) have been Frank Anderson, of Salt Lake City, and Ellsworth Daggett, who was manager of the Winnemucca mine at Bingham, Utah, in 1878, also of Salt Lake. Albert Burch, consulting engineer, who has operated extensively in Utah and in the Coeur d'Alene district, and elsewhere, was completing his testimony at the time of writing. The testimony in general was directed with the object of proving that the ore was directly connected with the fissuring and made as much in the quartzite as in the limestone.

New Apex Litigation Probable in Coeur d'Alenes

Marsh Mines Consolidated Claims Apex of East Vein of Hecla Mine

A real sensation was created recently by the announcement that the Marsh Mines Consolidated would lay claim to the apex of the east vein of the Hecla mine, at Wallace, Idaho, involving the ownership of lead-silver ore bodies valued at millions of dollars. At the date of writing (Nov. 10), no legal proceedings have been started, but formal notice has been served on the Hecla min-

ing company by the Marsh company that it will claim the apex, as stated above, and therefore, all the ore that may be in the vein thereunder or that may have been removed therefrom. The vein in controversy is about 600 ft. north and east of the original Hecla vein. It is known that a large body of lead-silver ore has been developed in this vein from No. 3 tunnel level to the 900-ft. shaft level; also that a raise has been made on the vein to the surface presumably establishing the apex in the Hecla ground, the distance from the 900 level to the surface being about 2,200 ft.

The apex claimed by the Marsh company is an extension of the old Tiger-Poorman vein and is on the Russell claim, which has a common south side-line with the Consolidated Extension claim, owned by the Hecla company. The Russell claim, as well as the O'Neil and Mono Fraction, is part of the Tiger-Poorman group, owned by the Federal Mining & Smelting Co., and is held by the Marsh company under a ten-year lease, which will expire on July 20, 1926. The leased ground lies between the Hecla and the Marsh ground property.

It appears from the lease on record that the Federal company was preparing to bring suit against the Marsh to recover the value of large quantities of ore alleged to have been removed by the Marsh through underground workings into the Tiger-Poorman ground, and in consideration of the agreements entered into in the lease, the Federal company waived its right of action to recover for the ore alleged to have been extracted. Under the terms of the lease the Marsh company agreed to spend \$40,000, at the rate of not less than \$2,500 per month, in the development of the Russell, O'Neil, and Mono Fraction claims, the work to be done under the supervision and direction of the Federal company, the lease expressly stating that "It is the intention of this agreement to leave the conduct of the work to the party of the second part (Marsh), but the judgment of the party of the first part (Federal) shall be conclusive as to the place or places where the work shall be done, and the character of the work to be done." The Marsh company agreed to pay the Federal a fixed royalty on ore shipped during the life of the lease. It may be assumed that in planning the work it was the apex of this Hecla vein that was being sought, albeit it is described as the extension of the Tiger-Poorman vein.

It is evident that the Federal company is more deeply interested in the final decision than the Marsh, for as

apex litigation goes it would be a physical impossibility for the Marsh, in the event it should win, to make much headway in mining the ore during the life of its lease, and unless there is an agreement outside of the lease that would give the Marsh a right to the ore extracted by the Hecla, and for which it would be required to account, it would seem that the Federal company would be the sole beneficiary. In the absence of anything but the most general information, the prevailing opinion is that the Hecla is secure in its apex rights. The company is capably and carefully managed, and it hardly seems likely that its rights would have been neglected in this respect. But in any event, the outlook is that another long apex battle is being staged in which will be matched the most brilliant mining lawyers, geologists, and mining engineers.

Ecuador Has New Mining Law

The Congress of Ecuador recently passed a law declaring that unless the exploitation of mines in that country was begun within two years from the promulgation of the law, the rights of the holder of the patents would cease until a new law would be enacted, according to a cable dispatch received by the Department of Commerce. The law further provides, according to the report, that unless the patents are paid for within a time specified by the mineral code, the acquired right would, ipso facto, be void. The charge for the annual patent fee is to be not more than 10 per cent of the gross production and not less than 45.

Industrial Dispute Compromised at Tonopah and Divide

The labor troubles which have been bothering the Tonopah and Divide districts for several months are believed to be definitely settled. The newly organized miners' and craftsmen's unions which called off the original strike recently made demands for an increase of \$1 a day in wages. After a number of conferences with the operators, a compromise was agreed upon, of which the following are the principal features:

The operators agree to establish a commissary within sixty days and to sell the necessities of life at cost to their employees, plus operating expenses, and the employees are to have equal representation on the advisory board. Coal shall be sold and delivered to all employees at cost. Operators will grant a bonus to all employees of 50c per shift, retroactive to the time the individual employee returned to work, provided such employee is still on the payroll. At the end of sixty days a Federal mediator will be

called in and if he finds the commissary functioning fully, he will so declare and the bonus will be withdrawn. Should he not find it so, he will return each thirty days thereafter until he does find it functioning fully, the bonus in the meantime to be continued. Board shall be given to single men at \$37.50 per month where boarding houses are now or hereafter operated by companies. Goods from the store to be sold to private boarding house keepers who furnish board to employees at \$37.50 per month.

The agreement, which was signed by both parties, is effective to Aug. 15, 1920.

Ontario's New Minister of Mines

The new Ontario government, which is a combination of farmer and labor members, has appointed a Minister of Mines in the person of Harry Mills, of

Fort William. Heretofore lands, forests, and mines have been under one department, but will now be under two departments, with the mines having a minister of their own. Mr. Mills is a labor representative and has been a locomotive engineer on the Canadian Pacific Ry., and, having once worked in a coal mine in Wales in his early youth, probably possesses the qualifications necessary for a successful minister for the Department of Mines. The industry is said to view the appointment with interest and some trepidation. In interviews credited to Mr. Mills it was intimated that his department would be expected to provide the revenue for the new scheme of mothers' pensions which the labor members propose to have enacted. The new members of the cabinet, however, impress one as being sincere and honest, and there is no doubt that Mr. Mills will familiarize himself with conditions before attempting to impose higher taxes.

Mesabi Ores Shipped to St. Louis by Water From St. Paul

A new outlet for Minnesota ores was opened on Oct. 21 when two large steel barges were loaded at St. Paul for shipment to the Mississippi Valley Iron Works at St. Louis. The barges are 300 ft. long and 48 ft. wide and are the forerunners of others if the traffic proves successful. Capacity is 1,500 tons, and with the current of the river a small tug can handle a large fleet of them. It is planned to institute a return traffic in coal. The original shipment was loaded by the simple but slow expedient of spotting the cars on a river bridge and tripping the hoppers into the barges below one at a time. An entire day was required for the loading of less than 3,000 tons, and better dock facilities will have to follow. The ore came from the Mahoning mine at Hibbing.

PROGRESS OF MINING OPERATIONS

Important Events of Interest
Condensed and Classified
for Easy Reference

ALABAMA. BIRMINGHAM DISTRICT

The coal situation in the Birmingham district is becoming acute. The miners are not returning to work as promptly as was hoped, and the non-union mines, though turning out record productions, are not able to supply the whole demand. A number of plants are said to be on the point of closing, owing to coal shortage, and those fortunate enough to have a large reserve stock are diminishing the same rapidly. This is particularly noticed at some of the ore mines. All the ore-mine and furnace operators are also interested in coal production, and the two interests are so combined that what affects one seriously affects the other.

One of the new batteries of the by-product coke plant of the Tennessee Coal, Iron & Ry. Co. at Fairfield, Ala., has been completed. The battery will be put in operation about the first of next year. A large crane is to be erected to make possible the storing of large quantities of coke.

ARIZONA.

BISBEE DISTRICT—SILVER BELL—MIAMI

Bisbee—The Copper Queen expects to use its new steel power line about Dec. 1. A substation has been established near the Warren concentrator site, from which lower voltage lines will run to the mill and the Calumet & Cochise shaft, where pumps will be elec-

trically operated. The builders hope to have the new 4,000-ton flotation and concentrating mill ready for operation by July 1, 1920—another Phelps Dodge property, operated by the Night Hawk Leasing Co., is working a large body of 10 per cent copper ore. James McKenna is the company's representative. —At Dos Cabezas the Basin mine has been shipping gold concentrates from its twenty-stamp mill. The property is operated by Gold Prince M. & M. Co., A. J. Welty in charge, and is considering erecting a 200-ton mill.—The Middlemarch mine, at Pearce, has repaired the mill machinery damaged by former employees, and its flotation mill is in operation again.

Silver Bell—El Tiro Mining Co. is installing a 250-kw. generator for the electric operation of pumps, blowers, haulage, and lighting systems. The company is shipping a carload of ore daily and reports large profits.

Miami—The Miami Mining & Milling Co.'s new mill at Doak station is complete. A 200-ton Blake crusher sends the ore to a Lane 50-ton mill, and thence it is delivered to plates and Wilfley tables. Tailings later will be treated by flotation, when the appropriate process is determined. A second mill section, with a battery of ten 1,000-lb. stamps, is already on the ground. The mill is at the portal of the 560-ft. tunnel that has cut four veins which are to feed the mill until the main vein

is cut at 1,000 ft. Additional drill and compressor equipment is being installed. Ore said to sample \$18 gold, with some lead.—The International Smelting Co. is operating two reverberatories, with its third under repair for an early resumption.

CALIFORNIA SHASTA DISTRICT

Ingot—The Afterthought Copper Company completed installing of a reverberatory furnace during October. The furnace is now treating 135 tons of siliceous copper ore from the mines daily. A concentrate fairly high in copper, from the old Horwood plant, is being smelted with the copper ores, resulting in matte containing 18 to 20 per cent copper. The 300-ton oil flotation plant is ready to run, and will probably start up Nov. 15. A selective concentration of the copper and zinc will be made. The copper concentrate will be smelted in the reverberatory furnace; the zinc concentrate will be stored for future treatment. The company expects to install an electrolytic zinc plant in the near future.

Iron Mountain—The Hornet Mine is now making an average daily production of 400 tons of pyritic ore. The ore is marketed for its sulphur content to the General Chemical Co., and to the Standard Oil Co. Some of the ore is also used in the manufacture of fertilizer at the acid plant of the Mountain Copper Co., at Martinez.

TUOLUMNE—NEVADA—ALAMEDA
COUNTIES

Stent—The ground around the Jumper mine has settled about six feet over an area approximating that of a city block. The engine and boiler works are situated in this sink. As a result of the condition of the ground, a new shaft may be necessary. It is understood that good paying ore is still in the mine.—The App mine has been unwatered by a raise from the lower workings of the Dutch mine. A large force of miners is engaged in timbering up the old App mine and in other repairs necessary by the long continued drowning of the workings.

Grass Valley—The Idaho-Maryland group, which recently suffered from flooding, has been unwatered to a depth of about 500 ft. by means of the air lift process. The shaft was found in poor condition below the 400 level, and much new timbering was necessary. Therefore no effort is being made further to lower the water until the first 500 ft. of the shaft has been repaired.

Livermore—The Western Magnesite Development Co. and other companies shipped the record quantity of 1,408 tons of magnesite from the Red Mountain district during October, 1919. Thirteen auto trucks were used.

Tule River Reservation—The lands of the Tule River Indian Reservation were thrown open to public entry on Nov. 1, 1919, under the act of June 30, 1919 (Public No. 3), authorizing location of mining claims on unallotted Indian lands. Since Nov. 1, fifteen mining claims have been located in the Cow Mountain section.

Porterville—The American Magnesite Co. has just been purchased by C. W. Hill, of Los Angeles and San Diego. A rotary kiln will be put in operation immediately on custom ore. Several sets of lessees are now operating on the property.

COLORADO.

Ouray—A. G. de Golyer, of Denver and Ouray, has taken over the Kentucky Giant at Ironton under the name of the Silver Hills Mines Co. He is erecting a large and convenient bunkhouse and putting in a compressor and complete mining plant, to ship ore this winter. He has announced that the Vernon Mining Co., nearby, will resume next spring, driving a long crosscut to develop at lower levels.—The American Smelting & Refining Co. has relinquished its option on the Revenue Tunnel group. A. E. Reynolds, of Denver, owner, is preparing to resume work on his own account. It is understood that development of the mine was not carried far enough and was not discouraging.—The Summit Copper Co. has taken over the Amazon group at Red Mountain, adding to its already

considerable holdings and large ore reserve. Mill erection this fall was abandoned, but probably will be accomplished next spring.

Leadville—Work has been resumed at the A. V. mine, which was a heavy shipper of high-grade manganese ores during the war. It had been idle since July, and the owners are entering upon an extensive prospecting campaign in hope of finding high-grade silver-manganese ores. Work is being done by M. L. Buchanan. No new contracts have been obtained for the straight manganese ores.—John Cortellini and associates, of Leadville, have taken over several of the old properties in Adelaide Park. They are developing several old silver-lead properties that have been idle for a good many years. This portion of the Leadville district has been little prospected, and results are awaited with interest.—Lessees on the Crescentia property in California Gulch have opened up a good sized body of high-grade zinc ore on the 600 level. In the same vicinity, on the Shamus O'Brien and the Seneca, lessees are also mining zinc ore and prospecting the formations known to have been productive of high-grade silver ore in the old days.

Georgetown—Isabell, Plant & Co., of Toronto and Montreal, representing Canadian and British interests, have taken over silver-lead property known as the Sunburst Group. This property has been operated for the last three years by the Longeley Syndicate. A 3,200-ft. tunnel was driven, and the mine completely equipped by this company. A 100-ton aerial tramway 7,000 ft. long was also built, as well as a complete camp for accommodating forty men. The Longeley company expended \$150,000 on this work.

MICHIGAN.

COPPER DISTRICT

Calumet—The Seneca Mining Co. is ready to ship copper ore to the Baltic mill, but is prohibited from doing so until the U. S. Railroad Administration determines what rate shall be charged for this important matter of hauling a few cars over a railroad that has been in business for thirty years. There is no precedent, the Seneca being a new mine and never having produced copper ore previously. The shaft is approaching the third level, which will be cut soon. Laterals on the second level are now opening 300 ft. of Kearsarge lode rock. A boiler has been installed and other surface equipment is being accumulated for unwatering the Gratiot property, recently purchased from the Calumet & Hecla.

Hancock—All parts for the Quincy Mining Co.'s new hoisting plant for No. 2 shaft are now on the ground, and erection is under way. The company

has a large stock of unsmelted ore on hand.—The Hancock Consolidated has ten drills at work, eight in drifts on the vein east of the shaft and two on crosscuts to the vein. All work is being concentrated in opening ground that will be rich enough to permit profitable operations on a scale of more than 500 tons daily.

MEMONINEE RANGE

Iron River—Water is causing much trouble at the Rogers property. No ore is being mined. Pumps are handling 4,500 gal. per min., but with practically no lowering of the water level in the overburden. A concrete shaft was put down, but this did not end the trouble. A new program of drainage has been decided upon. The water is to be drained from the sand in specially constructed drifts in the rock, close up to the sand. Drifts will practically encircle the orebody and form a big drainage tunnel. At intervals raises will be driven and from these laterals will be run so as to increase the drainage area. The laterals will be close to the sand, but within the rock to guard against sand runs. From the back of the laterals, holes will be drilled into the sand to drain it. Water will follow the laterals to the raise, then to the drainage tunnel and back through the tunnel to a new sump. Electric pumps will send the water to surface. A year will be required to complete this program.

MISSOURI.

SOUTHEASTERN LEAD DISTRICT

Iron Mountain—The old Iron Mountain property, eighty miles south of St. Louis, Mo., which covers an old Spanish grant five miles square, has recently been sold to parties connected with the Mid-Co. Iron Company for \$750,000. This property was purchased last spring by John Elledge, who continued a shaft that had been started on an old drill hole that was very promising and which was recently bottomed by Mr. Elledge in a fine body of high-grade specular hematite, that is associated with more or less mixed ore and porphyry. Mr. Elledge also reopened some of the old surface workings, with encouraging results. It now looks as though this property will have a new lease of life and produce a fair tonnage of high-grade ore, although it will be necessary to erect a concentrating mill. There are now three blast furnaces that will furnish a local market, and a 500-ton furnace is now being built at Granite City, Ill., which will greatly increase the local demand for iron ore.—The old Pilot Knob iron property, five miles south of Iron Mountain, is also being reopened and is making moderate shipments of low-grade phosphorus ore from a deposit that lies northeast of the old exhausted mine.

Annapolis—The Annapolis Lead Co. has begun work on a three-quarter mile railroad spur from the Missouri Pacific main line below Annapolis, and is preparing to sink a shaft to open up the body of disseminated lead ore found by diamond drilling. To date seventy-nine holes have been drilled. As soon as sinking is under way installation of a 500-ton mill will be started. D. G. Cook is president and A. J. Meier operating manager.

Flat River—The miners of the Federal Lead Co. at Flat River, recently went on a strike, but after two-weeks' lockout, they returned to work at the old rate of wages. The No. 12 shaft at Elvins, on the former property of the old Central Lead Co., is now producing 3,000 tons a day, which is being treated in the No. 3 mill.

Herculeum—The Herculeum Smelter of the St. Joseph Lead Co. is again operating, now on the open-shop plan, after locking out the union since last spring. The company's No. 16 shaft at Elvans, which is close to their No. 4 mill, is nearly completed and is expected soon to handle the output of the old mine at the River Mines and thus do away with delivering the ore from same by surface railroad. The Leadwood mine is still closed down, where the union has quite a stronghold, but is being kept unwatered. A slight advance has recently been made through the lead belt, which nearly restores the high rate that prevailed during the war.

The recently developed iron mine in Franklin County is partially supplying the local market with a high-grade hematite and some of the output is being shipped to Kentucky and Tennessee furnaces.

MONTANA

Butte—The Tuolumne Copper Co. has struck an orebody on the 1,000 level, the crosscut being in it on Nov. 17 for 24 ft., with the drills still in ore that runs high in silver and over 2 per cent in copper.—In October the North Butte company produced 2,019,421 lb. of copper, 81,940 oz. of silver, and 122 oz. of gold.

NEVADA

DIVIDE DISTRICT—ARROWHEAD

Divide—The new east-west vein recently found on Belcher Extension has been recently sampled by Andrew Walz in widths from 3 in. to 48 in., and 24 assays run, the results giving values in gold and silver of from \$3.20 to \$134.40 per ton. The vein was traced for 800 ft. on Belcher Extension ground and 300 ft. on the Belcher. Mr. Walz has recommended sinking a prospect shaft on vein near the Thompson Divide, where there is an unusually good showing.—The new shaft of the Tonopah Dividend Co. is down 50 ft. on what is

thought to be the extension of the Caldwell vein of Divide Extension. A hoist is being installed.—Crosscutting by the Divide Extension Co. for the hanging-wall vein has been started from the 200-ft. point at the Caldwell shaft.—At a depth of 365 ft. the diamond drill which is prospecting the Hecla Divide encountered gold quartz of good grade.

Arrowhead—As a result of improved showing in the property of the Arrowhead Mines Co. there is much activity at this new camp which is seventy-six miles east of Tonopah and only a short distance from the road to Ely. On the 145-ft. level of the main property the showing is good, much high-grade ore being in sight. A townsite has been laid out and Leonard & Chapin, owners of the Ely "Record," are talking of starting a paper.

of a receiver. It is reported that plans are under way to reorganize this company, as there is considerable ore in sight in this property that will yield a good profit under the present price of silver. A large number of claims are held in the Dry Creek country southeast of Mogollon, and prospectors occasionally send in good assays, but no extensive work is going on there at present. The gold occurs as a telluride in these prospects.

SOUTH DAKOTA

BLACK HILLS DISTRICT

Lead—Flooding of the Homestake mine continues, and the water is approaching the 900 level. It will probably be necessary to flood to the 500 level. Diamond drilling and development of other ground away from the main workings is being continued.—At



HOMESTAKE MINING CO.'S HYDRO-ELECTRIC PLANT NO. 1. WATER TAKEN FROM SPEARFISH CREEK, ABOVE SPEARFISH, S. D.

NEW MEXICO

Mogollon—There is not as much activity in the Mogollon district as might be expected with silver selling at its present price. The Mogollon Mines Co. is, however, operating at full capacity. It is reported that more ore was put through the mill last month than in any other one month in the history of the company. The profits were exceeded in only one month prior to last month. Besides ore from its own ground, this company is extracting ore from the Confidence ground to the east. This ore is coming from the extension of the company's 500 and 700-ft. levels east into the Confidence ground. About 150 tons per day being put through the mill. Extractions run over 90 per cent. The Socorro Mines Co. is in the hands

Galena, the New Silver Queen company has resumed work and is producing a good grade of lead-silver ore for shipment to the smelter.—At Maitland, the two-compartment shaft being sunk on the Echo property has reached the 200-ft. point, where a station will be cut and laterals driven. Sinking will be continued to 500 ft.

TEXAS

Freeport—All four units of the Freeport Sulphur Co.'s two steaming plants are operating steadily. Sulphur shipments by rail are being made regularly, but shipments by ocean freighters have been temporarily delayed by silting of the channel at the mouth of the Brazos River. Shipments will be resumed in a short time, when dredging is finished.

CANADA

BRITISH COLUMBIA

Alice Arm—A. J. T. Taylor, head of the Taylor Mining Co., that is operating the Dolly Varden mine at Alice Arm, together with two others interested in the company, has returned from a visit of inspection to the company's property. The season's work at the Dolly Varden mine, it is stated, has been satisfactory and shipments will probably be maintained throughout the winter. It is expected that the rate of output during October will be continued. At present a thousand-foot tunnel is being driven below the lowest workings. This should tap orebodies 250 ft. below the present tunnels. The statement is made that the Dolly Varden mine shipped 112,000 oz. of silver during September, and 150,000 oz. in October. The run of shipping ore is returning from 50 to 70 oz., although some sacked toward the end of the season is expected to run several hundred ounces.

The North Star group, adjacent to the Dolly Varden, has arranged to ship some sacked ore this year. The Tiger group and the Muskette, across the river, have developed some good showings, and will continue with development work through the winter, expecting to ship in the spring.

The Dolly Varden officials state that the railroad between tidewater and their mine has experienced no operating trouble so far this year, and the weather alone will determine the length of its winter operations. Up to the time of their departure there had been no snow at the mine.

MEXICO

GUANAJUATO DISTRICT

Guanajuato—The Pinguico Mines Co. has secured a lease and bond on the Esperanza group of claims at Santa Ana. This group consists of 197 acres on the Mother vein, about 2.5 miles northwest of the city of Guanajuato. Two shafts are at present being unwatered for the purpose of examination. Considerable work was done in the past on these properties, and it is expected that enough ore will be found to keep the San Prospero mill of the company operating for several years. The company is also examining the San Gregorio mine, twenty miles south of Guanajuato. In the event of satisfactory results it is proposed to move the Pinguico mill from Pinguico to the property.

La Luz—There is a project on foot to renew operations on a large scale at the Asuncion Company's properties in the La Luz district near the city of Guanajuato. The properties comprise 1,716 acres and consist of a number of mines opened up on two distinct vein systems. There are twenty shafts, and it is proposed to equip the mines so

that 1,000 tons per day can be milled. Some of these mines have been large producers in the past and are among the most celebrated of the Guanajuato district.—The Peregrina mill of the Peregrina Mining & Milling Co. continues dropping sixty stamps, and is undertaking a vigorous prospecting campaign in the neighborhood of the Peregrina mine, having acquired for that purpose leases and bonds on a number of properties.—The fifteen-stamp mill of the United Mines Co. at the Melladito group of mines has been completed and is now in operation. This mill is constructed so as to increase capacity at a future date.

NORTHERN SONORA

El Progreso—Although retarded somewhat during the last few weeks by the Yaqui Indian scare, which has gripped northern Sonora, operations at the property of El Progreso silver mining company have proceeded steadily and the mill recently completed is handling about 100 tons of ore daily by cyaniding and wet concentration. The company's offices recently removed from Nogales to Douglas, Ariz., and arrangements have been made to handle shipments of bullion and concentrates by truck from the mine 100 miles south of Nacoziari, near Batuc. At Nacoziari shipment is made by rail to the border at Douglas. The concentrates are to be shipped to the smeltery at El Paso and the cyanide precipitates to Perth Amboy, N. J., for refining. The principal values in the ore are in silver and gold, and the mine is known among mining men of Sonora as a former shipper of high-grade silver-gold ores.

The known ore resources of the property occur in five fissure veins traversing its holdings from end to end, paralleling one another. The mine is worked through two shafts, an old one now about 200 ft. in depth, with drifts on the first and second levels, which have opened up continuous oreshoots, the limits of which are unknown. However, about 50,000 tons of ore has been developed in the two drifts. A new double compartment, being sunk now, is below the 100-ft. level, being completely timbered to that point. It is equipped with a large hoist, headframe, and cage capable of carrying the working 500 ft. or more. It is the intention of the management to sink to the 500-ft. level, crosscutting at every 100 ft. to the various veins of the property, then drifting on the vein. Ore from the various dumps is hoisted by an incline track to the crusher level, but the collar of the new shaft is on a level with the crusher floor of the mill. Ores hoisted from the new shaft will be trammed by hand into the mill. The mill has been built on a steep hillside, all machinery being placed on concrete

foundations. The Progresso company has available an abundance of good Mexican labor, with plenty of wood and water in the vicinity. A Macfarlane is manager, and is assisted by five American department heads.

Mina Mexico—E. P. Ryan, manager of the Cusi Mining Co. and kindred interests in Chihuahua, is now at the Mina Mexico, forty miles east of El Progreso, making plans for re-opening the property. For more than four years, owing to revolutionary troubles, it has been idle. Mr. Ryan was unable to make a detailed statement of plans before completing his inspection, as no one connected with the management had visited Mina Mexico for between four and five years. Various rumors of theft of equipment and high-grading by natives have reached the outside world, but nothing definite was known. When the property was abandoned, about the time of Pancho Villa's raid from Chihuahua into Sonora, in 1915, there was a small smelter and a mill on the property, but whether these remained intact was not known. Mr. Ryan was of the opinion that it would be necessary to overhaul all equipment and probably to install a flotation mill.

Accompanying Mr. Ryan on the trip were C. B. Clyne, consulting engineer; J. J. McCleary, master mechanic, and J. S. Dickerson, chief electrician of the Cusi company, each of whom was to investigate the Mina Mexico from a technical standpoint. The natural route for shipping and receiving supplies at Mina Mexico always has been via Toniche, but the branch railroad of the Southern Pacific de Mexico from there to Torin having been destroyed by the Yaquis during the last three years, it will be necessary to ship hereafter via Batuc, where there is available the trucking road from El Progreso to Nacoziari, from where shipment can be made to the border by the Nacoziari railroad. Mr. Ryan's intention was to choose a route for a trucking road from the Mina Mexico to Batuc, should it exist, otherwise to use pack trains to that point and make arrangements for the freighting of the ore northward.

The opening of the Mina Mexico recalls the dramatic struggle to keep it open, approximately five years ago. Despite revolutionary and Indian troubles, which prevented freight from getting into that section for weeks and sometimes months at a time, every resource was strained to operate. When coke for the smelter ran short the then management of the property went so far as to have charcoal burned for use in the furnaces. It was not until the actual menace of Villa's anti-American followers hung over them that the Americans quit and came out.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Nov.	Sterling Exchange	Silver		Nov.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
13	412½	126⅞	69	17	408½	125¾	69
14	411½	124¾	68	18	406¾	127	70
15	410¾	124	67¾	19	404	127	70½

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

Daily Prices of Metals in New York

Nov.	Copper		Tin	Lead		Zinc
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.
13	20 @20¼	52¾@53	6.75@6.90	6.70@6.75	7.90@8.00	
14	20 @20¼	52¾@52⅞	6.75@6.90	6.70@6.75	7.90@8.00	
15	19⅞@20¼	52¾@52⅞	6.75@6.90	6.70@6.75	7.90@8.00	
17	19¾@20	52¾@52⅞	6.75@6.85	6.70@6.75	7.80@7.90	
18	19½@19¾	52¾@52⅞	6.75@6.85	6.70@6.75	7.75@7.85	
19	19¾@19½	52½@52¾	6.75@6.85	6.70@6.75	7.75@7.85	

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Nov.	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
13	100½	102	112	281¾	283¼	34½	34¾	47¾	48¼
14	100½	101⅞	112	283½	284¾	34¾	34¾	47¾	48
15	.....	.....	.....	.....	.....	.....	.....	.....	.....
17	99½	101¼	112	283¾	284¾	34¼	34¾	47¼	47¾
18	99	100¼	112	283¼	284¼	34¾	34¾	47	47½
19	97¾	99	111	282¾	284	34½	34¾	46¾	47¾

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

Monthly Average Prices

	September	October
Copper:		
Electrolytic, N. Y.	21.755c.	21.534c.
Standard, London	£100.767	£103.418
Lead:		
New York	6.108c.	6.487c.
St. Louis	5.853c.	6.249c.
London	£ 25.330	£28.473
Silver:		
New York	114.540c.	119.192c.
London	61.668s.	64.049d.
Tin:		
New York	54.482c.	54.377c.
London	£280.102	£279.239
Zinc:		
New York	7.510c.	7.823c.
St. Louis	7.160c.	7.473c.
London	£ 40.955	£43.630
Pig Iron:		
Bessemer, Pittsburgh	\$29.35	\$ 27.35
Basic, Pittsburgh	27.15	27.15
No. 2 foundry, Pittsburgh	28.15	28.30

Metal Markets

New York, Nov. 19, 1919.

Copper was weak in what was distinctly a buyers' market. Zinc, after an exhibition of strength in the early part of the week, experienced a relapse. Lead was strong, but was slightly easier.

Transatlantic freights were unchanged. Transpacific freights also were unchanged.

The British government's stocks of metals on Nov. 1, with the corresponding figures for Oct. 1 stated in parenthesis, were: Copper, 41,422,050 lb. (51,036,160); lead, 72,112 short tons (82,387); zinc, 29,444 short tons (32,831); aluminum, 20,950,720 lb. (22,408,960); nickel, 4,704,000 lb. (4,403,840); antimony, 3,584 short tons (3,696).

United States copper production in September, 1919, amounted to 108,703,075 lb., as compared with 107,994,040 lb. in August, 1919, and 157,992,487 lb. in August, 1918. Imports of copper ore and concentrates, and blister, during September, 1919, amounted to 35,634,562 lb.

Copper

At the close of our last market week it was clear that if any producer had an opportunity to dispose of a block of copper at 20c he would not let it go by. Before the end of the last calendar week business was actually done in million-pound lots at 20c, delivered. Some business was done at the same price on the following Monday, but before the end of Tuesday small producers accepted 19½c; and on Wednesday large producers were sellers at 19½c, delivered, which price was equivalent to 19¾c at refinery. The volume of business, as reported to us, was larger than in the previous week. Some of it was apparently of speculative character. There was a good deal of irregularity in asking prices, for each seller was playing his own hand and the consumer who requested offers was likely to get them over a wide range. It was absolutely a buyer's market. The business that was done for export was very small.

Continuance of good business is reported by domestic wire-drawers and brass-makers, but, nevertheless, they evince no inclination to contract for copper.

Copper Sheets—31½¢ per lb. Wire 23½ f.o.b. factory, weak. Domestic buying dull.

Tin

The market seemed easier and somewhat irregular. Singapore quoted c.i.f., London, £282 on Nov. 13; £283½ on Nov. 14; £284 on Nov. 17; and £286 on Nov. 19. In this market Straits tin ranged from 53½ to 55c during the week.

Lead

A fair amount of business was done, with certain large producers still sellers at 6¾c, New York, though other producers got as high as 6.85c. There was a renewal of offers of small lots of lead from second hands which could be obtained around 6¾c. St. Louis market was steady at 6.70@6.75c, with business done at and between those figures.

Zinc

During the earlier part of the week a rather large volume of business was done at 7.90@8c, which included some buying for export to England and France and some buying by strong speculative interests. Domestic consumers were conspicuous by their absence. Rather free selling was encountered at this level, and upon the failure of the foreign demand to develop any further, speculative support was withdrawn and the market receded to about 7.80c.

The cargo of Australian zinc ore, to be followed by a second one, that will presently arrive in this country is no new development in trade, but is simply the delayed complication of one of the contracts of four years ago.

Zinc Sheets—\$11.00 per 100 lb. since Nov. 14, less 8 per cent on carload lots.

Silver has continued to advance in London on short supplies, until it is now quoted at the highest rate on record, 70½d. This rise in London price has been affected here, however, by the falling rates for sterling exchange, which close at \$4.04, the lowest point reached. The strength of the silver market, however, still continues to depend on the China demand, which continues unabated and at a premium over the London price.

The general stock of money in the United States on Nov. 1, 1919, totaled \$7,721,561,106. Of this, \$2,872,525,066 was in gold coin and bullion, \$308,145,759 in standard silver dollars and \$245,127,765 in subsidiary silver. The money in circulation on Nov. 1, 1919, was \$5,816,925,779, or \$54.63 per capita.

Mexican dollars at New York: Nov. 13, 99½; Nov. 14, 98½; Nov. 15, 97%; Nov. 17, 99½; Nov. 18, 100%; Nov. 19, 101½.

Platinum—Refined ingot was unchanged at \$135 and strong at that.

Palladium—Unchanged at \$120.

Aluminum—33c per lb.

Antimony—This market was strong and steady at 9¼c for spot, at which price a rather good volume of business was done. Futures were quoted at 9@9¼c, duty paid.

Bismuth—Unchanged at \$2.96.

Cadmium—\$1.40@1.50.

Nickel—Ingot, 42c; shot, 43c; electrolytic, 45c.

Quicksilver—This market was a little easier. Business in prompt metal was done at \$90 and metal to arrive was sold for \$80. San Francisco telegraphed \$82.50, steady.

Tungsten Ore—Only a small amount of business was done. Chinese wolframite, at \$8.75@10, and Western scheelite, at \$15.

Molybdenum Ore—Quoted nominally at 75c per lb., but no business reported.

Manganese Ore—Quoted nominally at 50c per unit, c.i.f., Atlantic ports.

Pyrites—Spanish pyrites is quoted at 17c per unit for furnace-size ore, free from fines, c.i.f., New York, or other Atlantic ports. Markets slow and unsettled.

Fluorspar—Lump ore containing 85 per cent CaF₂ and not over 5 per cent SiO₂ is quoted at \$16, f.o.b. mines at Tonoucu, N. M. Freight to Chicago \$7.50; to New York \$15.00. Prices quoted f.o.b. Kentucky and Illinois mines are \$25 for washed gravel grade.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 15.—Blende, basis 60 per cent zinc, \$50 per ton for Prime Western grade. Lead ore, basis 50 per cent lead, \$82 per ton. Shipments reported for the week are 1,992 tons blende, 226 tons galena, and 360 tons sulphur ore. For the year to date the totals are 88,713 tons blende, 5,886 tons galena, and 17,471 tons sulphur ore. Shipped during week to separating plants, 2,335 tons blende.

Joplin, Mo., Nov. 15.—Zinc blende, per ton, high \$49.20; basis 60 per cent zinc, premium, \$48.50; Prime Western, \$47.50; fines and slimes, \$45@42.50; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$46.07; calamine, \$34; all zinc ores, \$45.83.

Lead, high, \$86.37; basis 80 per cent lead, \$88@85; average settling prices, all grades of lead, \$86.37 per ton.

Shipments the week: Blende, 9,945; calamine, 191; lead, 1,134 tons. Value, all ores the week, \$562,550.

The midweek metal market gave hopes of higher prices, and sellers were nearly certain the Prime Western price would be \$50, but later metal declines left the week-end market unchanged.

Iron Trade Review

Pittsburgh—Nov. 18.

Though the striking coal miners have not returned to work, the steel mills have not thus far suffered from lack of coal, as their stocks have in the main proved ample, particularly as many of the mills have been operating under a sub-normal consumption, on account of the iron and steel strike. In exceptional cases the Railroad Administration, acting for the Fuel Administration, has released coal, as there was a large amount held, and there is now a fairly large production from non-union mines. The Connellsville region, for instance, is producing more than ever. About 3,000 cars are loaded with coal in railroad yards in the Youngstown district.

The iron and steel strike, now in its ninth week, is waning rapidly. Most of the mills in the Mahoning Valley are working fairly well. In the Wheeling district, a tour of the operating mills conducted by the Wheeling Chamber of Commerce for shopkeepers and representatives of the workmen has had beneficial results, by showing that other mills actually are operating. The Chicago and Gary mills are rapidly approaching normal operation.

The American Sheet & Tin Plate Co., as of Nov. 15, has opened its books for sheet and tin-plate contracts, for the first quarter of 1920 in the case of jobbers and for the first half in the case of manufacturing consumers, prices being precisely those of the Mar. 21 schedule. As previously noted, the Steel Corporation has been strongly opposed to price advances, and its October bookings of nearly a million tons, practically all for 1920 delivery, showed that it was carrying its principles out in actual practice. Many of the independents have strongly favored advancing prices.

Pig Iron—Though certain conservative interests making bessemer and basic iron were strongly in favor of holding prices at \$27.25, Valley, and bessemer at \$28.50, the market has got away from them, sales being made at \$30, Valley, for 2,500 tons of basic iron, December to March delivery, and at \$31.50, Valley, for about 2,000 tons of bessemer, approximately the same delivery, the iron in each case being for steel making, so that the business was distinguished from sales recently made of these grades as substitutes for foundry or malleable. Foundry iron has continued to advance, with sales at \$34, Valley, though \$33 might possibly be done. We quote the market advanced to the following: Bessemer, \$31.50; basic, \$30; malleable, \$31@32; foundry, \$33@34; forge, \$31.50 f.o.b.

Valley furnaces, freight to Pittsburgh being \$1.40. These prices average nearly \$5 a ton above the Mar. 21 schedule.

Ferromanganese — The market has been quiet, with occasional sales of prompt domestic at \$105@110, delivered, English being sometimes available at \$95@100, Baltimore.

Steel—The Steel Corporation has covered regular customers some distance ahead at Mar. 21 prices, \$38.50 for billets and \$42 for sheet bars, but there is much unsatisfied demand, and the only open market offerings are at \$3 to \$4 a ton premium.

Coke—Coke operators expect to secure much higher prices on foundry and furnace coke on contracts for the first half of 1920 than they are receiving on contracts for the present half year, partly on account of scarcity and partly on account of increased costs due to the prospective wage advance, hinging on the settlement for the union coal mines, now under negotiation at Washington. One operator sold foundry coke for first half at \$7, plus whatever increased cost may come from wage advances, and then withdrew. Some furnace coke is understood to be offered at \$5.50, but most operators talk \$6 or higher. The prompt market is about \$6 for furnace at \$7@7.50 for foundry, per net ton at ovens.

Metal Market

New York, Nov. 26, 1919.

Further crumbling away in the price for copper, and a distinctly easier tone in the market for lead, were the distinguishing features of this week. Zinc experienced another sudden and sharp rally. Tin, after being erratic, advanced sharply, reflecting what appears to be the institution of a bull movement in London.

Transatlantic freight rates were unchanged. Transpacific rates declined, \$12 being quoted from San Francisco to Hongkong and Kobe.

Copper

By the afternoon of Nov. 20 copper was available from nearly all quarters at 19c, and during the remainder of the week the bulk of the domestic business was done between 18½ and 19c. The market was more or less uncertain, some producers being suspected of selling on private terms and endeavoring to conceal their tracks, which gave rise to various rumors and gossip coming back into the market via buyers. At the close the situation seemed to be about like this: Consumers were willing to pay around 18½c., f.o.b. refinery, for delivery during the first quarter of 1920. Business had been accepted at 18%, refinery, by producers for prompt delivery. Japanese buyers

Silver and Sterling Exchange							
Nov.	Sterling Exchange	Silver		Nov.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
20	400	132¾	71¼	24	406	136¼	75½
21	404¼	134	73½	25	406¾	137½	76
22	404	135	74	26	404½	135	75¾

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

Daily Prices of Metals in New York

Nov	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
20	19 @ 19¼	52¾	52¾	6.75@6.90	6.60@6.70	7.65@7.75		
21	18½@19	52¾	52¾	6.75@6.90	6.60@6.70	7.60@7.70		
22	18½@19	52¾	52¾	6.75@6.90	6.60@6.70	7.65@7.75		
24	18½@19	52¾@52¾	52¾	6.75@6.85	6.60@6.65	7.80@7.90		
25	18¾@18¾	53¾	53¾	6.75@6.80	6.60@6.65	7.87½@8		
26	18¼@18½	53¾	53¾	6.75@6.80	6.57½@6.62½	8		

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Nov.	Copper			Tin		Lead		Zinc	
	Standard	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot								
20	97¼	98½	111	283	284¼	35¾	35¾	46¾	47¼
21	98½	99¾	111	284¾	286¼	36¾	36¾	47	47½
22	98¾	100¼	111	288¾	290¼	37	37	47½	48
24	97¼	98¾	109	292¼	294	36¾	36¾	48	48½
25	95½	97	109	295¼	296¾	36¾	36¾	48	48½

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

were reported as showing some interest in copper and willing to pay 18¼c. A lot of 200,000 lb. was sold on the Metal Exchange at 18¼c.

Small business was done through the week by the Export Association at slightly higher prices than prevailed in the domestic market. In the latter the buying was mainly by wire-drawers, but there was some by brass-makers. The brass-makers are reported to be feeling sore over the way in which the copper market has been allowed to go, and speak about signs of recession in their own business.

Tin

This market was erratic, reflecting what appears to be the institution of a bull speculation in London, the basis for which is supposed to be the theory that there will be shortage in the supplies from the Straits. It will be noted, however, that the Eastern market did not advance in anything like the same proportion as London.

Singapore quoted, c.i.f., London, £287 on Nov. 20; £288½ on Nov. 21 and 24; and £289 on Nov. 25. Quotation for Nov. 26 not received. In London, spot tin was £283 on Nov. 20; £284¾ on Nov. 21; £288¾ on Nov. 24; £290½ on Nov. 25; and £295¼ on Nov. 26. Sales

on these days were 450, 500, 1,100, 900, and 650 tons respectively.

In the New York market prices rose in sympathy with London, that for Straits tin ruling about ½c per lb. above that for 99% brands. The advance in prices inspired the liquidation of some old bull accounts, but there was not induced any significant buying by consumers.

Lead

Reports were conflicting, some producers reporting important inquiry and the consummation of a good deal of business, while others reported just the reverse. Assembling all reports, however, it appears that a pretty fair tonnage was placed, but, on the whole, at slightly lower prices than in the previous week. The situation in lead has in fact become distinctly easier, which is ascribable to increasing production. This has been reflected emphatically in the St. Louis market, where some small producers have been shading prices, while today a large producer offered lead below 6.60c.

A rather fair export business was done with France, England, Sweden and South America.

Zinc

During the early part of the week the reaction went further under the influence of some large speculative

offerings, but on Nov. 24 began one of the sharp recoveries that have been characteristic of this market recently. The last recovery followed upon considerable buying for export, together with some fair orders by domestic consumers. The houses that are buying for export continue to give preference to zinc available for delivery west of the river. This, together with position as to time of delivery, creates differentials in prices. At the close the market is quoted firmly on the average basis of 8c., St. Louis.

Antimony—This market was strong, with considerable business done. We quote spot at 9@9½c. and the same for futures.

Aluminum—Unchanged at 33c. per lb.

Palladium—Unchanged at \$120.

Platinum—Refined ingot \$135@\$140.

Quicksilver—Business in prompt metal was done at \$85@\$88, and metal to arrive was quoted at \$80@\$85. San Francisco telegraphed \$80 steady.

Tungsten Ore—Only a small amount of business was done. Lower grades of tungsten ore were quoted at \$6.50@ \$7. Bolivian and South American ore at \$10@\$12 and Western scheelite, at \$15.

Molybdenum Ore—Quoted nominally at 75c per lb., but no business reported.

Manganese Ore—Quoted nominally at 50@55c. per unit, c.i.f., Atlantic ports. There is a little more inquiry.

Copper Sheets—30c per lb. Wire 23c f.o.b. factory, weak. Domestic buying dull.

Zinc Sheets—\$11.00 per 100 lb. since Nov. 14, less 8 per cent on carload lots.

Bismuth—Unchanged at \$2.96.

Cadmium—\$1.40@\$1.45.

Nickel—Ingot, 42c; shot, 43c; electrolytic, 45c.

Silver—During the last week silver has advanced rapidly in London from the price on Nov. 20 of 71¼ to 76d. on Nov. 25. This figure is the highest price silver has attained in this spectacular advance. The London quotations have gone up chiefly from the fact that the amounts for sale in London have been limited and not equal to the demand. Then, in turn, the London price has stimulated Shanghai quotations. As a result of this combination, the official price in New York has moved up rapidly. The sharp advance in New York on Nov. 20, when the price here was materially influenced by the Oriental exchanges, also reflects the focusing of the Asiatic demand on New York and San Francisco, rather than on London; and it followed naturally after the restrictions put on the export of silver from London, as well as the curtailment of supplies from Mexico, owing to the attitude of the Mexican government. The future out-

look of silver from this point is uncertain, as influences at work may create a reaction from current figures.

Mexican dollars at New York: Nov. 20, 102½; Nov. 21, 103½; Nov. 22, 103¾; Nov. 24, 104¾; Nov. 25, 105½; Nov. 26, 100¾.

Pyrites—Spanish pyrites is quoted at 17c per unit for furnace-size ore, free from fines, c.i.f., New York, or other Atlantic ports. Markets slow and unsettled.

Sulphur—Prices remain unchanged at \$20 for export delivery and \$18 for domestic delivery; per ton f.o.b. mines at Freeport, Tex., and Sulphur Mine, La. Shortage of labor and coal continues to prevent Sicilian mines from providing for European demand, and prevailing rates remain high on shipments from the United States.

Nitrate—Spot supplies are quoted at \$2.97½ per cwt. for carload lots.

Fluorspar—Lump ore containing 85 per cent CaF₂ and not over 5 per cent SiO₂ is quoted at \$16, f.o.b. mines at Tonuco, N. M. Freight to Chicago, \$7.50; to New York, \$15. Prices quoted f.o.b. Kentucky and Illinois mines are about \$25 for washed gravel grade.

Graphite—Ceylon grades are quoted: Lump, 15@16c.; chip, 11@12c.; dust, 8@9c. The recent increase has been owing to the increase of premium on rupee exchange and higher freight rates.

Feldspar is quoted from \$13.50 to \$17 per ton, according to quality. Labor difficulties are hindering producers in increasing production.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 22.—Zinc blende, per ton, high, \$49.80; basis 60 per cent zinc, premium, \$46; Prime Western, \$45; fines and slimes, \$42.50@\$40; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$46.44; calamine, \$32.45; all zinc ores, \$46.45.

Lead, high, \$88.30; basis 80 per cent lead, \$85@\$88; average settling price, all grades of lead, \$87.23 per ton.

Shipments the week: Blende, 12,097; calamine, 80; lead, 1,130 tons. Value, all ores the week, \$664,160.

Producers generally are now convinced there will be no stability to the ore market until international credits are established on a basis that will permit a free purchase of metals abroad. Representatives of Belgium smelters, who visited this district in the summer, expected to have an exchange basis permitting them to export ore from this district before the end of the year. Production continues strong, but some mines are down from lack of coal.

Platteville, Wis., Nov. 22—Blende, basis 60 per cent zinc, \$50.50 base for Prime Western grade; lead ore, basis

80 per cent lead, \$85 per ton. Shipments reported for the week are 1,912 tons blende, 291 tons galena, and 175 tons sulphur ore. For the year to date the totals are: 90,625 tons blende, 6,177 tons galena, and 17,646 tons sulphur ore. During the week 2,759 tons blende was shipped to separating plants.

Iron Trade Review

Pittsburgh, Nov. 25.

The iron and steel strike has been crumbling fast in the last fortnight and is now nearly over. The coal strike continues, but the steel mills have not been hampered in operation, as they had considerable coal stocks, coal taken by the Fuel Administration just before the strike is being released in cases of necessity, and there is a fair volume of production from non-union mines.

The serious item for the steel industry now is not the strike, but the after-effects of the strike, with working forces disorganized and the necessity of training many new men, or old men in new jobs. Some mills made a rule against taking back strikers of certain nationalities or degrees of illiteracy. A long period is faced, perhaps six months, of production being much below capacity on account of the labor situation. As to the general labor shortage, the majority of manufacturers hold it will affect the iron and steel industry also, but a few claim that the wages paid are sufficient to attract enough men from the outside to man all the equipment that is to be operated, the training necessary being the chief restrictive influence.

Pig Iron—It is difficult to buy at prices quoted by conservative producers as the market, but the situation has not been thoroughly tested, as the call is chiefly for the early deliveries, and few if any producers would sell for late deliveries in any event. On this basis we quote: Bessemer, \$31.50; basic, \$30; malleable, \$32@\$33; foundry, \$33@\$34; forge, \$31.50, f.o.b. Valley furnaces, \$1.40 freight to Pittsburgh.

Ferromanganese—The market is stronger, and domestic producers may be able now to get their asking price of long standing, \$110 delivered. Recently there were sales of 500 tons, 200 tons, and two lots of about 100 tons of English, to local consumers, at \$100, Baltimore, but there are no regular offerings now at any price. Spiegeleisen is quotable still at \$34@\$35, furnace, but some makers are asking up to \$45.

Steel—Premiums seem to be the rule for small lots of prompt, but leading producers are adhering to Mar. 21 prices with old customers.

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A Question of Policy

What shall be the policy of the Engineering and Mining Journal with relation to vital problems which affect the mineral industries? That is a question which we have to think over and decide at the start, and we don't mind thinking aloud—it may help. First, it seems clear that the Journal covers and represents the whole field of the mineral industries—not only that of the miner, but the smelter, the dealer, and the consumer. The ties between all are so close that no one of these nowadays can transact his business intelligently without understanding the whole cycle; and an increasing number of organizations combine two or more of these functions.

There are no strings on the Journal or its editorial staff. It is neither subsidized nor financed by mining or smelting interests or by those of the consumer; but it is plain that the welfare of all is vital. Substantially, then, the mineral industry of the United States is its field. But the American mineral industry is not confined to American territory. It reaches into Mexico and South America; and in a lesser degree into Europe, Asia, and Africa. We believe in the protection by our Government of the rights of American industry abroad, and in the theory of commercial *aure* or *penumbra* around the nation, which, although diffused in varying degree, still retain the rights and duties of nationality. Beyond all this is the international situation with which we are each day more closely bound, as members of a shadowy, waxing and waning, but ever more clearly defined, world brotherhood. We have many readers in Australia and Japan, for example, who look to us for a clear and fair presentation of facts concerning the mineral industries elsewhere.

Thus far, all plain sailing. Let us suppose, however, that a flourishing abrasive (garnet and corundum) mining industry could be developed in the South, by subsidy or protection, but that the change would be disadvantageous to abrasive consumers, would cause a lessened consumption, and the adoption of substitutes of inferior quality by manufacturers at an equal or greater cost to the final consumer. What then? Let us suppose, similarly, that any section of the country has its new baby of a mining industry, which it desires to have fed by the country at large, at the expense of the diet of the rest of the family. Shall we fight the battles of the kid because his last name is Mineral, and we belong to that clan?

Our representative government, our legislative bodies—whether municipal, state, or national—operate more or less fully and frankly, on the basis

of sectionalism: each Alderman gets what he can for his ward, each Assemblyman for his corner of the state, each Congressman for his district, and each Senator for his state; and the outcome of such competition, when tested by voting, forms a fair sort of representative government, though an expensive and turbulent one. Similarly, trade journals may reflect and advocate as a matter of course the interests of the trade they represent, with no pretense of sympathy or understanding for the impinging trades.

When it comes to the mineral industry, we find associations of producers sometimes sharply in conflict with associations of consumers; or we find the interests of the producers of one mineral opposed to those of the producers of another, where the two are competitive for a market or for use. Such special-interest organizations are necessary and useful. Even organizations of national scope, if they frankly represent, let us say, the producing phase alone of the mineral industry, or the consumers or the importers' interests alone, regardless of the rest of the mineral industry, or of the country at large, are justified and worthy, so long as their field and attitude are clear to themselves and others.

In ascending the scale of responsibility, however, a stage is reached where partisanship and favoritism should be discarded in favor of a calmly judicial friendship to all. Such a stage, it seems to us, is occupied by the executive branch of our government, in all its forms; and in this group are included the bureaus representing the mining industry, the Bureau of Mines and the Geological Survey. What should be the policy of these bureaus? Should they support doctrines and measures which would benefit ten miners and injure a thousand farmers, and so conflict irremediably with the Agricultural Department, which, in its turn, would have the motto "We represent the farmer; the miner be damned"? We think not, as all are arms of the Chief Executive, who ideally is what the Indians call him, the Great Father in Washington; and so these mining bureaus will act as experts to further the prosperity of the mining and mineral industries, will be on watch as special "friends at court" to interpret, represent, and help them; but will do so in all fairness as regards other men.

In these vexing problems, there is no rule that works except the national one of the greatest good to the greatest number; and from this national point of view in the last analysis, a Federal bureau will not deviate. Where the interests of the mining and mineral industries, or any portion of them, conflict

with the average best interests of the whole country—East, West, North, and South—a branch of the Federal Executive will recommend to the rest of the Federal Government the solution which means the welfare of the majority.

Finally, to return to our own problem, what about the mining press—what about the Engineering and Mining Journal? The common-sense reply, it seems to us, depends on whether we represent a trade or a national publication. If the former, by all means boost—don't knock. It is also the easiest way. But the actual scope of the Journal, above partially sketched, is not only national but international. It seeks to cover (how inadequately we recognize with humility) all phases of an industry which in its entirety is not sectional, but is part of the very fibre of the nation's being and of the business and welfare of every citizen.

Iron and steel, copper, oil, lead, and zinc—these represent the foundations of prosperity of every state and group, and of the states united. We cannot see that it is possible consistently to assume partisanship for any part against the whole. Even in the most trying possible case, where a certain policy may appear to be for the benefit of the American mining industry as a whole, but opposed to the best interest of the country at large, we find no safe ground except in the rule of the greatest good to the greatest number. To favor groups or minorities at the expense of the rest of the country is to be unfair even to them; for whatever benefits the country at large is bound to react favorably on all groups, and be most to the advantage of every citizen.

The Conservation of Metals

SOME years ago, Gifford Pinchot, backed by Theodore Roosevelt, then President, launched a vigorous campaign in opposition to the popular impression that the resources of the United States were inexhaustible and indestructible. A trained forester, he focused his preaching on the reckless destruction of American forests (the heritage of centuries and the common dower of America—past, present, and future), for the enrichment of a few swift grabbers. He showed that unscientific and opportunistic forestry meant the destruction of the forests, irreparable washing away of the soils that had accumulated for thousands of years, and the trifling with local climatic conditions. The result of his campaign was the establishment of the Forestry Service, the withdrawal of Government forest reserves, and much other work that was good, even though it has not been far-reaching enough.

At the time of this forestry campaign, some attention was called to the advisability of conservation measures regarding our other natural resources, such as our minerals; but this phase was passed over lightly. Yet a forest of some useful varieties, like eucalyptus or white pine may grow from infancy to marketable age in a generation; but an ore-body, once removed, is never renewed. Every pound of metal extracted from the earth leaves mankind in practical perpetuity that much the poorer.

The full consciousness of two things has only recently begun to dawn upon us—first, as to how immensely important to our modern civilization and to the strength and power of nations it is to have mineral wealth within our boundaries; and, second (through the more mature understanding of the geology of ore deposits) what are the relative and probable limits of metallic supplies in this country and in the world. Many nations are now enacting legislative measures to secure to themselves the maximum benefit from such mineral wealth as they have and enable them to "stake" all they can elsewhere in the earth before the world is all "located," to use the parlance of the prospector, to whose role the nations are turning.

Conservation measures of many countries, such as England, France, Spain, Mexico, and others, include a discrimination against aliens in favor of nationals, in order to prevent the benefits of their political control being superseded by a more powerful commercial control, and their mineral resources extracted to increase the wealth and power of foreign nations.

There is the stress of approaching necessity behind this movement. Already the competition for metals and metal-bearing districts has become keen among the great industrial nations; and, granted that our modern civilization is not quenched for all time by a bolshevist upheaval, we see clearly directly ahead of us an industrial era far more active than anything of which the world has ever dreamed. New peoples and new countries will demand the devices of modern mechanism, as a result of their own emulation and the missionary salesmanship zeal of the nations which are leaders in industry. Science and skill can cultivate renewed and even larger crops of many of the staple raw materials, such as textiles and foodstuffs; and even, to a degree, lumber; but progress of time and industry means a swiftly increasing shortage of mineral wealth. This would have visited the world long ago had any such intensively exploiting period ever before occurred in its history; and now that it has come, we must consider the results.

Doubtless most of us think that a serious shortage of metals is a matter too remote to affect us practically. It is true that the maximum effects will doubtless be considerably postponed. If, however, we look a thousand years ahead with the present rate of progress, we must picture a strange world, where many substitutes and devices have taken the place of the metals now prodigally used. Should the present rate of extraction be kept up, practically all our easily accessible and our higher-grade mineral wealth will have been used up long before this period, and mankind will either have had to give up the attempt, and have reverted to a simpler civilization, or will be extracting, at great cost, the elements from the rocks themselves.

Some metals, however, will be exhausted before others. Iron and coal will last a few centuries, and are abundant at present; other materials have a relatively long time to run; but in some things the

shortage is already upon us, and will increase swiftly. This is true, for example, of the precious metals gold, silver, and platinum, of various steel-hardening minerals, like tungsten, chromium, and vanadium; of radium and of tin. These metals are going the way of the auk, the aurochs, and the buffalo. It is estimated that the petroleum of the United States will be exhausted in ten to thirty years.

The war has brought home to the world the necessity of a wise nationalism: that the great states and races should hold themselves as separate units of the world league; otherwise the fusion of all would result in a mongrel mixture in which the benefits of evolution and the patient breeding of superior types would be lost. Therefore the great nations are casting about for measures to preserve their natural advantages, and increase them by adroit measures.

The "squeeze" of diminishing resources has not yet come to the United States as it has to the European nations, and therefore we have no national consciousness of one impending. We have for the moment the advantage of wealth, which we are squandering but which is still unsquandered, and we therefore estimate ourselves as a people with special gifts. It is the popular conception that we have only to develop our mineral industries like tungsten and chrome by protection, for these industries to be established on a policy of ever-increasing prosperity, and warnings of the geologist to the contrary are looked upon as "old wives' tales." Consider, however, the chrome industry of Maryland, which, in the earlier part of the nineteenth century, was the chief source of the world's supply: it is no longer producing. Already the gold deposits of Alaska are largely exhausted after twenty years of modern exploitation. Some metal deposits, like tin, we do not possess in commercial quantities at all; others, like tungsten and chrome, we have in so small a quantity that they would be exhausted in a few years of extraction, under the forced draft of prices artificially heightened by protection; others, like copper, we have been abundantly provided with, but we have already reached or passed the zenith of our meteoric exploitation. In other words, the sapping of our national strength by prodigal consumption of our irreplaceable limited stocks of metal is not a matter of a thousand years hence, but of the present generation, and still more intensely of the next. We are passing to our sons to bear the debts the United States has incurred in this war. Is it fair for us to squander their patrimony and not leave them as well provided as possible with the means wherewith to pay? Is it generous for a few of us to howl for sudden wealth through feverishly robbing the earth of the fruits of all time; and to have the wealth made possible by forcing an abnormal market on the rest of the people through special legislation? Certainly it is not for the best interests of the country. We may not expect the Republic to last forever, but we have inherited the results of our forefathers' work, and our duty, at the least

estimate, is to hand on the Republic unplundered and unscathed to our sons. When our own stores are gone, we shall have more difficulty than now in getting them elsewhere, for other nations are waking earlier than we to these fundamental facts; and the principle of export duties and other discriminatory legislation in order to further conservation and to give the national possessors of wealth economic advantage, is coming to be more commonly employed. For the immediate present, let us conserve the stores of our own "cache" prudently, and eke out by buying where we can most cheaply. We shall not always have the opportunity.

The Downtrodden Capitalist

A capitalist, says our good friend the dictionary, in effect, is one who has accumulated goods, which he uses to promote the production of more goods, rather than for his immediate enjoyment. Most of us are capitalists—all but the unfortunate and the unfit. The owner of a prospect, a mine, a share of mining stock, or a Liberty Bond, a farm, a taxi, a fishing sloop, or a sawmill, is a capitalist. A country is strong and steady in proportion to its amount of capitalism. In France, we are informed, nearly every one is a capitalist. In the United States, there are fewer capitalists, perhaps, than in France, because more, even of the prosperous, live from hand to mouth. The man with an automobile and a mortgaged home is not, perhaps, a capitalist, but the plumber who holds the mortgage is one. Let every one who does not belong to the capitalistic class start a savings-bank account, and become a capitalist.

Is the above far-fetched or humorous? Not in the least. The working capital of the country is mainly held by the population at large, who have invested their savings in Liberty Bonds, railroads, public utilities, mortgages, and savings banks. And having invested his savings in railroads or public utilities or other ordinary forms of investment all necessary for the country's progress—having loaned his accumulated overtime labor and self-denying thrift to the public in response to its urgent solicitations and demands,—the individual with the formidable designation of "capitalist" becomes the most helpless lamb imaginable. He has no rights nor friends. When not only his income from capital but the capital itself is wiped out by the great forces of the day, he seldom has courage even to expostulate. He is outside the law. He is the prey of the wage-earner on the one hand and the organizer on the other. The former, spending as he works, has prior claim on all available moneys so long as there are any; and the latter has many devices to assure of not being overlooked in the division. If worst comes to worst, he reorganizes the enterprise in question, and there is enough left for the wage-earner and himself; but the capitalist finds himself thrown out into the street. Possibly he deserves no better, for he is not greatly gifted with sense; he is usually a strong partisan of the wage-earner (whom he calls the "laborer") and hostile to the organizer (whom he calls the "capitalist"). He loves what he conceives to be

the under dog, as a result of the atmosphere of fanciful economic folk-lore in which we live; and when he is sandbagged and robbed by both the maiden and the dragon, he is so ashamed to think that he had secreted a private fund that he will not go to the police with the story, but starts another surreptitious hoard out of his \$36 or \$72 per week.

The organizer is a most useful citizen. He is a great producer, who deserves a far higher share in the division of the profits than the rest of us. Our problem for the future is to decide how much he shall have, and that he does not take too much. The virile organizer has sometimes spells of berserk madness; he reverts temporarily to his viking ancestors and cannot help trying to pirate the whole. Our other problem is to see that the wage-earner (honest laborer) does not take it all, for he is not gifted with imagination and would gladly take it all, and more—he needs it.

Know then, honest miner, mining engineer, or holder of mining stock, that the quaint division into capital and labor, if it ever applied accurately anywhere, does not do so here and now. The average and the ideal American is both capitalist and laborer; he works, and produces, and he has, by overtime work or the expenditure of excess energy, saved something to make his old age dignified. About one in ten, perhaps, of such average Americans is also an organizer to a greater or less degree. The organizer, again, may or may not be a capitalist; but if he is not one, he hopes so to become. They are all indispensable professions; and a proper division of the rewards will not ignore the rights of any—least of all the members of the unorganized capitalistic class who can now only compensate their losses by the fact that they are also laborers. If they are past labor—and there are many of them—then may God console the aged or broken-down capitalist and wage-earner or his widow, for the law does not provide against his robbery by the other two active parties.

Gasoline Locomotives Underground

IN THE November Bulletin of the American Institute of Mining and Metallurgical Engineers, F. J. De Wilde contributed an interesting discussion of the paper on "The Wisconsin Zinc District," by W. F. Boericke and T. H. Garnett. From this discussion we quote the following paragraph:

"Haulage—It seems to me that the gasoline and storage-battery locomotives have been slighted by the authors and favoritism shown to the mule. The authors state that haulage costs when using mules are from 25c. to 35c. per ton-mile. This is excessively high when compared to mechanical haulage, where the cost is seldom above 24c. per ton-mile with a limited tonnage. Where large tonnages are hauled, the average is about 16c. per ton-mile. When first used, the cost has been as low as 8c. per ton-mile. These figures include the cost of maintenance, repairs, oil, gasoline, and depreciation. The exhaust from gasoline locomotives vitiates the air consider-

ably and it always takes some time for the men to become accustomed to the fumes. The mines must be kept well ventilated for good results."

The methods of underground haulage, the burden of the paragraph quoted, are given as, mule, gasoline locomotive, and storage-battery locomotive. Concerning the mule and storage-battery locomotive there need be little discussion, as both methods are safe insofar as underground conditions are concerned, and the selection of either is dependent upon comparative costs of installation and operation in specific cases. The writer's statement of the vitiation of the air by the exhaust from the gasoline engine, and that it always takes some time for the men to become accustomed to the fumes, should make mining engineers sit up and raise the question whether men can ever become accustomed to the "fumes." The poisonous constituent of the "fumes" is carbon monoxide. Viewed from a physiological standpoint it is a matter of doubt whether the human system can accustom itself to the continual presence of even a small percentage of this noxious gas in the air of a mine. In justice to Mr. De Wilde, it should be noted that he states that the mine must be kept well ventilated to secure "good results."

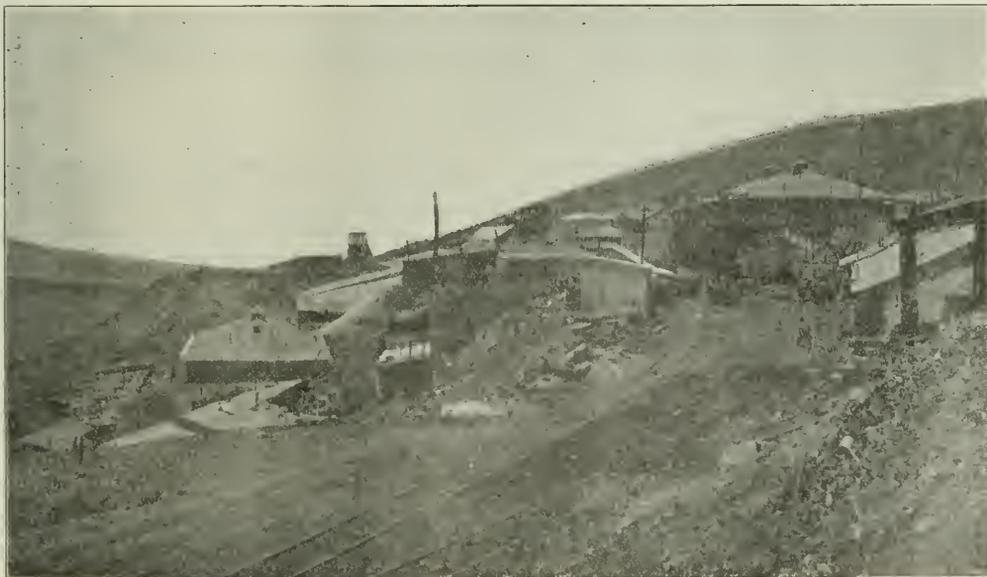
The use of the gasoline locomotive underground at all is objected to by many well-qualified engineers. The Bureau of Mines advocates the elimination of internal-combustion locomotives from underground workings. A similar position is taken by some states in their safety regulations. The prevailing use of the internal-combustion engines for many purposes raises the question as to whether this position is not a reflection on the ability of engineers to overcome a difficulty which imposes such restrictions upon the use of gasoline locomotives underground. We do not know of any recent work done upon the gasoline locomotive with the objective of rendering the exhaust gases innocuous; but we believe that experimental investigation should be pushed, and the question of the practicability of the gasoline locomotive underground determined on more substantial grounds than at present exist. Whether the difficulty lies in the carburetor, or in a change in compression, or in the proper selection of lubricants, are points which should be cleared up. There are few absorbents of carbon monoxide, and probably none is practical. It appears to us that the design of the engine, the perfection of a suitable carburetor, and the standardization of the operating details of the engine are the significant features that might lead to the development of an engine unit that could be satisfactorily used underground. Until this is done there will be the temptation to use the existing gasoline locomotive underground, and though its use may be restricted to those parts of a mine where there is good ventilation, occasions may arise where portions of the mine might become charged with dangerous amounts of monoxide in quantities greater than even "men accustomed to the fumes" can safely inhale. It seems to us that the investigating already done by the Bureau of Mines might well be extended and pushed to early completion.



BRADEN COPPER CO.'S ACID PLANT AND CONCENTRATOR, SEWELL, CHILE

Mining Operations in Chile

LA GRANDE MINE, COLLAHUASI, CHILE



Panel System of Stopping at the Herman Mine

Underground Conditions Made Advisable the Adoption of a Method of Mining Which Assured Economic and Safe Removal of Ore—Stopes Worked by a System of Raises Within Oreshoot, Followed by Panel Stopping

BY S. H. BROCKUNIER

Mining Engineer, Lowell, Mass.

THE Herman gold mine, in Placer County, Cal., presents unusual features, and, in the mining of the vein, offers difficult conditions. This article describes the vein and the manner in which an unprofitable method of stoping was changed a few years ago into a profitable one.

The Herman vein consists of quartz, lying wholly within schist walls. This schist is blocky and has many cross fractures. On the hanging wall there is a layer of soft black slate, making the upper part heavy and subject to many falls without warning. This is especially true if a large surface is exposed to the air for any length of time.

to four inches in diameter and sometimes twelve inches long. Some of them were clear quartz and some stained from the iron in the vein, producing different shades of amber and brown. Contrary to the usual rule, the gold content increased in or near these watercourses, so that often the mill would be stamping rock crystal and recovering gold. Surrounding the courses the vein was usually shattered; the quartz could be dug out by hand and resembled dirty rock salt. The greatest gold value was found in these places, and depth may prove that the pockets result from a mechanical sorting and concentration of the gold from the vein above.

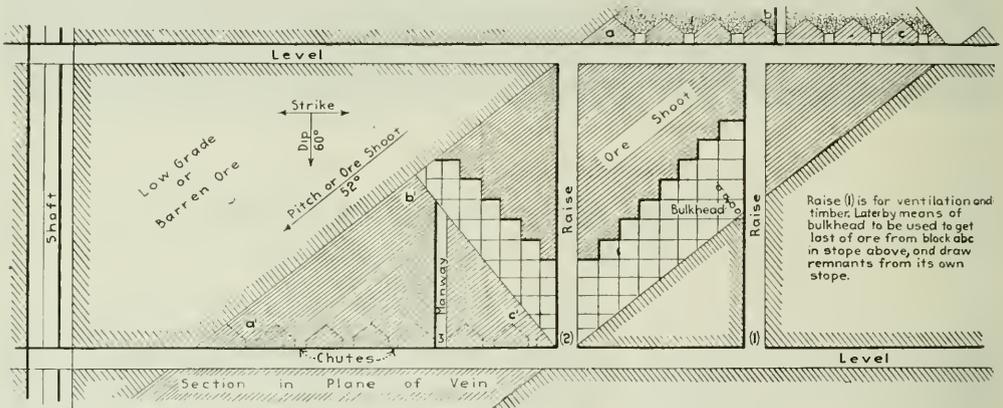


FIG. 1. FIRST SYSTEM USED AT HERMAN MINE. OVERHAND STOPING USING SQUARE SETS

The quartz vein is from four to thirty feet thick. The gold is confined almost entirely to shoots, which are generally in the thickest part of the vein. Usually the value decreases without any change in the thickness, although there is a physical change, which the trained eye can detect, as the quartz becomes denser and more glassy as the value decreases. There are many high-grade spots in the shoot, but as a whole the ore is a low-grade, and all the methods of mining and milling were consequently governed by that circumstance.

The quartz in the principal oreshoot was unusually abrasive to tools and mill, but was brittle and easily broken. It contained numerous water courses, some of which occurred at a depth of 1,000 ft. below the outcrop and formed caverns or holes six or eight feet in diameter. These caverns were lined with beautiful quartz crystals from a fraction of an inch

The quartz, where shattered, was usually ten or twelve feet thick, and much of it could be picked down. When dynamite was used, the charges were made light to avoid caving of the heavy hanging wall, which had caused so much trouble that the previous practice had been to open the shoot by raises from the level below and then extract the ore by overhand stoping, timbering closely with heavy square set timbers. (See Fig. 1.)

This method worked satisfactory in that the hanging wall was supported during the progress of the work but the practice was dangerous and entirely too slow and expensive, considering the grade of ore obtained, and at least one of the raises was in waste all of the time, and therefore was an additional expense, with no return.

After considerable experimenting it was found that the hanging wall in these stopes would stand

well, without timber, up to twenty feet of open space, providing that a little quartz was left on the hanging and the opening was given an arched roof. The method of mining was therefore changed, and the stopes were worked by a system of raises within the oreshoot, followed by stoping in panels across the shoot (see Fig. 2), using only an occasional stull to catch up a loose piece of ground, or as a support for the drillers where the dip was steep. If the work was too slow there were occasional falls of large blocks, and these had to be worked out, and were used to fill the lower stopes.

One hundred and fifty feet between levels proved to be the proper distance for synchronized work of the miners in a shoot 200 ft. long and from eight to twelve feet thick. Two drillers were started in raises No. 1 and No. 2, and one driller worked in

The temporary manway into No. 2 was necessary in the beginning to permit entrance to stopes after blasting when chutes No. 1 and 2 were filled with ore. When the driller in No. 3 made connection with the upper level he came back to the lower level and made the openings for chutes on each side of his own raise, as shown at a, b, c. These chutes were used in stoping the block of ore a-b-c by the usual method, leaving pillars to support the hanging.

After the stopes were fully opened, the pillars on both sides of the panel stopes were sliced down and finally cut through, leaving the small pillars shown by reverse cross-hatching. These pillars were drilled at this time and were shot down as the ore was drawn in the stope. The pillars in the level above were also drawn at this time, allowing the caved waste and mat from the stope above to rest

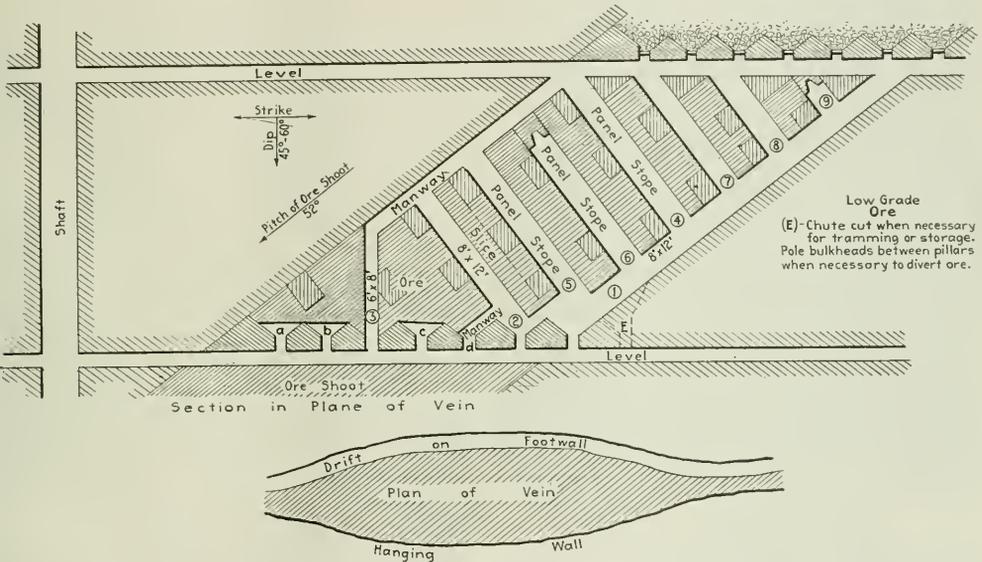


FIG. 2. PANEL SYSTEM LATER USED AT THE HERMAN MINE

raise No. 3, all on the foot-wall side of the vein. Raises No. 1 and 2 were 8 x 12 ft. and raise No. 3 was 6 x 8 ft., hence the footage to be made in each was the same, and No. 2 and No. 3 intersected at the same time that No. 1 reached No. 4. The driller in No. 3 then turned with the oreshoot and continued to the upper level. His raise was used for a manway and for ventilation, and was necessary to this manner of working. The drillers from No. 2 then moved to No. 4 and drove that raise, while the drillers in No. 1 continued to the level above. The drillers from raises No. 1 and No. 4 were then changed into the panel stopes 5 and 6, and two other drillers put in 7. When half way up the drillers sometimes broke through the pillars on either side in order to get air and timbers more readily, and to permit leaving broken ore in the stopes below.

on the top pillars and follow them down when they were drawn last. Of course, if the level was to be retained for haulage or access, it was necessary to leave these pillars until later or to replace them by timbers. The thickness of the pillars depended upon the nature of the ground, although they were kept as narrow as was consistent with safety.

The disadvantages of the method were that it threw the bulk of the ore into two or three chutes, thus making it more difficult to get speedy tramming, but this was also true of the old method; and there was little opportunity for storage of ore, as the stopes were worked practically open, the only storage being in the lower part. The method would, therefore, be inapplicable excepting in cases where ore was to be removed quickly. Shrinkage stoping had not worked well on large areas, as the hanging crushed down and pinched the broken ore.

The advantages of this method were as follows: Speed in opening the stope, which was vital in order to prevent large areas from being exposed to the slacking influences of the air; little timber used; no ladder ways excepting in the bottom of No. 3 raise; practically no mucking in stopes, unless the vein became very flat; the miners at all times working under a cover, and several men were always working in proximity and could help each other in case of trouble, although having their own places of working out of sight of each other. All of the development was in profitable ore the entire time, doing away with handling of waste, and all raises, excepting No. 3, were large enough and pulled enough ore to be classed as stopes.

The miner in raise No. 3 pulled 15 to 20 tons per shift, the miners in Nos. 1, 2, and succeeding numbers, pulled 40 to 50 tons per shift per raise, and the pockets in No. 1 and No. 2 chutes had therefore to be made large enough to accommodate that amount of ore and yet allow access through the temporary manway d, while No. 1 and No. 2 were being driven.

Of course the presence of unusual quartz made it possible to secure such tonnages in the raises, and speed was further facilitated by driving the raises without timbering, excepting for an occasional stull. In harder and more compact quartz the method would not have worked—that is, it would not have been economical—but in that case the probabilities are that the hanging wall also would have been better and the practice described would not have been necessary.

The method was developed to meet difficulties in a special case, and was used on only one oreshoot; the other oreshoot, where the vein was four feet thick, worked by the ordinary shrinkage method. The plan of operation outlined lessened the cost of stoping, and no miners were injured after its adoption.

Lowering Cable in a Shaft

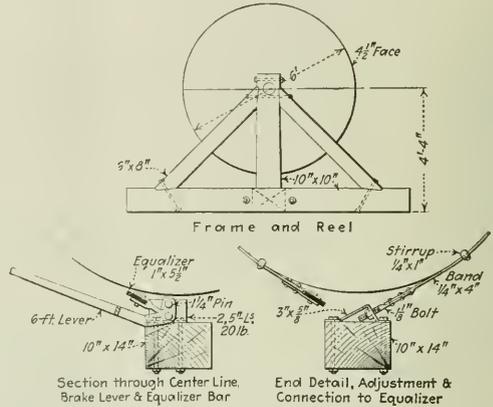
BY H. F. MILLS

At the Loretto mine, Loretto, Mich., a No. 0 B. & S. 3-conductor, 5,000-v., armored cable weighing 7,800 lb. was recently lowered in an 800-ft. vertical shaft by means of a hand brake, using the original reel.

It is common practice to lower the reel to the desired depth and then pull the cable up by means of the hoisting rope, but that method could not be used in this instance, as the reel was too large to pass through the shaft. Another method which is sometimes used—that of lashing the cable and the hoisting rope together at intervals and lowering by the mine hoist—was discarded on account of the difficulty of lashing to the $\frac{1}{2}$ -in. x 4-in. flat hoisting rope, and because of the danger of the ropes spreading and straddling a pipe tee, or other projection, as the ladderway is small and much of the space is filled with pipes and cables.

A substantial wooden frame was built to accommodate the reel. Two brake bands, as shown in the

accompanying sketch, were mounted, one on each side of the reel, the bands being provided with a number of U-shaped clips to prevent their slipping off the reel. One end of each band was provided with a screw tension adjustment, the other ends being connected to the opposite ends of an equalizer bar. This bar was, at its center, connected to the forked end of the brake lever by a short arm. This arrangement relieved the reel of most of the twist which would result from the use of one band.



DETAILS OF APPARATUS USED TO LOWER CABLE IN SHAFT

The frame and reel were set over the ladderway, and the cable was lowered to the 800-ft. level. Two men on a hoisting cage kept abreast of the end and guided it when necessary. It was then secured by a heavy timber clamp below the 500-ft. level, and again lowered, the bight in the cable being pulled in the shaft station where a tap was to be made. The remainder of the cable was then secured at 150-ft. intervals by timber clamps. One man handled the brake easily, and the cable was lowered and in place in four hours.

Petroleum in Switzerland

Interesting information as to the oil-bearing properties of the Swiss soil is contained in a work entitled "Investigations on the Petroliferous Molasse in Switzerland," by Arnold Heim and Adolf Hartmann, which has just been published, says the "Financial Times," London, Oct. 31, 1919. In the introduction the authors make the following statement, which indicates that there may be great possibilities of development if the requisite enterprise can be found in Switzerland for developing this new line of mineral production: "In general it is little known that rich oil-bearing shale is common in Switzerland, particularly in the Canton of Geneva, where hundreds of thousands of tons of lubricating oils of the best quality are lying in the ground, besides benzine and burning petroleum. If we can solve the problem of developing these resources in a rational manner our country will in future be fully provided for in the matter of the raw products of the petroleum industry."

Ore Contracts—Part II.*

An Ideal Ore Schedule Should Provide Equitable Payment for the Desirable Contents of All Ores and a Distribution of Profit Calculated to Cause Maximum Economical Development

BY C. A. GRABILL

THE schedule is simply a statement of the method of ascertaining the payment to be made for the desirable substance in the ore and the deduction for the undesirable ones, with the charges for treatment. An ideal schedule may be defined as one that is applicable to all ores, that will provide payment for all the desirable contents proportional to the value to the buyer of the respective amounts recoverable or usable, and for deductions for the undesirable contents proportional to the harm caused, and for a treatment charge in accordance with the work to be done and the expenses incurred in reduction, refining, and delivery, but with the quantities so adjusted as to yield the minimum profit to the buyer on ores of low grade or high cost of production in periods of low prices, and the maximum on high-grade or cheaply mined ores in times of high prices, the actual profit to the buyer in each case to be such as to cause the greatest development of the seller's property economically possible, and therefore the maximum possible profit to buyer and seller combined.

Of course, it is not possible to evolve such a contract, but with the simple omission of the last three words and the word "therefore" the above long sentence represents the aim of most ore contracts.

The substances usually covered are gold, silver, copper, lead, iron, lime, silica (insoluble), zinc, arsenic, bismuth, antimony, and sulphur, to which is added a treatment charge. They will be considered in this order.

Gold

The value of pure gold at the mint (mintage value), is a fraction of a cent more than \$20.67 per oz. Troy (England, £4 4s. 11.45d. per fine oz. Troy). This is equivalent to about 66.5c. per gram in metric measure. This is not necessarily the available value. In Mexico, for example, there are extraction or other taxes that may amount to 10 per cent of the value, and there is or was until recently a provision which was practically an embargo on export of gold. The result was that the effective value of the fine gold to the owner was governed largely by the rate of exchange between Mexico City and some foreign point, mainly New York City. This applied not only to foreigners doing business in the country but to the natives who had to purchase large amounts of their supplies from foreign sources.

Ore contracts usually specify that if there is more than .05 oz. per ton of gold in the ore all will be paid for at \$20 per oz. This is sometimes made \$19 or \$19.50, but \$20 is the usual amount. The smelting company must pay for refining and de-

livery and mint charges, so it is obvious that it is not going to make much from low-grade ores on this item. It also has to assume a positive loss in the slag. In spite of this slag-loss, books on smelting state that the recovery of gold is usually 100 per cent or more, and it is commonly accepted that this is due to small amounts in ores too low grade to pay for determination or consideration. The truth is that the average smelter has a pretty fair idea as to the source of the gold in his shipments and the 100 per cent recovery. The protective factor is the cupellation loss. In buttons of large size this is very small, amounting to only a fraction of 1 per cent, but most smelting charges contain comparatively small amounts, and the cupellation loss increases (stated in per cent, not absolute units) quite rapidly as the size of the button decreases. I have not the exact figures at hand, but as I recall them the loss is of the order of 10 per cent on a copper ore containing \$1 per ton in gold. At any rate, the smelter gains on this item are not of great importance, because as soon as the amount on the charge becomes appreciable its slag losses increase and the protective cupellation losses decrease. The presence of gold may therefore be considered to have no effect on the balance of the schedule.

At \$20 per oz., .05 oz. Au is \$1. On small shipments the cost of assaying by both parties and a possible umpire will not leave much of the \$1 to worry about. If there is, say, \$0.50 Au in the ore, it is usually considered in making the other terms. In large shipments the limit is often lowered.

Silver

New York prices for silver are based on the fine ounce, Troy, but London prices are quoted in pence per Troy ounce of standard silver, 925 fine. Formerly the London price was the governing price, but since the war the New York price is the base, the London price varying from the other in accordance with the cost of delivery and the exchange.

The schedules usually provide for the payment of 95 per cent at the New York price if the ore contains 1 oz. or more per ton. Sometimes the figure is as low as 90 per cent and rarely as high as 100 per cent, but in the large majority of cases it is 95 per cent. All treatises on smelting place the silver loss at about 5 per cent and as due to two causes, namely, silver in the slag and silver volatilized in the fume.

In a modern plant there is a baghouse or Cottrell plant, and in such cases the volatilization losses may be assumed at zero. There is a dusting loss on all ores which, though undetermined and perhaps amounting to fairly large figures in the aggregate,

*Part I was published in the "Engineering and Mining Journal" of November 22 and 29, 1919.

is quite small on the percentage basis, a small fraction of 1 per cent in a good plant, I should say, and is partly covered by the 1 per cent minimum moisture clause. As a matter of fact, the 1 per cent minimum is usually exceeded except in dry climates like Arizona, and even there most ores have some moisture.

The slag remains, then, as the only important source of loss. The only questions consequently are: does 5 per cent represent the general condition, that is, is it too high or too low; and is the percentage basis correct or should there be a fixed deduction of, say, 1 oz. per ton and 100 per cent of the remainder paid?

C. H. Fulton (Bureau of Mines, Technical Paper 83) as quoted in the report of the Colorado Commission estimates the silver losses in copper smelting at from .5 to 10 per cent, and in lead smelting from a loss of 1.5 per cent to a gain of 1.75 per cent. Although stated in this form, he really means that in lead smelting the recovery is from 98.5 to 101.75 per cent of the assay value of the ores treated, or such is my interpretation of the statement, and in copper smelting it is from 90 to 99.5 per cent.

There is little accurate published data. The big custom smelters do not care to publish theirs, for obvious reasons, and the private plants, where silver is usually a comparatively small part of the values, rarely keep records that are sufficiently accurate. I am inclined to think that 5 per cent is an underestimate of the loss and 95 per cent an underestimate of the recovery. The discrepancy is due to the difference between the actual silver contents of the ore and the assay, as commonly reported, caused by cupellation and kindred losses in assaying.

The general opinion is that these are small, perhaps 1 per cent. This belief is due largely to the fact that experiments in this line have been made mostly in connection with bullion work or on high-grade ores, on which the loss is low. Fulton states, in his work on assaying that the silver recovered in a "corrected" assay is from 98 to 100 per cent of the amount present, but it is not common to make corrected assays in mine, mill, or smelter work. By "corrected" assay he means the determination of the silver absorbed by the cupel or scorifier slag and its addition to the regular result. Sharwood states (Bulletin of the A. I. M. E., Vol. LII, page 129) that the percentage loss in cupellation is inversely as the cube root of the weight of the button, and for silver is 1 per cent for a 1,000 mg. button and 10 per cent for a 1 mg. button. In the scorification assay it is customary to take a charge of from .2 to .3 A.T. On a .25 A.T. charge a 1 mg. button would mean an ore with 4 oz. Ag per ton. Fulton gives a series of tables showing that the additional loss in assay slag is from .14 to 3.0 per cent and that the cupellation loss in the ordinary assay is materially increased by the presence of Fe, Sb, Sn, As, Se, Te, and Zn, and gives a table showing that the addition of 1 gm. of Te to the cupel caused a loss of 65 per cent, approximately.

The Colorado report gives the average of all ores smelted in that state for four years as 18.5 oz. Ag

per ton. That would mean on a crucible charge with a .5 A.T. charge a button weighing 9.25 mg.

Sharwood's figures would indicate a 4.75 per cent cupellation loss, to which should be added an increased amount for loss in the assay slag and increase due to impurities or perhaps 6 per cent as the total assay loss. In other words the smelter has 6 per cent unreported silver in the ores which will readily explain Fulton's figures of 98.5 to 101.75 per cent recovery, in spite of the known silver in the slag.

If Sharwood's figures are correct (and there is no reason to doubt them), a plant operating with 4 oz. per ton will have about 12 per cent unreported silver, and if it reports a 5 per cent loss the real loss is around 17 per cent.

Of course a difference of 15 per cent on a 1 oz. charge means only 16c. per ton, even at present prices, and on small lots would not pay for the extra cost of determining it. This also accounts, in a measure, for the failure to pay for small amounts of silver, say when it is less than 1 oz. If known that the average will be around .5 oz. per ton, compensation may be made in a slight decrease in the treatment charge, with better monetary result to both parties.

All of which brings up the question as to what the actual loss in the slag is, and what the laws are that governs it. Discussion of it would lead too far, but there is one point that is interesting. The silver in the slag is always some function of the silver in the collector, though in lead smelting the presence of more than one collector complicates matters. In copper smelting, within the ordinary limits the relationship may be represented by a straight line. In cases where this condition is not obscured by some other factor it is interesting to note that the percentage loss of silver has nothing to do with the amount on the charge. This may be demonstrated as follows:

For convenience let the relationship be represented by the factor K, and assume that the collector is copper matte, then

$$\text{Oz. Ag in charge} \times K$$

$$\text{Oz. Ag in the slag} = \frac{\text{Oz. Ag in charge} \times K}{\text{Wt. of Cu matte produced}}$$

Dividing both terms by the number of ounces of silver on the charge, and noting that the left-hand term is then the silver loss expressed decimally, and multiplying both terms by 100, so that the figure will read in per cent, we have:

$$\text{Silver loss in per cent} = \frac{100 K}{\text{Wt. of Cu matte produced}}$$

The whole matter is complicated, and many other factors appear that may interfere with the application of this rule, but where it does express the condition it means that the percentage loss is dependent on the amount of collector available, other things being equal and is independent of the amount of silver on the charge.

The 95 per cent payment clause originated in Colorado, and it is interesting to note that in that state

the smelting companies have to import lead ores at some expense, and consequently all companies try to operate on a minimum of collector that is more or less the same, and the conditions tend to be the same. O. R. Whitaker, in his report of the Colorado Commission, assumes a constant loss of 1 oz. per ton of ore, and calculates the percentage loss against this for the different grades of ore, but I do not believe he was justified in so doing.

It is obvious also that a dry ore containing no collector might displace some of the collector already on the charge, and thus be at a disadvantage in comparison with one carrying copper or lead, in sufficient amount. The subject is too big for discussion here.

Lead

Copper smelters do not pay for the lead in ore received by them, because it is not normally recovered by them, and, when it is, by the aid of a baghouse Cottrell plant or otherwise, the cost of recovery is about the value of the product. Part of the lead on the charge of the copper blast furnace goes in the slag, part in the matte, and about half into the fume, and that in the matte goes to the converters, from which it emerges as fume. The time is approaching when this fume will be treated to recover the lead, arsenic, antimony, and bismuth at a profit, but they are not yet considered as assets.

Wet methods only should be used for the determination of lead. The dry assay is easy, but usually low, though not always so, because arsenic, antimony, bismuth, and zinc may raise the weight of the button above the percentage as determined by wet assay. When the dry assay is used in the schedule it should be made by running a wet assay and deducting an agreed upon figure, from $\frac{3}{4}$ to 2.0 units as the case may be, calling the results the dry lead.

Small amounts are not paid for even at lead plants, or are paid for at a very reduced rate, but the reason is not the same as with silver and gold. Lead furnaces require at least 8 per cent on the charge for satisfactory work. If the ore contains less than this, the difference must be made up by the addition of richer ores, sometimes, notably in Colorado, obtained at considerable expense. Furthermore, the lead loss is largely a fixed amount, independent of the amount on the charge (unlike silver, where it is the percentage loss that is independent of the quantity) and consequently the percentage loss increases as the assay decreases. Ores without lead are penalized by a higher treatment charge in lead practice. When they are siliceous and low in lead, they may be sent to the copper furnaces if such are available and the lead lost rather than incur the extra expense of furnishing the extra lead for them.

Originally there were large losses of lead in the fume by volatilization, but the introduction of baghouse and Cottrell is eliminating this and the lead in the slag will soon be the only serious loss. Mr. Whitaker gives the loss in Colorado practice at about 30 lb. per ton of ore; this probably is intended to include losses by volatilization in plants not equipped

with baghouses. In another place he says that with low-grade ores 10 per cent goes into the slag, and Fulton, as quoted in the report, states the total loss as from 5 to 20 per cent.

**Smelter Investigation Committee
State of Colorado**

The schedule is as follows:

Gold: \$19.50 per oz. if 5/100 oz. or over per ton.

Silver: 95 per cent of New York quotation, date of assay.

Lead: Prices based upon \$4.00.

Wet assay, 1.50 units off wet assay for dry assay.

Copper: Deduct one unit from wet determination for dry assay, and pay for dry copper on casting quotation for copper; defined as the electrolytic cathode quotation, as given by the "Engineering and Mining Journal" for the week preceding date of assay, less 3-10th of a cent per lb., with the following deduction:

Six cents per lb. from above quotation.

Zinc: Limit 10 per cent; 50c. penalty for all excess per unit.

NEUTRAL SCHEDULE						
	5%	to 10%	lead incl.	40c.	per unit:	\$5.00 treatment
Over 10	" 15	" "	" 43	" "	" 4.00	" "
" 15	" 20	" "	" 45	" "	" 3.00	" "
" 20	" 25	" "	" 47	" "	" 2.00	" "
" 25	" 30	" "	" 49	" "	" 2.00	" "
" 30	" 35	" "	" 51	" "	" 1.00	" "
" 35	" 40	" "	" 52	" "	" .50	" "
" 40	" 45	" "	" 52	" "	" .00	" "
" 45	" 50	" "	" 53	" "	" .00	" "
" 50	" 55	" "	" 54	" "	" .00	" "
" 55	" "	" "	" 55	" "	" .00	" "

Neutral basis. 10c. up or down.

FLAT SCHEDULE						
	5%	to 10%	lead incl.	40c.	per unit:	\$7.50 treatment
Over 10	" 15	" "	" 43	" "	" 6.00	" "
" 15	" 20	" "	" 45	" "	" 5.00	" "
" 20	" 25	" "	" 47	" "	" 4.50	" "
" 25	" 30	" "	" 49	" "	" 3.50	" "
" 30	" 35	" "	" 51	" "	" 2.50	" "
" 35	" 40	" "	" 52	" "	" 1.00	" "
" 40	" 45	" "	" 52	" "	" .00	" "
" 45	" 50	" "	" 53	" "	" .00	" "
" 50	" 55	" "	" 54	" "	" .00	" "
" 55	" "	" "	" 55	" "	" .00	" "

"Neutral Schedule" to be used when it figures better for shipper.

SILVER QUOTATION

The New York quotation for bar silver, as furnished by Handy & Harman, or their successors in business (or, in case said firm and its successors should go out of existence, by the firm of J. W. Seligman & Co.) to the Western Union Telegraph Co. on date of assay.

LEAD QUOTATION

The prices paid per unit for lead in all ores and concentrates are based upon a quotation of \$4.00 per hundred lb., 1c. up or down for each change of 5c. in this quotation.

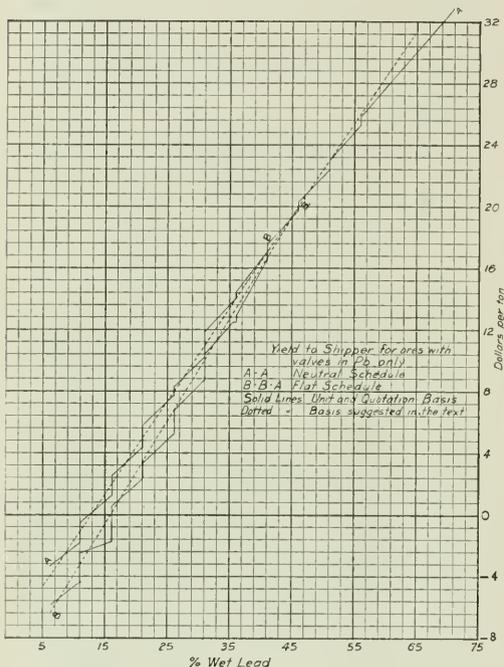
The quotation used as a basis of settlement shall be 90 per cent of the sales price in New York of the American S. & R. Co. of common, desilverized, domestic lead, in lots of fifty tons or over, for delivery within thirty days, on date of assay; provided said sales price does not exceed \$4.00 per hundred lb. When it does exceed \$4.00 per hundred lb., the quotation used as a basis of settlement shall be \$3.60 per hundred lb., plus $\frac{3}{4}$ the excess of said sales price above \$4.00 per hundred lb.

I have given here as a typical example of a lead schedule of the "unit-and-quotation" type, one taken from the report of the Colorado Commission. For obvious reasons I have omitted the name of the company which issued it, but it was published in 1917, and whether it is in force now or not is immaterial. With it was published a similar schedule for dry and copper ores, and a clause covering concentrates was included.

There is nothing to note about the payment for gold and silver, and the only thing about the penalty for zinc is that 50c. per unit is $2\frac{1}{2}$ c. per lb., and the shipper can afford quite a little expense in sorting or other treatment to avoid it.

The payment for copper is low, because, as previously noted, the losses and expenses are high for copper in lead work. The quotation for casting copper is .3 below cathodes, which, in turn, are about .1 below wirebars and ingots, so that the deduction is really 6.4c. per lb. from electrolytic wirebars.

At first sight the lead prices seem to be complicated. Putting them in tabular form has a tendency to confuse, so I have plotted the returns to the shipper by both tables on the basis of 4c. lead, using lead values alone and deducting treatment



charges before plotting. The result is shown by the solid lines in the figure. Where the line passes below the zero line it means, of course, that the indicated quantity must be deducted from the other values in the ore.

Personally, I do not care for schedules in tabular form, because they result in these step curves and there is always considerable jockeying and squabbling around the change points such as occur in this every 5 per cent. At 30 per cent Pb it may be noted that a difference of .1 per cent Pb makes a difference to the shipper of \$1.60 per ton although at the price assumed it is only worth 6c.

If any one finds difficulty in using the tables on which to base shipping estimates, a general statement can be calculated without difficulty that will give the same effective result. I have plotted one, and it is shown on the diagram in dotted lines and gives results that vary less from the tabulated values than they differ in themselves. It will cover ores from 5 per cent to 60 per cent Pb, and with prices from 3c. to 9c., a range sufficiently broad.

The basis of this curve may be expressed as follows:

Lead: Deduct $1\frac{1}{2}$ units from the wet assay and pay for the remainder at $\frac{3}{4}$ of the New York price. Treatment charge: \$7.00 per ton for neutral ores, 10c. up or down, but the total of such increase for excess silica not to be more than 6c. for each unit paid for less than 45 per cent Pb (dry). No excess silica will be charged on ores with more than 45 per cent Pb (dry). This covers both tables.

When stated in this manner it is to be noted that there is a deduction of $1\frac{1}{2}$ units for losses (Mr. Whitaker's 30-lb.), a deduction from the New York price, which with lead from 3c. to 9c. will vary from $\frac{3}{4}$ c. to $2\frac{1}{4}$ c. per lb., the larger amount in the time of highest price, and presumed to cover refining and delivery. There is also a smelting charge of \$7.00 per ton. Somewhere in these amounts is also hidden the profit which the smelting and refining companies expect to make. The expression 10c. up or down is intended to mean that there will be an additional charge of 10c. for each unit (20 lb.), more of silica than iron plus lime per ton of ore, and that if the iron and lime exceed silica there will be a corresponding credit.

Copper

The dry assay of copper is obsolete, though it is sometimes referred to in ore contracts as a kind of explanation for certain deductions; but it really has nothing to do with the case. Of course, the old theory was that the difference between the dry and wet assays represented the smelter losses. It may have, approximately, in the days of Welsh reverberatories, but it does not now and has not since the time water jackets were invented.

Copper is not volatile, and does not appear to any extent in the fume. The only exception is in the case of copper chloride, which it is generally believed is completely volatile. It is rare in North America, and good dust chambers should collect all that escapes from the furnace top.

For many reasons it is usually desirable in custom work to produce about a 35 per cent matte. The result is that in blast-furnace work slags usually contain from .2 to .45 per cent Cu and in reverberatory work from .3 to .5 per cent averaging say .35 per cent. Copper is sometimes used as a collector, and sometimes that property is of secondary consideration. In the first case the amount on the charge will be as low as possible, but in the second case will vary from one extreme to the other. The slag will vary from 60 to 85 per cent of the charge, so that if the average copper in the slag is .35 per cent, the loss may be considered to be .25 per cent or, say, 5 lb. per ton. This will tend to be a constant figure, irrespective of the amount on the charge, and may be considered as a proper deduction. In cases of high iron and low silica slags it will be considerably increased, particularly in reverberatory work. If the copper is being used as a collector, barren ore and fluxes may be added to the slag and will absorb their proportion of copper. Each ore should be charged with the copper necessary to saturate its slag-forming components, as should the fluxes. The total of these

may raise the copper loss from what might have been a reasonable amount to a very large part of the total, both as regards absolute units and as percentage.

From which it follows that the deduction for losses need not be the same on ores containing the same amount of copper. As an example, assume the case of a plant operating with an excess of siliceous ore. One ore is offered that is self-fluxing, that is, it contains the requisite proportion of bases and acids and sulphur to produce the type of slag made at the plant. It will have the average loss at the plant. Another ore is offered consisting, as an extreme case, of copper carbonate and quartz. It will require the addition of lime, iron, and sulphur, and will produce about twice the weight of slag that the former will; therefore the deduction for loss should be double.

Take another case: Assume a plant with ores requiring no flux and producing an ideal slag high in lime and containing little copper. The ore offered in this case, say, is an iron gossan with 5 per cent Cu, no sulphur and 50 per cent Fe. It is true that no additional fluxes would be required, but the effect would be to lower the percentage of silica and increase that of the iron, and thus increase the copper lost in the slag. Roughly, one may say it would have double the normal loss. The same ore delivered to a plant buying barren iron flux would be entitled to credit for the full copper contents, with no deduction for loss at all.

I have before me the open schedule of a Western smelting company, which I recommend for simplicity. After providing for the gold and silver, it specifies that the company will pay for the copper, less a deduction of 1.3 units at the New York price of electrolytic cathodes less 3c. per lb., as quoted by the "E. & M. J." Under present conditions and with present prices the deduction from the New York price is figured about as follows: Selling and delivery commissions are about $\frac{1}{8}$ c. per lb. each. The last figures that I have seen for refining were $1\frac{1}{4}$ c. per lb. Shipping converter bars from somewhere in the West to Baltimore or New York may be taken at $\frac{3}{4}$ c., converting at from $\frac{1}{4}$ to $\frac{3}{4}$ c., depending on the condition of the market, as regards ore for the converters, and interest and insurance. Only rough figures can be given, as they are changing rapidly, but it will be seen that 3c. can be accounted for. As regards the 1.3 deduction for losses: The smeltery in question is operating under severe metallurgical conditions and has a much higher loss than most companies are required to meet. It also aims to take some of its profits in a deduction here rather than in the treatment charge.

Some smelters are now making a fixed deduction from the price when copper is low and an additional deduction in the form of a percentage of the increase when the price rises above a certain fixed figure. The idea behind this is supposed to be that when conditions are bad the smelter will make as little profit as possible, thus carrying the miner through the hard times, and when prices rise will

recoup himself by correspondingly increased profits. It may be so, but the miner is inclined to regard it as an example of "all the traffic will bear" tariffs. If honestly carried out this arrangement is susceptible of great good to the small companies, but it is also capable of great abuse. Another idea behind it is that the smelter has just as much right to profit by high prices as has the miner. Still another is that the smelting companies are unable to sell their product so as to get the full advantage of the high prices. First, the high prices bring increased production of ore, and it takes from 90 to 120 days to get the product on the market, by which time the peak price has passed. The marketing company could, of course, try to protect itself on the purchase of each lot by selling a corresponding amount for future delivery, but the price for futures at peak times is usually below the peak. A high price is indicative of a sold-out condition of the market and is generally coexistent with a prior selling for future delivery at a price below the peak.

That this is not a fanciful statement may be seen by reference to the table in the Copper Handbook, 1918, page 211, at which the price actually received by many producers is given as 1.5 cents below the average of the quotations for 1916. This year, on account of the large stocks accumulated last winter at the time of low prices, many companies should show large quotational gains. The absolute suspension of quotations for a long time had a demoralizing effect on both shipper and buyer, and the question of what quotation to apply on their resumption was by no means an easy one, and it speaks well for the business as a whole that there was so little friction.

Copper in lead ores is in a better situation than lead in copper ores. It is recovered largely, but the refining and delivery charges are heavy, and so are the losses, as a rule. It is collected as a matte and turned over to a copper smeltery for further treatment, usually with the loss of the accompanying lead.

Silica, Iron, and Lime

These three must be considered together. For many years the payments and deductions for these elements were in most cases based on the theory of type slags, and the development of the industry has consequently been greatly influenced thereby. Just the same, many have been convinced for many years that there "ain't no such animal," and the development of the reverberatory and the production of flotation concentrates are introducing factors that are resulting in an entirely different view of the matter.

The theory of type slags was based on the hypothesis that there are a few limited combinations of silica iron and lime in simple ratios which give much cleaner and more satisfactory slags than any others, even though they may approximate the favored ones closely in composition. It is now known that slags are mutual solutions of various silicates containing dissolved oxides, sulphides, and other materials, all in more or less dissociated state, and that

their properties vary without abrupt changes. According to the original theory, iron and lime had to be provided for the silica in definite proportions, whereas it is now known that these limits are purely economical. Thus it is possible to smelt with a slag containing as much as 60 per cent SiO_2 , or as little as 10 per cent, or any point in between, the only limiting factor being the expense bill. A slag may have no lime or it may have 50 per cent and the iron may be from some unknown lower limit to 75 per cent FeO or more, and the correct amount is determined by a balance of the economical forces. Operators do not smelt with a 60 per cent slag—not because it cannot be done, but because it does not pay. The furnace will not run under ordinary conditions of operating, it is true, and the smelter cannot afford to produce the conditions under which it will run.

Now, the bearing of this on the subject under consideration is that the majority of ore schedules are based on the assumption not that it costs \$x to smelt a ton of ore, but that it costs \$y to smelt a ton of silica, and that iron and lime, being necessary for that purpose, are of value. This is a perfectly legitimate assumption in those cases where barren iron and lime must be added to keep the cost of smelting it at the economical point, but with the coming of flotation concentrates containing iron, and the production of slags containing 36 per cent of silica or less, there may be, and often is, more reason for assuming that it costs \$x to smelt a ton of iron and that silica and lime are the fluxes, and it is sometimes assumed that a ton of ore is a ton of ore as far as costs are concerned, irrespective of its contents.

Now it is important to the shipper which one of these views is held by the smelter. From the standpoint of a smelter having all three to draw upon, silica and lime are really of more value than the iron (within limits). In copper smelting for smooth furnace running it is best to have at least 15 per cent FeO in the slag, but from that point up each additional unit has a fouling action on the slag, this being true whether it is substituted for lime or silica, or, what is the same thing in quality if not in amount, added to the other two. Increasing silica or lime decreases the metal loss in the slag. These statements hold true within the present smelting limits, but unfortunately the curves showing the effect of varying amounts of the different substances are not always simple ones. I am, of course, referring to the assay value of the slag and not to the loss in pounds, which is more complicated.

As concerns the schedule, matters of policy may enter largely. A company may be smelting a heavy sulphide ore and obtain sufficient silica at a good treatment charge to produce a 30 per cent silica slag. The addition of more silica would produce a better and cleaner slag, but conditions might easily be such that the offer of a bonus for free silica would produce only a very small additional tonnage and cause the loss of the substantial profit on the original supply.

When a penalty for silica is exacted it is usually based on the insoluble, it being assumed that this will also cover most of the alumina. The silica and

alumina determinations are difficult and expensive, and the insoluble is simple and cheap, and therefore will always be used on small lots. The silica and alumina together are generally more than the insoluble, and in such cases the deduction for the insoluble is justifiable, but calcium fluoride, barium sulphate, garnet, and some other minerals are insoluble.

Large amounts of alumina are unquestionably bad and cause all kinds of trouble, but I consider small amounts, say, up to 2 or $2\frac{1}{2}$ per cent, as beneficial rather than otherwise. In fact, I consider small amounts of almost all slag-forming bases as beneficial and attribute the property to the effect of Raoult's Law that the addition of small amounts of dissociated substances in solution lowers the freezing point. This effect is soon overcome by their other properties if increased amounts are added.

Manganese is supposed to act as iron, and is frequently included for payment at the same price. It is said to have a bad effect on silver losses, but I have had no personal experience with large amounts.

Contracts sometimes read that available lime will be paid for. This is intended to exclude calcium fluoride, but the ordinary method of determination will also exclude lime silicates and garnets. The theory is that calcium as fluoride is of no value as a flux. This may be true in lead smelting, but in iron work a good price is paid for it to make a liquid slag. It seems to have this property in copper smelting, and I believe that it has a cleansing action on the slag.

Magnesia is supposed to be a substitute for lime, but it is almost never paid for. I have used it with satisfactory results as a substitute for part of the lime, and one of the fastest running slags that I have ever seen contained more than 10 per cent of this element. It apparently emphasizes the bad properties of zinc when the two occur together, and the fact may be easily explained from a chemical standpoint. The same is said to hold true of barium, but the explanation is not so obvious. In the one case coming under my observation it seemed to be true, but the bad qualities of zinc are so great that it is likely to warp one's judgment as to the effect of small amounts of other elements accompanying it.

Barium occurs as sulphate, and then there is an argument as to whether it is "insoluble" or not, which chemically it is, and penalizable or not, which, in the absence of zinc, I do not think it ought to be. Slags containing large amounts were run in British Columbia several years ago, and from my own limited experience it would seem as though it could be calculated as lime per cent for per cent, but I am not convinced.

Zinc is rightly penalized. There is usually a small amount allowed free. This is also in accordance with conditions. A small amount on the charge does not seem to do any harm; perhaps otherwise. Then its evil effects begin to manifest themselves and become serious when 6 per cent is reached. The free limit is generally higher because some ores carry none and

will help take care of the more zincy ones. It is to be hoped that some method of benefiting by the presence of this element will be discovered, and a means found for avoiding the present enormous waste.

In lead smelting sulphur is a nuisance and requires preliminary treatment of the ore at considerable expense; hence the charge against it. Under the present system of sintering fines a small amount is needed, but there is usually more than required, and a penalty is essential to keep down the supply.

In copper smelting it is absolutely necessary, though in a few contracts I have noticed the rather amusing statement that it will not be charged for. Of course there are some plants which have an excess that must be disposed of, and a penalty is allowable. On the other hand, in a great many camps it should draw a premium. Unfortunately it is extremely difficult to settle upon an equitable basis. The first few units are essential, the next few quite valuable; then they decrease in value until they finally become a source of expense. Furthermore, at the same plant, sulphur in one ore may be more valuable than that in another, depending on the nature of the constituents. The result is that it is usually disregarded in the schedule and provided for by variations in the treatment charge, depending on the probable character of the ore expected under the contract. In many camps such as exist in the Southwest I think that this is a mistake and that some form of payment and penalty depending on the ratio between the sulphur and the copper or some other element, would be desirable. Shippers are prone to look on penalties as an unmixed evil, but there is another side to the shield, even from their point of view. A properly designed penalty will permit of a cheaper total treatment charge and prevent the shipment of material that will be a source of loss to both parties.

Comes now the shipper and sets forth "Arsenic is selling for 5c. per lb. in New York, and not only am I not being paid for it, but I have to pay a penalty because of its presence in my ore." The amount of arsenic lost in the smelter fume is estimated at four times the total amount consumed in the United States. Who wants to buy it? The present price is due to a combination of the high cost of recovery and a temporary scarcity due to war demands. With the installation of fume-recovery plants, methods of separation for the arsenic, antimony, and bismuth will be developed and ores containing appreciable quantities will profit accordingly, but there will be considerable likelihood of a decreased price due to overproduction.

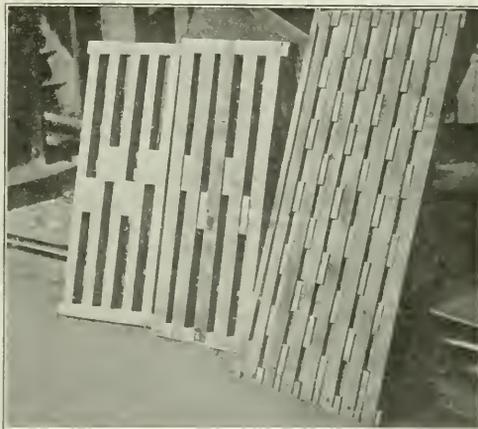
Treatment charges are of all kinds, flat, sliding scales varying with the value, with the metal contents (lead or copper), with the silica, and many other variations. One of the best, though complicated, was based on the cost of prime materials used in the treatment. This is much what is done in the "Jackson Price" in Chile. There is usually a minimum charge, to be applied on small lots to cover the cost of sampling and assaying. It is not commonly

appreciated that the assays made on an ordinary lot at the time of purchase would cost, if made by an umpire according to his regular price, from \$20 to \$50 per lot. There is usually an additional charge in the case of fines, to cover the cost of briquetting or sintering. It is based on material less than $\frac{1}{4}$ inch in size.

With the addition of a few special clauses, such as one providing for the transfer of the contract or for reference to arbitrators in case of dispute, this covers the general ore contract. It sounds fearsome, but with a few exceptions is really quite simple, though it will never be like a contract for 1,000 bushels of No. 2 white corn.

Gold-Saving Riffles on a Dredge

The gold-saving riffles used upon the dredges of the Yuba Consolidated Goldfields Co. have been standardized, like most other parts of the dredge. They are made in sections, five riffle bars to a section. The five bars are held by two end pieces and are separated by wooden blocks between each pair, staggered as shown in the photo. The bottom of the section is flush so that it will bear evenly on the sluice.



GOLD-SAVING RIFFLES ON A YUBA DREDGE

The upper face of each riffle is protected by a $1\frac{1}{4}$ -in. iron strap, $\frac{1}{8}$ -in. thick, held in place by wood screws, the flat heads of which are countersunk. This strap is set at a slight upward angle, the highest edge downstream, the upper surface of the wooden bar being cut at an angle corresponding to the upward tilt of the strap. The side bars have slots cut in them for the reception of the straps.

At intervals in the sluices a mercury, or trap riffle, is placed. In this, the spaces between the riffles are fitted with short wooden bars which do not quite reach the surface of the strap, these wooden pieces dividing each trough into a number of smaller troughs, as shown in the left of the photo. Each pocket is filled with mercury after the section has been placed in the sluice.

The Mackenzie River Basin

Possibilities of the Vast Territory Which Is Being Opened in Northwestern Canada—
Geological Features of the Area and Most Favorable Regions in Which to
Prospect for Minerals and Oil

BY PHILLIPS THOMPSON

TO THE prospector and the mining man the Mackenzie River basin affords a vast field of unknown but great possibilities. Not only is the greater part of the territory quite unexplored, but more than one-third of it is still unexplored, and even its geographical features are unknown.

With the opening of this region for settlement, increased attention is being given to its economic resources, concerning which the amount of available information is very limited. With the view of presenting, in a concise form, such data regarding the geological features and mineral occurrences of the country as are procurable, the Canadian Geological Survey has issued a volume compiled from numerous sources by Charles Camsell and Wyatt Malcolm, including information acquired by Mr. Camsell in personal exploration.

Vast Unexplored Territory of the Region

The basin of Mackenzie River occupies about 682,000 square miles in the northwestern part of the continent comprising the northern parts of British Columbia, Alberta, and Saskatchewan, the western part of the Northwest territories, and parts of the southeastern and northeastern Yukon. Lakes cover a large part of the area, and though many large bodies of water are still unexplored and unmapped, it is estimated that the water area cannot be less than 40,000 square miles. Its longer axis, about 1,350 miles, conforms in direction to the trend of the main physiographic features, and strikes north-westward. In width, it ranges from 100 miles at the mouth of the river to 900 miles near the center of the basin. It includes within these boundaries three physiographic provinces, each of which runs almost the whole length of the basin and has characteristics which sharply distinguish it from the others.

On the western border, and extending throughout the whole length of the area, is a lofty mountainous district known as the Cordilleran region. It forms a belt varying in width from 20 to 200 miles, extending from the foothills which border the central lowlands to a height of land separating the Mackenzie waters from those which drain westward to the Pacific. The great physiographic province known as the Laurentian plateau, which covers such a great part of northwestern and northern Canada, extends for some distance into the basin of the Mackenzie River, occupying a strip along its eastern edge from 80 to 280 miles wide and stretching over a length of 800 miles from the height of land at the south to the northern shores of Great Bear Lake. The western border of this province is a fairly well-defined line marked by the contact between the Pre-Cambrian crystalline or metamorphic rocks.

The physical features of this province are typical of the whole Laurentian plateau generally. It has, as a rule, little or no soil or loose material covering its bedrock, the region having been subjected to intense glacial erosion. The physiographic province termed the Great Central plain occupies the central portion of the basin, including all the region between the Laurentian plateau on the east and the Cordilleran region on the west. It has a length of about 1,300 miles and its width ranges from a maximum of 420 miles to about 200 miles.

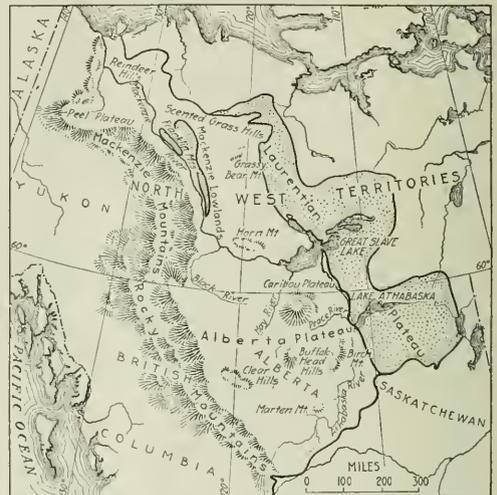


DIAGRAM OF THE MAIN FEATURES OF THE MACKENZIE RIVER BASIN

The distribution of the Pre-Cambrian rocks coincides with the physiographic province known as the Laurentian plateau. On the east these rocks extend over to the Hudson Bay, far beyond the boundaries of the region, but on the west they pass under a cover of later stratified rocks. The contact with these younger rocks runs from Methye portage to the west end of Athabaska Lake, thence down the valley of Slave River to Great Slave Lake, and from the north arm of that lake north-northwesterly to McTavish Bay, on Great Bear Lake. North of Great Bear Lake the contact has not been defined. The Pre-Cambrian rocks of the region have not been subdivided in such great detail as in the Lake Superior region or Northern Ontario, and only three different subdivisions have been recognized and mapped.

The oldest of the three groups consists of highly metamorphosed schists, slates, limestones, quartzites,

and volcanic rocks, occurring in isolated areas as erosion remnants. This group includes formations that have been uncertainly correlated with the Keewatin, Huronian, or Grenville of other regions. These rocks have been intruded by granites or gneisses of probably more than one age. Overlying these two groups is a series of younger rocks, not greatly disturbed, consisting of sandstones, conglomerates, shales, limestones, and some associated volcanic rocks that have been referred to as Keweenaw or Animikie. The rocks which have been more or less doubtfully correlated with the Keewatin or Huronian, consisting mainly of schists, slates, limestones, and quartzites, occur here and there throughout the Pre-Cambrian, in areas usually small but sometimes many square miles in extent. They occur in isolated bands which are merely remnants of formerly more widespread series, and have been so reduced in area by intrusions of granite and by deep erosion that they now form apparently the smallest portion of the Pre-Cambrian.

Though these lands are really not of great extent, they are much the most important economically of all the divisions of the Pre-Cambrian, and although no commercial mineral deposits have been found in this division within the limits of the Mackenzie basin, the rocks of which they consist have been proved in other parts of Canada and the United States to contain valuable deposits of gold, silver, and iron ores. The rocks are frequently traversed by quartz veins, which, in a band on Yellowknife River, are known to carry free gold. It is advisable, therefore, for the prospector working in the Pre-Cambrian of this region to pay particular attention to these rocks, as they are more likely than any other formation to contain ore deposits.

Gold Placers Not Likely to Be Found

Gold has not been discovered in any important quantity in the Mackenzie basin east of the Rocky Mountains, and the extent of country known to be favorable for prospecting for it limited. Gold has been found in small quantities on Peace River above the mouth of Battle River, on the Loon and the McLeod rivers, and in some other localities, but the glaciation to which the Pre-Cambrian area was subjected renders the occurrence of important placers highly improbable.

Coal is one of the most important resources of the Mackenzie basin, and occurs in the Cretaceous formations of the southern part of the basin and in the Tertiary formations of the northern parts. Mining operations are being conducted on important seams in the Cretaceous rocks along the Grand Trunk Pacific Ry. The report contains descriptions of the principal less-known deposits found in the north, including those on Smoky River, and in the Peace River district.

An immense body of bituminous sands, so-called tar sands, is exposed on Athabaska River, extending from Boiler rapid, about 200 miles below Athabaska, to a point many miles below McMurray. Outcrops occur, also, in the banks of the rivers and many small streams tributary to the Athabaska be-

tween these points. Although the area represented by actual outcrops has not been determined, it is probably not less than 750 square miles. The estimated thickness of the bituminous beds and the overburden, and the conclusions to be drawn are based wholly on surface indications. In 1915, experiments were conducted on the commercial utilization of the bituminous sands in street construction in the city of Edmonton, the result indicating that they could be successfully used for this purpose. The conclusion reached from a comparative study of cost data, as compared with imported asphalts, was that the application of the bituminous sands in a crude state to pavement purposes will be restricted within comparatively narrow limits in western Canada, and that extensive development of the McMurray deposits will probably depend on the evolution of a commercial extraction process, whereby the bitumen can be marketed in a fairly pure form.

Attention has for some time been directed to the possibilities of discovering petroleum and natural gas in localities where numerous striking indications of their occurrence have long been known. Boring operations have been conducted along Athabaska and Peace rivers, where strong flows of gas were struck in two or three wells, and petroleum-bearing strata on Peace River have been penetrated. Oil and gas indications are found in the sediments of Cretaceous and Devonian age, both of which are of wide distribution. From the point of view of the prospector for oil or gas, the McMurray sandstone is, so far as present knowledge goes, the most important formation of Cretaceous age in the Mackenzie basin. It comprises the great body of bituminous sands exposed on the Athabaska River, and is the formation from which issue the strong flows of natural gas struck in the wells sunk by the Dominion government and by the Pelican Oil and Gas Co. in the vicinity of Pelican River.

No important deposits of copper, silver, or iron are known to exist, though argentiferous galena containing 38.86 oz. of silver to the ton of pure galena is stated to have been found at a point in the vicinity of Great Slave Lake east of Resolution. No nickel deposits of economic value have been discovered, but nickeliferous sulphides occur at the east end of Lake Athabaska, where a number of claims have been staked. Gypsum is exposed at many points, the deposits most likely to prove commercially valuable occurring on Peace River and in the escarpment to the west of Slave River. Considerable interest has been manifested in the possible occurrence of potash in commercial quantities, but analyses of samples taken from brine springs and waters from strata pierced in boring operations have proved disappointing. There are numerous brine springs, from some of which salt is obtained for local consumption.

Considerable Water Power Available

Water power will be an important factor in the development of the region, because of the scarcity of coal. As in the Laurentian plateau regions elsewhere, the rivers of the eastern part of the basin

contain a number of falls at which power could be developed, including Black River, at the east end of Athabaska Lake, and Taltson, Lockhart, and Yellowknife rivers, flowing into Great Slave Lake. Water power could also be developed on Peace River at the chutes, on Slave River near Fort Smith, and on a number of rivers which fall over the face of the Devonian escarpment south of Great Slave Lake.

Sorting Ore in Raises

BY A. C. BIGLEY

At one of the important mines in Butte, Mont., ore sorting chutes are used in all raises. As a rule the sorting is done on the fourth or fifth floor above the sill. Fig. 1 shows a raise having two chutes and a manway in between. If chute A is drawn first, the chute directly below it is used for ore and the one alongside it below, B, receives the waste. Under the lips of chutes A and B grizzlies with bars 4 or 5 in. apart are used. Some of the bars of the waste grizzly must be removed to admit the large pieces of waste.

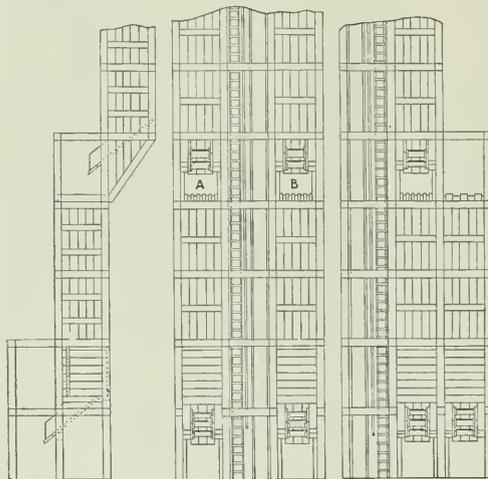


Fig 1
Fig 2
ORE SORTING CHUTES FOR RAISES

In drawing chute A the broken ore and waste from the blast is allowed to run on to the grizzly beneath the lip until it begins to heap up. Most of it, having been broken fine, passes readily between the bars. The larger pieces of ore must be broken with a sledge so that they will pass through. Such waste as will not pass is picked out and thrown down the waste chute under B. After chute A is empty, or enough ore has been drawn, chute B is drawn in similar fashion, the chute under the lip of A now becoming the waste chute.

Fig 2 shows a raise having one chute and a manway, with an extra chute for waste carried up as far as the sorting floor. This extra chute is directly alongside the main chute, to facilitate handling the large pieces of waste.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for October, 1919, and the figures for October, 1918, as finally revised, are as follows:

IMPORTS, OCTOBER, 1918, AND 1919 (In pounds unless otherwise stated)		
	Oct. 1918	Oct. 1919
Metals and ores:		
Antimony, contents	30,271	14,054
Antimony matte, regulus or metal	3,025,609	2,420,025
Copper:		
Ore, contents	2,908,758	4,004,003
Matte and regulus	3,156,878	3,256,640
Concentrates, contents	4,046,730	3,208,468
Imported from (in part):		
Canada	917,162	3,051,262
Mexico	5,745,218	6,493,722
Cuba	1,959,063	221,760
Chile	713,349	30,223
Peru	1,655	166,865
Venezuela	353,736	Nil
Unrefined, black, blister, etc.	33,884,114	17,392,398
Refined, in bars, plates, etc.	2,080,763	Nil
Old, etc., for manufacture	43,863	182,001
Composition metal, copper chief value	Nil	224,109
Lead:		
Ore, contents	2,247,673	3,036,568
Bullion, contents	11,252,412	8,285,550
Imported from (in part):		
Canada	1,654,000	885,614
Mexico	11,846,085	8,706,834
Pigs, bars and old	9,812	1,721,764
Pyrites, long tons	35,051	67,155
Imported from (in part):		
Spain, long tons	Nil	42,707
Canada, long tons	35,051	19,548
Tin ore, long tons	30	366
Tin bars, blocks, pigs, etc.	9,885,984	16,210,512
Imported from (in part):		
Straits Settlements	6,448,003	11,611,756
Dutch East Indies	792,041	742
United Kingdom	1,355,405	3,226,310
Australia	592,055	510,760
Hongkong	544,330	Nil
Zinc:		
Ore, contents	4,104,712	2,998,115
Imported from:		
Canada	190,000	220,993
Mexico	3,914,712	2,777,122
Blocks or pigs, and old	Nil	469
Manganese ore, long tons	48,917	15,363
Imported from (in part):		
Cuba, long tons	6,176,171	32
Brazil, long tons	37,885	8,620
British India, long tons	Nil	2,300
Tungsten ore, long tons	959	592
EXPORTS OF COPPER, LEAD AND ZINC (In pounds)		
	Oct. 1918	Oct. 1919
Aluminum:		
Ingot, metals and alloys	1,253,000	389,000
Plates and sheets	133,254	47,099
Copper:		
Ore, contents	364,000	3,000
Concentrates, contents	15,400	46,457
Unrefined, black, blister	110,066	Nil
Refined, in ingots, bars	31,088,599	44,001,230
Exported to (in part):		
France	7,906,150	18,637,926
Italy	7,404,974	Nil
United Kingdom	7,579,083	11,233,988
Canada	5,561,528	2,689,079
Sweden	Nil	246,400
Composition metal, copper chief value	5,447	5,297
Old and scrap	332	2,355
Pipes and tubes	257,291	785,585
Plates and sheets	601,020	698,120
Wire, except insulated	2,439,991	4,112,327
Lead:		
Pigs, bars, etc., produced from domestic ore	3,686,207	4,593,603
Pigs, bars, etc., produced from foreign ore	3,551,419	3,742,333
Exported to (in part):		
Canada	198,124	158,530
United Kingdom	4,182,248	448,000
Australia	158,053	1,120,000
Japan	2,464,000	4,109,929
France	Nil	1,120,000
Brazil	336,103	604,075
Zinc:		
Dross	2,373,237	42,100
Spelter:		
Produced from domestic ore	12,948,271	21,426,860
Produced from foreign ore	2,927,366	190,950
Exported to (in part):		
France	672,000	2,364,510
Italy	158,053	236,004
United Kingdom	13,069,286	10,615,759
Canada	1,068,411	605,534
Mexico	2,173	Nil
Japan	628,068	5,924,472
In sheets, strips, etc.	4,208,002	2,756,837

A hearing in the matter of the steel-price basing point was held before the Federal Trade Commission on December 2. The commission received a large number of statements from important interests on each side of the question.

Exploration in Southeastern Asia

Prospecting of Virgin Territory Difficult Owing to Jungle and Infrequent Outcrops—Natives a Source of Information, but Many Dialects Make Interpreters Necessary—Government Co-Operation Must First Be Secured

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THE facts to which attention is directed in the paper here presented should be of interest at the present time, when renewed activity is being manifested in the mineral exploration of little-known regions. They are based on experience gained in Burma, but are in a general way applicable to the greater part of southeastern Asia.

An absolute essential to exploration work of any magnitude in the Far East is the assent and, in fact, co-operation of the government of the country in which it is carried out. An attempt to search for mineral deposits without the previous consent of the government would involve certain failure of the expedition.

Exploration work in an unexplored country is of two types: (1) Virgin prospecting, by which is meant the examination of a section of country concerning which nothing regarding definite occurrences is known. This type of work implies the examining of outcrops and of stream float and thorough cross-examining of the natives of the country. (2) The investigation of reported occurrences where the approximate situation and kind of ore are already known and the presumed existence of which is the reason for the expedition. This second type is not discussed in this article, as it is analogous to examinations of prospects anywhere, and differs only in the fact that the information is generally vague and may eventually prove to have no basis in fact.

The physical difficulties met in the tropics, such as transportation, distance from supplies, and rainy seasons, merely call for a general knowledge of the country, and a sensibly equipped expedition will have no troubles of any magnitude.

Few Outcrops Make Prospecting Difficult

Virgin prospecting through practically all the region under discussion has to combat the serious obstacle of heavy jungle and a thick covering of soil, with a consequent great paucity of outcrops. The trails in all countries of heavy rainfall such as southeastern Asia follow the ridges wherever possible, and descend into the valleys only for short stretches. Contradictions to this occur only when the valley bottoms are fairly wide and flat, in which cases the valley floors are covered with fluvial deposits and are generally cultivated. The search for outcrops would thus entail the cutting of paths through the jungle and would take a prohibitive amount of time in relation to any possible results.

It is obvious that, even with any help derived from technical knowledge, it is impossible to go over any definite section of ground in a few days as thoroughly as has been done by the inhabitants of the district in the course of their daily work over a prolonged stretch of years. The hill tribes of south-

eastern Asia are all hunters and fishermen, and during the course of their daily wanderings have explored practically all accessible points in the neighborhood of their homes. The constant moving of the settlements themselves implies the acquisition of knowledge concerning a wide range of territory.

It is, of course, true that the almost absolute ignorance of the natives concerning the various ores, combined with their lack of interest, may be the cause of their overlooking mineral deposits. However, the appearance and weight of the commoner metallic minerals, such as pyrite, chalcopyrite, hematite, sphalerite, and cassiterite, unusually attract the attention of anyone, even if he is not looking for them. That their presence has been noted by the natives is evidenced by the fact that mineral specimens have been observed in the houses of villages near deposits. The rapidity of erosion of exposed outcrops is so great that the sulphides almost invariably outcrop on the surface, thus doing away with the oxidized ores which are recognized with greater difficulty. This is not always true of the copper minerals, but among these the appearance of the oxidized ores is more striking than that of the sulphides.

An examination of an area by means of working along its lines of drainage is extremely unsatisfactory, as the distance that sulphide float of any appreciable size is carried from its source is generally measured by yards rather than by miles, and this implies the working of streams practically up to their sources. To do this carefully entails a prohibitive amount of time, two miles of stream bed having been found to take a full day's work. The question of float in streams really falls into the category of things as to which better results can be obtained by questioning the natives rather than by actual search. Float other than in stream beds is practically non-existent.

Questioning Natives Produces Best Results

It follows naturally from the above that the most productive method of prospecting is by means of inquiries among the natives. This method is of necessity a leisurely one, as information must generally be secured by indirect methods, entailing time and patience. The payment of small sums of money for information is, of course, necessary. The amount asked depends largely on the eagerness shown by the questioner, but it is, even in the cases of the larger demands, a small sum, and can generally be made partly dependent on whether the information turns out to be of any value.

The ignorance of the natives about the various minerals entails a great amount of useless work in reported occurrences. Reported gold or copper is

generally found to be pyrite; silver, muscovite; coal, a dark carbonaceous band; iron, any red-colored rock. The obvious remedy for this is to insist on seeing actual specimens from the reported localities before visiting them. This is generally satisfactory as far as determining the kind of ore is concerned, but is useless as to grade. The invariable careful selection of specimens is carried to such an extreme that the least mineralization is made to produce high-grade samples. It is sometimes possible by carefully interviewing the bringer of specimens to ascertain in a way the nature of the deposit, but the information derived in this manner is always so vague and unsatisfactory that it is of no help in coming to a decision as to whether to visit the spot or not.

Ancient Workings Help, but Are Hard to Find

In all the sections contiguous to the southern border of China, and, to a lesser degree, in those more distant, the presence of ancient workings is a prominent aid to prospecting. This is not so much owing to the help which they afford in actual examination of the deposits, as because of the fact that their existence is generally known over a wide stretch of country. Information as to the existence of such workings has been secured from points forty to fifty miles distant. In fact, villagers at a distance from a deposit are generally more free with their information than those close to it; the latter often being afraid of interference with their normal life.

Ancient workings are generally hidden in dense jungle, the old dumps apparently favoring the growth of heavy vegetation, especially of undergrowth. In one case, at least, an hour or more had been spent by three or four men in finding a single tunnel, when the final result revealed six old workings within a radius of a hundred yards.

As far as their being an aid to examination is concerned, the ancient workings generally prove disappointing. The majority are either caved, generally at the mouth of the tunnel, or filled with water. Most of them are inclines sloping at 20 to 45 degrees. A moderate amount of work will often make them accessible, but it is generally necessary to do fresh underground work to secure reliable information.

Inability to speak the language of the natives is naturally a drawback, but practically an unavoidable one. The mountainous regions of southeastern Asia, especially the areas bordering on China, are not inhabited by a single homogenous race of people, but by a large number of races; each speaking a distinct dialect. If the territory covered by an exploring party be large, it is inevitable that the members of the party will have dealings with numerous races, thus making necessary the use of a number of little-known languages. It is practically impossible for the members of a temporary expedition to acquire a knowledge of these tongues. Recourse must, of necessity, be had to native interpreters. In many instances it will be necessary to translate the conversation through two stages, namely, from the language of the hill tribe to the general language of the country, and then into English. Naturally such a process is unsatisfactory, but is less of a

drawback than would appear at first glance. As mentioned previously, the knowledge secured by questioning natives is vague and unsatisfactory. The main object of the questioning is therefore simply to secure two items of information: (1) Whether any valuable minerals have been observed in the neighborhood; (2) how to get to them, the latter meaning simply the securing of a guide. This limited amount of information can generally be satisfactorily secured through interpreters. As an aid to obtaining an answer to the first question, exhibiting of type specimens of the different minerals has proved of help. Owing to a human trait, a native is more apt to impart information to one of his own kind than to one of an entirely different race, even if the latter has a knowledge of the local tongue. This fact is an argument in favor of using an interpreter, even if he is not actually necessary.

It will be understood from the observations set down that virgin prospecting by itself in the section discussed involves a rather slow trip through the country, and that the main chance of finding mineral deposits is through information secured from the inhabitants. The possibility of finding valuable mineral deposits in this fashion is so uncertain that it rarely attracts capital.

Geologists Leaving Government Employ

Seventeen per cent of the scientific force of the U. S. Geological Survey resigned during the last fiscal year, it is shown by the annual report of its director, Dr. George Otis Smith. The cause, Dr. Smith points out, is inadequacy of compensation. Separations in the clerical force were much larger than in the scientific force, for the same reason.

"The relation between Government salaries and outside salaries of geologists," says Dr. Smith, "has been determined definitely in a compilation of the records of twenty-nine geologists who left Government service after receiving an average salary of \$2,271. The average initial salary of these men in private employ was \$5,121, and after two years of service this compensation averaged \$7,804. Eight of these geologists received \$10,000 or more. The disparity is even greater if consideration is given to the large financial returns from investments made by the private geologists in connection with their professional work, a privilege properly denied by statute to the official geologist.

"That the value of these men as specialists and consulting geologists is far greater to the country at large than to private corporations is undeniable. Furthermore, it is important to note that most of these geologists had resisted to the limit of endurance, with a magnificent spirit based on their love of scientific research, and their desire to contribute to the sum of geologic knowledge. Unless adequate measures are taken to ameliorate the situation, the geologic staff is destined to suffer far greater deterioration of morale and depletion in its ablest, most responsible, most experienced, and most valuable members."

PETROLEUM SECTION

Engineering Notes and Equipment Details
Production Statistics—Progress
in Important Fields

Extinguishing a Burning Gas Well

Exploding of Nitroglycerine, in Conjunction With the Use of Steam, Water and Slime, Proved Successful—Details of the Process

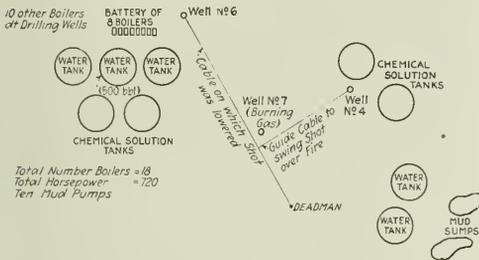
BY SETH S. LANGLEY
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ON JUNE 6, well No. 7, of the Standard Oil Co., California, on Sec. 36, Township 30 N., R. 23 E., M. D. B. & M., was being bailed to bring it in as an oil well, when gas broke in and caught fire. The 6-in. casing had been cemented at 1,800 ft., and the total depth of the well was 2,141 ft. This cement job must have failed, as the gas sands in the other wells are at a correlative depth above 1,800 ft. As well No. 4 had broken in as a gas well, the casing on No. 7

best that had been accomplished was to lower the flame to a point about 40 ft. above the collar of the well.

The last and successful attempt was most ingenious. A cable was strung from a nearby rig to a deadman beyond and in line with the fire. To this a second cable was attached from another rig, the two cables forming a right-angle at the fire. The second cable was to serve as a guide to swing the first directly over the well. With the steam, water, mud, and chemicals turned on, and the fire lowered to about 40 ft., a charge of 150 lb. of nitroglycerine was guided down the first cable directly above the flame. The shot was detonated by a battery and the fire was out on Aug. 5, 1919. The figure is a general sketch of the arrangement finally used.

[The means employed to extinguish the fire at well No. 4 were described in the Journal of July 12, 1919, on page 73.—Editor.]



GENERAL ARRANGEMENT OF TANKS, BOILERS AND WELLS

was provided with a gate and relief valve to meet such a contingency. When the drillers heard the gas coming they were able to close the gate and open the relief valve, but the pressure was too great and tore off the fittings. The fire did not start at once, but broke out about an hour later. It was apparent that this was a much bigger gasser than No. 4, but the steam from sixteen boilers had been all that was necessary in that case, and eighteen were at once made ready.

After clearing away the remains of the drilling equipment, an attempt was made to smother the fire with steam. Several attempts resulted in failure. The gas had been bringing sand and shale with it to such an extent that the two upper joints of the casing were worn away and the hole enlarged around the collar of the well. This allowed the flame to reach down below the surface and increased the difficulty of smothering. After the steam had proved of no avail, water and slime were added with no better success. The next attempt included all of these with fifteen tons of a solution of carbon tetrachloride and as much sulphuric acid and bicarbonate of soda. The fire refused to smother. The

Status of English Oil Development

According to the American Chamber of Commerce in London, the oil discovery at Derbyshire, England, which caused so much excitement some few months ago, has amounted to practically nothing. The Hardstoft boring, at which the strike was made, is still the only one to have come in, and even there the flow is small. The bore hole is now down 2,800 ft. and has passed through two colliery workings, but the yield of oil was only about 2,000 gal. per day. A powerful pump, introduced in the hope of increasing the flow, has now broken down, and the oil is penned up in the bore hole, escape having been cut off by means of a safety valve. It is hoped, however, that the subterranean supply is good, because the flow up to the present has been continuous.

The other borings, at Ironfield, Reinshaw, Ridge-way, Brimington Common, and Heath, have not struck oil at all. It is reported that drilling on these sites has been suspended, owing to the non-arrival of the steel tubes necessary to keep out the water and to prevent oil from escaping in any subterranean crevice which the drill may have passed through.

No Japanese Oil Concessions in Mexico

Persistent rumors that Japanese are acquiring petroleum lands along the Gulf Coast of Mexico were denied emphatically by the Secretary of Industry and Commerce of Mexico, according to official information reaching Washington. Not a single concession of such a nature, up to the present time, has been granted to Japanese subjects, it is stated.

Irish and Scottish Oil Shale*

Geological and Mineralogical Character of Deposits, and Estimation of Reserves—Yields of Oil and Sulphate of Ammonia

THE earliest recorded production of oil shales was in 1873, when the output amounted to 542,643 tons, and there was a steady increase until the year 1913, when the highest production, amounting to 3,280,143 tons, with a value of £822,394, was reached, all of which, with the exception of 240 tons from Flintshire, came from Scotland.

Oil shale has been obtained during varying periods from many English counties, but the Scotch deposits in the counties of Edinburgh and Linlithgow have at all times been the most important.

Some clay rocks split readily into fine leaflets or laminae parallel to their bedding, and this structure is accentuated by films of other materials, such as sand or vegetable debris. Laminated clays of this nature are generally known as shales. They are found in many formations, but are most common in the carboniferous. Some of them contain much organic debris, and when distilled yield paraffin oil, wax compounds of ammonia, and other products. In these oil shales are clear, globular, yellow bodies which seem to be resinous, and a suggestion has been made that the admixture of large quantities of decomposed fresh-water algae among the original mud explains the origin of paraffin. Many shales contain great numbers of nodules of clay and ironstones, and others are rich in pyrites which on oxidation produce sulphuric acid; this attacks the aluminous silicate of the clay and forms alum shales. The lias shales of Whitby contain blocks of semi-mineralized wood or jet.

Geological Character of Deposits

The oil-shale measures of Scotland form part of the calciferous sandstone series which embrace two subdivisions. The upper, known as the shale group, is over 3,000 ft. in thickness and contains in its higher parts, beds of coal usually of inferior quality and further down about six main seams of oil shale interstratified with beds of sandstone, shale, fireclay, marl, and estuarine limestones. Oil shale is found both in the coal measures and in the carboniferous limestone series of Scotland, and has been wrought in various localities together with seams of coal and ironstone. At present practically none of these shales is considered workable, exclusive attention being paid to the valuable seams occurring in the calciferous sandstone series. In thickness these seams vary greatly. At certain localities they disappear, passing into ordinary carbonaceous blaes, and at others swell to 6 or perhaps 15 ft. in thickness.

There is undoubtedly a considerable resemblance between the Scottish shale measures and those found in the Ballycastle mineral field in the North of Ireland. The field is in the lower carboniferous series, and the calciferous sandstone series being composed of massive sandstones, shales, thin beds of limestone, ironstones, and coal seams. A good section of the

lower carboniferous series can be found on the cliffs forming the coastline between Ballycastle and Fair Head, showing the outcrop of the different seams.

Possibility of Future Developments

As pointed out, the shale seams in the Scotch carboniferous series have hitherto been but little availed of for exploitation, but it would be premature to depreciate the value of Irish measures on that account. It is stated on good authority that the 8-ft. seam of limestone which outcrops in part of the Irish field at Colliery Bay is recognizable as the Burdiestone limestone, a well-known horizon on the Scottish field. As the outcrop of this 8-ft. bed is at sea level, it is anticipated that there should be a considerable thickness of productive strata below this horizon. At Pumpherton in Scotland there is up to 1,000 ft. of productive strata below the Burdiestone limestone. At Colliery Bay the outcrops are first met about half a mile to the east of the town of Ballycastle, continuing for a distance of four miles to Fair Head. The cliffs gradually rise in height from 150 ft. near Ballycastle to 636 ft. at Fair Head. The seams of shale outcropping on the cliffs are eight in number, varying in thickness from 3 to 17 ft., making a total thickness of 90 ft. of shale, of which about 25 ft. is true oil shale.

As numerous mines have already been driven into the face of the cliffs to work the coal and ironstone, it might be possible to restore them with but little expense to work the seams. The total area of this district is 9,230 acres, and the shale reserves have been estimated at 189,000,000 tons. This computation allows for 25 per cent for losses incurred in connection with faults, intrusions, and loss in working, and takes into account only 5,600 acres, as the remainder would be required to be proved by boreholes. A drawback in connection with the Ballycastle field is the presence of many faults and disturbances which follow a more or less north-and-south course, splitting up the field into numerous divisions. Practically the whole of the region is capped with sheet basalt and, unfortunately, in one section zones of this material are noted through the stratified rocks.

The Irish field is not, however, peculiar in the possession of these disadvantages. Broadly speaking, the effect produced on oil shales by the intrusion of igneous rocks depends on the proximity, the temperature, and mass of the intruded matter, and the amount of water with its cooling power in the sediments which are invaded. Specimens of Broxburn shale taken some distance apart from localities beneath the dolomite sill—a coarse variety of basalt—near Newbygan gave some interesting results. Two samples yielded 23 gal. each, which was comparatively low, but the other two gave 31 gal. each, the explanation probably being that the igneous rocks were further off.

Again, in another part of the Scotch field, near Drumshoreland, the existence of a basalt dike about a mile or two long has had the effect of rendering useless the shales for about a distance of 70 ft. on either side. A process of distillation of the shales has been evidently carried on here by the molten

*From "The Statist," London, Oct. 11, 1910.

material. The basaltic cap is not of general occurrence in the Irish field. Around Ballyvoy it is absent, the strata are covered with a considerable thickness of drift, and consequently better inducements for working might be afforded here. It is stated that shafts sunk in the locality have cut through at 120 ft. a seam of shale 15 ft. in thickness; and, directly over the coal seam, a seam of shale 60 ft. in thickness was encountered.

A distinct similarity has been traced between the cannel coal once mined in Ballyvoy and the highly-bituminous Boghead coal or Torbanehill mineral, returning 120 to 130 gal. of crude oil per ton, and worked out in Scotland in 1862. The main difference between shale and cannel coal consists in the percentage of ash, rich shales approximating to the coal in their composition. This is well illustrated by the New South Wales kerosene shale, which contains only 8 per cent of ash, and a splinter of which will burn like cannel coal.

As regards the oil yields from Scottish shale, the figures vary for the richer kinds from between 30 and 40 gal. per ton, but the higher yield is usually obtained at the expense of the solid paraffin and of the quantity of heavy oils. Contrasted with this the Irish yield is comparatively low, but in this connection much would depend on the extent to which investigation was restricted to outcrops. It is also worthy of notice that the inferior shales in Scotland, producing about 18 gal. of oil per ton, give a proportionately larger amount of sulphate of ammonia.

The Ballycastle field is not unfavorably circumstanced for development. The town of that name is connected with the standard Irish gage railway by a narrow gage line seventeen miles long, the latter, however, being capable of considerable improvement. As the area is situated on the coastline, the sea would provide an alternative method for disposing of mineral products were harbor accommodation sufficient. The coal reserves are estimated at 83,000,000 tons, and it is unnecessary to emphasize the advantages of the centre as a coaling station and its favorable position for business connections with the industrial area in Ireland, the South of Scotland, and the North of England.

The oil shales of Scotland yield by destructive distillation at a bright-red heat, crude oil and ammonia, and this oil furnishes on fractional distillation a series of products resembling those obtained from its rival, petroleum. It yields from 3 to 6 per cent of gasoline and naphtha, about 30 per cent of burning oils (for use in lamps), about 9 per cent of gas oil, 20 per cent of various lubricating oils, and about 10 per cent of paraffin.

Of course petroleum products are more easily and cheaply won than those from shale. The crude oil of the former is obtained without the expense of mining and retorting. A bore is simply put down and tubed and the oil flows like a fountain or is brought to the surface by a pump. In this state it is much easier to refine than that produced by the violent method of the shale retort which yields unsaturated hydrocarbons and a little sulphur.

Crude petroleum in its first distillation separates a considerable proportion of burning oils which require only one treatment each with oil of vitriol and soda to render them fit for the market. Scottish burning oil, on the other hand, demands three or four distillations. A gigantic bench of 60 retorts with 250 tons of shale put through every day gives a very thin stream of crude oil and ammonia water. Nevertheless, there are consolations in the presence of ammonia and in the issue of more homogeneous products as a result of repeated distillation.

California Oil Production and Developments for October

The production of oil in California fields during October, according to information given out by the Standard Oil Co. of California, amounted to 277,589 bbl. per day, a decrease of 3,205 bbl. daily as compared with September. October shipments were 306,060 bbl. per day; a decrease of 1,592 bbl. per day as compared with September. Stocks were decreased 882,601 bbl. during the month. Forty-nine new wells were completed during the month, with initial daily production of 5,960 bbl.

SUMMARY OF DEVELOPMENTS AND PRODUCTION FOR ALL CALIFORNIA OIL FIELDS FOR OCTOBER

FIELD	New Rigs	WELLS			Producing	Production Per Day
		Drilling	Completed During Month	Abandoned During Month		
Kern River	5	22	16	...	2,035	20,040
McKittrick	...	9	...	1	347	7,317
Midway-Sunset	10	74	6	...	2,339	87,800
Lost Hills-Belridge	2	19	3	...	558	11,740
Coalinga	5	35	8	2	1,223	44,698
Lompoc and Santa Maria	3	24	4	...	377	16,980
Ventura County and Newhall	2	34	4	2	496	4,930
Los Angeles and Salt Lake	...	2	...	...	666	3,762
Whittier-Fullerton	19	126	8	...	876	80,190
Summerland	...	...	...	...	142	147
Watsonville	...	...	...	...	5	77
Totals	46	345	49	5	9,064	277,589
Total crude oil stocks, October 31, 1919.....					32,017,037	bbl.
Total shipments from fields, October, 1919.....					9,487,858	"

CRUDE OIL PRICES AT THE WELL

San Francisco, Nov. 14, 1919
 Effective June 10, 1919, Standard Oil Co. offers the following prices for crude oil at the well.

San Joaquin Valley Fields	Per Bbl.
Kern River, Midway-Sunset, McKittrick, Lost Hills-Belridge, Coalinga.	\$1.23
14° to and including 17.9° gravity.....	1.24
18° to and including 18.9° gravity.....	1.25
19° to and including 19.9° gravity.....	1.25
and for each increase in gravity of one (1) full degree above 19.0° gravity, up to and inclusive of 35.9° gravity, two (2) cents per bbl. additional.	
37° to and including 37.9° gravity.....	1.62
and for each increase in gravity of one (1) full degree above 37.0° gravity, three (3) cents per bbl. additional.	
Whittier-Fullerton and Santa Maria Fields	
16° to and including 17.9° gravity.....	\$1.23
18° to and including 18.9° gravity.....	1.24
19° to and including 19.9° gravity.....	1.25
and for each increase in gravity of one (1) full degree above 19.0° gravity, up to and inclusive of 35.9° gravity, two (2) cents per bbl. additional.	
37° to and including 37.9° gravity.....	1.62
and for each increase in gravity of one (1) full degree above 37.0° gravity, three (3) cents per bbl. additional.	

California Petroleum Development Activity is indicated by reports filed with the California State Mining Bureau, Department of Petroleum and Gas, during the week ended Oct. 4, 1919, which show sixteen new wells ready to drill, making a total of 501 since the first of the year. Other operations reported are 26 tests of water shut-off; 14 deepening or re-drilling jobs; and 6 abandonments.

Natural Gas and Natural Gas Gasoline in the United States

Great Increase in Value of Natural Gas Used—The Recovery of Gasoline From Natural Gas Has Become a Large Industry

MORE than 2,100 cities and towns in the United States are supplied with natural gas, which is furnished to domestic consumers at rates that should arouse the envy of those consumers of artificial gas who have to pay about a dollar a thousand cubic feet. The average price per thousand cubic feet charged to domestic consumers of natural gas in the United States in 1917 was about 30c. The average price charged to manufacturers was less than 12c.

Most of the towns and cities supplied with natural gas are in New York, Pennsylvania, Ohio, West Virginia, Kansas, Oklahoma, and California. In Ohio, 872,000 domestic consumers were supplied in 1917, in Pennsylvania 480,000, in California 239,000, in Kansas 188,000, in New York 164,000, in West Virginia 129,000, and in Oklahoma 95,000. The industrial consumers, by whom the gas is used for manufactures or for generating power, use twice as much gas as the domestic consumers.

During the present century the value of the natural gas used in the United States has risen annually without break from \$27,000,000 to \$142,000,000 and is still rising.

A report on "Natural Gas and Natural Gas Gasoline in 1917" by John D. Northrop, just published by the U. S. Geological Survey, gives statistics of the production and consumption of natural gas and sketches the condition of the industry in twenty-five states. It gives also statistics concerning gasoline made from natural gas in that year.

Gasoline From Natural Gas

The recovery of gasoline from natural gas has now become a large industry, which contributes materially to the supply of motor fuels. Experiments in the conversion of natural gas to gasoline were made as early as 1903, but experiment did not give way

to commercial production until about 1910. The growth of the industry since that year has been remarkable. In 1911 there were in operation 176 plants, which produced about 7,400,000 gal. of raw gasoline from natural gas. In 1917, only six years later, there were 886 plants, which produced nearly 218,000,000 gal.

Prior to 1916 most of the gasoline recovered from natural gas was derived from casing-head gas obtained from oil wells, by methods involving compression and condensation, but from year to year an increasingly large proportion of the annual output of natural gas gasoline has been recovered by the absorption process, which has now been applied not only to "wet" gas from oil wells but also to so-called "dry" gas, which occurs independent of oil and constitutes the main supply of natural gas. Dry gas cannot be profitably converted into gasoline by compression.

New Petroleum Legislation in Rumania

A communication from the British commercial secretary at Bucharest printed in the "Board of Trade Journal," London, Oct. 16, 1919, reports that a new law of Sept. 12 provides that all those properties in Rumania upon which no work has as yet been done shall be subjected in their future working to laws which are to be passed later. This is considered in many quarters as a preparatory measure to enable the Rumanian government to become an interested party in their exploitation. This point, however, should not be considered serious, because only those properties upon which no exploitation work has yet been done are brought into control, and these—or the majority—have been held presumably for speculative reasons.

Art. 1 acts, on the other hand, rather in favor of companies having established rights over properties, as their present rights remain valid and cannot be attacked or limited during the period of application of the new law, although it prevents further exploitation on other lands, or transmission of existing rights, and is thus an infringement on the "right" of free sale or mortgage of holdings.

ITEMS FROM TEXAS AND LOUISIANA OIL FIELDS

WHITE AND HUMBLE COMPANIES PLAN TO ADD TO TEXAS PLANTS

The White Oil Corporation of Delaware has decided to build a 15,000-bbl. light oil refinery on the Texas Gulf coast, to be connected to the mid-continent oil-fields by an 8-in. pipe line, 400 miles long. P. J. White, president; Thomas White, vice-president; and Louis E. Stoddard and George E. Colvin, directors, have recently visited Houston and a decision as to the site of the refinery is expected shortly. The

pipe necessary has been purchased from the National Tube Co., and the construction will be in the hands of the J. G. White Co., and Stone and Webster. To handle its increasing capacity in the Homer, La., field, the White Oil Corporation will install twenty 50,000-bbl. steel tanks there.

The business of the Humble Oil and Refining Co. has expanded to such an extent that the capital stock will be increased from \$8,200,000 to \$25,000,000. The company owns leases on extensive areas in Texas, Oklahoma and Louisiana, with lesser holdings in Wyo-

ming. Eighty-one wells, 60 of them producers, were drilled in the past year in west and northwest Texas, and 154 are now being drilled. In the Gulf coast district, 19 wells were drilled, 12 being producers, and 20 wells are now being put down. The company has 3,000,000 bbl. of oil in storage, which is a little more than three months' production. The 8-in. main trunk pipe line from Stevens County to Texas City, Galveston County, with a daily capacity of 20,000 bbl., is expected to be finished by Jan. 1, 1920. The 8-in. line from the West Columbia field to the Webster

tank farm, 50 miles long, with a daily capacity of 14,000 bbl., was put into operation last July. A 10,000 bbl. refinery at Baytown, near Goose Creek, will be in operation, it is hoped, in June, 1920. Provision will be made for increasing the capacity later, as has been done at the San Antonio refinery, which is now handling 2,000 bbl. daily of crude supplied by rail from Burkburnett. Two casinghead gasoline plants at Iowa Park, Tex., and Healdton, Okla., are making 2,500 bbl. of gasoline daily, and a third plant, with a capacity of 1,500 bbl., is being built near Burkburnett at a cost of about \$100,000. A skimming plant is under construction at Comyn, Comanche County, for treating Ranger and Desdemona crude oils before sending them to storage. A dock at Texas City, sufficiently large to load two tank steamers at a time, has been built. The extensive development in all of these fields has necessitated an extensive building campaign to house employees, especially at Cisco. A new six-story office building will be erected, fronting on Polk St., Houston, to cost \$1,000,000.

OIL BOOM AFFECTS OTHER INDUSTRIES

Industries other than oil are soon called into being in districts where petroleum is found. A new telephone corporation, capitalized at \$1,000,000, has been organized by Eastland, Tex., men to serve the Central-West-Texas oil region. The company has been financed, and long distance service with Dallas and Fort Worth will be installed.

The Lucey Mfg. Co., of Houston, will expend about \$1,000,000 on a steel plant and a new factory for the manufacture of oil well equipment and supplies; and 800 to 1,000 men will be employed. The new plant will be so arranged that the capacity can be greatly enlarged in a short time, and it will, it is expected, eventually be the largest of the company's works. The old plant will be temporarily doubled in size to fill present demands.

PIPE-LINE OWNERS FEAR BEING MULCTED

The proposal of the Texas Railroad Commission that pipe lines cannot be laid without securing the written permission of the owners of the land over which the lines pass, is being opposed by the oil companies. The latter claim that gathering lines are laid in a rush to meet emergencies and that there is no time to obtain permission. Furthermore they argue that such a ruling would lay them open to the rapacity of some land owners on whose property, lines have already been laid without protest.

CLAIBORNE FIELD LACKS PIPE LINES

New Gushers Overtax Capacity—Much Property Changing Hands

Wonderful progress is being shown in the oil developments of northern Louisiana. Several large gushers have been brought in recently in the Homer field. One of the recent completions in Claiborne Parish is Gilliland & Foster's No. 6 Oaks, which is flowing over 5,000 bbl. daily through a 4-in. pipe line, 4 miles long, to Homer. This well was drilled as an offset to Standard Oil Co.'s No. 1 Oaks, the first big well completed in the deep sand. These operators are drilling several other wells. The Louisiana Oil & Refining Co., in the Claiborne field, completed its No. 4 Jackson well recently, and this is producing satisfactorily. No. 9 well of the Fortuna Oil and Gas Co. in the Bull Bayou district, is now making 1,000 bbl. daily from 2,750 ft., a greater depth than former producing wells had reached.

The Claiborne field is held back on account of insufficient pipe line capacity. The Sinclair Consolidated Oil Co. has completed survey of its pipe line from Cisco, on the Houston ship channel, Harris County, Texas, to Mansfield, La., and the Homer field. The line will be 226 miles long and will have three pumping stations. The Simms Oil Co. will also build a 6-in. pipe line, 20 miles long to its projected tank farm at Sibley.

Considerable property is changing hands in northern Louisiana. Recently the Simms Oil Co., of Houston, Tex., bought the holdings of the Rowe Oil Co., in the Homer field for a price reported to be \$9,000,000. The property has several producing wells and is making 15,000 bbl. daily. The Simms Oil Co. has also purchased a one-third interest in the 3-in. pipe line of the Claiborne Pipe Line & Refining Co. from the Homer field to the loading racks on the railroad at Homer. H. T. Stati and associates, of Houston, Tex., connected with the Simms Oil Co., have purchased the property of the Frost Oil Co., with four producing wells, for the reported price of \$1,500,000.

LEGAL HAPPENINGS AT AUSTIN, TEXAS

Several oil companies have recently been chartered at Austin, the largest being the Duquesne Oil Corporation of Wilmington, Del., with a capital stock of \$5,000,000, and headquarters at Eastland. The West Texas Oil Co., of Wilmington, Del., has a capital stock of \$1,000,000. The United States Oil Co., also of Wilmington, has a capital of \$2,000,000, and the Belle City Oil Co., with workings in Cement County, Oklahoma, is capitalized at \$500,000.

The suit between A. Goldman and the Invincible Oil Co., in which 160 acres in the Landslide tract of the Humble field, and the oil removed from it, were involved, has been settled in favor of the defendants. The plaintiff, as shown by the evidence, did not have a grant from the state for the land.—The Burk-Senator oil land dispute was discussed at a joint meeting of representatives of Texas and Oklahoma at Fort Worth beginning Nov. 20. The governors and attorney-generals of both states were present. It was agreed that for the present the district judge having jurisdiction over the boundary lines shall act as receiver, operate the wells, sell the oil, and hold the receipts until such time as the U. S. Supreme Court shall finally decide which state owns the land. In a later statement, Attorney-General C. M. Cureton, of Texas, said he would go to Washington and resist all efforts by Oklahoma to obtain control of the Burk-Senator oil property through the Supreme Court. The suit by the state to retain option on the Bassett Blakely lands at Blue Ridge has been postponed until the next term of the district court in January, 1920. No steps, however, will be taken to prevent drilling on this land in an attempt to find oil.

PERSONAL ITEMS

Grover Hartt, formerly a member of the faculty of the University of Texas, and later an attorney in Ranger, has been appointed president of the American Oil & Refining Association, of Ranger.

E. F. Simms, president of the Simms Petroleum Co.; Oscar L. Gubelman, of Knauth, Nachod & Kuhne, and Thomas Streeter, vice-president of the American International Corporation, were recent visitors in Claiborne Parish, La.

A. C. Veatch has been appointed by the Sinclair Consolidated Oil Corporation to search for oil in promising districts. Mr. Veatch was formerly connected with the Lord Cowdray interests in England and was the discoverer of the petroleum deposits in that country.

James P. Nash has been named by the oil division of the Texas Railroad Commission as one of the supervisors for Eastland and Stephens Counties. Mr. Nash was formerly connected with the state highway department and with the University of Texas Bureau of Economics.

Olaf J. Perkins has severed his connection with the Arizona State Bureau of Mines to enter the employment of the Pearson syndicate. Mr. Perkins has gathered the greater portion of the data for the geographic base map of Arizona now being compiled, and has also had charge of mapping and investigational work in several sections of the state.

BY THE WAY

A Mining Song

There is lots of gold in the ore of life
 When men extract it all;
 In the stream of woe, or the fire of strife
 It does us good to fall.
 While the poison lies of a misplaced trust,
 Should teach us to be true,
 As although our bodies may turn to dust,
 The golden soul is you.
 And the gold remains when the slag sloughs off,
 To the real, true metal our caps we doff.

—L. M. Weston.

Wanted a Metallurgist with Wheels

To have a bonanza on your hands and yet be able to interest no one in it is most tantalizing. But when this state of affairs is owing to the lack of a metallurgist with sufficient ability to detect the value in the ore, it is also most surprising and the profession should take notice. To this end we publish below a letter received from G. A. E. Martin, druggist and physician of Adona, Ark. Will some metallurgist whose wheels are running as they should, kindly lend a hand to Mr. Martin and thereby aid the mining industry at the same time?

The Adona Irido Mining Co.'s wealth consists only of the immense deposits of the metals iridosmine, ruthenium, palladium, gold, silver, copper and vanadate of iron, heterogeneously mixed in gangues of sandstone, shale, coal and blue-clay, and this known only to the writer, notwithstanding the fact that many of the best-informed metallurgists have had samples of these different gangues to test for these metals. I know they only gave them a specular examination. Surely if they had put any of the many samples they have been presented with to test they would have found at least one or two of these many metals in it, for I have failed in no one of the many thousand that I have examined, and me only an amateur—learned all I know without a teacher.

I am enclosing you a small sample, though large enough to produce an acid-test sample. I ask that you kindly look out for a metallurgist that hasn't got his wheels of locomotion so deep in the ruts of classical metallurgy that he cannot get out of the adamantine walls of the idea that everything that is has long since been known to the scientists; and that because these metals have never before been found in these gangues it is impossible for them to contain them—and he will find the metals as I say.

I should admit that I sent a sample each of the shale and sandstone gangues to John Ogden, then of Philadelphia but now of Denver, who did examine the shale-gangue and found platinum, gold, and silver; the sand-stone gangue was the richer of the two, but its values were mostly iridosmine.

To get the sample from the gangue, first crush the gangue in a clean agate mortar to a fine powder; then lift it out of the gangue substance by carefully stirring a smooth well-magnetized penknife blade in the gangue, jarring the microscopical, flat, metallic granules that adhere to it on to a smooth oiled paper; then jar it from the paper into a dry clean test tube and it is ready for the nitromuriatic acid. And it generally needs to be fortified with sulphuric acid.

I have written to the "Patent News" for advice about my discovery being of sufficient merit for a patent, but have not yet heard from them. Will you kindly give me such advice.

What Was the Sentence Pronounced?

The State Corporation Department of California has issued a bulletin announcing that "Diamondfield Jack" Davis, who was arrested some time ago in San Francisco charged with violating the provisions of the Corporate Securities Act, has been found guilty by Judge Oppenheim in San Francisco. Davis was accused of having made frequent and successive sales in California of shares of stock of the Silver Reef Divide Mining Co., a Nevada corporation, which had been issued to him in Nevada, without having first obtained from the Commissioner of Corporations of California a certificate authorizing him to do so. The bulletin states further:

Judge Oppenheim, in pronouncing judgment upon Davis, declared that he was convinced of Davis' guilt and intended to see that the provisions of the Corporate Securities Act were enforced, and, if he was found at any future time violating any of the provisions of the act in connection with the sale of corporation stock, he (Judge Oppenheim) would see that Davis would be severely dealt with.

Commissioner of Corporations E. C. Bellows, in commenting upon the outcome of the charges against Davis, declared that it is his purpose to take every means provided by law to put a stop in California to the operations of such dealers as "Diamondfield Jack" Davis.

California is fortunate in having a Blue Sky law and an official who will enforce it. Experience has shown, however, that only the imposition of severe penalties will make the fractious obey.

Dan McGann Declares Himself

BY EDGAR A. GUEST

Said Dan McGann to a foreign man who worked at the self-same bench,

"Let me tell you this," and, for emphasis, he flourished a Stilson wrench.

"Don't talk to me of the bourgeoisie, don't open your mouth to speak

Of your socialists or your anarchists, don't mention the bolsheveek,

For I've had enough of their foreign stuff, I'm sick as a man can be

Of the speech of hate, and I'm tellin' you straight that this is the land for me!

"If you want to brag, just take that flag an' boast of its field o' blue,

An' praise the dead an' the blood they shed for the peace o' the likes o' you.

I'll hear no more," and he waved once more, his wrench in a forceful way,

"O, the cunning creed o' some Russian breed. I stand for the U. S. A.!

I'm done with your fads, and your wild-eyed lads, don't flourish your rag o' red

Where I can see, or at night there'll be tall candles around your bed.

"So tip your hat to a flag like that! Thank God for its stripes and stars!

Thank God you're here where the roads are clear, away from your kings and czars.

I can't just say what I feel today, for I'm not a talkin' man, But first an' last, I am standin' fast for all that's American. So don't you speak of the bolsheveek, it's sick of that stuff

I am,
 One God, one flag is the creed I brag! I'm boosting for Uncle Sam."
 —Ax-i-dent Ax.

PERSONALS

W. H. Goodchild has left England for South Africa.

William Cullen has left England for South Africa, where he will remain for six months.

Harley C. Hooper has left Burma for Australia, where he expects to remain until March, 1920.

E. F. Yates, formerly of the Miami Copper Co., has been appointed city engineer of Globe, Ariz.

C. W. Purington has returned to England from Eastern Siberia and the Federated Malay States.

T. R. Jones, for many years manager of the Buffalo mine, Cobalt, has returned to the United States.

H. M. Gallagher has been appointed general auditor of the Phelps Dodge Corporation, with headquarters in Douglas.

Walter Lyman Brown has returned to London from Holland and is in charge of the operations instituted by Mr. Hoover for relief in eastern Europe.

Horace F. Lunt, State Commissioner of Mines of Colorado, with Bulkeley Wells, visited the mines of the Radium Co. of Colorado early in November.

E. W. Martin, A. T. Roos, Burt Rogers, and W. H. Seaman, all of Deadwood, S. D., attended the meeting of the American Mining Congress at St. Louis.

J. G. Lawn has left England on his return to South Africa to take up the position of managing director to the Johannesburg Consolidated Investment Co., Ltd.

R. M. Thompson, of New York, has entered the Matachewan mining field of Northern Ontario and taken an option on four claims adjoining the Matachewan mine.

Ralph S. Rainsford, formerly with J. G. White & Co., has become vice-president of W. B. Richards & Co., accountants and engineers, of 71 Broadway, New York.

A. J. Robin has severed his connection with the Mazapil Copper Co. and has accepted a position in Aguascalientes, Mexico, with the American Smelting & Refining Co.

Sergio Bagnara is consulting engineer and general manager of the Marine & Commerce Pocahontas Corporation, one of the large operators of the Pocahontas field in West Virginia.

Thomas H. Tulloch has resigned as general superintendent of the Chestnut Pyrites & Chemical Corporation to accept a position with the American Venture & Mines Corporation, Thomson, Ga.

C. F. Mason, after completing the installation of powdered-coal equipment at the Hayden, Ariz., smelter, is visiting the various smelting centers of Arizona before returning to his home in Canton, Ohio.

B. O. Pickard, engineer in charge of the Bureau of Mines station at the Michigan College of Mines, left for Hibbing, Minn., on Nov. 15, to attend a conference of the safety men of Pickands, Mather & Co.

Jesse Butler has been appointed superintendent of the Michigan mine in Ontonagon County, Mich., succeeding the late Samuel Brady. Mr. Butler, who is a graduate of the Michigan College of Mines, worked under Mr. Brady for two years and has intimate knowledge of the property.



J. A. BATTLE, JR.

J. A. Battle, Jr. is now in private practice. As stated in the "Journal" of Oct. 25, Mr. Battle resigned recently as acting chief engineer in the investigation of claims filed with the War Minerals Relief Commission.

William Boyce Thompson, of New York, has been in Phoenix, Ariz., visiting his brother, J. E. Thompson. Colonel Thompson, accompanied by Charles Ayers, president, and W. C. Browning, manager of the Magma Copper Co., will visit the holdings of that company, in which he is heavily interested.

Horace V. Winchell and Bradley Stoughton, president and secretary, respectively, of the American Institute of Mining and Metallurgical Engineers, are on a trip through the Western States, during which they will visit all of the local sections of the Institute. They will be absent about two months.

Robert R. Boyd has accepted appointment as assistant superintendent of mines at Bisbee, Ariz., for the Cop-

per Queen branch of the Phelps Dodge Corporation. Mr. Boyd has resided for fifteen years in the Globe section, where he was connected with the Warrior, Old Dominion, and Arizona Commercial companies.

OBITUARY

J. W. Moffett, former manager of the Beaver and Temiskaming mines, Cobalt, and a pioneer of the Cobalt camp, died recently from tuberculosis at Hailybury, Ont., after a long illness. He was about forty-five years old and a native of Missouri. In his younger days he was engaged in mining in the Joplin district, and came to Canada about fourteen years ago. He designed and built the Beaver and other mills, and afterward became superintendent of the Beaver and Temiskaming mines. Mr. Moffett leaves a widow and one child.

Benjamin Hollinger, a noted prospector and mining man of Northern Ontario, and the discoverer of the Hollinger mine of Porcupine, died suddenly from heart failure at his home in Pembroke, Ont., on Nov. 26. He was thirty-four years old. He was born at Chalk River, Ont., and engaged in prospecting when quite young. His labors yielded little result for some years, until the discovery of the Hollinger, his share of which was estimated at \$250,000. The Hollinger Reserve was another of his fortunate discoveries, and he was interested in a number of other properties. Mr. Hollinger was apparently in good health up to the time of his death, and had just returned from a deer-hunting expedition. He is survived by a widow and three children.

SOCIETIES

Idaho Society of Engineers has voted to affiliate with the American Association of Engineers under the title of the Idaho Society of Engineers Chapter of the American Association of Engineers.

Canadian Mining Institute held its annual general meeting at the Hotel Vancouver, Vancouver, B. C., Nov. 26-28, 1919. A number of interesting and practical papers were on the program. An account of the proceedings will be published later.

American Institute of Mining Engineers.—The Puget Sound Section held its annual meeting at the Faculty Club Building, University of Washington,

on Nov. 12. Following the usual dinner, the secretary's report was presented and officers were elected. The Montana Section held a meeting at the Montana Hotel, Butte, on Nov. 8, 97 members being present. Addresses were made by Frederick Laist, H. J. Maguire, James K. Murphy, and E. B. Young.

Rice Lake Mine Operators' Association.—At a meeting of mining men interested in the Rice Lake gold field of Manitoba, held in Winnipeg, Nov. 21, preliminary steps were taken toward forming an organization under the above title, with the object of improving transportation conditions and otherwise promoting mining interests. A committee consisting of J. W. Harris, F. O. Fowler, Col. A. C. Gray, Joseph Myers and Gordon McTavish was appointed to draft a constitution and by-laws.

INDUSTRIAL NEWS

Pittsburgh Testing Laboratory announces the death of William Frazier Carpenter, second vice-president, on Oct. 10.

International Exposition of Mining Industry will be opened to visitors on Dec. 1, but it will not be complete, as many exhibitors have not yet been able to arrange their exhibits. It is expected that everything will be in condition for the formal opening on Jan. 1, 1920.

Parsons-Moorhead Machinery Co., Hostetter Bldg., 237 Fourth Ave., Pittsburgh, has been organized to do a general machinery business. William L. Moorhead, of this company, was formerly vice-president of the Duquesne Electric & Manufacturing Co. Mr. Parsons has been doing a general machinery business for several years.

Redwood Manufacturing Co. was awarded a contract by the Butte Water Co., in October, 1919, for twenty-four miles of 26 and 24-in. Remco continuous stave pipe for additional water supply, this line to run from the pumping plant on the Big Hole River to a connection with the city water system. In 1892 the Redwood Manufacturing Co. installed a line of pipe 46,000 ft. in length and 24 in. in diameter, and in 1899 it installed 64,700 ft. of 24-in. and 32,000 ft. of 26-in. pipe, also for the Butte water supply. The lines installed in 1892 and 1899 were thoroughly examined in October, 1919, and found to be free from deterioration, the redwood showing no decay and being in its original condition. The pipe lines have operated continuously since they were installed, notwithstanding the fact

that they are situated in a climate where the temperature goes 50 deg. below zero at times. Mr. Eugene Carroll has been general-manager of the Butte Water Co. since 1892, when the first line was installed. The fact that he gave the last contract to the Redwood Manufacturers Co. may be taken as evidence that the Remco pipe gave satisfactory service.

TRADE CATALOGS

D F C Melting Furnaces. Bulletin No. 450. Denver Fire Clay Co., Denver, Col. 7 x 10 in.; 20 pp., illustrated.

Imperial Incandescent Headlights for Electric Traction and Mining Service. Ohio Brass Co., Mansfield, Ohio. Catalog No. 205. 6 x 9; 96 pp., illustrated.

Black & Decker Electric Air Compressors, Portable Electric Drills and Electric Valve Grinders. Black & Decker Mfg. Co., Baltimore, Md. 8½ x 11; 31 pp., illustrated.

Concrete Pipe. American Concrete Pipe Association, 210 S. La Salle St., Chicago, Ill.; 8½ x 11; 12 pp.; illustrated. Booklet aiming to show the broad field for concrete pipe and adaptability for its many uses.

Concrete Tanks for Industrial Purposes. Portland Cement Association, 111 W. Washington, St., Chicago, Ill.; 6x9; 35 pp.; illustrated. Gives examples of concrete tanks used in different industries for storing various liquids, covering water, mineral oils, salt brine, chemical solutions, etc. In the mining industry concrete tanks are used as depositing tanks in electrolytic refining, for storing sulphuric acid and for slime-settling.

Bacharach Instrument Co., of Pittsburgh, Pa., has recently issued two new pamphlets as follows. Pamphlet P, on "Pitot Tubes and Orifices for Measuring the Flow of Gas in Connection With Hydro Flow Meters," and Catalog F, describing a new pressure-volume indicator for the control of air delivery to cupolas, suitable for either permanent installations or testing purposes.

NEW PATENTS

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

Alloys—Manufacture of Metal Alloys. William Lawrence Turner and Harold Alexandre Blackwell. (1,321,684; Nov. 11, 1919.)

Cement—Process and Apparatus for Cooling Cement-Kiln Gases and the Re-

covery of Dust Therefrom. Levi Stevens. (1,315,254; Sept. 9, 1919.)

Conveyor-Belt Drive. Charles Piez, assignor to Link-Belt Co. (1,319,109; Oct. 21, 1919.)

Crushing—Pulverizing-Mill Roller and Supporting Structure for Same. Robert A. Lachmann, assignor to Raymond Brothers Impact Pulverizer Co. (1,321,379; Nov. 11, 1919.)

Drills—Mounting for Hammer-Drills. William A. Smith, assignor to Ingersoll-Rand Co. (1,321,565; Nov. 11, 1919.)

Electric Furnace for Heating, Annealing and Melting Metallic Material. Mario Fossati, assignor to Societa Anonima Stabilimenti Biak. (1,322,416; Nov. 18, 1919.)

Fuel—Method and Apparatus for Feeding Pulverized Fuel. Cloise H. Baldwin. (1,320,963; Nov. 4, 1919.)

Grizzly for Ore Separation. William Ross. (1,321,716; Nov. 11, 1919.)

Mining and Quarrying Machine. Cyrus S. Oldroyd. (1,321,840; Nov. 18, 1919.)

Nitrogen—Process for the Fixation of Nitrogen. Frank L. Slocum. (1,318,929; Oct. 14, 1919.)

Oil-Well Screen. Clarence N. Scott, assignor, by mesne assignments, to The Texas Co. (1,475,6; Nov. 18, 1919.)

Ore Concentrator. William F. Walda, assignor to Deister Concentrator Co. (1,321,577; Nov. 11, 1919.)

Roasting—Rotary Furnace for Roasting Blende, Pyrites, or Other Minerals. Henry Charles Bingham, assignor to Huntington, Heberlein & Co., Ltd. (1,322,223; Nov. 18, 1919.)

Separation—Ore-Separating Apparatus. Lewis H. Falley. (1,322,487; Nov. 18, 1919.)

Sulphuric Acid—Apparatus for the Fractional Distillation of Sulphuric Acid and Other Liquids. Henry Jander. (1,321,210; Nov. 11, 1919.)

Thorium—Recovery of Thorium. Magnus A. Goltz. (1,322,185; Nov. 18, 1919.)

Tungsten—Means and Method of Compressing Powdered Tungsten, Tantalum, and the Like into Crucible Form. Carl A. Pfanstiehl. (1,321,125; Nov. 11, 1919.)

Zinc—Recovery of Zinc by Electrolysis. Royale Hillman Stevens, assignor to Electrolytic Zinc Co. of Australasia, Proprietary Ltd. (1,322,071; Nov. 18, 1919.)

Zinc Oxide—Manufacture of Zinc Oxide. Frank G. Breyer, James A. Singmaster and Albert E. Hall, assignors to New Jersey Zinc Co., New York, N. Y. (1,322,088 to 1,322,091, inclusive; Nov. 18, 1919.)

Zinc Oxide. Manufacture of Zinc Oxide. James A. Singmaster, Frank G. Breyer and Earl H. Bunce, assignors to New Jersey Zinc Co. (1,322,142; Nov. 18, 1919.)

THE MINING NEWS

New York, December 6, 1919

Important Uranium Deposit in Wyoming

Fifty-Ton Plant to Treat Uranophane Ore

About a half mile north of Lusk, Converse County, Wyoming, a small town on the Chicago & Northwestern Railway, about twenty miles from the Nebraska border, is a small conical-shaped hill. This hill is about a quarter of a mile in circumference at its base and about 350 ft. high. The hill is known as "Silver Cliff Hill," and for years it was known to contain small amounts of copper and silver, but of too low grade to be commercial.

In the spring of 1918, Ross Lambert, a farmer, of Casper, Wyo., purchased some land near Lusk. Mr. Lambert desired to have this small hill excluded from the tract that he purchased, but the owner insisted that he must buy the tract intact, and thus Mr. Lambert was forced to pay for this seemingly worthless hill.

In looking over the small dumps of a silver mine that was abandoned about thirty years ago, Mr. Lambert's curiosity was aroused by the variety of colors of the rock. He sent ten samples to W. L. Piers, an assayer of Denver, Col., and requested Mr. Piers to make complete analyses on all the samples; he wanted to know what could cause this variation in color. Nine of the samples were found to contain small amounts of uranium and small amounts of copper and silver, and the rest consisted of silica. The tenth sample, however, ran more than 20 per cent U_3O_8 . Thus was the deposit discovered. Later the property was acquired by the Lorimer Minerals Co., and several carloads of ore containing about 3 per cent U_3O_8 were shipped.

The uranium occurs intimately mixed with well-rounded grains of quartz, forming a quartzite bed lying between mica schist and granite. The ore is conspicuous for its wide variations in color and occurrence. The most typical is an olive-green color, occurring as a cementing material between the grains of quartz. In places, the color is masked by the oxides of copper and iron, and it is difficult to tell which is high-grade uranium and which is not. A variety containing much iron oxide has a rich chocolate-brown color, and in some instances it contains as much as 15 per cent U_3O_8 . Then again other shades that are characteristic of ura-

nium minerals contain only a trace. In places the ore is found having a variety of colors, but the uranium content may be fairly uniform. Dr. F. B. Laney and Dr. E. D. Larson, of the U. S. Geological Survey, who made a study of the optical properties of the mineral, are of the opinion that it is identical with uranophane, a hydrated calcium silicate containing some barium and lead, to which the formula $CaO (UO_2) \cdot (SiO_2) \cdot 6 H_2O$ has usually been assigned.

The chemical evidence of Dr. S. C. Lind and C. W. Davis (Op. cit.) does not substantiate the above optical investigations, but this may be due to the fact that it was impossible to obtain absolutely pure specimens, owing to the masked occurrence of the mineral. Dr. Laney's micro-photographs indicate that small amounts of uraninite U_3O_8 are present, which were introduced subsequent to the deposition of the sandstone and replaced the cementing materials, chiefly iron and copper oxide, to a less extent than the sand grains themselves. It also appears that the uranophane is an oxidation product of uraninite. If this is the case, this is the first occurrence known of a free higher oxide, and it has been suggested that the mineral be called "Lambertite," in honor of its discoverer. However, further chemical and optical investigations will be necessary to substantiate this evidence.

The Lorimer Minerals Co. has just completed a 50-ton wet gravity concentration plant to concentrate the low-grade material.

The Wasapika Promotion

The promoters of the Wasapika property at West Shining Tree, northern Ontario, have now decided to form a new company which will take over the Wasapika and some adjoining properties, paying for them in stock. There will be 6,000,000 shares, having a par of \$1 in the new company, so there should be enough to go around and suit everybody. Wasapika, with a capitalization of \$1,000,000, has been selling above par. The property has been developed to a limited extent only, and not enough work has been done to indicate a sufficient tonnage of a grade of ore which will permit of profitable operation under present conditions of power and transportation.

¹"A New Deposit of Uranium Ore," by Dr. S. C. Lind and C. W. Davis, "Science," May 9, 1919, page 441.

National Mining Corporation Formed in London

Leading British Mining Houses Unite to Secure Dominant Position in World Industry

A company known as the National Mining Corporation, Ltd., has been organized in London, with an authorized share capital of £3,000,000, divided into 3,000,000 shares of £1 each. An issue of 2,500,000 shares of £1 each at par was advertised on Nov. 3 last, of which 2,000,000 shares had already been applied for by the directors and their associates. These directors, who include many well-known men, are as follows: Herbert Guedalla, chairman, managing director of the Imperial Foreign Corporation, Ltd.; John Alexander Agnew, director of Burma Corporation, Ltd.; Frederick William Baker, chairman of the Mexican Corporation, Ltd.; Stanley Christopherson, director of the New Consolidated Goldfields, Ltd.; Edward Mackay Edgar, partner of Spurling & Company, merchant bankers; Alexander Stanley Elmore, managing director of the Chemical & Metallurgical Corporation, Ltd.; Francis Algernon Gouvet, chairman of Lake View & Oroya Exploration, Ltd.; Berthold Kitzinger, director of the National Bank of South Africa, Ltd.; Walter McDermott, chairman, Consolidated Mines Selection Co., Ltd.; Henry Strakosch, managing director of Union Corporation, Ltd.; and Henry Steel, chairman of the United Steel Companies, Ltd.

The reasons for the formation of the National Mining Corporation are advertised by the company as follows:

"The principle of financial co-operation among the leading mining houses in this country has hitherto not been sufficiently considered as a material factor in the maintenance of the important position which British capital and enterprise have attained throughout the world. As a result, this country has to some extent lost the commanding position which it once held in the mining and metallurgical industries, the control of which has been secured by foreign capital, particularly in the United States and Germany, where the industry is vested in powerful corporations with great financial resources, supported by their banking institutions, and commanding the services of technical experts of the highest ability.

"The main reason that has brought about such loss of control is the fact

that, with one or two exceptions, the financial resources of any one mining house or group in this country have not been sufficient to undertake the provision of the capital necessary for large mineral industrial enterprises. As the advantages of financial co-operation have now been accepted, a number of the leading mining houses in the City of London have united in the formation of this company with a view to securing a dominant position in the industry.

"The major portion of the £2,000,000 capital privately subscribed (and forming part of the present issue of £2,500,000) has been applied for by and will be allotted to the co-operating mining houses, each of which will be represented by a director on the board.

"In addition to the advantages of financial co-operation, the company through its directorate will secure the benefit of the accumulated experience, financial, technical and local, of the gentlemen who have agreed to serve as directors, and through them of the mining houses which they represent."

More Michigan Copper Companies Insure Employees

The Mohawk, Wolverine, and Michigan mines, employing 2,000 men in all, have announced that life insurance policies have been given to all men on their forces. Two months ago the Calumet & Hecla company and subsidiaries, with a payroll totaling 11,000 men, determined upon this plan of insuring their men without cost to the latter. The Stanton properties make the second important group in the Michigan district to adopt the scheme. All employees are given policies dated Dec. 1, for sums ranging from \$1,000 to \$1,500, depending upon the length of time they have been with the company, this without cost to the men and without medical examination.

British Columbia's Gold Problem

With the depreciation in the purchasing power of gold, the system of taxation of gold mines of British Columbia has become obsolete and unfair, in the judgment of some members of the British Columbia Chamber of Mines. If the gold-mining industry is to be maintained, they hold, the fundamental principle in fixing taxes must be the ability of the properties assessed to pay. Owing to the fact that, since taxes were last adjusted, mining costs had practically doubled, a joint committee, representing the B. C. Chamber of Mines, the Canadian Mining Institute, and the mine owners, has been appointed to investigate the matter and submit a report with a view to making whatever representations are thought advisable to the provincial government.

Interest Awakening in Phosphate District of Idaho

BY R. N. BELL

The increasing demand for rock phosphate by agricultural interests, and advanced land values, have induced a sudden active interest in the phosphate field of southeastern Idaho, and several big deals are pending concerning the few privately owned properties that are not within the tracts withdrawn by the Government. At Paris, in Bear Lake County, the Western Phosphate Mining & Manufacturing Co. is shipping 2,000 tons of crude rock per month. It is building a three-mile railway spur to the mine and erecting a 250-ton mill for preparing the rock for market. A new double-track development tunnel is being driven, with two headings, at the rate of 600 ft. per month, the work being done by a prominent railway tunnel contractor. The deposit is a uniform vein of gray rock phosphate 7 ft. thick, with a 45 deg. dip, and is developed by adits. Its guaranteed shipments are 70 per cent tri-calcium phosphate, with not over 1 per cent iron and alumina.

The Waterloo mine, three miles from Montpelier, also in Bear Lake County, is likewise undertaking active operations, and for several months has been shipping a car a day of 70 per cent rock. Its resources are extensively developed through short crosscut tunnels and drifts. Other enterprises are on foot involving railway spur construction to deposits that have been shown to contain a huge tonnage in this county and adjoining counties. It looks as if an important new mining industry were being inaugurated in this great western phosphate field.

New Railway Sought From Elk Lake to Gowganda

The Ontario government has been asked to grant a charter for the construction of a light railway, such as was used in France, from Elk Lake to Gowganda. The present terminus of the Elk Lake branch of the Temiskaming & Northern Ontario Ry. is at Elk Lake, and the new road will make the connection to Gowganda. It is planned to use gasoline locomotives, which it is expected would be more economical. If this road should be built it would mean a great deal to this interesting camp. At the present time the only large producer is the Miller Lake O'Brien, but recent developments on the Castle property, which is being taken over by the Trethewey, point to another shipper in the near future. There are a number of other interesting and promising properties in the district, but development has been retarded by the excessive cost due to poor transportation.

The Magma Company Buys Three R Mine

The long-expected sale of the Three R mine to the Magma Copper Co. has at last been consummated, though the purchase price has not been announced. To work the property the Patagonia-Superior Copper Co. has been formed, of which W. C. Browning, general manager of the Magma company, will be general manager while retaining charge of the Magma interests at Superior. An offer of \$20,000 has been made for the surface machinery, of which the ownership is now in litigation. The entire acreage is to be explored by diamond drilling. The mine has long been owned by R. R. Richardson, of Patagonia, Ariz. Prior to 1914 it was under bond to N. L. Amster, of Boston, who gave it up after making heavy shipments of ore. Later it was bonded by H. C. and H. M. Harrison, of San Antonio, Tex., for \$500,000. They organized the Three R Mining & Milling Co. and built a 200-ton concentrator, which appears to have had only a small degree of success. For failure to meet payments, the property reverted to Richardson, and a receiver was appointed for such property as might belong to the defaulting corporation. The property is situated nine miles from Patagonia, in the Patagonia Mountains, and consists of 55 claims, or about 1,000 acres.

A. S. & R. Must Continue to Smelt Ore From Christmas Mine

The case of the Gila Copper Sulphide Co. against the American Smelting & Refining Co. was recently decided in favor of the former. Former president William H. Taft, acting as special master in the case, decided that the smelting company must keep the ten-year contract that it made three years ago to smelt 250 tons a day of the Gila company's ore. The mining company, which is operating the Christmas property in Gila County, Arizona, is said to have been saved from bankruptcy by the decision.

The company has been in the hands of a receiver since April, 1918, by reason of owing \$690,000 to a trust company of New Haven, Conn., most of which has been paid off with funds derived from ore shipments delivered to the Hayden smeltery of the American Smelting & Refining Co., which is nine miles by rail from Christmas. Shipments have averaged about 3 per cent copper, and have netted the mining company about \$30,000 a month. The smelting company claimed to have the right to break the contract, and maintained that recently it had been losing money on it.

PROGRESS OF MINING OPERATIONS

ARIZONA

Johnson—The Mines & Development Corporation of Arizona, formerly known as the Copper Chief, has struck two new veins of high-grade copper ore, one in the No. 1 shaft, the other in the No. 2 shaft, both places carrying native copper and glance. Shipments have been curtailed also by the Arizona United Mining Co., not to exceed 100 tons per day, in order to push the large amount of development work contemplated. It is understood that the machinery for the Keystone Mining Co.'s new concentrator is being purchased and will be shipped in the very near future.

ARKANSAS. ZINC DISTRICT

Yellville—More activity is apparent in the northern Arkansas zinc field than for two years past. Eastern chemical

is making a good production of jack.—J. B. Dyerle has leased the Boo-Gra-Loo company's mine and mill and is operating steadily.—J. H. Haddox, of Oklahoma City, president of the Magnolia Lead & Zinc Co., has put a force at work in the Tar Kiln mine.

The Katie mine, at Rush, is being developed by D. J. McCargar. Drifting on the 46-ft. level opened a small head of carbonate ore, and the ground looks promising.—The Michigan mine at Conville is to start development.

CALIFORNIA

Grass Valley—The Central Consolidated Mines will probably re-equip its old mill in about six months' time, re-designing it for amalgamation and flotation. The work of designing will be placed in the hands of Hamilton, Beauchamp & Woodworth, consulting metallurgical engineers, of San Francisco.

Mining & Tunnel Co. has been especially successful. It was organized less than a year ago by local capital. Sixty thousand dollars was subscribed, and all of this amount has already been redeemed, and a 25 per cent dividend declared.

Cripple Creek—Stockholders of the Elkton company are considering the formation of a leasing company similar to that recently organized by the Isabella Mines Co. If suitable leases can be obtained the company plans an extensive prospecting campaign.

Durango—The company operating the Southern Boy has opened up a high-grade shoot of gold ore 4 ft. wide and 90 ft. long. The vein is in a monzonite porphyry intrusion in the Dolores formation.

Leadville—A. A. Garret, promoter of the Prospect Mountain Tunnel Co. has announced that the company has opened offices in the Bank-Annex building, Leadville, and that he is making necessary arrangements preparatory to commencing operations early next spring. This company will undertake the development of the Canterbury Hill district, two miles northeast of Leadville.

Empire—The Primrose Exploration Co. has a crew of men at work at Urad constructing a 200-ton aerial tramway. Development work is being carried on at the upper mine and considerable ore is being blocked out.

Boulder—Fluorspar is being gradually resumed and the outlook for the fluorspar mines is more favorable than any period since the signing of the armistice. Then the market price slumped so as to make it impossible for the mines to operate. But recently Hibbs & Co., of Boulder, obtained substantial contracts for the delivery of high-grade concentrates to Eastern markets, so that the fluorspar mines and milling plants are now gradually resuming operations on a vigorous scale. Crude ore is hauled from various mines such as the Emmet, the Alice, the Argo and Humboldt, by auto truck to either the Lehman mill or the Colorado Pitchblende mill. By ordinary table concentration a 92 per cent fluorspar concentrate is obtained; 500 tons of these concentrates are being produced monthly.

IDAHO

Leadore and Gilmore Districts
BY R. N. BELL

Leadore—Recent development has disclosed one of the most promising lead-silver deposits that has been discovered in the state for years on the



VILLAGE OF ZINC, ARK., ON SUGAR ORCHARD CREEK, IN NORTH ARKANSAS ZINC DISTRICT

companies are bidding for the carbonate ores and are taking everything that is being offered at prices several dollars higher than the Joplin quotations for this ore. The specifications required are that the ore must carry approximately 40 per cent metallic zinc, and not over 2 per cent sulphur, 0.25 per cent lead and 2 per cent lime. Practically all the carbonate and silicate ores produced in the entire field come within this requirement, and it is thought now that a new market for the ores produced will be developed with the chemical companies.

ZINC DISTRICT

At Zinc, the Salina company has started a new concentrating plant and

COLORADO

Aspen—Great activity is taking place in this one-time bonanza silver camp. Local people are organizing companies and are taking over options on properties that have been idle since the panic of 1893. A mill operating on the Little Annie property is treating custom ores from adjoining properties. Most of the ore, however, is coming from old dumps. The Highland Mary group, 1,500 ft. south of the Oakland, where discovery of rich silver ore was recently made, is again about to enter the ranks of the producers. The Smuggler mine is to be unwatered and shipments resumed as the owners of the company have settled their differences. The Newman

Kimmel group adjoining the Sunset mine. The Sunset has been mined in a desultory fashion for several years and is credited with probably 150 car-load shipments of ore, one-third of which was 50 per cent lead and 50 oz. silver, the balance being varying grades of concentrates and second class ore.

The newly discovered deposit is on a contact between lake bed gravel and blue carboniferous lime with a 30 deg. dip in favor of crosscut tunnel work and lies near the edge of a broad valley at the foot of the main range of the Rocky Mountains. This limestone zone is 50 ft. thick and is paralleled by a belt of quartz porphyry or silicious igneous rock 2,000 ft. thick. The Kimmel development showed that the contact between the limestone and the porphyry was mineralized, the mineralization penetrating the porphyry. Considerable crosscutting has been done.

The silver-gold contents show appreciable increase, the ore remaining completely oxidized. Rather serious water trouble encountered is believed to be caused by seepage from a drain tunnel that crosses the shaft workings and not due to ground water. These two properties have made a gross production of several million dollars at considerable profit. The entire output has been sent to Salt Lake City as crude ore. The present yield is about 2,000 tons per month, carrying 30 per cent lead and 15 oz. silver with 50c. to \$1 gold per ton.

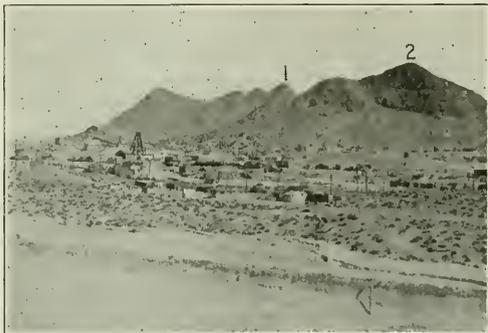
MICHIGAN COPPER DISTRICT

The No. 8 shaft (Pontiac) of the Quincy Mining Co. is making the best showing in the history of the property. The openings in working ground at present total 4,580 ft. Sinking is in progress from the 71st level to the 72d.

three-shift system abandoned. Two shifts now employed on straight mining.—The Oliver Iron Mining Co. will open up its underground property to handle the shallow deposit on the forty south of the Tener prospect.

Biwabik—The American Bridge Co. recently received the contract for erecting a 250-ton steel coal trestle at the Biwabik property. The foundation is being laid.

Cuyuna—The main shaft of the Croft mine has been deepened 114 ft. A station is now being cut for development of a new main haulage level. At the Cuyuna-Duluth at Ironton, shipments discontinued and underground force laid off until further notice. The Northland is also down and it is not yet decided whether or not the property will be kept pumped during the winter. The latter was originally developed because of the demand for manganese.



1. Mt. Butler 2. Mt. Broucher 3. Tonopah of Nevada 4. Montana Tonopah 5. North Star 6. Mt. Oddie 7. Silver Top Shaft 8. Desert Queen Shaft

Some of the faces show 10 to 15 per cent lead ore, but it is believed the whole mass will be low grade, probably as low as 2 per cent on the average. The ore carries about an ounce of silver to the unit of lead. The porphyry is fractured and could probably be readily caved. The deposit may possibly yield a large tonnage of low-grade lead-silver ore that may warrant large milling equipment when more fully developed. The contact is traceable along the foot of the mountain for eight miles with occasional shallow development and a succession of bunches of good ore at intervals.

Gilmore—The Latest Out mine in the Gilmore district is working at the 600 level one of the best orebodies that it has ever had. The Pittsburgh-Idaho mine has recently extended its 700 level development, resulting in the disclosure of five distinct orebodies. Interesting fissures and faults that were barren in the upper levels, here show good ore.

Sixteen levels are active from the 54th down. The tonnage of mass and barrel and ordinary ore will total 350,000 for 1919. All work in this shaft is confined to the east branch. Openings to the north at a distance of 2,000 ft. are in poor ground, which makes the outlook gloomy for Pontiac shaft No. 9. The lode continues to flatten with depth.

MINNESOTA MESABI AND CUYUNA RANGES

Chisholm—The open pit portion of the Shenango Furnace Co. made its last steam-shovel shipment at the close of the present season. About 4,000,000 tons estimated in reserve will be mined by milling and scrambling for which equipment will be placed during winter. With the cessation of open pit operations, the underground portion, which has been closed during most of the season, resumed operations with 20 gangs on double shift.—At the Billings property the main part of the development work has been completed and the

NEVADA

Tonopah—The Tonopah Mining Co. has resumed shipment of ore which is now being treated in the Belmont mill. The West End Consolidated company recently announced a dividend of 5c. per share, payable Dec. 31. The California-Tonopah company has announced that final payment has been made to the defunct State Bank & Trust Co. by Stall brothers and associates for the California mine which adjoins the Jim Butler property in Tonopah.

Round Mountain—Plans of the Gibraltar Silver Mines for development of the Gibraltar property, which lies across Smoky Valley from Round Mountain, north of Tonopah, are being carried out under the direction of William J. Loring, president and general manager. The vein or mineralized zone is 87 ft. wide on the surface and from the high average of assays secured Mr. Loring believes it is one of the most promising prospects he has seen.—An

average of 40 tons of good grade ore is being treated in the Sunnyside mill at Round Mountain, and the Fairview mill is treating an average of 30 tons daily.

Midas—Two new orebodies, which were found during the last few months, are being developed in the Elko Prince mine in the Gold Circle district. The first was found on the 600 level, 1,200 ft. north of the main oreshoot which is 600 ft. in length. The new find has been developed for several hundred feet, the drift on the hanging-wall showing five feet of \$25 ore, with no footwall in sight. The second new find was made on the 750 level, where from 8 to 14 in. of ore is said to run 300 oz. in silver, in addition to the gold. An unusual feature is the remarkable straightness of the vein and the smoothness of the hanging-wall.

Virginia City—The addition to the cyanide equipment of the Mexican mill has been housed in and the new filter has arrived and will soon be installed.

OKLAHOMA

ZINC-LEAD STRICTION

Miami—Short line railroads serving the zinc mining district have been notified that they may have an unlimited amount of empty coal cars for ore shipments now. The coal strike has released the cars. Mining operators are preparing to take immediate advantage of the offer. The ore bins have been full since late summer. The car shortage has been acute since Sept. 1.

OREGON

SUMPTER-GRANITE DISTRICT

The old E. & E. Mine has been leased by John Arthur, and thirty men are employed overhauling the mill and on underground repairs. New machinery will soon be installed. This mine is on the same vein with the Columbia, Taber Fraction, Golconda, North and South Pole.—The Ibx is working another large vein developed to some extent by tunnels. The company recently purchased the mill of the Ball Mountain mine, and will begin operating it in the spring. The Ibx is about seven miles from Sumpter and the Sumpter Valley R. R.—In the Cable Cove district the Imperial mine, about twelve miles from Sumpter, has been shipping good ore steadily for the last few years, but it is difficult to get the ore to the railroad, as the roads are too poor to permit of auto-trucking.—The Powder River bridge, three miles below Sumpter, is operating steadily on good pay gravel.—The Sumpter Dredging Company has just purchased a dredge, which will start operations in the early spring, on some of the best ground in this section. All outside work has been done, and dredging will begin as soon as the Eastern Oregon Power Co. can furnish the power.

The Bonanza mine, about nine miles from Sumpter, is driving a new cross-cut tunnel 500 ft. deeper than any other tunnel, thereby avoiding the present long tramway haul. The work will be completed this winter.—In the Greenhorn and Granite district, the Ben Harrison property has been shipping for over a year, and is now installing machinery to treat the ore on the ground, saving long hauls.—The Independence is milling ore developed last winter, and blocking out fresh ore.—The Buffalo mine, which has shipped ore steadily, has just opened up a 6-ft. vein of shipping ore. This mine is substituting machine drills for hand drilling. Its progress will be more rapid hereafter, but at present all chutes are full of ore, because snowfall has stopped auto-truck hauling.—A new property, the Continental, has just opened up a 3-ft. vein of high-grade ore, which the company is treating in its small mill. Development will be continued through the winter. A larger mill may be built in the spring.

The old La Bellevue mine is putting in a ball mill and a concentrating and cyaniding plant. The frame of the large mill is already in place. Some of the old workings are being retimbered. The ore carries a good percentage of silver.—The Monumental has considerable silver ore blocked out, and expects to start up in the spring.

SOUTH DAKOTA

BLACK HILLS DISTRICT

Lead—In the Homestake mine the water is now above the 700 level, and flooding of the 500 level is expected to be complete early in December. Unwatering will then be started immediately, and mining work should be resumed on the upper levels about the middle of the month. J. W. Dyer, engineer in charge of U. S. Bureau of Mines rescue car No. 5, which has been stationed at Lead during the Homestake fire, has been called to Mullan, Idaho, where a cave-in has entombed several men. Car No. 5 will remain in the Black Hills until the Homestake fire has been extinguished.

UTAH

TINTIC DISTRICT

Tintic shipments for the week ending Nov. 15 amounted to 140 cars, as compared with 118 cars the week preceding, several of the largest shippers almost doubling their output. Chief Consolidated shipped 38 cars; Dragon Consolidated, 19; Grand Central, 10; Iron Blossom, 17; Tintic Standard, 18; Centennial-Eureka, 9; Eagle and Blue Bell, 6; Colorado, 4; Swansea, 3; Mammoth, 3; Ridge and Valley, 2; Bullion Beck, 1; Victoria, 1; Eureka Hill, 1; Laclede, 1; and Sunbeam, 1.

Eureka—Suit has been filed by Tintic Standard against the Chief Consoli-

dated to determine the ownership of White Wing No. 5 claim, the plaintiff alleging defendants to have included a part of this claim in the survey for a patent of Cedar No. 10. North Tintic Mining Co. is also suing the Chief Consolidated in regard to the Miller claim.—The Lehi Tintic Mining Co. is driving a 1,000-ft. tunnel to cut at depth three fissures that are mineral bearing in its upper workings. The bunkhouse has been completed.—At the Eureka Bullion mine a winze is being sunk from the 800 level to cut at depth the intersection of two fissures, and is now down 60 feet.—The Pinion Queen continues to sink its shaft.—The Apex Standard property, south and east of Tintic Standard, reports mineralization increasing 250 ft. out from shaft in the drift on the 900 level.—Ore is being mined at four places in the Tintic Standard. The recent find on the 1,350 level, a short distance southeast of older workings, is opening up satisfactorily. The management hopes to increase shipments to four cars daily.—The Colorado and Iron Blossom mines of the Knight interests are shipping under the leasing system. The October earnings of the latter property are stated to have exceeded \$10,000. Considerable development is being done at both properties, but particularly at the Iron Blossom, where much deep work is in progress. Knights are also developing the eastern end of the district. From that section the Tintic Drain Tunnel will be extended to unwater the older part of the Tintic district. A shaft is being sunk in ground owned by the Tintic Drain Tunnel Co. not far from the tunnel portal, and is already down 150 ft. The same interests are also sinking a shaft at the Big Hill property in East Tintic.

WASHINGTON

Seattle—With a cargo of lumber, machinery and supplies, including a boiler weighing 44,000 lb., the steamship Norwood, under charter to the Alaska Sulphur Co., sailed from Seattle Nov. 6, for Akun Island, Western Alaska, where the company is developing valuable sulphur deposits and erecting a plant where the sulphur will be refined and shipped to Seattle. The steamship also carried 18 employees who will be engaged on construction of the plant and the completion of a two-mile aerial tram. T. H. Landswick, secretary of the company, states that the plant will have a capacity of 100 tons and by April of next year they expect to be supplying sulphur to Seattle and principally the paper mills of the Northwest. He states that the company has 400 acres of land on Akun Island and a large tonnage of sulphur already developed. He further states

that about \$250,000 are being spent on the plant and aerial tramway. Another shipment of machinery for the smelter will be sent north during February.

WISCONSIN ZINC-LEAD DISTRICT

Platteville—The Mineral Point Zinc Co. (Galena, Ill.) has opened a new shaft at Mifflin, Wis., on the Coker Range, and has resumed milling at the Coker mill No. 2.—Kistler & Stephens, Platteville, have started a new shaft on the Goke land, a half mile east of the Blockhouse mine.—At Shullsberg, the Little Giant mine, with its mill equipment, has been overhauled by T. A. Hansen and others, and mining operations are underway.

CANADA BRITISH COLUMBIA

Barkerville—The Mining Corporation of Canada has undertaken the work of proving up the gold-quartz claims situated on Proserpine Mountain about four miles north of Barkerville, B. C. A promising discovery was made on this property about a year ago. It is said that the present work, which is being done under the direction of Robert H. Bryce, of Toronto, is expected to demonstrate by spring whether the mineralization continues at depth. A crew of more than fifty men is now at work. Cabins for 100 men have been built, as well as offices and other necessary buildings. A contract for driving two 200-ft. tunnels has been let to John Bell, and I. E. Moore has a contract for two others. Two diamond drills are being shipped to the property and will be at work before long. Work done thus far on the property is said to have shown an average gold content of \$17 per ton. Many claims have been staked in the Barkerville section as a result of this company's activity.

Nelson—The ore of the California mine, which is near Nelson, is to be treated at the old Athabaska 10-stamp mill. A ball mill will be added to the equipment of the latter for primary grinding. The product after classification will be passed over Senn amalgamating tables and finally be treated by flotation. The capacity of the mill is small, about 25 or 30 tons, but may be increased. A recovery of 90 per cent is anticipated.

Kamloops—The difficulty of obtaining labor is hampering the completion of a number of British Columbia enterprises which are expected to benefit the mining industry. One of these is the branch line of the Canadian National Rys. between Kamloops and Kelowna by way of Grande Prairie and Vernon. Another is the branch railroad from the Kettle Valley Ry. to Copper Mountain, where the Canada Copper Corporation is opening up extensive de-

posits of low-grade ore on a large scale. A third is the construction by the Kootenay Power & Light Co. of its power line from Bonnington Falls, where the power is developed, to Princeton, where it is to be used by the Canada Copper Co. in its new mill. The new Kamloops-Kelowna branch road will afford transportation facilities necessary to the development of the gypsum deposits at Grande Prairie, which are owned by the Manitoba Gypsum Co. and said to be of great extent.

Trail—The practice of wet magnetic concentration has been successful in the test mills of the Consolidated Mining & Smelting Co. of Canada, at Trail. Success was first attained in the laboratory, then in the 150-ton test mill, which was later increased to 250-tons daily capacity. It is expected that equally good results will be obtained in the 600-ton temporary mill about to start operations. The practice may also be used as part of the treatment to be employed in a much larger concentrator to be constructed in the course of a year or two years.

Anox—The Granby Consolidated Mining, Smelting & Power Co. blew in its fourth furnace here on Nov. 15, thus bringing the entire plant into operation for the first time since last spring. Restriction of operations had been caused by shortage of coke.

NOVA SCOTIA

Sydney—An option on a zinc-copper-lead property at Stirling, N. S., was recently acquired by Captain P. J. Webb, manager of the Sydney Investments Limited, at Sydney, from James Nolan of Glacé Bay, who is owner of the leases. It is claimed that over \$40,000 has been spent in developing this property.

ONTARIO

Sudbury—The new smeltery of the British-American Nickel Co. at Nickelton, Ont., will be blown in about Dec. 1, it is expected. Two blast furnaces and two 13x30-ft. Pierce-Smith converters have been installed. This plant is the third to enter the nickel-copper field of the Sudbury district, the other two being the Mond Nickel Co. and the International Nickel Co. The head office of the British-American Co. is at Ottawa. W. A. Carlyle is general manager. The Mond company has one furnace in blast. The International Nickel Co. has increased its production to 3,000 tons of bessemer matte per month.

MEXICO NORTHERN SONORA

Nacozari—A shortage of skilled miners and surface labor in this district has hampered operation of the various properties to a considerable extent. However, this camp is not alone in experiencing a labor shortage, which has been evident also in Cananea and

other parts of Sonora. It is ascribed to the heavy drain of laborers secured by agents of farmers in the southwestern part of the United States to harvest their crops. Several thousand crossed the international boundary to work in the Salt River Valley picking cotton. These men and their families have only begun to return to their native land. Many others have gone as far east as Kansas to perform common labor for the railroads and other industrial enterprises. The statement was recently made that Nacozari could use between 300 and 400 men. Small properties in the outlying districts also are hampered by lack of pack animals, and fully 1,000 burros and mules could be used in the vicinity of Nacozari alone.

AUSTRALIA

Bendigo—The Bendigo Amalgamated Co. was formed several years ago to revive gold mining on the famous Bendigo field. The aim of the promoters was by centralizing the management to enable money that would otherwise be spent in administration and surface operations to be expended in underground developments. According to the report for the year ended July 1, the tonnage treated was 112,977 for a yield of 41,022, as against 146,769 for a yield of 41,130 oz. for the preceding period.

The financial position of the company is summed up in the following statement: Dec. 31, 1917, loss for 7 months, £38,459; June 30, 1918, loss for 6 months, £20,382; Dec. 31, 1919, loss for 6 months, £10,718; June 30, 1919, profit for 6 months, £2,934. One factor that has helped the company recently has been the premium obtained by the Gold Producers' Association on gold exported from Australia. The company's share amounted to £5,902.

Up to the present the company has not been fortunate in making any rich "strikes" such as have always been a feature of the Bendigo field, but should such good fortune be met with it would materially improve the position. Exceptionally good returns, however, have been obtained recently, particularly in the workings north from the Constellation shaft, where, within the last twelve months, gold to the value of about £40,000 has been recovered. The last week's milling of 314 tons from this reef gave a return of 604 oz. The aggregate output from the company's mines for a two-weeks period recently aggregated 417 tons for a yield of 2,140 oz. This is the best return obtained since the formation of the company and the only occasion on which it was exceeded was on Dec. 18, 1917, when the inclusion of 994 oz. of gold from the plates brought the fortnight's return to 2,196 oz.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Nov.	Sterling Exchange	Silver		Dec.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
27	...	...	74	1	399 ³ / ₄	129 ¹ / ₂	73 ¹ / ₈
28	402 ¹ / ₂	129	72 ³ / ₈	2	395	130 ¹ / ₂	73 ³ / ₈
29	400 ¹ / ₄	129	72 ³ / ₈	3	388 ¹ / ₄	130 ³ / ₄	74 ³ / ₈

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

Daily Prices of Metals in New York

Nov. and Dec.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
27	...	...	...	6.75@6.80	6.57 ¹ / ₂ @6.62 ¹ / ₂	8.00	...
28	17 ⁷ / ₈ @18 ³ / ₈	53 ³ / ₈ @53 ³ / ₈	53 ¹ / ₈	6.75@6.80	6.57 ¹ / ₂ @6.62 ¹ / ₂	8.05	...	
29	17 ⁷ / ₈ @18 ¹ / ₈	53 ¹ / ₈	53	6.75	6.50@6.55	8.05@8.10	...	
1	17 ³ / ₄ @18	52 ³ / ₄	52 ³ / ₄ @52 ³ / ₄	6.75	6.50	8.10@8.15	...	
2	17 ³ / ₄ @18	52 ³ / ₄	52 ³ / ₄ @52 ³ / ₄	6.75	6.50	8.15@8.20	...	
3	17 ³ / ₄ @18	52 ³ / ₄	52 ³ / ₄ @52 ³ / ₄	6.75	6.50	8.15@8.20	...	

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Nov. and Dec.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
27	95	96 ¹ / ₂	107	295 ¹ / ₂	296 ³ / ₄	367 ³ / ₈	363 ³ / ₄	48	48 ¹ / ₂
28	95 ¹ / ₄	96 ³ / ₄	106	296	297 ¹ / ₂	37 ¹ / ₂	37 ³ / ₈	48	48 ³ / ₄
29	...	...	...	...	...	...	...	...	...
1	97	98 ¹ / ₂	105	295	296 ¹ / ₂	38	38 ¹ / ₄	48 ⁷ / ₈	49 ³ / ₈
2	97 ³ / ₄	99 ¹ / ₄	106	294 ³ / ₄	296	39 ¹ / ₄	39 ³ / ₈	49 ³ / ₈	50 ¹ / ₄
3	98 ¹ / ₄	99 ¹ / ₂	107	294	296 ¹ / ₄	37 ³ / ₈	37 ³ / ₈	50 ³ / ₈	51 ¹ / ₄

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

Metal Markets

New York—Dec. 3, 1919

The features of the metal markets this week were further weakness in copper and a more decided easing in lead. On the other hand, zinc became much stronger, on the transaction of large business.

Efforts are being made to advance transatlantic freight rates, by agreement, to the scale of the U. S. Shipping Board, but it is uncertain whether such an arrangement can be effected, or maintained if it be effected.

Transpacific freight rates from San Francisco to Hongkong and Kobe remain unchanged at \$12.

The price for silver during the last week was erratic, reflecting speculative influences. However, high prices for

this metal may be expected to continue for a long time. Asia has been draining the world of gold and silver, and will continue to do so as long as the black and yellow races work harder and sell the white men more than they buy in return.

On Dec. 2, gold in London went to 106s., a premium of 19s.

Copper

At the beginning of the week some small sales were made at 18³/₈c., but before the end of the day copper was offered at 18c., delivered, although such offerings were not broadcast and did not immediately become generally known. As late as Saturday some small sales for export to Europe were booked as high as 18¹/₄c., f.a.s., by sellers outside of the Export Association. On

Dec. 1 copper was so freely offered at 18c., delivered, equivalent to 17³/₈c., cash New York, that the market could no longer be considered any higher than that. On the basis of 18c., delivered, which price prevailed in all quarters since Monday, the market showed some resistance, and in spite of rumors to the contrary, there were no authentic reports of any sales at lower figures. All producers were emphatic in their refusal to sell anybody but consumers, there being a determined effort to keep copper out of speculative hands.

The sales of copper in November attained a surprisingly large figure. Sales during the last week amounted to considerably more than in the previous week. Sales of the week were mainly with wire-drawers, but the Export Association did a rather fair business, divided among numerous foreign countries, at prices decidedly better than what prevailed in this market. However, there was no general inquiry from domestic consumers, and nothing much is to be expected until there is a general belief that the present decline in the market has ended.

Copper Sheets—28¹/₂c. per lb. Wire, 22c. f.o.b. factory, weak. Domestic buying dull.

Tin

This market was erratic, owing to the fluctuations in the exchange rate and uncertainty about the deliveries from steamships arriving in this port. There was not much buying by domestic consumers and not much interest in the metal on their part.

Singapore quoted c.i.f., London, £288 on Nov. 27; £291¹/₂ on Nov. 28; £299 on Dec. 1, and £302¹/₂ on Dec. 2.

Though tin of 99 per cent grade declined in this market, Straits tin remained rather firm.

Lead

The easing tendency in the market continued, and by Nov. 29 there were sellers at 6.75c. New York other than the A. S. & R. Co. The St. Louis market was steady at about 6.60c. On Dec. 1 a round lot was bought in St. Louis at 6.50c. and on Dec. 2 and 3 other round lots at the same figure. On Dec. 2 a large lot was booked in the New York market at 6.75c. At the close the market was squarely on the basis of 6.75c., New York, and 6.50c., St. Louis, with numerous of the large producers sellers at those figures.

During the week a rather large business in the domestic market was transacted, corrodors being heavy buyers. A large business was done in Mexican lead for export to Europe—England, France, and Germany being buyers. Europe has been buying more or less lead in this market for some time, taking especially Mexican lead for shipment from Tampico. This follows upon unexpected shortage of supplies in Europe, where consumption, especially in Great Britain, is good. The strikes in Australia resulted in a large loss of lead production, and the labor troubles in Spain have diminished supplies from that quarter. The cost of production in Spain is high. These influences indicate that Europe may have to get lead from here.

Zinc

Right from the beginning of the week there was powerful buying by speculative parties who accumulated large quantities, paying 8c. St. Louis, for any delivery, either prompt or first quarter. A domestic galvanizer who bought 500 tons on the same day paid 8c. for it. On Nov. 29 speculative interests bought at 8.05c. St. Louis, outbidding European buyers who offered to pay 8c., this being reckoned as the equivalent of £48 c.i.f., London. On Monday business was done in the morning at 8.05c. and later at 8.10c., a large lot of prompt zinc being booked for export at the latter figure. On Tuesday a large business for export was done at 8½c. More inquiry from galvanizers also developed on this day. At the close producers were asking 8.20c. With Wednesday, however, there was some relaxation in the demand and a development of some relatively low offerings, probably from sources that desired to realize. Transactions of the week were large, probably 6,000 or 7,000 tons having been sold for export, and, including speculative purchases, the total was doubtless upward of 10,000 tons.

Zinc Sheets—\$11.00 per 100 lb. since Nov. 14, less 8 per cent on carload lots. Slightly higher prices for export.

Silver—The New York silver price broke violently on Nov. 27 on the announcement that the U. S. Treasury was paying out silver dollars in San Francisco in exchange for gold, dollar for dollar, and that silver dollars were being exported in large quantities to China, thereby enabling buyers for export to obtain silver coin on the basis of \$1.29 plus per fine ounce. Naturally, buyers for export declined to continue paying a large premium over the price at which they could obtain silver by shipping silver coin, and the New York price declined to \$1.29. The Treasury Department has under advisement whether it will continue to pay out silver dollars in exchange for gold, and

whether it will require the melting of coin before export. Notwithstanding the lack of definite official action, the demand for export continues, and buyers are paying a premium over the silver-dollar equivalent.

Mexican dollars at New York: Nov. 27, holiday; Nov. 28, 99%; Nov. 29, 99%; Dec. 1, 99½; Dec. 2, 100%; Dec. 3, 101.

The Mexican government issues an official silver price on the last day of each month as a basis on which the export taxes on silver bullion for the month following are figured. This price is theoretically the average New York official quotation, taken from the 26th of one month to the 25th, inclusive, of the following month. For example, the Mexican government's official price for the month of November is calculated as the average of New York official quotation, beginning with Sept. 26 and ending with Oct. 25. The Mexican official price, as above stated, is used in calculating the value of silver put in the mint for export, and this same valuation is also used as a basis for express charges to the border.

The Mexican official prices for this year have been as follows:

Mex. per kg. fine Ag.	
January	P-65.16
February	65.16
March	65.16
April	64.84
May	64.94
June	63.14
July	71.24
August	72.06
September	70.96
October	71.80

The above prices are in Mexican gold and are transferred into U. S. Currency on the basis of 2:1.

Palladium—Advanced to \$125.

Platinum—Early in the week rather large quantities were sold at \$135, but about Dec. 1 the market experienced a sharp advance and closed at \$145, \$150 for refined ingot. The strike among the jewelry manufacturers relaxed demand for a while, but with the end of this labor trouble coming in sight, jewelers became more active buyers. Supplies are scarce. Whereas 100 oz. formerly used to be considered an ordinary wholesale lot of platinum, producers now do business in 20-oz. lots.

Aluminum—33c. per lb.

Antimony—There was considerable activity, with the market unchanged at 9@9½c. for spot, and the same for futures.

Bismuth—Unchanged at \$2.96.

Cadmium—\$1.40 per lb.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c.

Quicksilver—This metal was firm at \$95, a sharp advance from the previous

week. The price in London advanced to £21½ today. San Francisco telegraphed \$87.50, strong.

Monthly Average Prices for November

Lead, New York	6.808c
Lead, St. Louis	6.649c
Lead, London	£34.731
Zinc, New York	8.177c
Zinc, St. Louis	7.827c
Zinc, London	£46.588
Silver, New York	127.924c
Silver, London	70.065d
Copper, electrolytic, N. Y.	19.758c
Copper, standard, London	£98.894
Tin, New York	53.307c
Tin, London	£283.556
Bessemer pig iron, Pittsburgh	\$31.60
Basic pig iron, Pittsburgh	\$31.56
No. 2 foundry, Pittsburgh	\$32.16

Tungsten Ore — Chinese wolframite was quoted at \$7 per unit, Bolivian at \$10. Business in scheelite was actually done at \$10.

Molybdenum Ore—Quoted nominally at 75c.

Chrome Ore—Arrivals from South Africa are reported.

Zinc, Lead and Ore Markets

Joplin, Mo., Nov. 29—Zinc blende, per ton, high, \$49.40; basis 60 per cent zinc, premium, \$48.50; Prime Western, \$47.50; fines and slimes, \$45@42.50; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$49.19; calamine, \$33.45; all zinc ores, \$45.15.

Lead, high, \$89; basis 80 per cent lead, \$88@85; average settling prices, all grades of lead, \$87.09 per ton.

Shipments the week: Blende, 7,542; calamine, 29; lead, 1,038 tons. Value, all ores the week, \$432,250.

Shipments eleven months: Blende, 437,348; calamine, 11,597; lead, 66,610 tons. Value, all ores, eleven months, \$23,150,870.

With few cars provided for this week's loading, and prospects not encouraging for a larger number next week, and in the face of the threatened strike of railroad men, the market advanced \$2.50 per ton this week, on the strength of a slight improvement in metal. Nearly all buyers were holding back on \$45 offerings, until two or three came in with offerings of \$47.50.

Platteville, Wis., Nov. 29—Blende, basis 60 per cent zinc, \$51.50 base for premium grade and \$50.50 base for Prime Western grade. Lead ore, basis 80 per cent lead, \$85 per ton. Shipments reported for the week are 2,528 tons blende, 85 tons galena, and 85 tons sulphur ore. For the year to date the totals are 93,153 tons blende, 6,262 tons galena, and 17,731 tons sulphur ore. During the week 2,667 tons blende was shipped to separating plants.

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The Silver Problem

THE New York press reports that silver coins are getting scarce on Broadway. Theatre box offices receive too many bills and too few dimes; banks are paying out silver which never reappears, and are having a hard time in keeping their commercial depositors supplied. According to the "Tribune," a theatre auditor reported that "We have in our safe, as a precaution, \$17,500 in halves, quarters, and dimes. If that coin were to be melted, it would net a profit of \$1,400. This \$17,500 will vanish into the hands of theatre goers, and it will never come back. Even on a light day we give out \$2,000 in silver. At night, when we close, we bank nothing but bills—never a piece of silver."

"I am convinced," said the paying teller of a Broadway bank, "that silver coin is being melted up here in New York, and sold as bullion for the profit there is in it. I don't believe the big jewelers or silversmiths are doing it, but well-defined rumors credit the small dealer in metals with this sort of thing."

The report of this situation follows closely the discovery of a similar state of affairs in Paris, where this condition has reached a more advanced stage, partly on account of the relatively larger issue of paper money and also on account of the exporting of coins to be melted into bullion.

Silver is now quoted in New York at \$1.33 per ounce, the highest point yet reached; and at this figure the silver coin is worth considerably more as metal than its exchange value as currency.

No law, as we understand, exists against the melting of coin. A resolution introduced at the meeting of the American Mining Congress at St. Louis in November proposes a law to that effect. We are not in favor of it: first, because it could not be enforced; second, because it would not prevent the exporting of silver coins; and, third, because we doubt the logic and fairness of it.

In our bizarre system of finance silver has occupied a peculiar position between gold and paper: with no fixed real value, the United States silver dollar has been a strange monstrosity. In a system based on the gold standard, the silver currency was put out and circulated without even the promise to pay its face value in the legal standard, gold, which is the basal theory of the paper currency. Uncle Sam took fifty cents' worth of silver, and stamped it "One Dollar," and sent it out so to pass, and to be the equivalent in purchase value of one-twentieth

of an ounce of gold; a very dishonest trick, had it been done by folk of humble station and authority. The bright idea behind this legerdemain was that if you issued currency having real metallic value, you could make a few passes before people's eyes and get them to see that it was twice as heavy as it really was; but if you stamped something that had no value at all, you must in some cases promise to pay in gold, and in other cases let it be known that there was a "gold reserve" back of all paper, in some intangible way. Yet this gold reserve cannot be drawn upon by the silver currency; and some of the paper dollars are promises to pay silver dollars, which are worth, when issued, fifty cents.

As we write, we find in our pockets, by diligent search, two one-dollar bills. One is not a dollar at all, in any sense. It is a "legal tender" for one dollar. But the United States, which paid it out for a dollar, will not redeem it as a dollar (gold) or as a near dollar (silver), and, indeed, will not receive it in payment of duties. The other is good for one silver dollar when we choose to claim it. When issued, it was a clever thing in national finance to issue a demand note for a silver dollar which was only a half a dollar; but now that the silver dollar is worth more than a dollar (a thing utterly unforeseen) it will be a good time for us to cash in, and show, for a change, a little business acumen ourselves.

In short, silver in the United States is, and has been since Bryan's "Crime of 1873," a commodity like copper and lead. It has not been used as a standard commodity for exchange purposes, like gold. Its price has not been fixed, but has fluctuated with the natural law of supply and demand. In the form of Mexican dollars (pesos) it has honestly so circulated, and has been exported to India and China for the purpose of being used as a medium of exchange, on a sound valuation basis. If the holder of a silver "dollar" that he innocently accepted for a real dollar, but which cost Uncle Sam only fifty cents, has the chance of a lifetime to get his dollar—a real dollar—one-twentieth of an ounce of gold—out of his coin, or if he thinks he can beat the game in this way, is it fair to prevent him? Must he be ruled out of the game when the luck runs his way? As a matter of fact, though, (editorially speaking) we shall not keep Uncle Sam to his word in this respect, since it is dulce et decorum pro patria mori. Yet it will eventually be done, whatever may be considered to be the ethics of the thing; and by the

natural law of supply and demand, which any commodity whose price is not fixed follows, it is certainly being done right now. It constitutes a real danger to the business and credit of a nation short of gold, if it becomes short of its other metallic currency. It is wonderful how the chink of small coin in the pocket keeps us under the impression that all our transactions are in real dollars. The passing of the silver dime would undermine confidence more than the passing of the gold eagle has done.

Congress should take steps immediately. A law against the melting down of silver coin would be ineffective; if effective it would precipitate a more serious custom—the exportation of silver coin, to be melted abroad. An embargo on silver exports would be necessary to prevent this; but that would be an unwelcome check upon our silver-mining industry, and would tend to establish different silver prices here and abroad, without preventing the domestic conversion into bullion. There is only one remedy, it appears to us—to fix the price of silver. This is not so much a novel and fearsome thing to do as it used to seem; for we have become inured to the price fixing as a consequence of war emergencies.

At present two great commodities are pegged—gold and wheat; gold at \$20.67 per ounce, and wheat at \$2.25 a bushel. We are not therefore on a gold standard but on a dual standard—not gold and silver, but gold and wheat; and as our gold is not actively traded in as a real commodity exchange, while wheat is, it is wheat that is the true standard which determines, rather than gold, the relative value of things. So long as wheat is pegged at \$2.25, or over 100 per cent above the pre-war value, the cost of other commodities and the cost of labor and of living must remain at least double what it previously was.

Price fixing is a mischievous thing, a powerful force too dangerous to play with. There is only one thing that can safely be pegged, and that is the standard exchange commodity, which cannot be otherwise than fixed. This commodity will not likely be wheat permanently, as this is not durable or convenient; but it had better be wheat than a fictitious commodity, and a false theory of symbolism under which we are now working; and in this case gold should be unpegged. This, of course, is all impracticable; the precious metal standard of exchange is fixed and time-tried. In the wealthier countries it is essentially gold; in the poorer, like India and China, essentially silver. All attempts to introduce gold currency with India as a substitute for silver have failed—coin and notes alike are on the silver basis.

The necessity of both metals for a world standard is demonstrated, especially in this time of need of a real standard commodity of exchange—of real metallic money, or honest and solvent notes redeemable in full in real money, as specified. A double standard is not advocated; it must be a single amalgamated standard—the gold-silver standard, with the ratio of one to the other to be fixed and unchangeable.

An estimate by engineers and geologists of the available gold and silver resources of the world, of the average cost of extraction of gold and silver, respectively, and of the average relative market value over a period of many years, would constitute a sound basis for fixing a ratio. This done, no fixed price of any commodity should be attempted. Wheat should be unpegged as soon as possible, and the demoralizing expedient never repeated in the case of anything.

The League of Nations

SINCE many of our metal markets are stagnant and our mines idle, due to the lack of foreign demand for raw materials, which must postpone the program of reconstruction until the Treaty settlement by the United States and the arrangement of credits, it will not be foreign to our field to consider the main cause of delay in the Treaty signature.

No more important matter exists today, for all Americans, whether concerned in the mining and metal industries or otherwise, than the League of Nations; and its decision will have a far-reaching effect, usually not fully comprehended. Its importance transcends all politics; the Treaty is the most important document which Americans have had to consider since the drafting of the Constitution. It is necessary, therefore, that it should be closely viewed from all angles. That any one individual, however placed, should undertake to assume that his approval is sufficient, is an incredible insolence that ignores the first principles of democracy.

An alliance between Great Britain, France, and the United States is, in our opinion, desirable and necessary. This alliance should be stronger than the usual arrangement, and should be not only military but commercial; and other nations should be admitted if properly prepared for such responsibilities. To admit immature countries, not yet advanced to the standard of these three, would be to create serious difficulties.

Is the project of the League inserted in the Peace Treaty a workable plan? The debate and analysis of the Senate show that in parts it has been loosely drawn; that certain articles involve the transfer of important elements of the control and independence of the United States to the League organization, and that certain others are obscure but may be so interpreted; in other words, that in some important respects the United States would be under the control of Europe.

One of the provisions in question is the much-debated Article X, which binds members of the League to preserve against external aggression the territory of all members, and leaves to the Council the devising of means for carrying out this obligation. The reservation approved by the Senate in regard to this article is intended to preserve or make clear the autonomy of the United States as against the above: surely a necessary precaution. It provides that the Army and the Navy of the United States shall not be used for the above purpose except by authority

of Congress. Similarly, Article I provides that any member of the League may withdraw from the League "provided that all its international obligations and all its obligations under this Covenant shall have been fulfilled at the time of its withdrawal." This may apparently be interpreted as meaning that the League must sanction the withdrawal and release the member so desirous; and that it might on various grounds withhold or delay its consent and by military or economic pressure prevent the member from withdrawing. The reservation approved by the Senate concerning this article provides that the United States shall be the sole judge as to whether all its obligations have been fulfilled, and lodges the power of withdrawal in the Congress of the United States. This is a precaution necessary to maintenance of the autonomy and independence of the country, and no reasonable objection should be raised by any American to this interpretation.

The reservation on Article XXII, concerning mandates, is to the effect that mandates must be accepted by Congress. In the original article the responsibility of accepting a mandate is not fixed: it might conceivably mean that it could be accepted by the President, and the reservation of the Senate, as in the case of Article X, is drawn for the purpose of preventing such usurpation of the powers of Congress by the President. Unless the President really desires to deprive Congress of these powers, and to put them in the hands of the Chief Executive, there is no possible reason for his objection to the reservation on Article XXII.

Article IV of the Treaty provides that the Council of the League should consist of representatives of the United States, of the British Empire, France, Italy, and Japan, and representatives of four other members of the League. Article I provides that "Any fully self-governing state, dominion, or colony . . . may become a member of the League," and this provision was inserted with special reference to Canada, South Africa, Australia, and New Zealand; so that on the Council as at present specified the British Empire would have five votes out of nine; and as it is provided that in the Assembly also each member of the League shall have one vote, the British Empire's votes would here also be five against one for each of all other nations. In reply to this the reservation approved by the Senate declines to pledge the acquiescence of the United States in any "election, decision, or finding of the Council or Assembly in which any member or its self-governing dominions, colonies, or part of empire in the aggregate have had more than one vote."

Though it is provided in the Treaty that in the case of disputes between two members of the League the disputing nations have no vote in the adjustment, yet, as arranged, in the case of a dispute between the United States and England, votes would be admitted from Canada, Australia, New Zealand, and South Africa; and the Senate reservation in regard to this expressly declines to have the United States so bound. It seems to us that there can be no two ways of fair thinking about this, and surely

only one attitude for the United States to take—namely, that taken by the Senate. The dominions and colonies of the British Empire are self-governing, but they are not independent. The British Empire should have no more votes than the United States and its possessions. Our forty-eight states are self-governing, and some are much more populous than some of the British dominions or colonies involved. Should not the United States stand out for forty-eight members of the League?

It is not our purpose to analyze further the parts of the League provisions on which there is a difference of opinion between the President and the Senate; but we have indicated enough to show why, in our opinion, some of these reservations are absolutely imperative, and that the Senate will never withdraw them. Better than such ineptitude, to let the League, which we have so long desired, but which has been so crudely drawn by our American representatives, be definitely abandoned. England, as the price for her approval of the League, has safeguarded herself by providing for her domination of it by plural voting. France secures the guaranty of her territorial integrity, including Alsace-Lorraine. Both would benefit financially, through loans from America.

What will America have from it? Nothing, except that, if wisely advanced, it should operate greatly in the interests of the common good and the welfare of the world; and the Senate is anxious to do this, provided the independence of the United States, and its equal footing with any other nation, is not attacked, and the powers of Congress not usurped by the President. From this position the Senate will not recede.

Copper Boom Postponed

THE plight of the copper producers is becoming serious just about the time when a boom was expected. During the war, the supply of this metal among the Central Powers became so low that many manufactured articles had to be melted up for their copper content. German housewives were asked to give up their kitchen kettles to the cause. As Germany and Austria between them consumed before the war close to 350,000 tons of copper a year, almost one-third of the world's production, copper producers and investors looked to a large market at the conclusion of peace, both to replenish the depleted supplies and for current needs.

Germany needs the copper—of that there is no doubt—but of course has nothing with which to pay for it. In fact, practically all of our foreign consumers are temporarily bankrupt, resulting in such high exchange rates that they cannot afford to buy copper or any other commodity in greater amounts than is absolutely necessary for current needs. Meanwhile, the price of copper has dropped to the neighborhood of 19c., which is only about 25 per cent more than the pre-war price, although the cost of production, especially under the conditions of reduced output now obtaining, has increased considerably more.

The zinc and lead producers are both somewhat better off than the copper men, and of course the silver producers are in a bed of thornless roses.

During 1916, in view of the continued good business expected for some years, there was a disposition in some quarters to criticize the policy of the copper companies of not sharing with the stockholders a more liberal portion of the large profits then being made. The wisdom of the policy decided on is now apparent, for with no money in the treasury many of the high-cost producers would now be obliged to close down their plants, always an expensive thing to do in the long run. The present general operation of the companies on a basis of 40 to 50 per cent of normal output cannot be continued indefinitely, however, and unless conditions improve soon, the high-cost producers will be forced to succumb. This would be a calamity, for the world right now needs all the copper that can be produced.

The remedy, of course, is an early settlement of European affairs, so that the nations which need our copper will get back to work and produce commodities which we can use, in exchange. A temporary extension of credit will be necessary so that they may buy the raw materials on which to work. The signing of the peace treaty will be an important step to these ends, and, with the ending of the war more than a year in the background, further procrastination on the part of the politicians in Washington should not be tolerated.

Compensation of Engineers

AT A RECENT meeting of civil, electrical, and mining engineers, under the auspices of the American Society of Civil Engineers, Arthur S. Tuttle, Francis Lee Stuart, John S. Conwell, and several others discussed the compensation of engineers. The usual statistics were presented to show that the cost of living had more than doubled during the last fifteen years, and that salaries of engineers had not increased in proportion, but had risen only about 10 per cent. It was pointed out that these conditions had the effect of cheapening the profession because they lowered the standard of living, thereby making engineering less attractive to progressive young men. The natural result is a larger proportion of incompetent engineers in the lower ranks of the profession, with consequent increased cost of engineering work.

Furthermore, the struggle of the lower salaried engineer against the high cost of living develops a tendency toward trade unionism, especially when the engineer observes that the law of supply and demand, which is supposed to regulate his compensation, accomplishes nothing, whereas the simpler law of "demand," as applied by the unions of common labor, gets everything. However, any tendency toward unionism among engineers, for the purpose of enforcing unreasonable demands for higher pay, has gained little ground, thanks to the fact that the true engineer has ideals that lead him to think much about doing his work well, and little about his compensation. Compared with those in other occupa-

tions, engineers in general have fared well so far as compensation is concerned, if statistics of income-tax returns mean anything. According to available figures, those classified as stockbrokers have the largest incomes, engineers, including mining engineers, come fifth on the list, teachers are twenty-first, and farmers are twenty-second and last. The engineering profession seems to be holding its own.

The Engineering Council's General Committee appears to have made one strange discovery, namely, that the higher-grade engineers, or those receiving \$5,000 or more per annum, suffered proportionately greater injustice under present industrial conditions than the men who receive about \$2,000 or less per annum. It is as difficult to see how the committee develops this idea as it would be to demonstrate that the actual necessities of life are less costly for the \$2,000 man than for the \$5,000 man. Surely, it is clear that when the lower-salaried man is just meeting his expenses, the higher-salaried man could be saving money. If it is true that the higher-paid engineers need encouragement to keep them in their profession, is it not reasonable to consider what kind of encouragement is required to hold the younger and lower-priced engineers in line? Is it not a fact that the on-coming army of young engineers represents the raw material from which the big men of the profession are made? If this be true, then it behooves the men at the top to consider unselfishly what is good for the men at the bottom; otherwise, how will the higher positions be filled when their present occupants have passed on?

Aluminum vs. Aluminium

THE use of the term "aluminium" in "Mineral Industry" brings to mind the difference between the English and American pronunciation and spelling of this word. Time was when "Mineral Industry" spelled it in the familiar way, but since Dr. Richards has been covering the subject for that excellent publication, the English spelling has been used in his articles, and evidently the present editor, G. A. Roush, is also a convert to that form.

The old Roman word for bodies with an astringent taste was "alumen." Not until 1722, when F. Hoffmann announced the fact, was it known that the base of alum was an individual substance. About 1820 it was decided to call this substance "alumina." In 1809 Sir Humphry Davy succeeded in producing an iron aluminum alloy, and, in anticipation of the actual birth of the new metal, called it "aluminum," but was later persuaded to change the spelling to the present American form, "aluminum." A few years later, English chemists decided on "aluminium," to conform with sodium, potassium, and many other elements, and so it has remained to this day. This spelling has, however, not received recognition in America, except by a few chemists who have decided views on the subject. Aluminum is certainly a simpler pronunciation, and as it is analogous to platinum, molybdenum, glucinum, tantalum, and lanthanum, we fail to see how the American spelling should be very much of a crime.



THE PRINCIPAL VEIN AT COROCORO, BOLIVIA, FOLLOWING THE "HOG-BACK" SHOWN IN PICTURE

Copper Mining in Bolivia

THE POWER HOUSE NEAR CENTER OF PLATE IS THAT OF THE COROCORO UNITED COPPER MINES, LTD. THE BUILDINGS HIGH UP TO THE LEFT ARE THOSE OF THE COMPANIA COROCORO DE BOLIVIA



Precipitate Smelting at Tonopah

General Method of Treatment Much the Same at Each of the Four Plants Now Operating—Kinds of Furnaces Used and Details of the Process Employed at the Belmont and West End Works.

BY GEORGE J. YOUNG

THE method of treating cyanide precipitate at Tonopah, Nev., has been thoroughly standardized. Of the four mills now operating, the Belmont, West End, Extension, and MacNamara, the first three mills use Monarch double-chamber melting furnaces and the fourth mill employs a cylindrical tilting furnace of the crucible type. In all of the mills, clean-ups are made twice a month. At the Belmont, zinc-dust precipitation and Merrill presses are used; at the others, zinc-thread precipitation.

At the Belmont mill, the presses are discharged into sheet-steel false-bottom steam-heated pans, which are wheeled under the presses. The precipitate is dried in the pans and is weighed, mixed with

At the West End mill about 150 oz. of bullion is melted per gallon of fuel oil.

During the melting, which requires from three to three and three-quarter hours, the position of the furnace is changed several times by rotation upon its trunnions, for the purpose of rinsing down the sides of the melting chamber and for removing any portion of precipitate clinging to the walls of the furnace above the molten charge. When melted, most of the slag is poured into conical pots which are handled on buggies, shown in Fig. 2. The bullion is then poured into moulds, holding 2,000 oz., which are placed on a low truck and run under the furnace, as shown in Fig. 3. In pouring the bullion, crusts

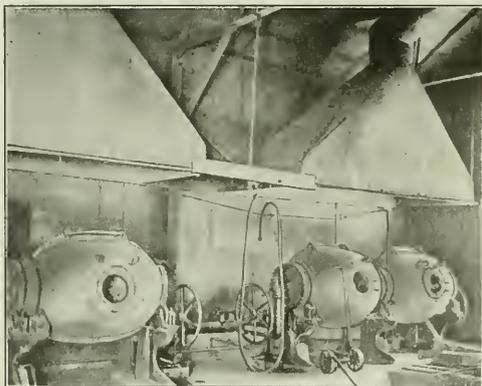


FIG. 1. MELTING FURNACES AND HOODS AT THE TONOPAH-BELMONT MINE

fluxes, and then briquetted. Four per cent of soda and 2 per cent of borax are used for fluxing. In some instances a little sand is used, but in most cases, sufficient sand is present to give a siliceous slag.

The furnace is lined with carborundum, which is first mixed with water glass and then rammed into place. An air hammer is used for tamping. To facilitate relining, the furnace, which is egg-shaped, is made in two symmetrical parts, bolted together. A crude-oil burner, using high-pressure air, is used for atomizing the oil and for supplying air for combustion. The furnace gases discharge into steel hoods (see Fig. 1), which are connected with a sufficient length of stack to remove all of the poisonous fumes and gaseous products. Fifteen trays, containing thirty briquettes to the tray, constitute the charge, which weighs from 700 to 900 lb. The lining of the furnace lasts from twenty to twenty-four melts.

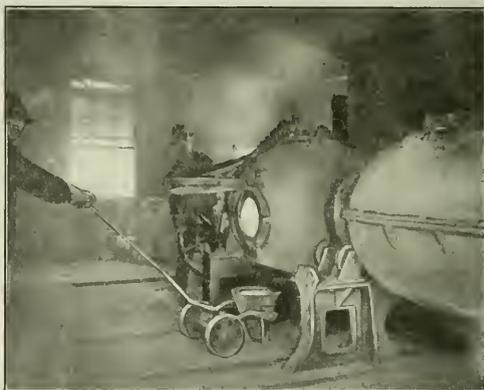


FIG. 2. SLAG POURING AT THE WEST END MILL

or portions of the lining which float in the remaining slag, on top of the bullion, as well as the slag itself, are kept back by a hoe-shaped implement.

After pouring, the slag layer is stripped from the bars while still viscous, the moulds are dumped and the bars lifted with tongs and placed in the cooling tank. The slag, after quenching, is passed through a small crusher and charged into a barrel-type ball-mill, where it is ground fine. The mill discharges onto a small table where the crushed slag is concentrated. The concentrates are added to the furnace charge, and the ground slag is sacked for shipment to the smelter.

At the West End mill, the fluxing charge consists of 3 per cent borax and 5 per cent soda. One man briquetts from two to two and a half tons of precipitate in an eight-hour shift. At both the Belmont and the West End mills two men are required to handle the melting. The bars, when cleaned and hammered free from slag, are numbered, marked,

and sampled. For sampling, a blacksmith's drill-press and 3/16-in. drill are used. Three holes, each about one and one-half inches deep, are drilled, two holes on diagonally opposite corners in the top of the bar and one hole in the center of the bottom.

The slag is crushed in a small stamp battery, concentrated on a small table, and the concentrates, together with all shots, pills, and bullion scraps, are



FIG. 3. CHARGING BRIQUETTES INTO FURNACE AT WEST END MILL

remelted. The crushed end-slag is allowed to accumulate until there is a sufficient quantity for a shipment to the smeltery.

The equipment of all of the "refineries" is much the same. Flat-bottomed, steam-heated rectangular open pans are used for drying the precipitate. Mixing of flux and precipitate is done by hand, although



FIG. 4. POURING BULLION AT THE WEST END MILL

a small inclosed mechanical mixer of a simple type could be used. The mass is briquetted, but a press is not absolutely necessary, as at the Extension mill the mixture is placed in paper bags and charged in this way into the furnace. For quenching bullion bars a small sheet steel tank, 2½ to 3 ft. square and ½ to 2 ft. deep, provided with water inlet and outlet,

answers the purpose for mills of from 100 to 400 tons' capacity.

Slag quenching is best done in a concrete sump, flush with the floor and not more than 2 ft. deep and 6 x 4 ft. in size. Overflow and drain connections are essential. For slag crushing, a 4 x 6-in. crusher and a small stamp battery, a clean-up barrel, or a small ball-mill for fine grinding can be used. A sump like the one just described is suitable for receiving the discharge from the fine-grinder, and a similar one can be used for the discharge from the small Wilfley table. Small platform scales of 1,000 to 2,000 lb. capacity, bullion scales, tongs, bullion, and slag moulds are necessities. A steel-frame, corrugated



FIG. 5. HOME-MADE BRIQUETTING PRESS AT WEST END MILL

iron building, with a well-constructed cement floor and of a size sufficient to give ample room for the workmen, completes the equipment.

Nevada Consolidated Copper Co.

The report of the Nevada Consolidated Copper Co. for the third quarter of the fiscal and calendar year, 1919, states that the production of copper for the three months was 9,336,753 lb., as compared with 11,149,362 lb. for the quarter ending June 30, 1919. During the present quarter 454,255 dry tons of ore, of an average grade of 1.54 per cent copper from the shovel pits and the Ruth mine, was treated, as compared with 558,525 dry tons, averaging 1.42 per cent copper, for the previous quarter. Of the tonnage milled during the quarter, 73 per cent was supplied from the pit and 27 per cent from the underground workings of the Ruth mine. In addition to the treatment of company ores as stated, 14,500 dry tons of custom ore was milled and the concentrates product of same was smelted at the Steptoe plant during the quarter.

The cost of production for the quarter, including charge for depreciation of plant and equipment, and the usual overhead or fixed and general expenses, but without credit for gold and silver recovered and miscellaneous earnings, was 21.68c. per lb. of copper.

The value of gold and silver recovered and the miscellaneous income earned for the third quarter amounted to 1.42c. per lb. of copper. The cost of production per lb. of copper for the first quarter of the current year was 16.85c., and for the second quarter 18.07c., all calculated on the same basis. The unusually high costs for this quarter are due largely to the fact that operations at mine, mill, and smelter, were entirely suspended during the greater part of August, because of a strike by certain classes of employees, which threw the burden of the extraordinary costs which usually attend a shutdown, plus the ordinary fixed and general expenses for the month, upon a materially reduced tonnage. Costs were further increased by an advance in wages which became effective in July.

Because of the loss of the August month's copper, the average monthly production for these three months was only 3,112,251 lb., as compared with an average of 3,716,454 lb. per month for the preceding quarter. If industrial and market conditions warrant, this shortage can be made up before the close of the final quarter, and the average monthly output for the year maintained on the basis of 50 per cent capacity of production, in accordance with the policy of production curtailment made necessary by post-war conditions.

The financial results of operations for the quarter are shown to include as operating costs the regular monthly charges made to cover depreciation of plant and equipment, and are set out in the statement following:

Operation profit or loss.....	\$331,153.83
Earnings from investments and miscellaneous.....	133,296.18
Net gain	\$464,449.01
Distribution to stockholders.....	749,796.38
Net deficit	\$285,347.37

The operating earnings for the quarter are based upon a carrying price of 25.23c. per lb. of copper produced, which is considerably in excess of the price of 15.12c. per lb. used in calculating the operating income for the previous quarter. This increase in carrying price is due to the fact that sales exceeded production, the result of decreased output and increased sales. All unsold copper is carried as usual at 13.5c. per lb.

The walkout of employees, which occurred late in July, tied up the entire property for practically a month, operations being in part resumed near the end of August. All departments of the mines and reduction works are now in operation at regular rate of production and output of copper on the curtailed basis which has been in effect since the beginning of this year.

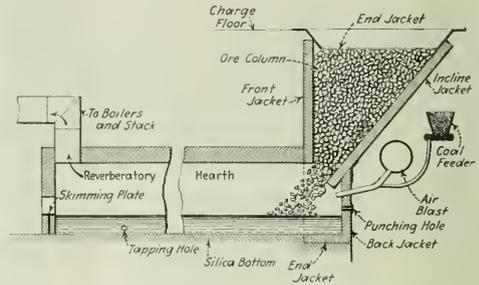
Concerning an Omission

Through inadvertence attributable to unavoidable difficulties of publication, the name of the writer of the article "E. & M. J. Quotations Recognized by Court," on page 683 of the Oct. 25 issue of the "Journal," was omitted. The author was Wellington Gustin, of Chicago, an attorney and writer of legal matters.

A New Furnace Using Pulverized Coal or Oil

Referring to the interesting article in the "Journal" of Aug. 16, describing experiments with the coal-dust firing of blast furnaces at the Copper Cliff and Tennessee smelteries, I wish to call attention to an entirely new type of furnace, which I believe would eliminate many of the difficulties encountered in the experiments described, and which has at the same time points of superiority over any other style of furnace now in use.

The advantages of the furnace illustrated in the accompanying drawing include: (1) No uptake is necessary on the feed floor, as the gases and dust are drawn downward through the ore column. (2) All the tuyeres point in one direction, through the base of the falling charge into the molten bath and also in the direction of the draft travel, so that most of



NEW FURNACE FOR BURNING POWDERED COAL.

the heat is utilized in smelting the charge and not so much heat wasted on the water jackets as is the case in ordinary blast furnaces. (3) As the charge slides down the inclined back jacket gradually, and only as the base of the charge is fused away by the direct flame from the tuyeres, no coke would be needed to carry or sustain the burden, and there would be very little heat in the charge above this local fusion zone at the tuyeres. Consequently, no accretions would build up on the furnace jackets. (4) Flue dust and fine ore could be dropped through side drop holes in the roof of the furnace in the usual way.

W. M. Barker.

McGill, Nev., Aug. 26, 1919.

[In the scheme which Mr. Barker suggests, it is doubtful if there would be enough voids in the bank of ore which would pile up in front of the burners, to allow the burning coal to pass through. Continuous punching would probably be necessary, which would be an extremely uncomfortable job, and even then the passages for the flame would hardly be sufficiently large. The opening at the bottom of the jacketed charging compartment would, of course, have to be great enough to prevent the ore from hanging up in the bin. If the ore were not allowed to pile up to the roof of the reverberatory, but were charged intermittently, we would merely be going back to the old practice.—Editor.]

Cottrell Electrical Precipitation Process in Japan*

Initial Installation Made at the Ashio Smeltery of the Furukawa Co. Has Been Followed by Several Others—Valuable Dust Recovered and Fume Nuisance to a Large Extent Obviated

BY DR. RITARO HIROTA AND KYOSHI SHIGA

THE history of the Cottrell electrical precipitation process in Japan begins with the purchasing of the Cottrell patent rights in 1916 by the representative of seven well-known mine owners in Japan, T. Wada, from the International Precipitation Co., of Los Angeles, Cal., of which Walter A. Schmidt is president.

An experimental precipitator consisting of sixteen pipes, 12 in. in diameter and 16 ft. long, with a capacity of 3,000 cu. ft. per min. at 4 ft. per sec., was erected in the compound of the Ashio smeltery by the Metallurgical Research Institute (Kinzoku Kogyo Kenkyusho), Tokyo, of which Mr. Wada is the president. This experimental treater, with the electrical

city in the vicinity of the plant, because of the dust nuisance. If this nuisance had not been abated by Dec. 25, 1917, the Asano Co. would have been obliged to move this plant to some other locality. Confronted with this difficulty, and learning of the successful results obtained at the Riverside Portland Cement Co., the Asano Co. decided to install the Cottrell process at the plant. As the time limit was strict they immediately proceeded to build the treaters, F. B. Church and K. I. Marshall being sent from Los Angeles to look after the design, erection, and operation. Their strenuous efforts benefited not only the Asano Cement Co., but also the community in general, as the Cottrell plant, starting a



MAIN TREATER OF ASHIO SMELTERY WITH CURRENT ON



MAIN TREATER OF ASHIO SMELTERY, ELECTRICAL CURRENT OFF

equipment, was erected according to the design and suggestions of the International Precipitation Co., in October, 1916. The tests were conducted by the engineers of the Metallurgical Research Institute, who were assisted by F. B. Church and K. I. Marshall, engineers of the International Precipitation Co. The test treater proved satisfactory, treating the mixed gases coming from the roasting pots, blast furnaces and converters of the copper smeltery, and precipitating the dust, containing oxides of arsenic, zinc and lead, and a small amount of copper.

Among the mines and smelteries, the Ashio copper smeltery of the Furukawa Mining Co. was the first to apply the results of these important tests. The pipes and electrical equipment were at once ordered from American manufacturers and foundations were begun.

The Asano Portland Cement Co., of Tokyo, was having considerable trouble with the residents of the

few days before the specified time, caught more than 95 per cent of the dust causing the nuisance. Thus, the long-pending problem was solved satisfactorily to all concerned. It was one of the striking examples in Japan where engineering science has contributed to the welfare of the nation and the advancement of industry.

To perfect designs of Cottrell installations for prospective customers and to study the actual operation of installations in the United States, the Metallurgical Research Institute sent its engineer, Kiyoshi Shiga, to the offices of the International Precipitation Co., of Los Angeles, where he studied the design and operation of precipitators. In May, 1917, after completing his study, Mr. Shiga was joined by Dr. Rituro Hirota, the manager of the Electrical Precipitation department of the Metallurgical Research Institute, and both visited the principal smelteries and factories in the United States, in which the process had been installed, such as the plants in Miami, Garfield, Tooele, Anaconda, Riverside, Hagerstown, the Duquesne Reduction Works,

*Excerpt from a pamphlet published by Kinzoku Kogyo Kenkyusho, No. 1 Yayasue-cho Ichome, Kojimachi-ku, Tokyo, Japan.

the Pennsylvania Smelting Co., the Portland Gas Works, and the Merrimac Chemical Co.

In the meantime, orders were placed with the Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., the General Electric Co., Schenectady, N. Y., and the Kelman Electric Co., of Los Angeles, Cal., for electrical equipment, such as extra-high-tension transformers, motor generators, and rectifiers. Orders were also placed with the Western Pipe & Steel Co., San Francisco, and the Robertson Bros. Co., Chicago, for pipe electrodes, for treater installations at the smelteries belonging to the Mitsui and Mitsubishi companies.

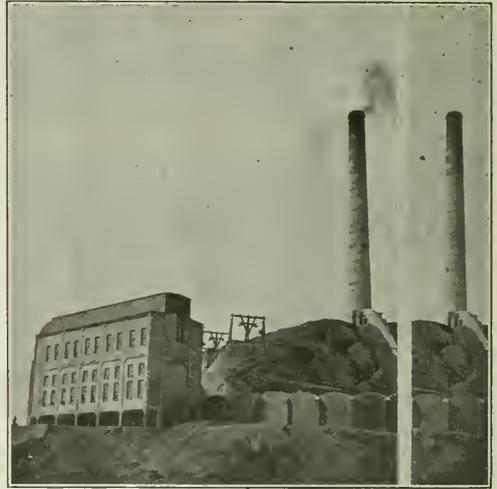
Since the return of Dr. Hirota and Mr. Shiga to Japan in the autumn of 1917, several plants have been equipped with Cottrell installations, and these plants are now working satisfactorily, eliminating the smoke and dust nuisance, and collecting many tons of valuable dust, which was hitherto going to waste. The Metallurgical Research Institute did not lose the opportunity of making the Cottrell process widely known, and has exhibited a model installation at the expositions in Tokyo and Osaka. Lectures have been delivered by Dr. Hirota at the meetings of the Mining Engineers, Mechanical Engineers, and Railway Association, and by Mr. Shiga at the Chemical Industrial Association and the Smoke Abatement Association of Osaka City.

Thus the Cottrell process, although only a few years old in this country, has made rapid progress. Eight treaters, having a total of 1,984 pipes, have been built and are now operating. However, on account of war conditions, there has been considerable difficulty in procuring the equipment. Engineers and metallurgists in Japan are eagerly investigating the work being done, and several plant managers now intend to install precipitators for collecting sulphuric-acid fumes coming from acid-boiling kettles, and acid-concentrating furnaces; cleaning iron blast-furnace gases used for firing boilers and hot stoves; and for collecting sulphuric acid liberated from alunite calcination furnaces. Designs and specifications have already been submitted for the Imperial Mint, Shikama Alum Factory, Kanto Sanso Alkali Works, Hokkaido Iron & Steel Works, and the Fujita Mining Co. The Imperial Mint has recently decided to install a plant for collecting sulphuric-acid fumes from acid-boiling kettles. The following are brief descriptions of the electrical precipitators installed in Japanese smelteries and refineries up to the present time:

Ashio Smeltery, Furukawa Mining Co.

Two treaters were installed in 1918. One, which is called the "main treater," was intended to treat the mixed gases from four McDougall roasters, two blast furnaces, and four converters of the copper smeltery; the other, called the "reverberatory treater," was intended to treat the gases from a reverberatory furnace after their having passed through waste-heat boilers. Each treater is furnished with an independent power plant. Six electrical units are being used for the main treater, one unit being spare; and two are used for the reverbera-

tory treater. Each electrical unit consists of the following General Electric Co.'s equipment: One 10-k.v.a. 50-cycle, single-phase, 200- to 100,000-volt transformer; one 10-k.v.a. 200-volt, 50-cycle, single-phase alternator, driven by a 15-hp., 50-cycle, 500-volt, three-phase induction motor; and a disc-type rectifier, manufactured by the Kelman Electric Co., directly coupled to the motor-generator shaft. Besides these machines, exciter sets for the excitation of the field of the alternators are furnished, two for the main treater and two for the reverberatory treater. The charging voltage is adjusted by regulating the intensity of the field current of the alternators. By this means, it is possible to produce practically any desired voltage from zero up to 100,-



THE NAOSHIMA TREATER, SHOWING APPEARANCE OF SMOKE WITH CURRENT OFF, COMPARED WITH THE CONDITIONS WHEN THE COTTRELL PROCESS IS IN OPERATION

000 on the secondary terminals of the transformer. The average power consumed by the precipitator is about 30 kw.

The main treater consists of ten sections, each containing 64 riveted pipes, arranged in a square (or a total of 640 pipes), and the reverberatory treater consists of three similar sections (or a total of 192 pipes). These pipes, 12 in. inside diameter and 16 ft. long, of No. 16 sheet steel, were manufactured by the Western Pipe & Steel Co. The gases are drawn through the main treater by two induced draft fans, and are discharged directly from the fan casings. Those from the reverberatory furnace are drawn through the reverberatory treater by the natural draft of the stack. As the reverberatory furnace is not operating continuously at present, the Ashio smeltery uses eleven pot roasters, four blast furnaces, and four converters, the gases from which are mixed and treated entirely by the main treater. Thus the gas volume now handled by the main treater seems somewhat in excess of 150,000 cu. ft.

per min. as designed. The amount of dust collected varies from 13,000 to 22,000 lb. per twenty-four hours.

The efficiency of precipitation seems to depend upon the nature of the furnace charge and the moisture and temperature of the gases treated. The recovery runs as high as 98 per cent, and sometimes it drops to about 70 per cent. When the conditions are such that the charging voltage can be raised above 80,000 volts with a comparatively small increase of the current, precipitation is very satisfactory. Actual experience at the smeltery has shown that when the smoke has a white appearance, precipitation is satisfactory, but when the smoke coming from the treater outlet has a yellowish appearance, the efficiency of precipitation is not so high and the current increases greatly, even if the operator tries to raise the charging voltage. The smeltery engineers are now investigating this phenomenon, and no doubt will soon be able to get entirely satisfactory precipitation, regardless of the different smoke conditions encountered.

Several years ago a large dust chamber was installed, using the Roesing wire system. The gases passed from this chamber to four large stacks, in which they were diluted by the forced admission of fresh air, before being discharged into the atmosphere. The main treater was installed at the side of this dust chamber, so the gases pass through the dust chamber, before going through the treater. The numerous suspended wires in the dust chamber were removed, so that only the heavier dust, which is of more value because of its higher percentage of metals, would be caught in the chamber; and all the lighter dust, which cannot be efficiently collected by gravity settling, would be caught in the Cottrell treater. An analysis of one of the samples of the dust settled in the Ashio main treater is as follows:

Per Cent		Per Cent	
Cu	1.37	As	31.83
Fe	2.99	Al ₂ O ₃	1.45
S	19.72	Pb	0.84
SiO ₂	3.92	Zn	5.57
CaO	1.19	Moisture	6.40

Thus the electrical precipitator collects not only the poisonous dust, such as arsenious oxide, but also the fine particles which were hitherto escaping into the atmosphere and which perhaps were acting as the nuclei for the concentration of the noxious gases, such as SO₂, preventing their free diffusion. Such poisonous dust and concentrated noxious gases cause damage to vegetable growth.

As the analysis shows, the precipitated dust contains rather large quantities of the oxides of arsenic. These oxides are extracted by subliming the dust in a small reverberatory furnace, and the cinder resulting, rich in copper, is sent back to the pot roasters after being briquetted.

Kamioka Smeltery, Mitsui Mining Co.

This treater operated by this company consists of three sections, each containing sixty-four riveted pipes arranged in a square (or a total of 192 pipes). It was started in May, 1918. The pipes, 12½ in. inside diameter by 16 ft. long, made of No. 14 gage

sheet steel, were manufactured by the Western Pipe & Steel Co.

The gases passing through the treater come from the following furnaces: Three lead blast furnaces, two liquation furnaces, five softening furnaces, and all the lead-refining furnaces and kettles. At first it was intended to install a treater having four sections of the same size as those specified above, and three electrical units. In fact, three 15-k.v.a., 200- to 100,000 volt transformers and three motor-generator sets were ordered from the Westinghouse Electric & Manufacturing Co. On account of the delay in shipment of this electrical equipment, due to labor troubles and difficulties of transportation caused by the Great War, the size of the treater was reduced and temporary electrical machines were substituted until those from the Westinghouse company could be obtained.

The Kamioka smeltery is situated in the heart of the sericulture district, and the residents in the vicinity made strenuous objections, demanding heavy indemnities, as they claimed that the smeltery smoke damaged the mulberry leaves and killed the silk worms. Therefore, every effort was made to complete and start the Cottrell plant at an early date. The temporary electrical machines supplied by the Metallurgical Research Institute consisted of high-tension transformers, the voltage of which was regulated by an induction regulator and "K-1" type rectifiers driven by synchronous motors. The precipitator worked continuously without trouble, and from 2,200 to 3,300 lb. of dust per twenty-four hours was collected, even though temporary electrical equipment was being used. Recently the Westinghouse equipment arrived and has now been installed. Analysis of the treater precipitate is as follows:

Per Cent		Per Cent	
SO ₂	0.63	As	19.65
Zn	1.68	Pb	37.25
Ag, oz. per ton	1.5	Cu	Trace
Au	Trace	Bi	0.16
Insol. in HCl	0.31	Fe	0.16
Moisture	0.90	Total S	5.91
		Free S	1.13

The treater charging voltage is about 70,000, and the power consumption is approximately 6 kw. Not only has the Cottrell process settled the smoke nuisance problem, but it has also been the means of saving dust which is valuable to the smelter because of its high metallic content. This installation, although not large in size, may be taken as the most striking example in Japan of the benefits which may be derived both by the public and the smelters.

Naoshima Smeltery, Mitsubishi Mining Co.

The erection of this smeltery was permitted by the government on condition that the gases would be cleaned by the Cottrell process. The operation of the treaters was therefore begun when the smelter was blown in in March of this year (1919). The treater consists of five units, each containing sixty-four lock-seam pipes arranged in a square (or a total of 320 pipes). These pipes, manufactured by the Robertson Bros. Co., of Chicago, are 12½ in. inside diameter by 16 ft. long and are of No. 14 gage sheet steel. The treater was designed for a capacity of 80,000 cu. ft. per min., assuming a velocity

through the pipes of 5 ft. per sec. The fumes from the lead furnaces, and from the McDougall roasters and converters of the copper smeltery, are mixed and then treated by the precipitator. Natural draft is furnished by a stack 150 ft. high and 10 ft. inside diameter. The electrical equipment consists of three Westinghouse units, the same as those described above for the Kamioka smeltery. As the delivery of these machines was delayed, the plant was started using temporary machines, as at Kamioka.

The smeltery being only recently started, the furnaces are not yet running at their full capacity, and the gas volume handled runs from 40,000 to 45,000 cu. ft. per min. The efficiency of precipitation is so high that the stack is practically smokeless, and the people scarcely realize that such a large smeltery, producing hundreds of tons of copper and lead every month, is in that locality. The dust collected every twenty-four hours amounts to about 3,300 lb., and its analysis is as follows:

	Per Cent		Per Cent
Au	Trace	Cu	2.30
Ag, oz. per ton	2.9	Pb	22.54
Sb	3.14	Fe	11.20
Zn	3.29	S	12.00
Loss on heating	25.68	As	13.43

After much study and discussion, sixty-four pipes, arranged in a square, as designed for the Naoshima

by an exhaust fan and are discharged from the old stack into the atmosphere. Two sets of electrical equipment, one unit being spare, and each consisting of a 15-k.v.a., 200 to 100,000 volt, 60-cycle, single-phase transformer, and a motor-generator set, were ordered from the Westinghouse Electric & Manufacturing Co. In January of 1919, this treater was started, using a temporary electrical equipment.

At the first trial, the treater showed good efficiency. This efficiency lasted only two days, and then the operation became so unsatisfactory that the diminution of smoke was scarcely perceptible even when the treater was charged with a high potential. After experimenting in various ways, it was decided to humidify the gases, a practice which was found necessary for satisfactory precipitation in several American plants. A dozen orchard spray nozzles of 1/16-in. diameter, arranged in the dust chamber, using water at 120 lb. per sq. in., injected a fine spray into the gases before they entered the treater. Precipitation was conspicuously improved and the efficiency raised to about 95 per cent. Now, the operator can raise the charging voltage to 80,000 volts while the current is only approximately 30 amperes. When, in order to examine the effect upon precipitation, the water sprays are turned off, the charging potential drops and the current increases so that the efficiency becomes as low as 50 per cent. This experiment shows that smeltery smoke, difficult to precipitate on account of its non-conductive properties, may be treated easily by being humidified. The amount of dust precipitated per twenty-four hours is about 1,350 lb., and its analysis is as follows:

	Per Cent		Per Cent
Zn	6.80	Ag, oz. per ton	0.2
CaO	0.30	Pb	7.80
MgO	Trace	Cu	0.50
SiO ₂	1.05	Bi	2.48
S	12.17	As	32.39
SO ₂	6.78	Sb	Trace
H ₂ O	5.40	Sn	10.80
C, etc.	12.32	Fe	1.01
		Al ₂ O ₃	0.20

Nikko Electrolytic Copper Refinery—Furukawa Mining Co.

The gases from two cupellation and two reduction furnaces are treated to recover silver-bearing lead dust. The treater consists of one section of thirty-two pipes, arranged in a rectangle 8 x 4 ft. These pipes, manufactured by the Western Pipe & Steel Co., are 12½ in. inside diameter by 16 ft. long, and are of No. 14 gage steel plate. The treater was designed to handle a gas volume of 8,200 cu. ft. per min. The actual volume is about 6,500 cu. ft. at a temperature of from 100 degrees to 200 degrees C., and is drawn through the treater by an exhaust fan. The electrical equipment consists of a 10-k.v.a. 50-cycle, 200- to 100,000-volt transformer, manufactured by the American Transformer Co., and a rectifier of the rotary-arm type, 30-in. in diameter, supplied by the Research Corporation of New York. The rectifier is driven by a 1½-hp. 220-volt, three-phase, Westinghouse synchronous motor. The transformer has taps on the low-tension windings which will give voltages of 50,000, 62,500, 75,000, 87,500 and 100,000 on the secondary. These taps, together with a rheostat of a few ohms' resistance in the transformer primary



THE IKUNO SMELTERY, SHOWING TREATER AT THE RIGHT OF STACK. PHOTOS TAKEN BEFORE SPRAYS WERE USED.

treater, were chosen as the standard treater unit by the Metallurgical Research Institute. For small plants, thirty-two pipes, arranged in a rectangle of 8 x 4 ft., or half the size of the standard unit, are used. This plan was adopted to facilitate the design and erection of plants, the object being to benefit by the standardization of parts.

Ikuno Smeltery, Mitsubishi Mining Co.

The treater at the Ikuno smeltery handles the gases from two blast furnaces smelting copper ores. It consists of two sections, each having sixty-four lock-seam pipes, arranged in a square (or a total of 128 pipes). These pipes are 12½ in. inside diameter and 16 ft. in length, and are of No. 14 gage sheet steel. The gases, after passing through an old dust chamber, are drawn through the treater

circuit, are sufficient to produce any desired voltage. The treater was started in May of this year (1919). The analysis of the precipitation dust is as follows:

Pb	Per Cent	Au	Per Cent
Se	54.90	Nil	165.0
	14.23	Ag, oz. per ton	0.23

The amount of the precipitate is about 100 lb. per twenty-four hours. The power consumption is comparatively high, being from 2.5 to 5 kw.

One more Cottrell treater was to have been built, but delay in delivery of the building materials and electrical machinery has compelled its erection to be temporarily suspended. This treater, of 256 pipes, was to have been installed at the Miike lead smeltery of the Mitsui Mining Co. When times become more settled the smeltery will undoubtedly be finished and the Cottrell treaters used.

Chronology of Mining, October, 1919

Oct. 1.—National Safety Council opened its annual congress at Cleveland, Ohio.

Oct. 3.—American Foundrymen's Association annual meeting at Philadelphia ended.—Governor Boyle of Nevada announced end of strike of miners at Tonopah and Divide.

Oct. 6.—National Industrial Conference called to order at Washington by William B. Wilson, Secretary of Labor.—Mine taxation conference held in Washington, the mine taxation committee of the A. I. M. E. and representatives of the income tax unit of the Bureau of Internal Revenue participating.

Oct. 7.—Shareholders of New Baltic and New Arcadian copper companies, of northern Michigan, approved plan to merge companies.—Decision in case of Arctic Iron Co. vs. Cleveland Cliffs Iron Co. and Mr. Mather handed down by U. S. Circuit Court of Appeals in favor of defendant, the Cleveland Cliffs company.—House passed magnesite tariff bill.—General anti-dumping bill introduced by Senator Smoot, pending passage of new protective tariff legislation.—Strike of metal crafts in Butte, Mont., ended after two months' duration, the strikers losing.—Miners in Republic district of Washington demanded \$1 wage increase resulting in closing down of mines.

Oct. 8.—Strike of miners and millmen in Coeur d'Alene district, Idaho, called off by International Union of Mine, Mill & Smelter Workers.

Oct. 9.—House voted to repeal Canadian Reciprocity Act.

Oct. 19.—Mine Rescue and First Aid Association of Globe-Miami district, Ariz., opened "Safety-First Week" program.

Oct. 21.—Completion of Montana Southern Ry. from Divide, Mont. to Elkhorn, Mont., announced.

Oct. 24.—American Iron & Steel Institute opened its sixteenth general meeting at Hotel Commodore, New York.

Oct. 30.—General leasing bill passed by House.—Old Pandora mill of Smuggler Union Mining Co., at Telluride, Col., burned down.

Monthly Copper Production in 1919

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE COPPER PRODUCTION, 1919

	August	September	October	November
Alaska Shipments (c)	1,333,009	6,208,840	4,210,274	6,067,735
Arizona:				
Arizona Copper	2,300,000	2,300,000	2,500,000	2,500,000
Calumet & Arizona	1,814,000	1,104,000	5,398,000	6,320,000
Cons. Ariz. Smelting	650,000	600,000	625,000	
Inspiration	6,500,000	5,800,000	7,000,000	7,000,000
Magma	638,483	770,357	934,511	
Miami	3,699,120	4,139,103	4,877,353	3,718,985
New Cornelia (a)	3,006,000	3,092,000	2,604,000	2,896,000
Old Dominion	1,937,000	2,460,000	2,265,000	2,261,000
Phelps Dodge	7,159,731	6,102,000	5,873,000	6,453,000
Ray	4,805,000	3,850,000	3,000,000	
Shattuck Arizona	388,027	70,412	157,589	238,969
United Verde	4,970,000	4,990,000	5,000,000	5,100,000
United Verde Extension	3,275,452	3,247,216	3,790,892	2,288,414
Michigan:				
Calumet & Hecla	7,586,601	8,305,991	9,715,740	
Other Lake Superior (b)	8,826,000	6,490,000	6,121,000	
Montana:				
Anaconda	12,600,000	12,780,000	15,000,000	14,120,000
East Butte	2,054,740	2,093,780	2,027,340	1,902,380
Nevada:				
Nevada Cons.	Nil	4,250,000	4,200,000	
New Mexico:				
Chino	3,321,857	3,538,704	3,287,905	
Utah:				
Utah Copper	8,640,000	8,220,092	9,525,700	
Eastern Smelters (b)	1,400,000	1,400,000	1,400,000	
Total reported	89,944,040	96,303,075	101,183,143	
Others, estimated	18,050,000	12,409,000	13,650,000	
Total United States	107,994,040	108,703,075	115,143,143	
Imports: Ore and concentrates, etc	7,434,970	12,918,092	10,469,111	
Imports in blister, etc	15,954,604	22,408,470	17,392,398	
Grand Total	131,383,614	144,337,637	143,004,652	
British Columbia:				
Granby Cons.	2,471,204	1,584,515		
Mexico:				
Boleo	1,597,040	1,477,280	1,708,560	
Cananea	4,200,000	4,200,000	4,000,000	3,900,000
Phelps Dodge Mexican Properties	3,422,000	2,827,000	3,053,000	2,331,000
Other foreign:				
Cerro de Pasco	5,726,000	5,266,000	5,652,000	4,752,000
Chile	8,594,210	7,044,000	6,800,000	
Katanga	5,026,488	4,340,064	4,916,258	
Bactus & Johnston	2,118,000	2,280,000	1,360,000	1,712,000

(a) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smelter. (b) Estimated. (c) Official figures of the U. S. Department of Commerce; includes Kennecott production from its Alaska mines.

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 were as follows:

	1918	1919
January	165,431,598	135,733,511
February	160,011,364	111,649,512
March	185,325,168	102,040,460
April	163,207,096	98,808,898
May	181,070,350	92,652,875
June	166,723,599	95,856,370
July	159,329,031	100,369,241
August	165,550,799	107,094,040
September	157,992,487	108,703,075
October	153,398,775	115,143,143

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Granby, Cananea, Braden, Cerro de Pasco, and Chile. As a matter of record, however, the individual figures are given after the total. We also report the copper output of the Boleo and Katanga companies, which does not come to the United States.

The Marlborough Oil Development Co. has been chartered by the State of South Carolina for the purpose of developing the oil prospects on the plantation of Cliff N. Jackson, near Five Points, S. C. The capital stock of the company is \$125,000.

Accident Prevention Akin to Good Sportsmanship

The American Smelting & Refining Co. Proves Its Theory That Co-operation of Employees May be Secured in a Spirit of True American Sport, Fair Play and Good Fellowship

BY J. F. BELFORD

Secretary of Labor, Safety, and Welfare Department, American Smelting & Refining Co.

IT MAY not be amiss to say that in the smelting and refining of the precious metals may be found a wider variety of the hazards of accident to its workers than in any other of the great industries, for its operations include important features of such industries as well as activities peculiarly relating to itself. Accident hazards that are found in commerce, transportation, mining, manufacturing, building, the iron and steel, and chemical industries also contribute to the dangers that are met in the smelting and refining of ores, and risks incident to two or more of these diversified industries may be found in a single smelting or refining operation. The industry, therefore, ranks well up on the scale of those enterprises, occupation in which is classified as hazardous.

The steady decline in the accident rates of the American Smelting & Refining Co. since the establishment of plant safety organizations, and more especially during the past year, has gone far to take that company off the list of those industries whose employment is still regarded as hazardous. So pronounced has been the reduction of accidents throughout the plants of the organization that it should be of more than passing interest to know of the work that has been done in accident prevention, and the methods which have been pursued toward its accomplishment.

Marked Reduction in Accidents Achieved

For the year 1914, at which time plant safety organizations had just begun to take a decisive hold of the problems confronting them, the average disabling accident rate per 1,000 employees per annum (based upon 3,000 working hours per man per year) for all plants was 233. At that time, too, available statistics show that quarry accidents ran as high as 187 per 1,000; that in ore dressing establishments the rate was 113; in auxiliary works (machine shops, carpenter shops, and like places), 170; in metal mines, 195; in smelting and refining establishments generally, 204; in the iron and steel industry, 160; in industrial railways, 145; and that 35 per cent of the accidents occurred during the first six months of employment.

For the first eight months of 1919 (on a yearly basis) the accident rate of the American Smelting & Refining Co. was 89 per 1,000, a reduction under its 1914 performance of over 61 per cent. During this latter period eleven of the nineteen smelting and refining plants scored a no-accident record for a month at least. Twenty-seven such records were made during that time. One plant, with an average of 285 employees, covering a period of 194 consecutive days without having a single disabling accident;

another, with an average of 500 employees, going four months consecutively without a disabling accident; and still another, with an employment average for the period of 847 men, went four months—three of them consecutively—without a disabling accident, its accident rate during the entire eight months—placed on a yearly basis—being only 27 per 1,000 employees per annum.

In 1914 the accident rate for fatal injuries was 1.25 per 1,000; for permanent injuries (not necessarily totally disabling), 4.32; and for the first eight months of 1919, based on the yearly basis, the fatal accident rate is .906, and the permanent injury rate is 1.81. The reduction in the accident rate under that of the preceding year, beginning with 1915, has been as follows: 1915 under 1914, 7 per cent; 1916, 9 per cent; 1917, 24 per cent; 1918, 28 per cent; first eight months 1919, 16 per cent.

How the Record was Accomplished

In the face of such a showing, indicating a steady and persistent decline in accidents in an industry that has been and still may be regarded as hazardous, the reasons why such an accomplishment has been made possible, and the conditions under which it has been effected, become important. With operations partaking, as has been said, of many of the important functions of other industries, a double responsibility rests upon management and employee, in such circumstances, to recognize all the risks incident to the general and the particular employment, to safeguard against each danger, wherever possible, and to exercise such watchfulness and care as should nullify all the hazards present.

If the responsibility were to be recognized and assumed, the company felt that it must be the pioneer in first setting its house in order. It began by doing all that was humanly possible to eliminate all dangers that were present in structure, in mechanical operations and appliances, in manual implements, and in environment. Side by side with the safeguarding of the plant the company carried on its educational campaign for safety and safe methods among the staff and the rank and file. Foremen's, workmen's, and general safety committees were formed and carried on with all the enthusiasm that could be injected into them. Safety inspectors were appointed, efficient methods encouraged, and a closer scrutiny was given to employment selection and the placing of employees in activities where they were the best fitted to serve.

During the last five years the company has expended in safeguards and their replacements over \$155,000, and its expenditures for the same period on account of safety has been over \$406,000. As a

part of the campaign for safety close attention was paid at the same time to welfare and service needs of the employees, and in this work it has expended over \$386,000 in the last five years. At the larger plants of the company, in addition to the regular medical staff, are visiting nurses, who aid the wives of the employees in the care of their children, give instruction in sanitation and hygiene, and are helpful in many ways. The expenditure for welfare and service covers the building and maintenance of pure water-supply systems, plant bath houses, lunch rooms, coffee stands, modern sanitary toilets, employees' clubhouses, children's playgrounds, baseball grounds, and the costs of moving-picture shows, musical entertainments, and other forms of amusement and education.

Value of Welfare and Service Work

Though the welfare and service work should not be technically considered as a part of nor be confused with the accident-prevention activities of the company, such work has had, in reality, a marked effect in creating a better understanding by the employee of the advantages of favorable hygienic and sanitary conditions in a plant as a spur to cleanliness, better health, a closer co-operation, and consequently more personal care in operations and fewer accidents.

Having given a visible expression of its desire to do all that was mechanically and physically possible to promote safety by safeguards, by the elimination of dangerous places, so far as could be done, and continuing to provide every facility for care and cleanliness and also having placed the safety educational features upon a basis where they could reach each employee, it was believed that the full co-operation of the employee was bound to follow and that the results looked for in accident prevention could be achieved. The record, as given, is proof of the co-operation between management and employees.

Details of Safety Measures Adopted

A glimpse at a few of the features of the methods in reaching the employees and securing their valuable assistance in helping them to help themselves along the path of safety should have an interest to employer and employee alike. The company proceeded on the theory that accident prevention was true sportsmanship; that sportsmanship was an American institution, innate in the native and quickly absorbed by the alien after he could get a view of and settle down to the American form of civilization; and, that the best elements of sportsmanship were found in our national game—baseball. If the men could be reached in the spirit of baseball they would play the game with every ounce of energy in them.

Baseball is the game that you can't job, that you can't throw, that you can't cheat in—and get away with it. Your hits must be clean, your base running honest, and you must beat the ball if you want to win. It calls for the highest type of team-work, energy, understanding, and a strong heart. It gives opportunity for the highest skill in finesse and of

individual play, double play, and mass performance, and though one man, by brilliant workmanship, may save his team or put over a shut-out, he doesn't win for himself alone, but for all concerned—himself, his team mates, his manager, his club, his league, his town or city.

In tossing out the ball for the first performance it is well to remember that bad ball can be played on a poor field, but good ball can't. A clean plant is like a baseball field. A player must have a clear way to make good running and good fielding. The grounds dry, the sacks whitewashed, the runways swept, the outfield mowed, the gong sounded, and the game begun, you have your eye on play and players.

The player must be awake—on the job every minute; keep his eye on the ball and the play, know the moves of the game, be at the right spot at the right instant, cover his particular station, and not be dead on his feet. He must know how to handle the implements of his calling and see to it that they are in good condition. He can't line out a home run with a split bat and a half-ripped ball. He must be a good judge of distance and of the other fellow; be quick to think in an emergency, and to think right. A muffed ball often brings in a home run for the opposing team. The player that can't hold on to the ball when it comes into his hands soon finds a place on the bench.

Cases of "Dropsy"

Seventy-five per cent of smelter accidents are hand-labor accidents. A large proportion of these are "dropsy" cases, where the employee lets something slip from his hands and drop on his feet. Get him in the habit of concentrating on his work and he can effect a self-cure of "dropsy." You've then developed a player who doesn't "muff the ball"; you've added to your "working team" an employee who isn't putting anything in the "error" column through bad play; you're reducing accidents.

The careless player, if he can remain in the game until the ivory is in plain sight, can throw away a world series, spike the bag holders, disrupt a club, and a riot call can't keep him out of the hands of the mob. He's a poor sport, who neither thinks of or for himself or for any one else; he's a piker, a welcher, a dangerous liability, a menace to his fellows, and a disgrace to the game. But there is hope and good material in the clumsy, willing fellow, for, with his heart in the game all he needs is training, encouragement, and practice to bring him around.

Manager, team captain, water boy, clubhouse rubber, mascot, are all part of a team's aggregation, and have their important functions in the game, but the club's standing, the batting, pitching, fielding performances, errors, assists, games won and lost, are the accomplishments or failures of the players themselves. Given an understanding of the game, a realization of the individual and collective part of it, a knowledge of the necessity of being in the pink of condition and staying fit, each player will strive to his utmost to play the game for all there is in it, and play it fair.

It was believed that, having organized and put on a sound running basis the workmen's safety committees—of which each employee must at some time become an active working member—if the employees themselves could conduct these meetings in their own way, but with the backing and encouragement of the management, they, the workmen, would show their true sportsmanship, would eliminate the slackers and boneheads, educate the butter-fingered, clumsy recruit, and play the safety game in championship form.

Pursuing the simile further, the safety inspector occupies the relative position of a team business manager, who looks over the field and makes report of its condition. If he finds a bit of bad ground it is reported and fixed. He inspects the paraphernalia and sees that the working tools are in good condition and fit for the players. If they are not, they go into the discard or to the repair shop. He consults with and advises the foreman—the field captain—in all matters concerning the rules, good practice, and bad play. He may suggest taking a man out of the game or placing him in another position where he can make a safe play. At all "team meetings" he is on hand, coming in close contact with the men and giving counsel or inviting suggestions.

Foreman Is the Captain of the Team

The foreman is field captain of his "department team," and he is looked to and expected to win with a no-accident "shut-out." He is held to strict responsibility and account for all accidents that happen to his men. He must assume the burden of proof that it is through no oversight of his, either in instruction (coaching) or play that an accident occurs; through no failure of commission or omission on his part that some bonehead stunt sends one of his men back to the bench. He is required to instruct each man under him in the safety rules and practices and to see that he observes them. The blame for an accident is lifted from the foreman only when it is shown that there has been no negligence on his part and that the accident was wholly beyond his power to prevent. He is encouraged by the management to give every aid and assistance in his power to each man in acquainting him with and helping him to master all the details and intricacies of his game; to arouse a comradeship that will develop teamwork and friendly co-operation to the highest degree, and to invite suggestions from his men as to safer and better methods.

Finally, one must come to those who at one time or another were themselves real participants in the field; who have perhaps covered every sack and station, and who are now the real backbone of the game—for without the Fan the game languishes and grows stale. Who, but the Fan, can put the real "pep" into the play; who sees the move before it is executed; who can cheer or "tie the can"; who can encourage with his enthusiasm or take the heart out of the sport?

Fortunate for the safety game of the American Smelting & Refining Co. its managers and superintendents are "nth" degree Safety Fans, and many

of them premier coaches who are there with the advice that brings in the run; and through their encouragement, active personal interest and concern in all matters relating to accident prevention have built up a confidence and real enthusiasm among the men that has made the record possible.

Battles are won off as well as on the field, and there is a strategy of sport as well as of war, and it is at the clubhouse (foremen's, workmen's and general safety committee meetings) that past performances are analyzed, new plays considered, and campaigns laid out.

Impressing the Value of "Safety First"

And so it is that at the respective safety meetings, where men can get together, become better acquainted, and frankly and freely discuss the matters before them, where every accident that has happened since the last meeting is thoroughly dissected and analyzed, and every unsafe place or practice noted is gone over, and where every suggestion for betterment is considered, the employees learn that carelessness is bad sportsmanship.

Every workman is encouraged to enter into the discussions at these meetings, to make such criticisms as he may desire, and to offer any suggestions that he may have, and these are fully considered and acted upon by the management.

Recognition and reward are given for good work in accident prevention, and the employees themselves are now the first to criticize and condemn the careless acts of their fellows. In addition to the stimulation given to the safety movement by the personal active interest of the managements; by the various safety committees; by the individual work of foremen and employees, and through safety publications and bulletins, there is issued each month and posted on the various plant bulletin boards a target, with the center as a no-accident bull's eye, showing the relative position of each plant with reference to a perfect score. The employees everywhere are thus shown how their work in accident prevention compares with that at the other plants. A pennant is given each year to the plant having the lowest accident rate for the preceding year. For three years the Omaha plant has successively won the pennant, but with such a spirited rivalry and a continued closer approach of the contenders that it will probably take the "official returns" to determine the 1919 winner.

The unmistakable fact in it all is that the employees generally no longer regard accidents as mere hazards of employment or as the common happenings of a day's work, but things that can be avoided if each one grasps a proper appreciation of himself, his surroundings and his fellows; that carelessness is poor sportsmanship, for it lacks that appreciation: that it is

". . . the close co-operation that
Makes them win the day.
It ain't the individual, nor the
Army as a whole,
But the everlastin' teamwork
Of every bloomin' soul."

Henry Clay Frick

Noted Financier Was One of the Most Prominent Figures in the Development of the American Steel Industry—Secured Control of Coal Land and Developed Coke Production Early Associate of Carnegie

IN THE death of Henry Clay Frick, on Dec. 2, at the age of seventy, America has lost another man who figured largely in the development of the country's steel industry. Although not as well known to the public in recent years as Carnegie, Mr. Frick took an equally active part in the industrial life of the country. He was averse to publicity, and had not it been for events connected with the Homestead strike in 1892, he might have remained almost unknown to most of the men in his organization. He was a giant of big business, and played the game

this fuel in its relation to the manufacture of steel. His business sagacity led him to secure control of as much coal land and as many coke ovens as possible, and in this he was assisted materially by the panic of 1873, which threw many valuable holdings on the market. At that time coke could be bought at 90c. per ton. Later it advanced to \$5, and, with the corresponding increase in the value of the wherewithal for making it, Frick became a millionaire before he was thirty years old.

Mr. Frick soon became associated with Andrew Carnegie, as the steel and coke business had become necessary complements. He exchanged a part of his interest for shares in Carnegie Brothers, of Pittsburgh, and had been made chairman of the board of managers when the labor troubles occurred in 1892. Frick insisted that the owner of a property could do with it as he pleased, and he resisted all efforts of the labor element to change working conditions. The result was one of the bloodiest labor disputes in American history. The strikers seized and fortified the Homestead works and had an armed battle with 300 detectives brought by Frick to restore order. Ten men were killed. Eight thousand National Guard troops were then called out, and in a few weeks order was restored. It was at this time that Alexander Berkman, the anarchist, who, with Emma Goldman, was recently deported from the country, attacked Frick in his office and came very near taking his life. For this crime Berkman served almost fourteen years in jail.



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HENRY CLAY FRICK

on an equal footing with men like Carnegie, Morgan, and Schwab.

Starting life a poor farmer boy, the story of his rapid accumulation of wealth is one of those romances of American business with which the magazine-reading public has become familiar. He was born Dec. 19, 1849, and until he was sixteen divided his time between school, his father's farm, and the Overholt distillery, owned by his grandfather, where he kept the books. He attended Otterbein University for one year, leaving to go into the coke business.

Frick's home was in the center of the coke-producing district, and he realized the importance of

Business rivalry between Carnegie and Frick later developed into a bitter estrangement, which was never healed. Frick's animosity also extended to Schwab, and he was successful in ousting him from the presidency of the U. S. Steel Corporation through power obtained by the purchase of steel stock during the hard times of 1903. In the last ten years Frick had acted largely in an advisory capacity to the numerous big corporations in whose directorate he was represented.

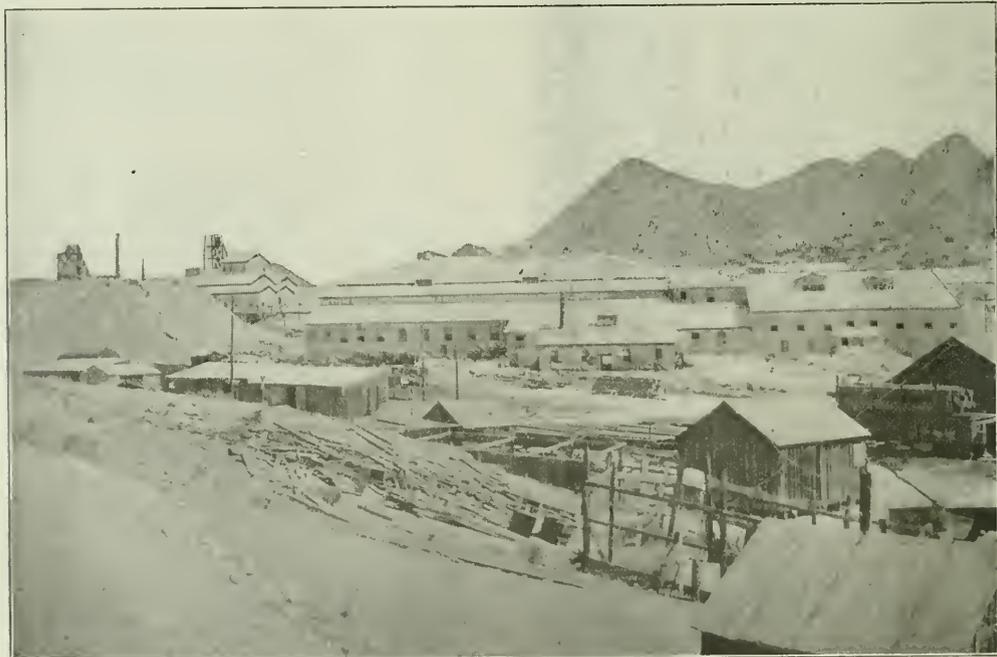
One of the principal reasons for Frick's financial success was his ability to keep his affairs in such a condition that he was able to take advantage of, rather than be harmed by, trade panics and depressions.

During his life Frick accumulated incomparably the finest private art collection in the world. This has been placed in a palatial building at Fifth Ave., at Seventieth St., New York City, and it is planned to make it a public gallery. Much of his money was devoted to private philanthropy which never became known to the public.

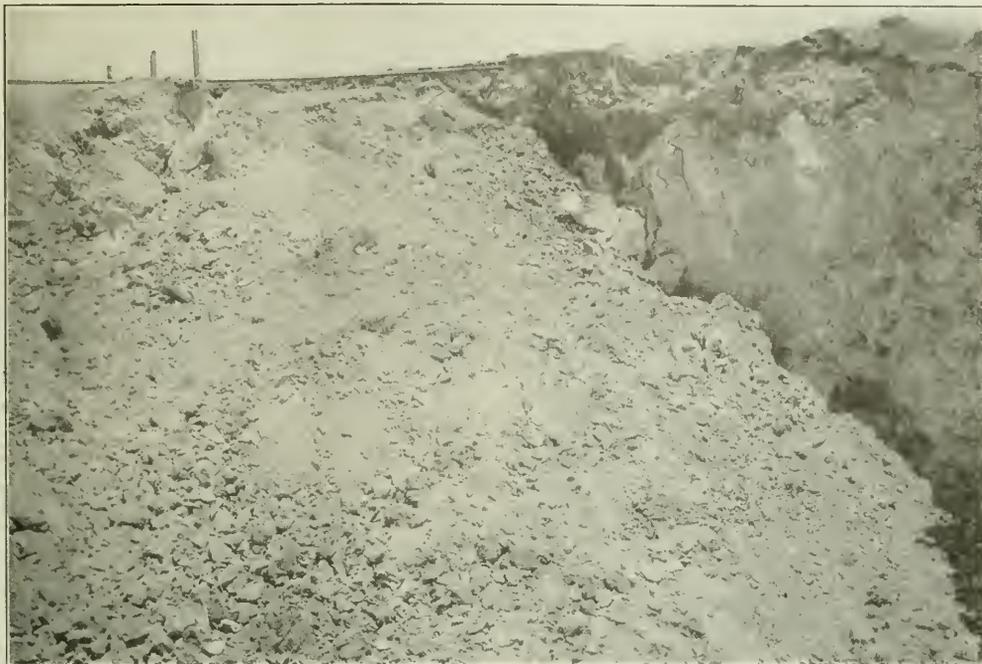
Photographs From Nevada



MILL OF WEST END CONSOLIDATED MINING CO., TONOPAH, NEV.



TONOPAH EXTENSION MILL, WITH MAC NAMARA MILL AT LEFT BACKGROUND, TONOPAH, NEV.



BEGINNING OF BLASTING OPERATIONS ON GOLDFIELD DEVELOPMENT CO. GROUND, GOLDFIELD, NEV.



MILL OF TONOPAH-BELMONT DEVELOPMENT CO. AT TONOPAH, NEV.

PETROLEUM SECTION

Engineering Notes and Equipment Details
Production Statistics—Progress
in Important Fields

To Develop B. C. Oil Lands

New Company Formed to Consolidate Individual Claims
in Southeast Kootenay Will Lease Part
of Holdings for Prospecting

FROM Eastern Canada comes the report that an organization calling itself the Amalgamated Oil Co., Ltd., after obtaining satisfactory reports from government and other geologists, has acquired considerable holdings in southeast Kootenay, to the end that the ground may be thoroughly prospected for oil. The company claims to have acquired a lease of 30,000 acres in the vicinity of Sage Creek, giving it the right of acquiring complete possession through crown grants at a cost of from \$10 to \$20 an acre. A tract of 4,886 acres has been leased to the Crow's Nest Oil Co., of Spokane, and associates on a royalty basis, with option to purchase at \$500 an acre. This company is drilling and is now down 1,800 ft. in one well.

Negotiations are in progress with one of the strongest U. S. companies toward leasing half of the remainder of the Amalgamated's property on a royalty basis, also with an option to purchase at \$500 an acre. Both of these leases include an obligation of the lessee to do certain development work. The company at present does not intend to operate, but will await the results of the development work being done on the property by the lessees.

"The business of looking for oil," according to the prospectus, "is always a speculation. There is nothing new in this statement, and the public knows it as well as the directors. The directors, however, believe that they have obtained the best advice available, and feel confident that their programme will result in what they consider one of the best prospects in Canada receiving a thorough testing.

"The indications of oil and gas at depth have been reported as most satisfactory, and analyses show that oil to be of extremely high grade and its value much higher than the average. Should oil be found in commercial quantities not only the shareholders but the whole country will benefit."

Inquiry in Victoria shows that the consolidation, under the control of one organization, of leases to land in southeast Kootenay held by individuals and by companies is in process. These leases in many instances were issued years ago, and prospecting for oil in some cases was undertaken. Not a few are in arrears in payment of government fees, action against the owners having been held up by the terms of the Relief Act which was brought into force for the duration of the war. With the war over, steps

will no doubt be taken to secure delinquent payments, and it is probable that the lessees, in assigning their properties to the new company, will pay up their arrears to the government. The Canadian people would welcome the thorough prospecting of these lands for oil or for any other natural resource which would be an asset to the country. The district has been mentioned by several authorities as a possible oil producer.

Petroleum in the Pacific*

Exploitation of Promising Petroleum Lands in Papua
by the Australian Government—Native Labor
Inefficient and Much Preliminary
Sanitation Necessary

RICH mineral deposits of various kinds, such as nickel, copper, chrome, and phosphate rock, have been exploited in the Pacific Islands, and the discovery of petroleum was long anticipated. Today it is known that there are parts of Papua (British New Guinea) and the late German colony in New Guinea exceedingly rich in petroleum deposits. These are believed to be a continuation of the proved deposits of the same belt which runs through Java, Sumatra, Timor, Borneo, Celebes, Ceram, and Dutch New Guinea. This belief is supported by the fact, testified to by experts, that the oil obtained so far in Papua is of the same type as the oil taken from the above-named islands.

Though private enterprise is desirous of thoroughly exploiting the deposits of Papua and German New Guinea, and is perfectly satisfied that the deposits are valuable and extensive, the federal government of Australia is exploiting the Papuan fields and prospects, and it is expected to undertake prospecting for deposits in what was German New Guinea. During the last five years the war has hampered both prospecting and work in the proved fields. The federal government has spent to date over £100,000 in pioneering work. Private enterprise has offered, and is ready to expend, ten times as much and place on the fields the labor and all the accessories for the production of the oil.

At the present time the British Empire is short of commercial oil. The opening up of oil fields such as those of the Pacific islands will bring far-reaching benefits to the whole of the empire. It has been proved by scientific exploration that the oil-bearing areas are extensive; experiment has shown that the oil is of a high grade, and it needs only the push and determination of British enterprise and adequate

*Commerce Reports, Nov. 10, 1919.

capital to develop petroleum industries in Papua and German New Guinea that will make the British Empire independent of supply elsewhere. Rumor has it that the Admiralty has long been aware of the vast possibilities of the Papuan oil fields, and that in sympathy with the Australian government these fields were held in reserve for some great commercial movement of the future; but in the meantime, should naval oil supplies run short from present sources of supply, the Papuan fields can be worked and opened up at a moment's notice. This, of course, may be mere island gossip.

Surveys of the oil fields of Papua and German New Guinea by British, American, and German scientists have definitely proved the value of the oil of these territories. Yet in both Papua and German New Guinea there are difficulties in the way of the present development on a large scale of this or any other industry. The question of native labor is a very serious one. Not that there is an actual shortage of this labor, for labor is plentiful, but it will not work. Then, when compared with the labor available in the oil fields of some other parts of the world, the native labor of the Pacific Islands can not be considered cheap. Wages vary from 10s. to £2 (\$2.43 to \$9.73) per month for laborers and overseers, or "boss" boys, but in addition to wages (and this is where the greater cost comes in), native labor has to be fed and housed in a most extravagant and wasteful manner. There is also the cost of recruiting from native villages, and this entails much expenditure in shipping and highly-paid and experienced management.

There are no railways in Papua and German New Guinea, and the construction of roads is slow and costly. These disadvantages would at present encumber private enterprise unless it was allowed full freedom of action and was liberally provided with capital. The introduction of suitable coolie labor, say, from Java or India, would solve the labor difficulty.

A Large Variety of Byproducts Obtainable

The oils obtained from the territories vary considerably in composition, and a large variety of byproducts can be distilled therefrom. Benzine, kerosene, lubricating oil, oil fuel, and paraffin wax are some of the products taken from the oils of Sumatra and Borneo, and it is reckoned that Papuan and German New Guinea oils have the same qualities, as they appear to belong to the same oil belt.

Malaria, a tropical fever common, but not dangerous, in Papua and the whole of German New Guinea, has checked wide prospecting for oil, but it is a noteworthy fact that once the clearing of jungle along the lines of oil wells begins this distressing fever departs. This is a factor of great importance in assuring the successful establishment of an industry in these territories. For the last five years, or even longer perhaps, white men have been engaged in boring for oil in the Vaiala River district of Papua, and malaria was a troublesome item in the prospecting and pioneering days. As soon as oil was

tapped and came to the surface the changed conditions led to the rapid destruction of the poisonous mosquito, and there were fewer cases of malaria.

Motor Oils

The Present Production and Qualities of Gasoline—Gravity Test Not of Importance—Oil Shale Products and Alcohol Promising Substitutes

THE use of vehicles propelled by internal-combustion engines is rapidly increasing, and the production of the raw material (crude petroleum) from which the most important type of motor fuel (gasoline) is obtained shows signs of reaching a maximum in the near future. Resources of crude petroleum are obviously limited, and the Bureau of Mines believes it desirable that conservation and efficiency in the production and utilization of gasoline be promoted.

Before attempting to arouse interest in any movement toward conservation of fuel, it is desirable that the facts concerning the present gasoline situation be understood. A paper has, therefore, been prepared which discusses the production, marketing, and use of gasoline, the physical and chemical properties of products now in the market, and present tendencies in the development of gasoline substitutes.

Three general methods for the production of gasoline are in use:

1. The "straight refinery" process, involving distillation of crude petroleum, with subsequent chemical treatment and redistillation of the volatile fractions.

2. The "casinghead" gasoline process, involving the extraction (by compression or absorption) of liquid constituents from certain types of natural gas.

3. The cracking process, involving the decomposition of heavy petroleum distillates under heat and pressure with the formation of gasoline.

The three types of gasoline differ somewhat in physical or chemical properties, but are all entirely satisfactory as motor fuel if properly produced.

The production of gasoline has increased from approximately thirteen million barrels for the year 1909 to over eighty-five million barrels for 1918, a gain of about 560 per cent. The production of crude oil in the United States has, during the same period, increased only about 95 per cent, though the number of cars and trucks in service has increased about 1,700 per cent. This means that, although the petroleum refiner has increased his efficiency more than has the producer, he has not kept pace with the manufacturer of automotive vehicles. The possibility of a motor-fuel shortage in the reasonably near future, unless other sources of supply are developed, is indicated by these figures.

Certain seasonal variations in the production, consumption and storage of gasoline may be noted. Production decreases slightly in the winter months and is at a maximum in the summer.

*Abstract of an address delivered before the Franklin Institute, Philadelphia, Pa., Dec. 11, by E. W. Dean, Petroleum Chemist of the Bureau of Mines.

Mapping of Oil Wells

Control of Water by Subsurface Correlations—Illustrations of Properly Made Charts From Drillers' Reports to Indicate Underground Conditions—Knowledge of Position of Oil and Water Sands Vital for Economical Work

BY S. S. LANGLEY

ACCURATE mapping of subsurface structure and mechanical conditions is as necessary in oil operations as in metal mining. The metal miner would not think of operating without accurate underground surveys, yet many large oil operators have no records to show the condition of their oil reserves, although these reserves are their only means of remaining in business. Of course, it is not possible to see the underground workings in oil operations, as it is in metal mining, but accurate maps can be drawn if detailed records are demanded and obtained from the drilling crews.

Fig. 1 is a field map of 160 acres of producing oil land, the surface of which is so completely covered with wash that no exposures of structure are visible to indicate the dip or strike of the oil-bearing strata. The wells average 1,000 ft. in depth, with a daily production of thirty barrels of twelve to fifteen gravity asphalt-base oil.

The tar and oil sands are so lenticular that accurate correlation of the structure, as shown by drilling, is the only means of solving the problems of water control intelligently. Mapping of the underground structure has shown this field to lie on the gently dipping southwest flank of a fold the strike of which is approximately north forty-five degrees west. The exchange of information between the various companies operating in this field has shown that the

water when tested, because the attempt to cement the 10-in. casing at 780 ft. was a failure, and the water shown at "A" has its source in the tar sand "B." The proof of this is that at correlative depths in Wells Nos. 1, 3, and 4, this oil sand does not carry water.

If no records were available, it would be reasonable to suppose that the sand at "A" in No. 2 was the same as the tar sand which shows water in Wells

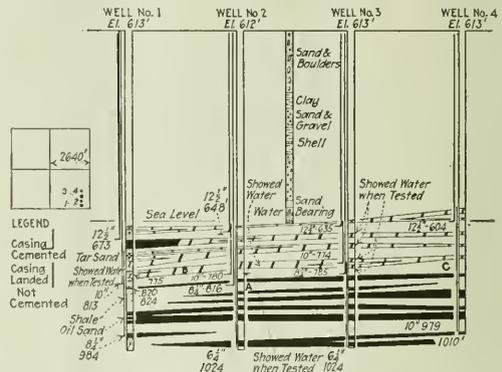


FIG. 2. CROSS-SECTION THROUGH WELLS NOS. 1, 2, 3 AND 4

Nos. 1 and 3, and, accepting that belief, to make no attempt to re-cement the 10-in. casing between the tar and oil sands. With the correct condition graphically shown, it becomes evident that if a shut-off is not made above "A," the water will enter the oil sand in No. 2 at "A," and, migrating from No. 2, its damage will be limited only by the amount and hydrostatic head of the water carried by the tar sand "B."

It is evident that Well No. 4 ultimately will require re-drilling and a second string of casing cemented in the shale break at "C" between the lowest tar and the highest oil sand. This is inevitable, as the edge-water originating in the tar sands, as shown in Nos. 1, 2, and 3, will rise along the fold and appear in this and all the upper wells, which, by correlation, are known to penetrate these tar sands.

Notwithstanding that the field operations have been closely followed by mapping, full advantage has not been taken of available knowledge. Fig. 2 shows that the two lowest tar sands in Well No. 3 are branches of the same sand, and as the upper carried water, the lower must also be water bearing. Had this fact been recognized, the 10-in. casing would have been cemented at 785 instead of at 774, with the

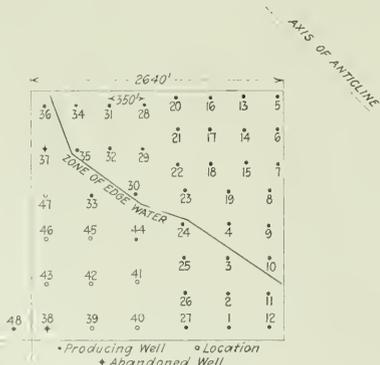


FIG. 1. FIELD MAP OF 160 ACRES OF OIL LAND

fold is an anticline whose axis is about five hundred feet northeast of Well No. 5.

Fig. 2 is a cross-section through Wells Nos. 1, 2, 3, and 4. A comparison of the depths at which the casing of the wells has been cemented shows that all but No. 4 have water-bearing tar sands lying between the highest oil stratum and the highest tar sand. The oil sand at "A" in Well No. 2 showed

8 1/4-in. casing landed as the oil string, thus saving one string of casing.

It will be noticed that the 12 1/2-in. casing is cemented in the first shale or clay stratum below the first or second tar sand. This is due to the fact that the wells were drilled by rotary to the point of cementing the 12 1/2-in. casing before enough wells had been completed by cable tools to show that the point of shut-off for this casing should have been the shale break between the lowest tar and the highest oil sand.

Fig. 3 is a cross-section parallel to the axis of the fold, and shows water-bearing sands in Wells Nos. 12 and 25 correlative with the wet sands of Well No.

any other effort to control the water in other wells will be nullified.

Fig. 4 shows the extension of the edge-water down the flank of the fold to Well No. 38, and, also, the height to which it has risen, corroborating the condition indicated in Fig. 2. The water-bearing sands in No. 38 at 762 and 785 ft. are correlative with those in No. 24 and 725 and 742 ft. In Well No. 24, these sands have been shut off from the lower oil sands, but have not been shut off in No. 38 from the sands at 875 and 920 ft. If the sands at 875 and 920 ft. were dry in No. 38, they would be a channel for the migration of water to the oil sands of No. 24 unless thoroughly slimed. As these sands themselves carry water, it is evident that there should be a water string cemented in No. 24 below the sands at 842 to 860 and 872 ft., but above the sand at 900 ft. Referred to Well No. 19, these conditions show that when this well is re-drilled for shut-off of edge-water, the second water string should be cemented in the shale logged at 840 to 860 ft. If this is done,

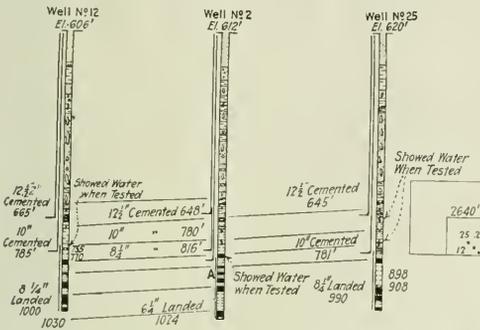


FIG. 3. CROSS-SECTION PARALLEL TO THE AXIS OF THE FOLD

2. As the correlative sands of Well No. 4 (see Fig. 2) are dry, the indications are that wells in the same relative position on the fold as No. 4 will also be dry, and, conversely, that wells situated similarly to Nos. 1, 2, 3, 12, and 25 will encounter edge-water. If

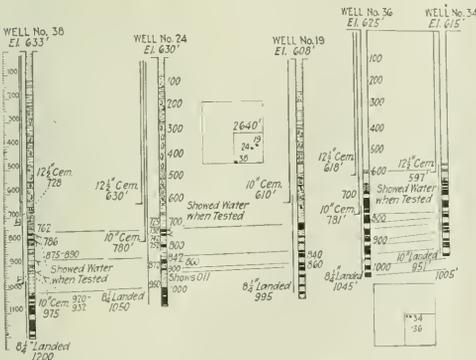


FIG. 4. WELLS NOS. 38, 24, AND 19, SHOWING EXTENSION OF EDGE-WATER TO WELL NO. 38. WELLS NOS. 36 AND 34. THE FORMER IN THE ZONE OF EDGE-WATER.

this proves true, then all of the wells yet to be drilled (Fig. 1) will be in the zone of edge-water.

Fig. 3 further illustrates the necessity of a shut-off in Well No. 2, between the lowest tar and the highest oil sand. If this condition is not corrected,

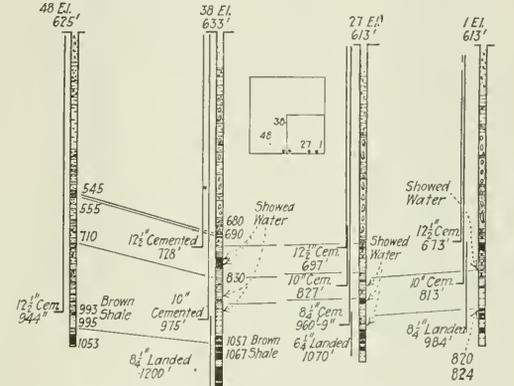


FIG. 5. CORRELATIONS OBSERVED IN DRILLING WELL NO. 48

and all formations are slimed, the lower productive sands will be protected in this and adjoining wells.

Fig. 4 shows Well No. 36 to be in the zone of edge-water, and No. 34 is east of this zone. Examination of the remaining well logs shows the line of demarcation to be as it is drawn on the field map (Fig. 1).

With the extent of the edge-water known, it is at once evident that Wells Nos. 10, 4, 30, 35, and 34 will soon show water. When these wells produce water, the source will be known, and the second water string cemented at the correct depth without a long and expensive series of bridges and tests on the sands of each well. The first clay or shale stratum below the lowest correlative wet sands of Well No. 38 will be the marker to determine the depth of cementing.

A study of the facts revealed by the cross-section leads to the belief that the wells within the zone of edge-water are on the northeast flank of the syncline. The appearance of sands that are water-bearing without traces of tar or oil substances this belief.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Increased Appropriations Asked for Survey and Bureau of Mines

Appropriations totaling \$1,655,880 have been asked by the Secretary of the Interior for the U. S. Bureau of Mines during the coming fiscal year. The principal items making up that total are as follows: For investigation as to the causes of mine explosions, as to methods of mining especially in relation to safety of miners, as to appliances best adapted to prevent accidents, as to the use of explosives and electricity, and for other technologic research, \$454,010 (an increase of \$31,800 over the appropriation for the current fiscal year). For investigation of mineral fuels and unfinished mineral products belonging to or for the use of the United States, \$175,000 is asked, this being an increase of \$25,000.

The sum of \$250,000 is sought for investigations concerning mining, preparation, treatment, and utilization of ores and other mineral substances with the object of improving health conditions and increasing safety and efficiency, and also with the view to developing domestic sources of supply and substitutes for ores and mineral products particularly required for military or naval purposes or needed for economic independence of essential industries, and which have been largely imported heretofore. The sum requested represents an increase of \$150,000.

One hundred and fifty thousand dollars (an increase of \$25,000) is asked for investigations concerning the mining, preparation, treatment, and utilization of petroleum and natural gas. For expenses in connection with maintaining and operating existing mining experiment stations and for establishing the four remaining stations authorized by law, \$250,000, an increase of \$100,000, is desired; for operating mine rescue cars, \$180,250, an increase of \$25,583; for the purchase of an additional mine rescue car, \$40,000; for inspection of mines in Alaska, \$7,000; and for the purchase or lease of land for headquarters of mine rescue cars, and for the site of an experimental mine and a plant for studying explosives, \$19,000.

The total of appropriations asked for the U. S. Geological Survey is \$2,592,920. The principal items included in that amount are as follows: For geologic surveys in various portions of the United States, \$500,000 (an increase of \$152,926.50 over the appropriation for the current fiscal year); for continuing the investigation of the mineral resources of Alaska, \$100,000 (an increase of \$25,000); for preparation of the report of the mineral resources of the United States, including special inquiries as to statistics of production, distribution, and con-

sumption of the essential minerals, \$200,000 (an increase of \$90,000); for chemical and physical research relating to the geology of the United States, including research with a view to determining the geological conditions favorable to the presence of deposits of potash salts, \$60,000 (an increase of \$20,000); for gaging streams and determining the water supply of the United States, \$200,000 (an increase of \$25,000); for examination and classification of lands, \$400,000 (an increase of \$225,000); for engraving and printing geologic maps, \$140,000 (an increase of \$22,000); for a survey of power production and distribution in the United States, including the study of methods for the further utilization of water power, \$250,000.

Bureau of Standards to Widen Scope of Research Work

An increased amount of metallurgical research is planned by the U. S. Bureau of Standards for the next fiscal year. Congress has been asked to appropriate \$75,000 for an expansion of the work, which was carried on during the current fiscal year for \$25,000. The research is to include alloy steel, foundry practice, standards for metals and sands; casting, rolling, forging, and the properties of aluminum alloys; prevention of corrosion of metals and alloys; development of metal substitutes as for platinum; behavior of bearing metals; preparation of metal specifications; investigation of new metallurgical processes, and study of methods of conservation in metallurgical manufacture and products.

The work is to be conducted under the immediate supervision of two consulting metallurgists at \$3,600, one associate physicist at \$2,700, two associate physicists at \$2,500, one associate physicist at \$2,400, one associate physicist at \$2,200, an associate chemist at \$2,500, two assistant physicists at \$1,800, two assistant physicists at \$1,600, and an assistant chemist at \$1,400, four laboratory assistants at \$1,200, a machinist at \$1,600, and two machinists at \$1,200, in addition to the necessary clerks and laborers.

More Silver Dollars to Be Used in Settling Foreign Balances

Announcement was made on Dec. 6 that, under arrangement made between the Treasury and the Federal Reserve Board, standard silver dollars that are free in the Treasury will until further notice be delivered against other forms of money to the Division of Foreign Exchange of the Federal Reserve Board, which will, through the Federal Reserve Bank of New York, co-operating with the branches of

American banks in the Orient, employ such dollars in regulating American exchanges with silver standard countries. This arrangement does not, it is stated, affect the redemption of outstanding silver certificates in standard silver dollars.

Approximately 60,000,000 silver dollars, against which silver certificates were issued and cancelled, can be exported under the new policy formulated by Treasury officials in connection with members of the Federal Reserve Board. The International Banking Corporation, the Park-Union Foreign Banking Corporation, and the Asia Banking Corporation, the three American institutions with branches in the Far East, will attend to the actual shipment of the coins.

The main demand for silver comes from China, which has a large balance of trade in its favor. The Chinese tael has been quoted as high as \$1.74, against a parity of \$1.45 and a low of 60c. a few years ago. The silver placed in China would be used to purchase dollar exchange. It would mark the settlement of international balances with silver and might temporarily lessen the demand on the part of the Orient for gold from the United States, of which \$67,000,000 was shipped in November.

Secretary Lane Makes Recommendations as to Oil Situation

In pointing out the necessity for the United States to develop petroleum supplies in other countries, the Secretary of the Interior, in his annual report, declared that American enterprise would find the oil supplies that the country needs if the Government does the following things:

1. Assures American capital that if it goes into a foreign country and secures the right to drill for oil on a legal and fair basis (all of which must be shown to the State Department) that it will be protected against confiscation or discrimination. This should be a known published policy.
2. Requires every American corporation producing oil in a foreign country to take out a Federal charter for such enterprise under which whatever oil it produces should be subject to a preferential right on the part of this Government to take all of its supply or a percentage thereof at any time on payment of the market price.
3. Sells, no oil to a vessel carrying a charter from any foreign government either at an American port or at any American bunker when that government does not sell oil at a non-discriminatory price to American vessels at its bunkers or ports.

War Minerals Relief

For the past several weeks the field force of the War Minerals Relief Commission has been working intensively on examinations. No time is being taken to write reports. Examinations will be continued as rapidly as possible, as long as the weather will permit, after which the mining engineers will return to Washington and write up all of the reports for which they have gathered data. This policy has brought forth some objections from claimants who are anxious that a report on their claims be written up immediately after the examination, in the hope that this will expedite the consideration of their

case. It was felt by the Commission, however, that benefit to a greater number could be obtained by making maximum number of examinations during the remainder of the field season.

Trade With Belgium Heavy

Commercial interests in the United States have lost no time in renewing trade relations with Belgium as is shown by the reports of the Bureau of Foreign and Domestic Commerce for the first nine months of 1919. During that period exports to Belgium have totalled \$283,417,698, or, \$37 per capita for the Belgian population.

Exports of refined copper in ingots and bars to Belgium during the first nine months of 1919 totaled 4,845,877 lb., valued at \$908,340. Exports of zinc, produced from domestic ore, to Belgium during that period amounted to 5,838,623 lb., valued at \$416,322.

Resigned from Geological Survey

Several names have recently been added to the list of resignations from the scientific staff of the U. S. Geological Survey. Members who have resigned to accept private employment are as follows: A. G. Maddren, C. C. Osbon, Miss Martinneau Knight, and W. A. Ingalls. It is thought that Miss Knight is the first woman to accept employment for geologic field service.

Copper Wire Surplus

Disposal of the remainder of the Government's surplus of copper wire and telephone cable was discussed at a recent meeting of those interested, with the Director of Sales. The surplus consists of 854,923 lb. of copper wire of various sizes and 1,710,000 ft. of telephone cable.

California Metal and Mineral Producers Association

On Oct. 22, 1919, a California Chapter of the American Mining Congress, to be known as California Metal and Mineral Producers' Association, was organized in San Francisco by a consolidation of the California Metal Producers' Association and the State Chapter of the Mining Congress, instituted in January, 1919. The following board of directors and officers were elected: George W. Starr, president; E. C. Hutchinson, first vice-president; L. D. Gordon, second vice-president; P. C. Knapp, third vice-president; Albert Burch; J. A. Fulton; W. J. Loring; O. J. Egleston; William G. Devereux; Robert I. Kerr, secretary-treasurer; C. H. Fry, engineer; Curtis H. Lindley, attorney.

Such reorganization will tend to broaden the scope of the association by admitting to membership producers of non-metallic minerals, including oil, and individuals directly and indirectly interested in the operation of metal mines, and its growing influence in state affairs will be increased. Additional benefits will be derived from membership in a national body.

All active and corporate members of the American Mining Congress residing in California were, by

resolution adopted at the meeting, duly elected members of the California Metal and Mineral Producers' Association and active members of the American Mining Congress were requested to indicate whether or not they desired to consummate such membership by the payment of annual dues in advance amounting to \$5.

Export Duties on Silver in Mexico

A cable dispatch from the United States Vice Consul at Mexico City states that according to a presidential decree of Nov. 25, in effect from Dec. 1, the duties payable upon the exportation of silver from Mexico have been modified. The new rates vary according to the daily New York quotations on silver and are as follows: When quotation is less than \$1 per oz., the tax is to be 7 per cent ad valorem; when the price is from \$1 to \$1.10, the tax is 8 per cent; from \$1.10 to \$1.20 the rate is 9 per cent; from \$1.20 to \$1.30, 10 per cent; from \$1.30 to \$1.40, 11 per cent; and if the quotation is above \$1.40 duty is to be collected at the rate of 12 per cent.

The government reserves the right to buy what silver it needs at the market price plus 1 per cent, but deducting taxes and shipping expenses.

November Mining Dividends

Dividends disbursed in November, 1919, by eleven United States mining and metallurgical companies making public reports, amounted to \$5,166,671, as compared with \$9,301,339 paid by eighteen companies in November, 1918. Reports from Canadian and Mexican companies indicate payment of only \$200,000, as compared with \$1,785,514 in November, 1918.

The White Knob Copper & Development Co., a holding company, paid its usual quarterly dividend on its preferred stock of 5c. per share (\$10,000).

MINING DIVIDENDS

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead & Sm. pfd.	U. S.	\$1.50	\$ 120,810
Anaconda, C., S., & Z.	Mont.	1.00	2,331,250
Ariz. Copper, pfd.	Ariz.	.01	53,840
Caledonia, ls.	Ida.	.01	26,050
Chief Cons., ls.	Utah	.06½	57,475
Golden Cycle, g.	Cal.	.03	45,000
Intergnat. Nickel, pfd.	U. S.-Can.	1.50	133,689
Miami, c.	Ariz.	.50	373,557
Mohawk, c.	Mich.	1.00	100,000
New Jersey Zinc	U. S.	4.00	1,400,000
United Verde Ex., g.	Ariz.	.50	525,000
Canadian and Mexican Companies	Situation	Per Share	Total
Amparo, g.s.	Mex.	\$0.05	\$100,000
Coniacaas, g.s.	Ont.	.12½	100,000

The totals for the first eleven months are as follows, the 1918 figures being given in parentheses: United States mining and metallurgical companies, \$82,536,134 (\$144,351,954); holding companies, \$1,151,578 (\$1,728,438); Canadian, Mexican, Central and South American companies, \$14,073,152 (\$15,402,875).

Miami vs. Minerals Separation Again

The second suit brought by Minerals Separation Co. in this country resulted in a decision against the Miami Copper Co., for patent infringement, the latter company at that time employing what the court construed as violent agitation of the oil and

ore pulp in Pachuca tanks. Determination of the amount of damages payable to the patent exploiting company has been in progress for some time. Meanwhile, the Miami Copper Co. has changed its flow sheet, in order, if possible, to come without the scope of the M. S. patents. The Minerals Separation Co., has, however, challenged this and has recently applied to have a restraining order issued to prevent further infringement. The application is now being argued in Boston, and a decision is expected before the new year.

Gold Lode Mining in Alaska

Twenty-five gold-lode mines were operated in Alaska in 1918, according to the U. S. Geological Survey. There was also a production from seven prospects—abandoned mines or small mines that were not in regular operation. The value of the lode-gold output decreased from \$4,581,453 in 1917 to \$3,473,317 in 1918, owing partly to the disaster at the Treadwell mine in April, 1917, and partly to curtailment of operations, especially in the Juneau district, because of shortage of labor. Southeastern Alaska, especially the Juneau district, is still the only center of large quartz-mining operations in the Territory. Next in importance is the Willow Creek lode district.

The production in the Fairbanks district decreased materially, as the lode-mine owners of Fairbanks are still awaiting the cheapening of operating costs, especially of fuel, which is expected on the completion of the government railroad. In 1918 the average value of the gold and silver contents for all siliceous ores mined was \$1.70 a ton; the average for 1917 was \$1.37 a ton. These averages reflect the dominance in the total lode production of the large tonnage produced from the low-grade ores of the Juneau district.

New Steel Works in China

The Ho Hsin Smelting Works, capitalized at approximately \$550,000, has begun operations at Pootung and aims to become one of the leading steel works in China, according to the Guaranty Trust Co., of New York. Its daily output at the time of the latest available report was ten tons of pig iron. When the plant is completed, the output will be forty tons daily.

Under the direction of Japanese chemists, certain chemical products, such as caustic soda, creosin, stearin and soaps, have been manufactured in Kwantung during the war. The raw materials were brought from Manchuria. A committee of chemical investigation reports that there is in Manchuria a great abundance of raw materials suitable for use in the chemical industry, awaiting only active participation of capital to yield large returns.

The Canton Automatic Mine Door

Some misunderstanding appears to have arisen from a recent article in the "Journal," in which the statement was made that "the Canton automatic mine door has been installed in many mines and has

given satisfaction when used against low pressure." These doors, of the type now made, can be used to advantage even when the pressure registers 4 in. of water and where two men would be required to open a common door. Of approximately 4,000 of these doors installed, about 100 of them work under pressures of from 2 in. to $4\frac{1}{2}$ in.

N. Y. Section A. I. M. E. Discusses Mine Valuation

Well-Attended December Meeting Devoted to Consideration of Taxation Problems, Depletion, Accounting, and the Difficulty of Administering the Law

THE regular monthly meeting of the New York Section of the American Institute of Mining and Metallurgical Engineers was held at the Machinery Club, New York City, Dec. 3, 1919. E. P. Mathewson presided. The subject for discussion was the "Valuation and Taxation of Mines." J. R. Finlay delivered an address on "Mine Valuation for Purposes of Taxation," wherein he pointed out some of the difficulties of administering the laws covering mine taxation, and recommended that for taxation purposes a mining company's capital investment be computed on the basis of earnings, and that equitable annual adjustment be made to cover depletion.

R. C. Allen explained some of the problems arising in connection with the proper administration of the law, and advocated that the taxpayer be given the benefit of the doubt in every controversy over what is equitable valuation, both in granting a low valuation for purposes of taxation on capital investment and allowing high valuation as a basis for taxation on income. B. B. Gottsberger described the development of mine taxation methods during the past few years in the state of Arizona.

Paul Armitage discussed the provisions of the law dealing with depletion, and suggested that it would be more equitable to compute tax by means of a formula which should regard the total profits and redemption of capital investment as a continuous flow of income, rather than as an annuity to be adjusted each year. Fleming discussed the tax problem from the standpoint of the large mine operator. Henry Fernald outlined accounting problems involved in mine taxation, and Ralph Arnold gave assurance that the attitude of the Internal Revenue Bureau in connection with mine taxation was to establish a fair valuation as of March 1, 1913, so that the law could be equitably administered. Eighty-seven members attended the meeting, a larger number than usual. A detailed report of the discussions will be presented in the "Journal" later.

Management and Training of Men

In an address delivered at the Eighth Annual Safety Congress of the National Safety Council, W. W. Gidley, safety inspector, Phelps Dodge Corporation, said:

"No factor in the industrial world today presents to the employer a problem of such extreme complex-

ity as the training and managing of men. It has been proven repeatedly, that wholesale discharging by those in authority, in order to procure the right man for the place, is a dismal failure. It is therefore expedient that a system be developed whereby this weakness may be properly analyzed and a correct solution applied.

"The time has arrived when men who supervise labor must know the meaning of morale and how it is developed. The heads of various departments in any industry must be interested in safety, efficiency, and democracy, and understand how these features may be linked with proper discipline."

Education of the Mining Engineer

New York, Dec. 19.—The Mining and Metallurgical Society of America held its regular meeting on Dec. 18 at Columbia University Club. J. A. Church, Jr. presided and introduced Robert Peele, who delivered the address of the evening on the subject, "Education of the Mining Engineer, discussing service and the progress in the development of a mining engineer's education as given by leading mining schools, and outlining the new graduate course in mining engineering at Columbia University, which consists of a three-year post graduate course of study following a three-year college course or its equivalent. Professor Peele pointed out that the new plan had not had a fair trial, due to interruptions on account of the war, but that those who favored it believed it would give the technical man a broader mental equipment and result in making better engineers. He emphasized the advantages of thorough training in use of English language and fundamental scientific principles, together with practice in certain immediately useful subjects like assaying and surveying that would enable the young engineer to earn a living while getting practical experience.

Professor Peele called attention to the excessive number of mining schools, stating that there were in the United States forty-three schools giving courses in mining engineering, of which thirty-six were departments of universities, and seven were separate schools where mining engineering was taught as a specialty, like the Colorado School of Mines and the Michigan College of Mines. He expressed the belief that there were about ten first-class mining schools in the United States, and that in these schools would be found at least 1,500 of the 2,500 students in mining and metallurgy.

An analysis of the membership lists of the engineering societies indicated that there were about 12,500 mining and metallurgical engineers in the country, of whom many were not technical graduates. It is estimated that the supply of first-class mining and metallurgical engineers could be maintained by about 350 technical graduates per year, and that six or eight strong mining schools would be ample to maintain this supply. He contended that there were too many mining schools and

that the recent tendency toward expansion in mining education was unwarranted and would have the effect of lowering the quality of the product.

An interesting discussion followed in which W. R. Ingalls, J. A. Church, Jr., W. Y. Westervelt, A. H. Rogers, J. P. Metzger, J. V. Lewis and others participated. Thirty-five members were present.

Zinc Mining and Metallurgy Pictured in the Movies

New York, Dec. 18.—A private showing of the first of two educational films depicting the zinc industry was given before a few members of the American Zinc Institute in New York on Dec. 17. The picture shows views of the mines in both the Southwestern Missouri and New Jersey districts and the exact locations of the deposit are indicated by maps. The miners are shown at work and the method of hoisting the ore in cans is pictured. Then come the tramping of the ore, dumping into bins, transporting it on conveyor belts on which it is hand-picked, dumping it into a gyratory crusher, table concentration, and flotation. Roasting furnaces are next shown, and the zinc retorting furnaces, the latter appearing to particularly good advantage. The end of the picture shows the casting of the metal into ingots. Another film is in course of preparation, exhibiting the manufacture and uses of finished forms of the metal. The photography is well done and the picture should be interesting to most of those who will see it, whether they know anything about the mining industry or not.

The films are being produced by the Ford Motor Company as part of their educational series, and will be released through Goldwyn.

French Technical Journals

I read in your issue of Sept. 27, on page 541, a list of French technical journals. I think it may be of interest to your readers to know what are the American equivalents of these journals. Being an attentive reader of the technical papers of both countries, I have amplified your list as published, in the hope that the following information will be of interest:

"La Revue de Metallurgie" is a scientific journal and is widely devoted to metallography and pure science, together with some brief descriptions of the principal French and foreign plants of recent construction. It is something like the "Transactions of the American Electrochemical Society" and of like publications of other similar societies.

"La Technique Moderne" and "Le Genie Civil" are far more widely read. They are like the English publication, "Engineering," and are of a special interest to those who desire to keep informed as to what is thought and done in the French technical world. They give, also, good extracts from the general technical press. The other journals which you list are rather trade papers, and not so interesting for engineers.

But I have forgotten one of the best French journals, "La Revue generale d'Electricite," 12 place

de La Borde, Paris (VIII), which your readers should know. One year's subscription costs 50 fr.

For readers of the "Engineering and Mining Journal" who are interested in geology:

"Publications du Service des Topographies Souterraine," by Ministere des Travans Publics, Paris.

"Bulletin des Services de la carte Geologique de France," by Ministere des Travans Publics, Paris. Both of the last-named publications are sold by La Librairie Beranger, 15, rue des Saints-Peres, Paris, (VI).

"Travaux du Laboratoire de Geologie de la Faculte des Science de Grenoble." Sold by Allier Freres, 26, Cours. Saint-Andre, Grenoble.

For railways: "La Revue generale des Chemins de fer," by Dunod et Tinat, 47 Quai des Grands-Augustins, Paris (VI); 28 fr.

For motor cars: "La Vie Automobile," by Dunod et Pinat also; 30 fr.

I was about to forget a small but good journal, "Journal de la Houille Blanche," 85 Rue Saint-Lazare, Paris (IX). This publication is something like "Power"—not so beautifully printed but very well made and full of information. The subscription is 16 fr. a year.

I was always glad to meet American engineers in France during the last two years, and I feel obliged to show them the best means of remaining in touch with us.

P. Bourdon,

Chief Engineer of the Livet Works of the 87 Keller et Laleux.

Livet, Oct. 12, 1919.

Fencing Off the Switchboard

Switchboards so placed that persons are likely to back into them while their attention is otherwise directed should be provided with a guard. The illustration shows a switchboard so protected on one of



SWITCHBOARD PROTECTION ON A YUBA DREDGE

the dredges of the Yuba Consolidated Goldfields Co., at Hammonton, Cal. The end is hinged and may be swung open. The front is made in two sections which slide past each other.

BY THE WAY

Honest Men and Geologists

The Secretary of the Interior, the genial and brilliant Franklin K. Lane, remarks in his annual report (p. 14), in speaking of the reserves of petroleum: "Geologists have estimated and estimated, and they do not differ widely, for few give more than thirty years of life to the petroleum sands of this country if the present yield is insisted upon. And yet, there is so much of mystery in the hiding of this strange subterranean liquid that honest men will not say but that it will become a permanent factor in the world of light, heat, and power." We commend this passage to the study of George Otis Smith, Dave White, et al. The classification of mankind into liars, damned liars, and mining experts is a familiar one, but the classification into honest men and geologists is something for which we are indebted to Mr. Lane's acumen.

Fractional Distillation

A recent occurrence in the state of Nevada reminds one of Daniel Webster's speech on Alexander Hamilton in which he said: "He smote the rock of the national resources, and abundant streams of revenue gushed forth." Nevada is an arid state, as every one knows. Fluids of various kinds are transported over the state, but the presumption is that an "oil tank" always carries oil. That such is not always the case was recently proved by an incident that was reported in a San Francisco newspaper. An oil tank was given an especially vicious bump while on a sidetrack at Elko, no doubt by an engineer dissatisfied with the existing wage scale. A bung, or was it a valve, was disturbed and instead of oil forth came claret flowing out on to the thirsty desert. Hereafter a trainload of tanks will be viewed with greater interest by the casual observer.

Efficiency Excelsior

Before the war it used to be asked "Why is an efficiency engineer like a Welsh rabbit?—the answer being that a Welsh rabbit is neither Welsh nor rabbit but mainly cheese. But the efficiency engineer has come into his own—the fruits of his labor are everywhere apparent. How efficient we were before the war and how well we accomplish things today! Not only does Mr. Bursleson show a profit, a burlesque show as it were, not only does the laborer ride in state who formerly walked, but even the very crooks are doing their "jobs" better than they did before. The high-powered automobile is now frequently employed to facilitate the get-away. The crook, moreover, is surely reducing his overhead by stealing in six figures instead of a mere four or five. Jobs, too, are attempted now that would have been passed as hopeless before. A recent report from Arizona shows that high-grading has moved up a notch or two. When Rudolfo Vasquez, of Los Angeles, lately visited his Gold Hill mine, four miles north of Nogales, Ariz.,

he found that his large gasoline hoist and gallows frame had disappeared, the collar of the 385-ft. shaft having been wrecked in tearing away the frame. Below, it was found that the thieves had first looted a particularly rich stope and left never a clue behind them. It is too late for regrets, but if Mr. Vasquez had been a closer student of some phases of modern efficiency engineering he might at least have trained the cage dogs to watch the premises. In that day when the millennium shall come, let us hope that every thief will have his own gallows frame and, if possible, swing from it.

Mining in the Orient

In the narrative of a "Journey Through Asia Minor, Armenia and Koordistan," by John Macdonald Kinneir, published in 1818, there is on page 434 a curious note. "In the side of a great mountain called Abdul Azaz, thirty hours south by east of Merdin, is a deep cavern where, on a certain day in the year, they make offerings to the devil by throwing jewels or pieces of gold and silver into the abyss, which is said to be so deep that no line ever reached the bottom, and supposed to lead into the infernal regions." It is a simple matter to identify Abdul Azaz as the site of the original mine of the Nineveh Keseph Charutz Corporation. The custom of throwing valuables into the hole doubtless resulted from the practice of paying annual assessments on the stock of the corporation. Some wag must have remarked "there's another month's salary gone to H——"; and gossip did the rest.

Jack, the Rescuer

Stewart and Hyder, sister mining camps, situated on the water front at the head of Portland Canal, the former on the Canadian side in British Columbia and the latter a few miles to the north and in Alaska, form the gateways to the Salmon River district. They are described by our correspondent as being typical old-time frontier mining towns. Prospectors and miners from the interior coming to spend a holiday reach Hyder first and not infrequently return to the hills to earn the wherewithal for more indulgence without getting as far as Stewart. Hyder's buildings are built on piles. There is one main street, which runs in conformity with the sinuosities of the shore. An amusing phase of the life of the town is the activity of a character known as "Jack, the Rescuer." A sharp twist in the main street, at a point where the sidewalk is without a protecting railing and where, below, is the cozy mud of the tide flats, makes a veritable trap for the unwary. Absent minded or temporarily befogged pedestrians are frequently precipitated from the walk into the cold water and mud. This happening so often that "Jack, the Rescuer" earns a comfortable living by pulling them out, mud from head to foot and cussing most blasphemously, at a fee of \$2.50 per rescue. Everybody knows the danger and yet, it would appear, Jack's business never grows slack. His rope was just as much in demand at last reports as it was at the beginning of Hyder's recently resuscitated and now hectic life.

PERSONALS

E. P. Mathewson has opened offices as consulting metallurgist at 42 Broadway, New York.

Fred B. Ely has accepted a position in geological department of the Pierson Oil Co., with headquarters at Shreveport, La.

Charles M. McNeill, president of Utah and Chino Copper companies, has been elected a director of American Vanadium Co.

A. F. Keene, of the Gold Fields American Development Co., Ltd., has just returned to New York from a trip to the Neihart Mining district of Montana.

J. B. Tyrrell, of Toronto, will sail for England on the Lapland on Dec. 13. His address during his stay in England will be 208 Salisbury House, London, E. C.

Marvin J. Udy, of Kokomo, Ind., will take charge of the cobalt mines of the Haynes Stellite Co. on Blackbird Creek, Idaho, succeeding J. W. Caples who died three months ago.

Alexander Mackay, president of the Dundee-Arizona Copper Co., with his son, Capt. F. B. Mackay, both of Dundee, Scotland, has made inspection of the property of the company at Jerome, Ariz.

James G. Parmelee, recently research metallurgist with the School of Mines in co-operation with the U. S. Bureau of Mines, at Moscow, Idaho, is now connected with the Hardinge Conical Mill Co., Salt Lake City, Utah.

Cornelius Kelley, president, and John D. Ryan, chairman of the board of directors of the Anaconda Copper Mining Co., accompanied by Frederick Laist and William Wraith have been making a general inspection of copper mines in the southwest.

R. N. Ferguson, deputy supervisor, Department of Oil and Gas, California State Mining Bureau, has resigned to take a position with the Polish Government in connection with the development and conservation of the petroleum deposits of that country. Thomas D. Kirwain has been appointed as his successor.

Frank Hess and R. M. Overbeck, geologists who have long been members of the staff of the U. S. Geological Survey, have sailed for South America, where they will look over various ore deposits in Bolivia, Chile and other South American countries, for private interests. They expect to be engaged for six months or more on this work.

Frank M. Smith, for seventeen years connected with the American Smelting

& Refining Co., as superintendent of the East Helena plant, has taken a position with the Bunker Hill & Sullivan Co. He will be in charge of an office in Spokane for the purchase of lead, silver and gold custom ores, which the smelter is prepared to treat.

Thomas Varley, superintendent of the metallurgical research station maintained by the U. S. Bureau of Mines in co-operation with the Utah School of Mines at Salt Lake City, and C. A. Wright, superintendent of a similar station in connection with the Idaho School of Mines at Moscow, recently visited Wallace, Idaho, to confer with Coeur d'Alene mine operators regarding the results of experimental tests in differential flotation for the separation of lead-zinc ores.



Harris and Ewing
W. R. CRANE

W. R. Crane has been appointed chief engineer for the War Minerals Relief Commission, to succeed J. E. Spurr. For ten years prior to the outbreak of the war Mr. Crane was dean of the School of Mines at the State College of Pennsylvania. He received his education as a mining engineer at Columbia University, and later was a member of the faculty of that institution. He was in charge of the mining department of the University of Kansas for several years. He entered Government service at the beginning of the war and since that time has been engaged largely in field work pertaining to war minerals.

L. D. Knight, who has managed the business of the Ingersoll-Rand Co. in the Michigan district for the past three years has been promoted to the management of the Butte office. He is succeeded in the Houghton office by E. L. Hawes, who is transferred from the Mesaba Range.

OBITUARY

William Hugh Freeland, who developed the first commercially successful pyritic copper-smelting practice, died at San Francisco on Nov. 22. A more extended notice will appear later.

Albert E. Gregory died at San Francisco on Nov. 11. Mr. Gregory was born in England in 1879, and received his early education there. He spent two years at the Colorado School of Mines. From 1897 to 1901, Mr. Gregory was connected with the Exploration Co., Ltd., at London; he was accountant for the Montana Mining Co., Ltd., Marysville, Mont., from 1901 to 1906, and later was connected with the Tomboy Gold Mines Co. as assayer, sampler and on examination work; and with the Smuggler-Union Mining Co. as assayer and mining engineer. In 1916-17 he was superintendent of the Beebe mines for Bulkeley Wells.

At the time of his death, Mr. Gregory had been in the employ of the Metals Exploration Co., and had only recently returned from New Zealand where he had been employed on exploration work. He is survived by a widow and one child.

SOCIETIES

American Chemical Society—The California Section held a joint meeting with the local engineering societies on Nov. 25. The subject of the evening was a symposium on the application of chemistry to engineering. The speakers were: Prof. C. G. Hyde, University of California; S. Barfoed, C. F. Braun, of San Francisco; Prof. J. M. Hyde and Prof. R. E. Swain, of Stanford University.

American Society of Mechanical Engineers held its fortieth annual meeting in New York, Dec. 2-5. On the opening night M. E. Cooley delivered the presidential address, and welcomed the president-elect Fred J. Miller. Honorary membership was conferred on two distinguished French engineers, Charles de Freminville, consulting engineer of the Creusot works, and Auguste C. E. Rateau, chairman of the Board of Directors of Rateau, Battu & Smoot Co., France. On succeeding days there were interesting sessions, "The Industrial Situation in Relation to Present Conditions," being among the subjects discussed.

THE MINING NEWS

New York, December 13 and 20, 1919

Anaconda's Mines and Smelters Close Down

Union Pacific Railroad Seizes Coal Consigned to Mining Company—
Twelve Thousand Men Out of Work

Coal shortage caused the Anaconda Copper Mining Co. to shut down all its mines and smelters on Dec. 2. Twelve thousand men are idle in consequence. The Butte & Superior and Davis Daly

Homestake Fire Submerged

The fire which started on Sept. 25 in the Homestake Mine at Lead, S. D., when miners blasted down a timbered raise on the 800 level, has finally been extinguished by flooding the property. The water is now between the 500 and 600 levels and preparations are being made to unwater the workings. Water was run in from the surface through

Mining in Mexico

Activities in Various Sections of Republic—Silver Operations Stimulated

In the state of Nuevo Leon there has been little increase in the activity owing to the rise in the price of silver. Most of the mines produce lead ores with low silver content. In the Villadama district, the Cia. de Minerales y Metales, S. A., is working the Minas Viejas and the Soledad mines, producing from each group about 100 and 500 tons respectively. The ores are leady iron carbonates. In the Vallecillo district, it has been rumored that H. E. Harrison, of Patagonia, Ariz., was about to take over the lead-zinc mines formerly operated by James Morlan, for account of the Vallecillo Mining & Milling Co. There are several other operators in this district, who ship small tonnages of galena to the Monterrey smelters. From the Montañas mine in the Alamo district Francisco Ancira is producing several carloads of zinc ore and lead ore per month.

In the Cerralvo district, Nuevo Leon, the Cerralvo Mining Co. is developing its properties under the direction of J. T. Perry. The Cinco Amigos Co. has recently shipped several carloads of ores to the Monterrey smelters. Harry Harrison and associates, of San Antonio, Tex., are developing the San Antonio mine. Maiz Brothers, of Monterrey, report that operations at their La Blanca mine have been seriously interfered with by the heavy rains which have fallen during the last month. The Cia. de Minerales y Metales, S. A., are operating El Refugio, El Oso and El Porvenir mines, shipping about 1,000 tons per month of lead ores, to the Monterrey and San Luis Potosi smelters. The Benavides smelter and the Carboneras concentrator of this company have been closed during the entire year. Due to bad roads and the planting season, there have been few freighters for the transportation of the ores of this district to the railroad.

In the Monterrey district the Mexican Lead Co. has suspended production at its Diente mines and is carrying on development work. J. S. Carnahan is manager. This property was recently examined by engineers of the American Smelting & Refining Co. The Santo Domingo property, owned and operated by Larralde Brothers, is shipping occasional carloads. Other operations in



OPEN CUT OF HOMESTAKE MINE, LEAD, S. D., SHOWING STREAMS OF WATER BEING PUMPED INTO WORKINGS TO FLOOD BURNING STOPES

companies were operating at the time this is written. The East Butte Copper Mining Co. has ten days' supply of coal on hand. The shortage has been immediately caused through seizure by the Union Pacific Ry. of coal consigned to the Anaconda company.

the open cut, all mills being shut down to make available a maximum supply of water. In all probability stamps will be dropping again before the first of the year. Further details regarding this fire have been given in previous issues.

this district, are those of J. J. Murphy, at the San Antonio mine; Dr. P. H. Foster, at the Santa Juliana mine; D. Verastegui, at the Malinche mine. Shipments from all these go to the Monterrey smelters.

In the City of Monterrey, the American Smelting & Refining Co. is operating its smelter on a reduced scale. The Cia. de Minerale y Metales, S. A., is operating the No. 2 smelter and refinery of the Cia. Minera, Fundidora y Afinadora "Monterrey," S. A. A large part of the production of the Monterrey smelters is being shipped to New York and Perth Amboy, by water, via Tampico. The Monterrey steel plant is also operating. It is rumored that it is filling a large rail order for the Mexican Government. In the Linares district the Las Flores and Dulcinea companies have been operating on a small scale shipping about one car per month of high-grade lead ores to the Monterrey smelter.

San Luis Potosi

In San Luis Potosi engineers are in the San Pedro district examining the San Pedro mines of the Cia. Metalurgica Mexicana for the American Smelting & Refining Co. The former company operates the San Luis Potosi smelter and has been running steadily for the last year.

Coahuila

In Coahuila the Cia. Minera Paloma y Cabrillas, S. A., has been operating its property continuously during the present year, shipping about 3,000 tons per month to the No. 2 smelter, in Monterrey. The Cia. Minera Las Higuera, S. A., has been developing its Las Higuera mine and reports finding a parallel fracture to the one which has produced its large orebodies. Prospecting along this fracture is in progress. The Cia. Minera La Mariposa, S. A., and the Cia. Minera La Fortuna, S. A., are exploring their properties in this district, but so far only low-grade bodies have been encountered.

Durango

In Durango in the San Juan de Guadalupe district grading has been started for the railroad which will be built from Symon station to the mines of the Sierra Ramirez district. This will be about twenty kilometers long and will make available nearly 1,000,000 tons of dump material, containing from 6 to 10 oz. of silver and 45 per cent lime. This ore is desirable for its lime contents at the various smelters of the republic. Present shippers are Luis Audiffred, Francisco Gorraez, M. Z. Betancourt and F. Manuel. Owing to scarcity of freighters, this railroad is welcomed by the shippers and a considerable increase in shipments is expected.

Zacatecas

In the state of Zacatecas in the Fresnillo district, the Mexican Corporation, Ltd., has taken over the mines and mill of the Fresnillo Mining Co. and active preparations are being made to increase the capacity of the mill to 2,000 tons per day. It is stated that the entire mountain on this property will assay 200 grams silver per metric ton and that the ore will be quarried, loaded into railroad cars by steam shovels and taken to the mill. The railroad is being changed to broad gage and an ample power plant will be erected. In the Sombrete district the Sombrete Mining Co. has been shipping dump material from its Tocayos mine to the Mapimi smelter.

Mexico

In the state of Mexico in the Zacualpan district, the Cia. Minera Chontalpan y Anexas, S. A., is again at work after a labor strike, which lasted nearly

New Project to Supply Water to Mining Towns on Rand

Vaal River Barrage Near Vereeniging to Furnish 20,000,000 Gal. Daily

BY M. EDWARD

One of the largest engineering schemes ever undertaken in South Africa is now being carried out to supply Johannesburg and the mining towns on the Rand's seventy-mile strip of gold-bearing reef with water. By this project 20,000,000 gal. will be supplied daily by pumping through a forty-mile pipe line.

It was decided that the present system of supplying the Witwatersrand with water, was inadequate, and a scheme for damming the waters of the Vaal River about forty miles away, was sanctioned by the government, with the result that the work was begun about a year ago. The Vaal River barrage is twenty-four miles down stream from Vereeniging, a spot famous for the



GENERAL VIEW OF VAAL RIVER BARRAGE, SOUTH AFRICA. FROM ORANGE STATE BANK TAKEN LAST AUGUST. PIERS IN FOREGROUND 6 FT. HIGH ALL PIERS 12 FT. HIGH OR HIGHER ON OCT. 3, 1919

a month. This company operates a concentrator and cyanide mill, shipping its product to Toluca by pack mules.

Sonora

The Canario Copper Co., operating near Nacoziari, whose stock is largely held in New York and the East, decided to increase its capital from \$2,000,000 to \$20,000,000, at a recent meeting held in New York. This was done by increasing the par value of shares from \$1 to \$10. James P. Harvey, president and general manager, who attended the meeting, counselled against entering the producing field at the present time, preferring to continue development until sufficient tonnage had been developed to warrant installation of a large concentrator. The company was reincorporated under the laws of Delaware.

signing of peace at the cessation of the Anglo-Boer war. Great progress has been made, and a glance at the huge works gives one an impression that a second miniature Panama Canal is in course of construction.

The initial plant to be installed at a total cost of \$8,750,000, of which the barrage itself will cost \$1,425,000, will supply 10,000,000 gal. daily. The barrage is over a quarter mile long. There are 37 piers, 38 ft. apart, each 55 ft. long, 8 ft. broad and 34 ft. 6 in. high. On top of the piers is the superstructure to carry the gate-lifting machinery. From the top of this structure to the bed of the river, is nearly 75 ft. The steel gates to be worked by machinery on the superstructure, weigh 28 tons each. The work employs altogether 600 men (550 black and 50

white), and is being carried out under the direction of W. Ingham, chief engineer of the Rand Water Board, with J. C. Hawkins, as resident engineer. On the back of the piers the Water Board is building for the Public Works Department, a much-needed bridge across the Vaal.

The barrage is expected to be completed early in 1921, and will back up the Vaal to form a huge lake nearly 40 miles long, which will contain 13,633,000,000 gal. of water. Besides supplying water to the towns, the dam will irrigate many square miles of country.



WINTER FLOW OF VAAL RIVER, SOUTH AFRICA, CONFINED BETWEEN SAND BAG WALLS

Arizona & Swansea R. R. Told to Resume Freight Traffic

When the Arizona & Swansea R. R. management was interrogated by the Arizona Corporation Commission concerning failure of the company to furnish service to the Swansea Lease, there was offered the novel defense that the road's only locomotive is in a Phoenix foundry for repairs for which the company had no money to pay. It was suggested that, as the Lease already had advanced funds for repair of the twenty-six-mile road, it should also furnish the \$3,000 necessary to get the locomotive back on the line. The Commission failed to see the point and ordered immediate resumption of freight traffic. The railroad, in northern Yuma County, was built by George Mitchell, who was at the head of the original Clara-Swansea mines incorporation, later bankrupt. The road is not in debt and is valued at \$500,000. The Lease, now said to be valuable through development of new orebodies, is held by the Clark interests of Jerome and J. Ross Clark, of Los Angeles, with seven years yet to run.

Utah Apex Suit Continues First Part of Trial Almost Ended— Testimony Concerns Highland Boy Limestone

The Utah Apex Mining Co. on Nov. 25 finished the presentation of its witnesses in the first part of the suit with the Utah Consolidated Mining Co. over apex rights, which has been in progress for about two weeks in the United States district court in Salt Lake City. Attorneys for the Utah Consolidated have declared that the rebuttal evidence will be short so that the end of the first

solidated officials to the Utah Apex workings. Mr. Channing was cross examined by Judge Marshall as to the 1,300-ft. level drift in the Highland Boy limestone through which a large orebody, known as the Leadville body, was opened in Utah Apex ground, and claimed by the Utah Consolidated as occurring in the Highland Boy limestone. This drift, the Utah Apex holds, was run through barren limestone as the result of an examination by Utah Consolidated officials to reach the Leadville orebody in the Utah Apex, while it is the contention of the Utah Consolidated that the drift was run to develop the Highland Boy limestone, and was carried according to theories held by its management as to the opening up of the orebodies.

Martin J. Heller Sues De Lamar Estate

Asks \$150,000 for Services as Engineer and Confidential Agent

Martin J. Heller, a mining engineer, filed a suit in the N. Y. Supreme Court Dec. 1, against the estate of Captain Joseph R. De Lamar for \$150,000 for services as engineer and confidential agent in negotiating for mining properties. Mr. Heller said he made a contract with Captain De Lamar under which he was to receive 5 per cent for any properties introduced by him to Captain De Lamar and, if sold, 5 per cent of the proceeds. Mr. Heller bought the Blue Stone group of mines in his name and, it is alleged, Captain De Lamar sent him a letter reiterating the terms of their agreement. Captain De Lamar sold the mines to the Blue Stone Mining & Smelting Co., receiving 100,000 shares and \$800,000 in notes of the corporation. It is alleged that the Dominion Reduction Co., Ltd., of Cobalt, Ontario, bought 90,000 shares for \$1,240,800. Mr. Heller says he never received his commission on this deal.

The Bluestone mine and claims included in the group adjoin the Mason Valley mine at Yerington, Nev., the Bluestone being the oldest property in the district. The mine has been opened to a depth of 540 ft. The ore is mainly chalcopryite and has been proved to 750 ft. by drilling. The ore is treated by the magnetic concentration process.

Manchester, Tex., to Have Sulphuric-Acid Plant

The Texas Chemical Co. has let a contract to Horton & Horton, contractors, for the construction of a sulphuric-acid plant at Manchester, Tex., on the Houston ship canal, to cost \$500,000. This plant will have a capacity of 100 tons daily, and will be in operation by April or May, 1920. Work has already begun. The company's offices are in the Scanlan Building, Houston. S. Peiser is manager.

part of the trial, the Leadville case, concerning the Highland Boy limestone, appears not far off. At the time of the last writing, Albert Burch was on the stand for the Utah Apex. He was followed during the latter part of last week and the first part of the present week by Orrin Peterson, geologist for the Utah Apex; Frank M. Wishman, for some time superintendent of the Bingham New Haven Co., now a part of the Utah Metal & Tunnel; Andrew C. Lawson, of the University of California; Waldemar Lindgren, formerly with the U. S. Geological Survey, and at present professor of geology at Massachusetts Institute of Technology; V. S. Rood, manager of the Utah Apex mine, and Edward Jennings, formerly assistant engineer. Roscoe H. Channing of the Utah Consolidated was recalled for cross examination at the end of the session.

The testimony in general, following the outline of Judge Marshall, was given with a view to proving the fissures to be connected with the ore and mineralization. Mr. Rood was questioned in regard to a visit of Utah Con-

R & S Molybdenite Property to Have Flotation Plant

Deposit Near Questa, N. M., Has Sufficient Ore in Sight—Formerly Considered Lead and Sulphur

The owners of the R & S molybdenite property, situated in the Red River mining district, about eight miles northeast of Questa, Taos County, N. M., have succeeded in getting long-time contracts for their concentrates and plan to erect a 200-ton flotation plant at the mine. This will eliminate the excessive cost of hauling the crude ore from the mine to the present mill,

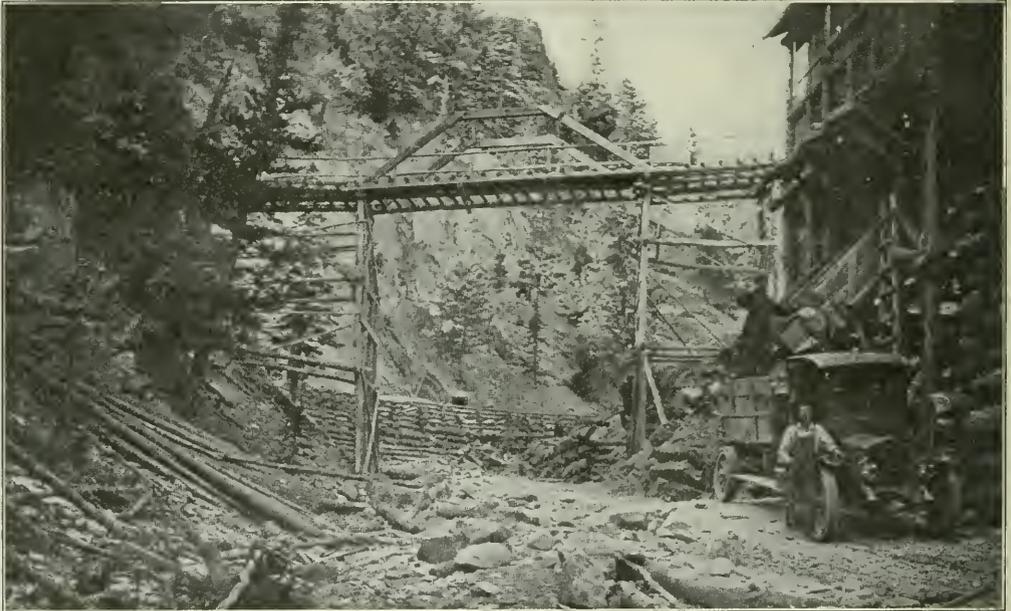
smelter was built, but because of its inaccessibility the enterprise failed.

Deposit Long Deceived Prospectors

The R & S molybdenite deposit has long been known to prospectors, being very conspicuous because of the extent and prominence of its yellow-stained outcrop of molybdenite. The old-timers supposed that this was sulphur. They made numerous attempts to mine the "lead ore," for which the molybdenite was mistaken. Since the "lead" contained neither gold nor silver it was considered worthless. It was not until the fall of 1918 that the true nature

of the water power available to generate about 1,000 hp., and a suitable hydro-electric site is within a mile of the mine. Climatic conditions are ideal for operation throughout the year, except for a few months during the winter. During these months little difficulty will be experienced if proper preparations are made.

At Red River, pre-Cambrian granites, schists and gneisses are found overlaid by Tertiary andesite and monzonite porphyries and breccias. A few miles below Red River, the river has cut through these volcanics and exposed the under-



LOADING CRUDE MOLYBDENITE ORE INTO MOTOR TRUCKS AT ORE BINS OF R & S MOLYBDENITE PROPERTY NEAR QUESTA, N. M.

a distance of five miles. It also plans to install a hydro-electric plant to furnish power for both mine and mill. At the present time seventy-five men are employed.

The R & S mine is named after its principal owners, M. B. Rapp and C. W. Savery, of Denver, Col. Questa, a small Mexican adobe village of about 350 inhabitants, is twenty miles east of the nearest railroad point, Jarosa, on the San Luis Southern R. R. The mine is five miles below (west) of the old mining camp of Red River. Mining has been carried on in a small way in this district for the last forty years. Gold and silver were the chief metals sought, although attempts were made to mine copper at the town of Red River, where a promising prospect occurs. A small

and value of the deposit was recognized by M. B. Rapp. Mr. Rapp succeeded in interesting C. W. Savery in the property, and together they spent over \$45,000 in developing the deposit and equipping an old cyanide mill, belonging to the Trinidad Mining & Milling Co., with flotation machinery. This mill, which they rented, is situated five miles up the river from the mine, and one mile below the town of Red River.

The mine is at an altitude of about 8,500 ft. above sea level and is situated in one of the spurs of the Sangre de Cristo Range, in the Carson National Forest Reserve. The summits of the mountains rise to a height of 1,500 to 2,000 ft. above the valley of the Red River. Timber is plentiful for fuel and mining purposes. There is also suf-

ficient water power available to generate about 1,000 hp., and a suitable hydro-electric site is found upon the basal complex. This has been extensively intruded by monzonite porphyry laccoliths and dikes, and completely metamorphosed. Subsequent to the contact metamorphism the rocks were subjected to regional metamorphism, and as a result both the sedimentaries and igneous rocks have been extensively fractured and altered. It is in these fractures that the molybdenite occurs, as the amorphous variety. Judging from the manner in which the limestone and monzonite porphyry have been altered, one is led to believe that the mineral-bearing solutions which contained the molybdenite, assisted in the metamorphism. The fractured zone is about 1,200 ft. wide and 3,000 ft.

long and approximately 100 distinct molybdenite veins are exposed.

Topography Facilitates Development

The deposit, because of the rugged topography, is adapted to development by tunnels. The accompanying photograph shows the two lower tunnels and also several open cuts. The top of the cliff is 400 ft. above the tunnel level, and the top of the hill is 200 ft. higher, thus making a total of 600 ft. In one tunnel there are two stopes adjoining one another which have 6,000 tons of $1\frac{1}{2}$ to 2 per cent ore developed, and another stope has 8,000 tons of ore of similar grade developed. The vein can be traced for 1,000 ft. on the surface. The average

hauled five miles to the mill. Here it is crushed in a jaw crusher and then fed into a ball-mill, which is in closed circuit with a classifier. After the material is ground to about 80 mesh it is fed direct to a Ruth flotation machine. The mill has a capacity of 40 to 50 tons a day. The concentrates have averaged from 85 to 90 per cent MoS_2 with a recovery of 85 to 90 per cent. The concentrates are dried and shipped in 100-lb. sacks.

Sulphur at Damon Mound, Tex.

Damon Mound, Brazoria County, Tex., while producing considerable oil, has a secondary importance in the sulphur discovered there. No information has been made public as to the quantity,

transactions, mainly at Bisbee and Miami, in all affecting about \$1,000,000. The firm, before dissolution, owned and so'd the Junction, Union and Rough Rider groups at Bisbee, and at Miami developed the Live Oak property and sold it to the Inspiration. The partnership also owned the valuable Warren ranch, irrigated from the pumped waters of the Bisbee district. The Rough Rider property was held in Smith's name and the Live Oak in Hoveland's.

New Project May Lower Cost of Timber in Southwest

It is possible that the great cost of mine timber in the Southwest is to be lowered to a degree by plans made for utilizing the pine forests of the western



TRINIDAD MINING AND MILLING CO.'S MILL, FIVE MILES FROM R & S MINE. TEMPORARILY RENTED BY THE LATTER FOR CONCENTRATING ITS MOLYBDENITE ORES BY FLOTATION

width of the vein as broken is about 4 ft. The ore as broken will average $1\frac{1}{2}$ per cent MoS_2 . In mining it is easily hand-sorted so as to maintain a grade of 3 per cent for shipment to the mill. Huge slabs of almost pure amorphous molybdenite are frequently found.

In addition to the ore already developed, there are approximately 100 veins out-cropping on the surface which as yet have not been developed. Many of them, judging from their surface indications, give promise of being as productive as is vein No. 1 upon which practically all the development work has been done.

The ore is loaded into a 5-ton White motor truck at the mine ore-bins and

but it is believed to be quite large. The property is largely owned by the Simms Co. Sulphur deposits in Texas known to exist in greater or less quantity, but not producing, are located at Damon Mound, Hoskins Mound and Stratton Ridge, all in Brazoria County. Deposits being worked are at Freeport, Brazoria County, by Freeport Sulphur Co., and at Gulf, Matagorda County, by Texas Gulf Sulphur Co.

Smith-Hoveland Dispute Being Heard at Tucson

At Tucson a long-drawn-out case is being heard before Special Master Jones involving the rights of Hoyal A. Smith and Henry B. Hoveland in certain mines and in the profits of certain mining

Sierra Madres, sixty miles southeast of Douglas, Ariz. Major Thompson Short, of Lexington, Ky., is now in the Sierras with a party of engineers, timber cruisers and attorneys, considering the question of working a timber tract of 87,000 acres on which he has an option. The mill is to be at Douglas and one question to be solved is whether it may be feasible to depend on motor truck transportation for the logs, thus saving cost of railroad construction. This tract is the same once held by Frank M. Murphy and W. C. Greene, but the latter finally concluded to operate on the eastern Sierra slope, where railroad transportation to El Paso could be secured.

Report on New Replogle Steel Co.

In a letter to stockholders of the Replogle Steel Co., which was recently formed to take over the property of the Wharton Steel Co., including the old Wharton iron mines at Wharton, N. J., the chairman of the new company, J. Leonard Replogle, includes a report on the property made by James Gayley, a former vice-president of the U. S. Steel Corporation. Mr. Gayley's letter, addressed to William H. Brevoort, president of Replogle Steel Co., says in part:

"I believe the Wharton property is fully assured of ore reserves amounting to 100,000,000 tons of high-grade ore and that these reserves will be materially increased as the orebodies are developed at greater depth.

"I have recommended modernizing of the two large blast furnaces, which should produce with good furnace management 30,000 tons of pig iron per month at a cost, under present conditions, of \$24.05 a ton. This cost is based on present market value of a 60 per cent ore, and coke at \$8.50 a ton, and should yield net profit of \$1,000,000 per annum on prices of pig iron prevailing in recent months.

"I consider the estimated profit of \$1,800,000 per annum for an output of 450,000 tons a year from the Replogle mill on a basis of present ore prices as very conservative. The market value today of a 60 per cent ore at Wharton, compared with Lake Superior ores in the Eastern market, is \$7.80 a ton. Your estimated profit was \$4 a ton. This would leave \$3.80 for producing the ore, which is excessive for that tonnage.

"I have recommended further development of the Dickerson and adjacent mines with view of doubling your production, as well as furnishing a variety of ores to produce different grades of pig iron and to insure the premium on your high-grade bessemer product which you are now shipping.

"In conclusion, I have reported that I consider you have at Wharton the backbone of a big steel industry already assured and that no improvements should be made that do not fit in as a component part to large and further extensions."

The total assets of the Replogle Steel Co. are given as \$12,121,289, which do not include any valuation of the 100,000,000 tons of ore reserves, nor any estimate of the 5,000 acres of mineral lands owned by Wharton Steel. The company's liabilities are not listed.

Canadian-American Resources, Ltd.

A new Company, the Canadian-American Resources, Ltd., has been incorporated under the laws of Ontario

with an authorized capital of \$50,000,000 for the development of natural resources, more particularly those of mines and oil deposits, in both Canada and the United States. It is the intention to acquire properties of value and operate them, some properties in the United States being already in view. The following are the officers: President, Alexander Alexander, New York; vice-president, L. E. Denyes, Toronto; secretary, Dr. R. Gordon Bogart, Kingston, Ont.; treasurer, George B. Leighton, New York; directors, Col. Jacob Ruppert, New York; George B. Gifford, New York; and S. W. Jenckes, St. Catharines, Ont.

Lake Superior Shipping Season Practically Ended

The 1920 shipping season from the Lake Superior iron ore district is about at an end, there being few boats remaining at the head of the lakes to be loaded. Loading has been carried on under difficulties during the last few weeks, as the weather has been quite cold and the ore has been freezing in the cars. Steam had to be used in large quantities in the yards near the docks to loosen the ore in the cars, entailing a heavy expense to shippers. The only ore that will go forward during the winter months will be to charcoal furnaces in Michigan and Wisconsin, there being a number of these furnaces in operation at the present time. It is believed that there is plenty of ore at eastern furnaces and in stock at lower lake ports to keep the furnaces in Pennsylvania and Ohio operating at capacity until next summer. The Indiana and Illinois furnaces also have their requirements. The total movement of iron ore from the district for 1919 is about 47,000,000 tons, or 13,000,000 tons less than in 1918. The predictions are that 1920 will be an active one in the ore business and the operators are looking forward to another 60,000,000-ton year.

Nothing has been heard regarding prices for 1920, and it is not believed that the ore scale for next year will be made until about Feb. 1. The operators contend that they should receive a higher price for their product, and it is likely that the 1920 prices will show an increase over the rates now in force. Costs have advanced considerably since the prevailing prices were made, and the outlook for lower costs is far from being encouraging. The prices now in effect range from \$5.55 a ton for Mesabi non-Bessemer to \$6.45 a ton for old range Bessemer, and the seller must produce the ore, transport it to the docks, down the lakes and unload it at the lower lake ports. Everything taken into consideration, the iron ore operator is not being in-

compensated for his investment, risk and hard work. The pit mines have an advantage over the underground mines, and the price must be such that those with the higher costs can show a profit at the close of the season.

Utah Metal Mines Unaffected by Coal Strike

The order of Fuel Administrator Garfield and Walker D. Hines, director-general of railroads, putting Utah coal mines on a war basis, cut off the supply of coal to all mines and smelters in Utah. R. C. Gemmill, general manager of the Utah Copper Co., has stated that he has coal enough to last from sixty to ninety days. The United States Smelting Co. has coal enough to last about thirty days. The American Smelting & Refining Co.'s local officials are quoted as stating that they do not know the exact amount of fuel they have on hand, but do not anticipate any immediate shortage. General Manager Gemmill of the Utah Co. said that if the American Smelting & Refining Co., which smelts its product, is forced to close down, the Utah Copper Co. will continue turning out concentrates and store them up.

Mining in Papua

Block 10 Misima Gold Mines Adds to Reserves—New Plant Under Erection

Development work at the Block 10 Misima Gold Mines, Papua, is stated to have considerably added to the reserves, previously stated at 130,000 tons, averaging 32s. 3d. per ton. Below the collar of the shaft they have over 34,000 tons valued at 56s. per ton. The assay plant shows an increase in value as depth is reached—probably due to leaching action—and it is anticipated the enrichment will continue to greater depth. It is officially added that indications point to the orebody having a length of not less than 220 ft. at the No. 1 level, with ore still in the face. During the June half year the mill treated 5,580 tons of ore, averaging 26s. 1d. per ton; and the sands and slimes were subsequently treated for bullion worth £5,716, equal to 20s. 6d. per ton. Costs for the term for mining development and ore treatment averaged 37s. 9d. per ton. Practically 45 per cent of the ore milled came from development work, and did not represent the average value of the reserves. There was a net loss of £4,300 on operations for the term. Owing to scarcity of shipping and labor troubles considerable delays occurred in sending forward new plant. However, one 20-head battery, with accessories, together with complete equipment for the tram line, has been delivered at Misima, while the balance of the equipment should be shipped at an early date.

PROGRESS OF MINING OPERATIONS

COPPER PRODUCTION OF "PORPHYRIES"

	Oct.	Sept.	Oct., 1918
Utah Copper	9,625,700	8,220,692	19,000,000
Chino Copper.....	3,287,905	3,538,704	7,063,000
Ray Consolidated..	3,900,000	3,850,000	7,490,000
Nevada Consol- dated	4,200,000	4,250,000	6,700,000

ALASKA

The shipments of domestic copper ore, matte, etc., from Alaska to the United States in October, were, according to the Department of Commerce, 6,523 gross tons, containing 4,210,274 lb. of copper valued at \$926,642.

Fairbanks—Increased activity at the mines in the Fairbanks section of Alaska in the spring is assured by the practical completion of the railroad between Fairbanks and the Nenana coal fields. The mines in the Fairbanks district have struggled against high fuel prices for several years. This has been caused by the depletion of the scant timber supplies of that region. The completion of the railroad will make available a rather low grade fuel but one which can be used to advantage.

ARIZONA

HELPS DODGE OFFICES TO BE CONSOLIDATED—CALUMET & ARIZONA MAY BUY SHANNON'S COPPER BELLE PROPERTY—SILVER KING SHAFT PAST 500 FT.

Douglas—For administrative convenience, there is to be consolidation in Douglas of most of the offices of the Phelps Dodge Corporation in Arizona. A floor of a new office building has been secured in which to house the legal and mining departments, headed, respectively, by Ellinwood & Ross, and Gerald Sherman, who will take with them twenty-seven employees. President Walter Douglas has been on an inspection trip to the various southwestern properties of the company, accompanied by a number of administrative heads. Only development work is being done at Morenci and Tyrone. At the former point it has been decided to build an entirely new mill, probably at a new location. At Tyrone the concentrator is being remodeled and enlarged.

Gleeson—It is reported that the Calumet & Arizona interests, of Warren, Ariz., are negotiating for the Copper Belle property of the Shannon Copper Co., \$450,000 being given as the price under consideration. The Copper Belle for several years past furnished the best of the ore that was handled by the Shannon smelter at Clifton and its ore reserves are said to be large and of fairly high grade. It had been proposed to work it in conjunction with the Shannon's Yeager Canyon property, but the latter has very different mining

conditions and is handicapped by lack of railroad transportation. It is considered obvious that the C. & A. could handle the Gleeson mines very much more economically than the Shannon, in view of ownership of a nearby smelter.

Inspiration—An experimental refinery and leaching plant has been placed in operation by the Inspiration Copper Co. for testing out methods of treating the large quantity of low-grade mixed ores on the property. Inspiration has about 40,000,000 tons of this mixture of carbonate and oxide ores. To handle a large tonnage and to get best results would probably necessitate the construction of a plant to cost several millions of dollars. New Cornelia, controlled by Calumet & Arizona Mining Co., has adopted this method of handling its ores and for some time past has been refining copper on the ground rather than shipping it to other points for custom treatment.

Superior—The new shaft of the Silver King of Arizona Mining Co., ground for which was broken in May, this year, was down 493 ft. on Dec. 1, having made 23 ft. in the week then ended. Sinking is proceeding at the same rate, the shaft being at 515 ft. as this is written. Lot No. 7, including 30 tons of concentrates, has just arrived at the El Paso smelter and is expected to net \$40,000. The lead and copper contained pay the freight and treatment charges. A crosscut was driven at the 415-ft. level connecting the new and old shafts, and another will be driven at the 600-ft. level. The mill ore at the 400-ft. level shows upwards of 17 oz. of silver to the ton, and shipping ore now being taken from the same levels shows upwards of 200 oz. of silver per ton, of which 365 tons were taken out in 1918, netting the company \$46,983.14. Ore extraction from this body was temporarily discontinued in 1918, due to the water level having been reached, but the added facilities provided by the new shaft now makes this orebody available. The returns from the 25-ton test mill since March, 1919, were \$58,392.99 at then prevailing silver prices, in addition to which a shipment of approximately \$40,000 of concentrates was made Nov. 24. A 250-ton mill is to be installed and additions made thereto as rapidly as the development work warrants. The shaft, when completed to the 1,000-ft. level, will have a capacity of upwards of 500 tons daily.

Kingman—The new mill of the Hackberry mine has been closed down, because of insufficient stoping ground.

Shipments of high-grade silver ores will continue. Workings will be extended on the 800 level to a point 400 ft. from the present shaft, where a raise will be started for a new working shaft. Work will be pushed on securing larger stoping ground.—The Berkeley property in Cedar Valley has been taken under option by T. N. Stanton, of Tucson, and Charles L. Jones, of Bisbee, from Mrs. Elinor Dennis and J. J. Jerome, of Kingman. This mine is known to have a main ledge with 9 ft. of commercial ore, with a high-grade streak. The old shaft will be reopened and pumps installed.—The Kingman Consolidated Co. is driving the Arizona Butte tunnel at a rate of 5 ft. a day in granite along the footwall of the Prince George vein. Modern equipment is installed at the tunnel mouth, including Diesel engine, compressor, etc., and electric transportation equipment is to be added soon. A new mill is to be built at the tunnel portal, and a smaller mill will be set up on the Banner group with jigs to handle low-grade base ores.

Chloride—At the Mollie Gibson mine a new engine house is completed, hoist and compressor are being installed.—Mine work is suspended at the Dardennes mine while a new shaft-head equipment is being erected.—A new hoisting engine and gallows frame are also being installed at the Emerson mine.—The Chloride Queen now has a working drift driven about 425 ft.—The Tennessee-Schuylkill Mining Co. is planning to install a large mill on the strength of lead-silver ore reserves said to approximate 100,000 tons. Heretofore necessary milling has been done at Needles reduction plant.

Prescott—The Centipede group in the extreme southeastern part of Yavapai County has been sold by Daniel J. Cawley to an El Paso company represented by Lewiston Hayward. Cawley worked this mine alone for 18 years. In the same section Henry Tilden has sold the Cavalry gold-copper group to a Miami company.—Another sale is that of the South Dome mine near Walker, to the Big Dome Silver Mining Co. for \$15,000.—The Big Bug mine at Mayer is being fitted with a new hoist, compressors and pumps; similar equipment is also being installed at the Mildred mine near Crown King. The latter mine is operated by Rosenberg & Co., of Los Angeles, who are building a wagon road and expect to deepen the shaft to 500 ft.—A flotation mill to handle silver ore is to be installed at the Monte Cristo mine near Prescott, by W. D. Worthington.

CALIFORNIA

CALAVERAS COMPANY'S FURNACE RUNNING EIGHT HOURS DAILY—GRUSS COMPANY HAS BEGUN WORK AT GENESEE

Copperopolis—The Calaveras Copper Co. is now mining a little over 300 tons of 2 per cent copper ore per day, two shifts being employed. This production is about 60 per cent of normal. The ore is milled and smelted to 40 per cent matte at the reduction works about a half mile from the mine. The matte is shipped to Tacoma for converting. Features of the treatment are: (1) The sintering of flotation concentrates in a Dwight & Lloyd machine, reducing the sulphur from 15 to 0.5 per cent and making a product suitable for blast furnace smelting; (2) the operation of the blast furnace, which is of the ordinary rectangular water-jacketed type, during only one shift a day. The balance of the time, the charge is banked with coke and flue dust. While, of course, the operation is not as economical as continuous running, satisfactory results are being obtained.

Engelmine—Feather River Copper Co. is rushing work on camp construction at Engelmine in order to be prepared for uninterrupted work during the winter. A large electric-driven compressor is being installed and a power line is in course of construction from the Great Western Power Co.'s line, to the property.

Victorville—Talmage Bros. are driving a cross-cut tunnel on the Al Watts group; a compressor and machine drills have already been installed.—The Gold Mountain mine has 30 stamps running on ore from Glory Hole, crushing one ton per stamp.

Angels Camp—Angels Camp Deep Mining Co. has just finished installing a 100-hp. double-drum hoist, a large jaw crusher and two air compressors. Work is being rushed on construction of the stamp mill which is expected to be in operation soon.

Forrest Hills—The Baltimore Deep Gravel mine has taken over the Forrest Hill electric power plant on the middle fork of the American River, and all the machinery at the mine will hereafter be operated by electricity.—At Colfax the Rising Sun Mining Co. has installed an electric-driven pump of 400-gal. capacity to unwater the mine. Power is obtained by a branch from the Pacific Gas & Electric Co.'s power line.

Greenville—The Droege mine has opened up, and will operate a full force of men during the winter. Tunnel No. 4 is being cleaned out and ground broken for a new mill at mouth of this tunnel.—The Gruss Mining Co. has started development work at Genesee and will carry it on throughout the winter. It is planned to drive a tunnel

from the 400-ft. station of the main shaft, a distance of 1,000 to 1,500 ft. The shaft will be sunk to the 6,000-ft. point where a new level will be opened up. The present stamp mill is being remodeled to treat sulphide ore by flotation, and will start up next spring.

Porterville—The American Magnesite Co., has been taken over by C. W. Hill, who will operate a calcining plant on custom ore.—The Blue Mountain gold mine at White River is being opened up by a new company of which J. M. Howard is president.

Placerville—In the Shan Tzy gold quartz mine or Shaw mine, four miles west and two south of Placerville, two new shafts are being sunk on the quartz vein and are now down 50 and 60 ft., respectively. The vein is "pockety" and some rich bunches of gold quartz are found occasionally.—The Pacific Deep Gravel mine, seventeen miles east of Placerville, has met very hard rock in the new crosscut being driven south from American River. The new tunnel is now in about 120 ft. and after another 100 ft. a raise to the surface will be made for a ventilating shaft. The total length of the tunnel will be about 1,000 ft. and several other raises will be cut.—The Sunshine Deep Gravel gold mine, including 60 acres owned by the Sunshine Mining & Development Co. of Sacramento, is situated at head of Steeley Creek, nineteen miles east and six miles south of Placerville. It is reported that a crew will be busy all winter getting out gravel for the spring clean up.

Nashville District—The Noonday gold quartz mine, on the Mother Lode at the north fork of the Cosumnes River, twelve miles south and two miles west of Placerville, has been taken over by the El Dorado Lime & Minerals Co. The manager, Rey La Fountain, has installed a boiler and hoisting engine, and is deepening the main shaft. Present developments include a 90-ft. crosscut and two shafts on the 7-ft. vein to depths of 50 and 60 ft. respectively.

COLORADO

The Golden Eagle property in the Argo tunnel at Idaho Springs has been bonded to Eastern interests. Much work has been done in retimbering, catching up caved ground and driving raises and skipways. A large tonnage is expected from the tunnel and upper levels. Al Weinberger is the general manager and T. D. McGuire superintendent.

MONTANA

NORTH BUTTE'S OCTOBER PRODUCTION INCREASED—DAVIS DALY MAKES IMPORTANT STRIKE—ACTIVITY NEAR IRON MOUNTAIN

Butte—North Butte has opened a width of 25 ft. of 6 per cent copper ore in drifting on the 3200 level of the Edith May vein. This company's cop-

per and silver production for October shows a 30 per cent increase over that for September. The Davis-Daly Copper Co. has opened a new vein near its 2,700 station showing a width of 5 ft., all high-grade ore carrying more than 6 per cent copper and about 7 oz. silver. The vein is well defined, and the discovery appears important from the standpoint of indicating a material increase in production and ore reserves. This fissure will be driven for on the 2,500 and other levels above. About two months of crosscutting will be necessary before workings on the 2,700 level will reach No. 2 vein, which is the principal fissure on the level above. Between this vein and the station it is expected that three other veins will be picked up first.

Iron Mountain—The Golden Sunset Mining Co., owning several quartz lode claims on Cedar Creek, fifteen miles from Iron Mountain, Mont., made a good showing last season. A mill for recovering gold has been erected, part of the machinery installed and the rest is on the ground to be installed early in the spring. The American Minerals Mining Co., of New York, has taken over the old-time placer claims known as the Venness and Eclipse, on Trout Creek, which have long been under development by A. P. Johnston, an old-timer in the district. Frank R. Gump, manager, has been putting this ground in shape and testing it since June 24. It is said the company will work it vigorously in the spring. The same company has purchased 60 acres of placer ground at the mouth of Windfall Creek, adjoining the Eclipse. Another company has been working further up Trout Creek, on Cement Creek, and it is said it will push work in the spring. Near these properties and lying between them and the Golden Sunset is the property of the Gold Hill Mining Co., which had a mill in operation last season. This property has a number of lode claims.

NEVADA

STRIKE OF SILVER-LEAD ORE NEAR MINA—BULKLEY WELLS TAKES OPTION ON MATJUBA MINES AT DMLAY—WEST END MINING CO. AT TONOPAH DECLARES DIVIDEND

Mina—A recent strike of silver-lead ore in the Marietta district, about twenty miles from Mina, is reported by the Mina Commercial Club to have caused some excitement at Mina. Jack Anderson and his partner, owners of the C & A group of five claims, brought in for shipment to Selby's ten sacks of ore valued at \$3,000. This ore came from a hole less than 6 ft. deep, and the vein has been traced for some distance from the strike. Samples have been taken at various points along the vein, the best of which assayed 6,000 oz. of silver and 33 per cent lead. The width of the vein is undetermined. The

deposit is said to be on a lime and shale contact.—British Columbia capital is associated with Mark Bradshaw in developing a new find in the Lafayette district, near Candelaria. J. L. Giroux, formerly associated with Senator Clark, is opening up an adjoining property.—The Olympic Mines company's 100-ton cyanide mill which was burned on night of Nov. 21 is a total loss. Mill cost \$75,000 in 1916. It was constructed of timber, with corrugated steel sheeting.

Yerington—The Nevada Coal & Oil Co. is mining coal in Coal Valley, thirty miles south of Yerington. The nearest railroad point is seventeen miles away and trucks will be used to reach it.

Dayton—Work on the big dredge being built for the Gold Canyon Dredging Co. and which will operate placer ground above Dayton is held up by the strike in the steel works at San Francisco where the hull is under construction.

Ludwig—Henry I. Moore, assistant manager of the Nevada Douglas Consolidated Copper Co., has issued a letter to stockholders of the company proposing a plan for re-financing the company and the erection of a flotation plant to treat the sulphide ores.

Imlay—Bulkeley Wells has secured option for control of the stock of the Majuba Silver, Tin & Copper Mines Co., and has added \$25,000 to the treasury fund for further development. Several thousand tons running over 12 per cent copper have been shipped and 500 tons showing 20 lb. of tin to the ton have been developed on one portion of property which comprises 1,580 acres. Jack Welch is manager.

Unionville—The Arizona Silver Mines Co. has declared a dividend of 3c. per share payable Dec. 15 to stockholders of record Dec. 1.

Tonopah—The MacNamara mill is again working to full capacity on ore from its own dumps and from the Divide mines.—The West End Consolidated Mining Co. declared a dividend of 5c. per share on Nov. 24.

Virginia City—The Comstock North-end Mines for the week ending Nov. 15, crushed a total of 573 tons of ore with a total value of \$9,209 at the Mexican mill. Of the ore crushed Consolidated Virginia produced 300 tons with an average assay value of \$11.77 per ton, and Ophir 273 tons with an average assay value of \$20.80 per ton. Work on the cyanide department is proceeding rapidly.

UTAH

UTAH COPPER CO.'S REPORT—LITTLE COTTONWOOD TRANSPORTATION CO. ORDERED TO RESUME

Bingham Canyon—Utah Copper Co. reports the total gross production for the third quarter of 1919 was 25,269,679 lb., 24,774,761 lb. of this from concen-

trates and 494,918 lb. from precipitates from the leaching plant, as compared with 28,046,978 lb. total gross production for the second quarter, when 27,523,978 was produced from concentrates. The Arthur mill treated 1,397,400 dry tons, of average grade 1.16 per cent copper and with 76.20 per cent recovery as compared with 1,242,500 dry tons of average grade 1.35 per cent copper and recovery 81.8 per cent in the quarter preceding. Average cost per lb. (excluding federal taxes, and without credit for gold, silver, and miscellaneous income, but including plant deterioration and all fixed and general charges) was 14.885c. as compared with 11.59c. The higher cost was due to wage increase of July 16, 1919, and lessened copper production. The earnings, computed at 22.225c. per lb. of copper as compared with 14.74c. in the quarter preceding, show an increase, in spite of the decrease in amount of copper produced owing to the lower copper content of ore. Capping removed totaled 549,166 cu. yd., more steam shovel work having been done than in second quarter, when 333,048 cu. yd. was stripped. A daily average of 9,949 tons of commercial freight sent over the Bingham & Garfield R. R. as compared with 8,734 tons in the quarter preceding, shows an increase due to heavier shipments from the Utah Copper mine.—The Silver Shield mine has good ore showing, and an assessment has been levied to further development.—The Little Cottonwood Transportation Co. of Alta, has been ordered by the Public Utilities Commission to resume operations on petition by the South Hecla Mining Co.

Park City—Shipments during the week ended Nov. 22 amounted to 3,537,480 lb. ore and concentrates.—The Three Kings mine made a shipment of 50 tons from the winze being sunk for the limestone-quartzite contact. This property embraces 156 acres adjoining the Silver King Coalition. Large tonnages in this district are secured from the limestone bedding just above the contact.—The Naildriver has installed a new compressor; and is shipping ore.

Tintie—Shipments during the week ended Nov. 22 increased to 160 cars as compared to 140 cars weeks preceding. The Chief Consolidated increased from 38 to 41 cars and the Tintie Standard, which has shortened its haul to the railroad from six and a half miles to one mile, shipped 28 cars as compared with 18 in the week preceding. In general the district is reflecting the higher price of silver.—At Eureka the Tintie Zenith, near the Apex Standard, is to be developed through the sale of treasury stock.—The Yankee mine, between the May Day and the Uncle

Sam, has a new superintendent in William Carter.—At the May Day, a drift from the Yankee shaft on the 1,800 level, is showing mineralization.

The Tintie Drain Tunnel is in 4,000 ft., and good progress is being made.—The older workings of the Sioux Consolidated at Silver City, are being operated by lessees.—At the Iron King the upper levels are to provide shipments of fluxing ore as soon as the Goshen Valley R. R. is completed to the property. Drifting is being done in two directions from the bottom (1,565 ft.) of the shaft; also drifting on the 1,000 level.—At the Bullion Beck mine work has begun on the dump from ore milled many years ago, and a profit is expected with the present price of silver.—Zuma mine shows 10 ft. of quartz carrying 2 to 3 ft. of high-grade silver-lead ore opened near the center of the property in 300-ft. winze from the 500 level.

Lion Hill—The old Lion Hill stockholders have been notified that the time for exchanging to Ophir Metals stock, expires Dec. 31. Stockholders on payment of 20c. per share are to receive share for share in new company, par value of stock being \$2.—The new road being built from Ophir on to Lion Hill is practically finished.

WASHINGTON

BLAST FURNACE WRECKED AT TACOMA SMELTER—WESTERN COPPER CO. AT INDEX TO START UP

Tacoma—One of the copper blast-furnaces at the Tacoma smelter of the American Smelting & Refining Co. was wrecked recently by a series of explosions. Fortunately no employee was injured. The property damage was estimated at several thousand dollars. It is stated that the breaking down of the furnace bottom, releasing the molten charge into a water drain, created the steam which caused the explosions.

Valley—Copper Blossom group has been acquired by Evan Morgan, of Loon Lake, formerly the operator of the Loon Lake Copper property. The claims are situated six miles east of Valley. Active development work will be undertaken.—At Danville new development work is under way on the Chetterboy Mining Co.'s property, formerly known as the Lucille Dreyfus mine. Two shifts are at work driving a crosscut to explore the orebody 500 ft. below the upper levels, and they expect to complete this drift in about 60 days. J. E. Leonard is manager.

Index—The Western Copper Mining Co. is situated five miles west of Index, Snohomish County, Wash., and one-quarter mile from the Great Northern R. R. The ore deposit is low-grade, lenses of chalcocopyrite occupying a shear zone in granodiorite. The property was formerly known as the Bunker Hill Mining & Smelting Co. Underground

development consists of about 2,700 ft. of tunnel work, a few short raises, etc. Surface equipment includes a 100-ton concentrator badly out of date, and a 75-ton copper reverberatory furnace. The property has been idle for a number of years, but plans are now being formed in the East for the resumption of work.

CANADA
BRITISH COLUMBIA

Kimberley—Preparatory to increasing output, the Consolidated M. & S. Co. has let contracts for driving tunnels and raises and for breaking ore at the Sullivan mine. The mine is shipping again. Shipping operations have been resumed at the North Star mine.

Trail—Shipments of ore received at the Trail smelter of the Consolidated

and its capacity will be increased. The mill has been closed temporarily on account of frozen water pipe.

Lillooet—The Mining Corporation of Canada has purchased the Pioneer mine at Cadwallader Creek, near the Pacific Great Eastern Ry. This mine has been developed during the last three years by a Vancouver syndicate, and last year produced about 2,250 oz. of gold, the crushing being done in a Chilean-type mill. The purchase price was \$100,000.

Surf Inlet—The Belmont Surf Inlet Mines, Ltd., is reported to be improving working conditions at its camp. A model town is being built, homes and public buildings all being equipped with electric light, steam heat and running water. There is a modern club hotel,

ties to resume underground work. Exploration will be carried on in the expectation of finding new orebodies.—Twenty-five acres of the Chambers-Ferland property, adjoining the La Rose, have been bought by the Northern Customs Concentrators, Ltd.—The Penn-Canadian property which has been closed since the strike is being dewatered—The Nipissing Mining Co. is negotiating for a large silver-lead property in the United States.

Kirkland Lake—During October 345 tons of ore was treated by the Lake Shores Mines with a production of \$5,565. The mine has been dewatered down to the 200 level.—A plant is being installed at the Chaput-Hughes property, preparatory to sinking a shaft.

Boston Creek—On the Boston McCrea property No. 1 diamond drill hole has cut four veins, two of which are gold-bearing. No. 2 hole is down 150 ft. and has passed through 10 ft. of vein matter.—The central shaft of the Miller Independence is now down 350 ft. A station will be cut at 400 ft. and cross-cutting done to tap the orebody developed to 200 ft. in an inclined shaft.

Larder Lake—The Associated Gold Fields is installing an electric hoist on the Harris-Maxwell property, the 400 level of which is now being opened up.

COLOMBIA

MINING QUIET IN IBAGUE DISTRICT

San Mignel—The year has been quiet in the district of Ibagué. La Norcasia worked the wooden stamp mill almost continuously. El Recreo kept one mill working and is transferring another one to a recently discovered promising outcrop. La Dorada seems to have found another ore lens, very near the former one which was worked from 1908 to 1912. Costs are still low in the district, running about \$4 per ton. Between \$8 and \$12, free gold, is saved on the plates, leaving a fair margin of profit.

The Department of Tolima contracted the construction of a railroad between Ambalema, the terminus of the Dorada Ry., and Picalaña, a point on the Tolima Ry., about six miles east of Ibagué. This connecting link is to be finished in three years. But no big mines, it is said, will be created without the influx of foreign capital. Nobody considers mines outside of the Departments of Antioquia and Caldas.

BURMA

The Burma Corporation, Ltd., produced in October from the mines at Baldwin 4,112,640 lb. of lead from 4,886 tons of lead-bearing material, including secondaries. The output of refined lead was 3,136,000 lb. The production of refined silver was approximately 149,560 oz.



PIONEER MINE, LILLOOET, B. C., LOOKING ACROSS CADWALLADER CREEK FROM CAMP. PROPERTY HAS JUST BEEN SOLD TO MINING CORPORATION OF CANADA

Mining & Smelting Co. of Canada during the week ending Nov. 21 are given in the following table.

Mine	Location	Gr. Tons
Alamo Mill	Alamo	30
Bluebell	Riondel	8
Chetterboy	Janville, Wn.	38
Eastmont	Enterprise	34
Emma	Johns	454
Florence	Princess Creek	153
Iron Mask	Kamloops	48
Jo Jo	Three Forks	10
Josie	Jossland	318
Kaslo Concentrator	Kaslo	77
Mandy	Lo Pas	156
North Star	Kimberley	198
Noonday	Sandon	8
Oriana	Joan City	48
Paradise	Athalmer	41
Rossland Properties	Jossland	1876
Rambler	Cariboo	62
Sullivan (Zinc)	Kimberley	259
St. Eugene (Zinc)	Noyle	487
Silversmith	Sandon	95
Standard	Silverton	199
Van Roi	Silverton	41
Whitewater	Ketalack	40
Total		4648

Omineca—A tunnel is being driven to cut the orebody of the Silver Standard mine at the 500 level. Considerable equipment is being added to the plant,

as well as churches, post office and school. The output of the mine is shipped to the Tacoma smelter. Surf Inlet is one of the most prosperous and wealthy mining camps of the north.

ONTARIO

Cobalt—The Mining Corporation of Canada, which has taken over control of the Buffalo Mines, Ltd., will treat the ore in its Cobalt reduction plant. Connection has been made between the two properties. It is also planned to treat the sands pumped from Cobalt Lake by the Mining Corporation at the regrading and flotation section of the Buffalo mill, which in the meantime will be closed. The company is said to have taken an option on property containing radium ores recently discovered in the township of Butt.—The Peterson Lake Silver Cobalt Mining Co. is dewatering the workings of the Seneca-Superior and Gould proper-

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver		Dec.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
4	391½	131½	75	8	385½	132½	75¼
5	386½	131	74	9	384	131	75
6	386	132	74	10	379½	130½	75¼

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.

Metal Markets

New York, Dec. 10, 1919

The metal markets were spectacular this week, with sharp advances in copper, lead and zinc, and the transaction of large business in each metal.

The expected arrangement for an advance in transatlantic freight rates did not materialize. The rate of the U. S. Shipping Board to British ports is \$14, but contracts with outsiders can be made at \$12, and perchance at \$10. Transpacific rates from San Francisco to Hongkong and Kobe advanced sharply to \$18.

Copper

The decline that had been in progress for many weeks continued into this week. During Thursday and Friday no inconsiderable quantity of copper was sold at 17½c., delivered, equivalent to 17¼c., cash, New York, and possibly not quite so much as that. The low prices attracted buyers, and immediately a large business began, in which all of the big producers participated. In fact, practically all of the business was done by them, most of the small producers having apparently previously sold themselves out. On each day business was done at a range of prices, not only as between producers but also as between times on business done by the same producer. The buying was in sufficient volume to effect advancing prices, and one producer would raise his price before others had satisfied themselves at the old price. In the early part of the week, about ¾c. less was accepted for spot than for first-quarter contracts, but at the close both deliveries were more nearly on the same terms. The bulk of the business of the week was for January-February contracts. Some December business was done, and a few contracts running into March were taken. The character of the buying was quite irregular. Certain producers did by far the major part of their business with brass-makers, while the business of others was confined to wire-drawers. Rollers were not large buyers, but late in the week they came more into evidence.

The Export Association did a fairly large business, which was widely scattered. Japan bought some and Germany took several lots, which added up to a fair total.

Total business of the week, domestic and foreign, attained a large figure.

Daily Prices of Metals in New York

Dec.	Copper		Tio	Lead		Zinc
	Electrolytic	Spot		N. Y.	St. L.	
4	17½@17½	52½@52¾	6.75@6.80	6.50@6.55	8.15@8.20	
5	17½@17½	52½@52¾	6.80@6.90	6.60@6.65	8.20@8.25	
6	17¾@18	52¾@52¾	6.90	6.65@6.70	8.20@8.25	
8	17¾@18½	53½	6.90	6.75	8.20@8.30	
9	18½@18½	53½	6.90	6.75@6.80	8.30@8.35	
10	18½@18½	53½	6.90	6.75@6.80	8.35@8.40	

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Dec.	Copper			Tin		Lead		Zinc	
	St. n lard		Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
	Spot	3 M.							
4	99½	100¾	108	296¾	298¼	39½	39¾	51	51½
5	101	102½	108	298½	300	40½	40¾	51¾	52¼
6									
8	101½	103¼	110	304¼	305½	40½	40¾	53¾	53¾
9	101½	103	110	308¼	309¾	40½	40¾	53½	54¼
10	100½	102½	110	306½	308	40½	40¾	53¼	53¾

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

Monthly Average Prices

Copper:		September	October	November
Electrolytic, N. Y.		21.755c.	21.534c.	19.758c.
Standard, London.		£103.767	£103.418	£ 98.894
Lead:				
New York		6.108c.	6.487c.	6.808c.
St. Louis		5.800c.	5.949c.	6.649c.
London.		£ 25.330	£ 28.473	£ 34.731
Silver:				
New York		114.540c.	119.192c.	127.924c.
London		61.668d.	64.049d.	70.065d.
Tin:				
New York		54.482c.	54.377c.	53.307c.
London		£280.102	£279.239	£283.556
Zinc:				
New York		7.510c.	7.823c.	8.177c.
St. Louis		7.160c.	7.473c.	7.827c.
London		£ 40.955	£ 43.630	£ 46.588
Pig Iron:				
Bessemer, Pittsburgh		\$29.35	\$21.35	\$31.60
Basic, Pittsburgh		27 15	27 15	31 56
No. 2 foundry, Pittsburgh		28 15	28 30	32 16

Copper Sheets—28½c. per lb. Wire 21¾c. f.o.b. factory, quiet. Market stronger.

Tin

The business in this market was mainly speculative. Only a few consumers were buyers. Western manufacturers who use tin are beginning to be affected by the coal shortage.

Singapore quoted, c.i.f., London, £303½ on Dec. 4; £301 on Dec. 8; £305 on Dec. 9; and £304½ on Dec. 10. In this market Straits tin sold at 53½c. at the beginning of the week and at 54½c. at the close.

Lead

The large buying of last week led one important producer to raise its prices on Dec. 4. It found no difficulty in obtaining the advance. On the following day the A. S. & R. Co. raised its prices to 6.90c., New York, and 6.65c., St. Louis. In view of the situation previously existing in this market, this sharp advance was unexpected. However, it followed the advance in the British market, and the imminent prospect that Great Britain would bid for domestic lead. During the remainder of the week, fairly large sales were made at the higher prices. A large business in bonded lead was done with Great Britain, France, and Germany, the latter country being a significant buyer. At the close, bonded lead was quoted at 6¾c., New York.

Zinc

Early in the week there was large speculative buying at 8.20@8.25c. A galvanizer bought a large lot, but in general, domestic consumers were conspicuous by their absence. Export sales were made right through the week, the volume increasing in the latter half. However, the total for the week was probably less than in the previous week. Nevertheless, the demand was sufficient to advance prices sharply, and in view of the fact that sales had been negotiated in London at prices above our parity, it is to be expected that our market will advance further. An interesting feature of the week was relatively low offers of zinc in the New York market, the supplies originating from consumers who desired to resell. Inasmuch as the export business is being done through Galveston and New Orleans, the New York market fell below the St. Louis parity.

Zinc Sheets—\$11.00 per 100 lb. since Nov. 14, less 8 per cent on carload lots. Slightly higher prices for export.

Silver—The feature in the silver market the last week was the announcement made by the Federal Reserve Bank that, under agreements between the Treasury and the Federal Reserve Board, standard silver dollars which are

free in the Treasury would be delivered until further notice against other forms of money to the Division of Foreign Exchange of the Federal Reserve, which will, through the local Reserve Bank, co-operating with the branches of American banks in the Orient, employ such dollars in regulating our exchanges with silver-standard countries. The American banks whose branches in the Orient are to be used in this operation are the International Banking Corporation, the Asia Banking Corporation, and the Park Union Foreign Banking Corporation. The Treasury, according to latest available figures, has between 60 and 70 million dollars of free silver with which to supply these banks. The banks will purchase this silver in current funds, and export it to the Orient. The object of this operation is apparently to stabilize the silver market, and prevent a rise in silver which might make it profitable to melt silver dollars and subsidiary coinage. The melting value of standard silver dollars is approximately 130c., whereas the melting value of subsidiary coinage is approximately 140c. for silver per oz. The knowledge that this large supply of silver is available for export is expected to result in holding the price down. It is possible that the United States Treasury will insist in the melting down of dollars before export. It is probable that if the demand from China continues, which seems likely, refined bullion will still continue to command around 130c. to 132c. per oz. The silver market in London continues steady around 75 to 75¼d., but the continued fall in sterling exchange makes the equivalent of the London shipping price below 130c. per oz., with the result that no shipments are being made to London. The China demand still continues unabated, but owing to the abnormal conditions this year, it is impossible to predict what effect the Chinese New Year, which occurs in February, will have on the China demand. As a rule, demand from China is suspended until after settlement occurring on the Chinese New Year, but this year may prove an exception to the rule.

Mexican dollars at New York: Dec. 4, 101½; Dec. 5, 100¾; Dec. 6, 101½; Dec. 8, 100¾; Dec. 9, 100¾; Dec. 10, 100¾.

Platinum—In strong demand and scarce. We quote refined ingot at \$150.

Palladium—We quote \$125@130.

Aluminum—33c. per lb.

Bismuth—Unchanged at \$2.96.

Cadmium—\$1.40 per lb.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c.

Antimony—The market was firm at 9½@9¾c. for spot, and there is be-

lieved to be an upward tendency. We quote futures at 9½@9¾c.

Quicksilver—Quiet and steady at \$100. London £24.

Tungsten Ore—Market very dull. Chinese wolframite continued to be quoted at \$7 per unit, foreign scheelite at \$10, and Western scheelite at \$15.

Molybdenum Ore—Quoted nominally at 75c. per lb.

Pyrites—Spanish pyrites is quoted at 17c. per unit for furnace-size ore, free from fines, c.i.f., New York or other Atlantic ports. Markets slow and unsettled.

Sulphur—Prices remain unchanged at \$20 for export delivery and \$18 for domestic delivery, per ton, f.o.b. mines at Freeport, Tex., and Sulphur Mine, La.

Brimstone situation in Sicily characterized by much unrest among miners, and prolonged strikes. Sicilian sulphur production for 1919 estimated at less than 175,000 tons. At present no Yellow Superior grade for sale. Brown, or best thirds quality, is quoted at \$51.50 per ton of 1,030 kilos, in bulk, f.o.b. Sicilian shipping points. The output to the end of September was 149,000 tons, against 142,000 tons last year. Exports to end of September were 119,000 tons, against 194,000 tons the previous year. The stocks were 136,000 tons against 113,000 tons in September a year ago. The normal pre-war production was 350,000 tons or more.

Graphite—Ceylon grades are quoted: Lump, 15@16c.; chip, 11@12c.; dust, 8@9c. The recent increase has been owing to the increase of premium on rupee exchange and higher freight rates.

Feldspar is quoted from \$13.50 to \$17 per ton, according to quality.

Fluorspar—Lump ore containing 85 per cent CaF₂ and not over 5 per cent SiO₂ is quoted at \$16, f.o.b. mines at Tonuco, N. M. Freight to Chicago, \$7.50; to New York, \$15. Prices quoted f.o.b. Kentucky and Illinois mines are about \$25 for washed gravel grade.

Nitrate—Spot supplies are quoted at \$3@\$3.02 per cwt. for carload lots. Contracts for delivery during first six months of 1920 are stipulating \$3.05@3.07½. Shortage and good demand.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 6—Zinc blends, per ton, high, \$39.60; basis 60 per cent zinc, premium, \$48.50; Prime Western, \$47.50; fines and slimes, \$45@42.50; calamine, basis 40 per cent zinc, \$30. Average settling prices: Blende, \$47.43; calamine, \$32.68; all zinc ores, \$47.12.

Lead, high, \$88.75; basis 80 per cent lead, \$88@85; average settling price, all grades of lead, \$86.96 per ton.

Shipments the week: Blende, 8,131; calamine, 175; lead, 1,356 tons. Value, all ores the week, \$510,130.

A little lead sold at \$88 basis this week, the price declining to \$85. Heger Bros.' Illinois zinc smelter is reported idle on account of the coal strike, but, contrary to rumor, all others are reported in operation. Electric service has been withdrawn from day operation of all mines until fuel relief is assured, the electric company installing oil burners under boilers in substitution of coal, releasing a large coal tonnage for distribution.

Platteville, Wis., Dec. 5.—No zinc or lead ore quotations; mines closed down by shortage of coal for electric drive power. Shipments reported for the week are 2,360 tons blende, 39 tons galena, and 30 tons sulphur ore. For the year to date the totals are 95,513 tons blende, 6,301 tons galena, and 17,761 tons sulphur ore. During the week 2,422 tons blende was shipped to separating plants.

Iron and Steel Review

Pittsburgh—Dec. 9

The coal strike is the chief item of interest in the iron and steel trade at the moment, but at this writing strong hopes are entertained that the strike will soon be settled. In that event the recovery from its effects will probably be rapid, as there are stocks of coal that will be released. It appears that since the coal strike started, on Nov. 1, the steel mills have been running chiefly on the stocks they had accumulated, but in a week or two weeks more these stocks would in most cases be exhausted. In the last week there have been a few closings, through stocks having become depleted. To date, steel production has been affected little, though tin-plate production has been curtailed 20 per cent or more, and sheet production more than half as much. Per ton of output, these branches of the steel-finishing trade use particularly large quantities of coal.

The iron and steel interests are limited to their own stocks of coal, and are not receiving any shipments, barring possibly, an occasional exception. Even shipments from their own mines, such as those in the Connellsville region, are likely to be seized.

Production of beehive coke is being curtailed by 25 per cent or more, through supplies of coke cars being limited, cars for coal loading being furnished instead, and in ample supply. By an order issued yesterday the old Government prices on coke have been restored.

Except for the Wheeling district, the iron and steel strike is over, as regards there being any large number of men intentionally out of employment.

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver		Dec.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
11	370	130½	76¼	15	372	133	78¾
12	369	131¼	78¼	16	374	133½	79½
13	367	131½	78½	17	382¾	133¾	78

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

Daily Prices of Metals in New York

Dec.	Copper		Tin		Lead		Zinc	
	Electrolytic	Spot	Spot	N. Y.	St. L.	St. L.	St. L.	
11	183¾	52½	6.90@7	6.75 @6.80	8.25@8.30			
12	183¾	52½	7.15	6.85	8.20@8.30			
13	183¾	51½@52	7.15	6.85	8.20@8.25			
15	183¾	52@52½	7.17½	6.85 @6.90	8.15@8.25			
16	183¾	52½	7.20	6.87½@6.90	8.20@8.25			
17	183¾	53¼	7.20@7.25	6.87½@6.90	8.20@8.25			

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Dec.	Copper				Tin		Lead		Zinc		
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M									
11	101¾	103¾	111	306½	308	40½	40¾	53¾	54¾		
12	102¼	103¾	113	309	310½	40¼	40¾	53	54		
13											
15	102¾	104¾	114	315	316½	39¾	39¾	52¾	53¾		
16	103½	104¾	114	313½	315	39¾	39½	52	52¾		
17	104¾	106¼	115	315	316½	39¾	39¾	51¾	52¾		

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

Metal Markets

New York—Dec. 17, 1919

The chief event of this week was the sharp advance in the price for lead. Copper was steady, but the bloom of the recent advance was gone. Zinc, which closed strong last week, with every prospect of immediately crossing 8½c., surprised everybody by a relapse. Gold sold in London on Dec. 12 at 111s. 6d. per fine oz., the highest price on record. The price on Dec. 11 was 109s. 7d.

Transatlantic freights unchanged. Trans-Pacific rates from San Francisco to Hongkong and Kobe declined to \$12.

Copper

A fair business was done, but very much less in volume than in the previous week. The bulk of the business was on the basis of 18¾c., cash, New York. During the last day or two the market exhibited a slightly easier tone. The Export Association did a business of moderate proportions.

Copper Sheets—28½c. per lb. Wire 22c. f.o.b. factory, quiet. Market stronger.

Tin

This market was erratic, conforming to the ups and downs in sterling exchange. A small business with do-

mestic consumers was done right along.

Singapore quoted £308½, c.i.f., London, on Dec. 11 and 12; £312 on Dec. 15 and 16; and £314 on Dec. 17.

Lead

The producers apparently abandoned all efforts to hold the market in restraint, and it bounded up immediately. The A. S. & R. Co. advanced its price on Dec. 12 to 7c., but on that day it was impossible for large consumers to get lead in tonnage at less than 7.15c. Higher prices were asked, but 7.15c. could be done. On Dec. 16 large business was done at 7.20c. The St. Louis market advanced to 6¾@6.90c., and the New York market moved substantially in conformity with St. Louis. Bonded lead was quoted at 6¾@6½c., New York. Lead production is increasing in Idaho, Utah, and Mexico, and this will eventually afford relief to the present acute situation. However, two smelting works in other districts are temporarily idle.

Zinc

Last week the market closed very strong, with every prospect that the price would immediately advance across 8½c., but with the beginning of this week free offerings developed, which appeared to be mainly the efforts of

speculators to realize, and the price receded in consequence thereof. Some business for export was negotiated, but the volume was less than in the previous week.

The United Zinc Smelting Corporation, owning plants at Moundsville and Clarksburg, Va., has passed under the control of Charles M. Schwab, who intends to enlarge and improve the plants.

According to the "Ironmonger," the total quantity of zinc exported from Germany to England by the German zinc syndicate since the resumption of business relations was 60,000 tons. This exportation is causing great dissatisfaction among German zinc consumers, who cannot get supplies.

Zinc Sheets—\$11.50 per 100 lb. less 8 per cent on carload lots. Slightly higher prices for export.

Silver—Although arrangements have been made by one government with the American-Asiatic banks to release silver dollars against legal-tender payments, the effect so far has not been sufficient to lower the price of bar silver for the Eastern market, as quotations would indicate.

Mexican dollars at New York: Dec. 11, 100%; Dec. 12, 100%; Dec. 13, 100%; Dec. 15, 101½; Dec. 16, 101½; Dec. 17, 101½.

Platinum—Very scarce and in great demand. We quote \$150@155.

Palladium—Scarce. We quote \$130@135.

Iridium—Quoted nominally at \$300.

Antimony—A fairly good business was reported. The market was firm at 9½@9¾c. for spot. Transactions in futures were reported at 9½@9¾c.

Bismuth—\$2.65 per lb. for 500 lb. lots. Price ranges from \$2.60@2.80 per lb. depending on quantity purchased.

Cadmium—\$1.40@1.50 per lb.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c.

Quicksilver—Quiet and steady at \$100. San Francisco telegraphs \$95, steady.

Tungsten Ore—Scarcely any business was done. Chinese wolframite was quoted nominally at \$7, foreign scheelite, \$10. Domestic scheelite at \$15.

Molybdenum Ore—Quoted nominally at 75c. per lb.

Chrome Ore—Business reported at 65c. per unit.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 13—Zinc blende, per ton, high \$53.20, basis 60 per cent zinc, premium, \$51; Prime Western, \$50; fines and slimes, \$47.50@45; calamine, basis 40 per cent zinc, \$35@32.50. Average settling prices: Blende, \$47.93; calamine, \$36; all zinc ores, \$47.82.

Lead, high, \$91.85; basis 80 per cent lead, \$88@85; average settling price, \$86.82 per ton.

Shipments the week: Blende, 9,431; calamine, 86; lead, 1,659 tons. Value, all ores the week, \$599,160.

For two weeks buyers have started the market on Monday, and sellers have thought it meant advances at the weekend, but the market has each week held to the price established on Monday, with the slightest inclination to weakening. A large tonnage was disposed of on the \$50 basis offerings of the week, and an increased tonnage was for sale today, when it was finally decided there would be no higher price level.

Lead, which weakened \$5 last week, came back to \$88 basis today.

Platteville, Wis., Dec. 13—Blende, basis 60 per cent zinc, \$54.50 base for premium grade; no sales of Prime Western grade reported. Lead ore, basis 80 per cent lead, \$85 to \$86 per ton. Shipments reported for the week are 1,592 tons blende, 323 tons galena, and no sulphur ore. For the year to date the totals are 97,105 tons blende, 6,624 tons galena, and 17,761 tons sulphur ore. During the week 1,476 tons blende was shipped to separating plants. The mines closed by the coal shortage have resumed work.

Iron and Steel Review Pittsburgh, Dec. 16

Recovery of the steel industry from the effects of the coal strike has been rapid, as was expected. No large proportion of the capacity was closed, and nearly all mills and departments that were idle last week are already operating. Large quantities of coal were held by the Railroad Administration, and such coal has been released freely; and the new production will begin reaching the mills in volume late this week. Restoration of a supply of coal, whether by accident or otherwise, is accompanied by resumption of mills in the Wheeling district that were closed by the iron and steel strike of Sept. 22, that having been of late the only important district in which the strike remained.

At many mills operations are not on a satisfactory basis, but all operating difficulties are expected to end with this month, and January should show a large production all along the line. Full efficiency cannot be attained at once, and capacity outputs cannot be expected before March at the earliest. Just before the strike, however, the steel industry was not producing at more than 85 per cent of capacity at the outside.

There continues to be an eager demand for steel products, both for quick and for moderately extended deliveries, and many buyers are willing to pay premiums above the Mar. 21 prices, to which the Steel Corporation and some of the large independents are strictly

adhering. In pig iron there are continued advances due to the bidding of consumers.

In conservative quarters suspicions are now growing that the alarm of buyers and the disposition of many sellers to demand advanced prices have gone too far, and that the market will soon present a much less buoyant appearance. Attention is directed to the fact that though pig-iron producing capacity is now about 45,000,000 tons a year, production in the year just ending is only a trifle over 30,000,000 tons, and most of the difference has been due to lack of orders, only about 2,500,000 tons of curtailment being due to the iron and steel strike; and the coal strike accounting for only about one-tenth as much. With the large increase in production that is in prospect, it is possible that supplies will equal demand within a few months, whereas buyers have been acting as if the shortage of the last few weeks would continue indefinitely.

Pig Iron—Sales of basic at \$35, Valley, seem to establish the market at that level, \$2 above the price of a week ago. Bessemer has gone in good-sized tonnages at \$36, Valley, representing \$1 advance. Foundry brings \$38 for early delivery, though \$35 or \$36 might be done on second quarter. Few furnaces have banked on account of coke shortage, and difficulties in this respect will be ended in a few days.

Finished Steel—The increase of 655,000 tons in the Steel Corporation's unfilled obligations in November indicates that sales of nearly 1,500,000 tons were made, as shipments were nearly 800,000 tons, and no sales were made at above Mar. 21 prices. More independents than formerly are asking premiums above the Mar. 21 list, and the advances are paid rather freely for any early deliveries. A few weeks ago plates could be had at 2.50c., the regular price being 2.65c. This week some large tonnages have gone at 2.75c., or \$2 premium, and premiums of \$3 and more are the rule on bars. Tin plate is uniform at \$7 except for export.

Ferromanganese—There have been fair-sized sales of domestic 80 per cent ferromanganese at \$120 delivered, and there is a fair running demand now. Spiegeleisen is stronger at \$38@40, furnace, for 18 to 22 per cent.

Ferrosilicon—Electrolytic ferrosilicon has advanced by the lower sellers becoming filled, and we quote 50 per cent at \$90 and 75 per cent at \$140@150, delivered Pittsburgh and Valley points. Bessemer ferrosilicon is held at \$59.50 for 10 per cent, \$62.80 for 11 per cent and \$66.10 for 12 per cent, f.o.b. Jackson, Ohio.

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The Mayflower and the Buford

On Dec. 21, 1620, the exploring party from the Mayflower (180 tons) landed at Plymouth. On this ship were Bradford, Brewster, Standish, Winslow, Carver, and others, in all, 102 men, women and children. They were all English; they came of the race that had steadily won greater and greater freedom for centuries and since then their freedom has progressed.

On Dec. 22, 1919, the Buford (5,000 tons) sailed from New York with 249 alien anarchists. On this ship the leaders were Goldman, Berkman, Lipkin, Bianky, and Bernstein. Nearly all were Russians; they came of a race that has never achieved representative government.

"I represent the devil," Emma Goldman said once. "I am the apostle upholding the glorious freedom, the apostle standing out against law and order and decency and morality. I am for the devil, who leads the way to the absolute yielding up to all the emotions here and now."

The Russians had plenty of American money; they fought against being exiled from the protection of the Government that they plotted to overthrow.

They have left behind 60,000 reds and 472 disloyal foreign-language newspapers.

SEND OVER THE REST!

It is a great Christmas gift to America.

We congratulate the Administration and the Attorney General in particular.

The Mexican Problem

THE Mexican problem concerns the mining industry more closely than any other group. There was, we believe, previous to the downfall of Diaz, at least, more American capital invested in Mexico than that invested by all other foreign countries combined; and of this capital the larger part was invested in mining and smelting enterprises. American-owned mines and plants of all degrees of importance were scattered all over the country. In the great oil regions around Tampico, also, American capital was being lavishly invested, along with that of England.

The mining engineer found Mexico an attractive field. In those pre-bellum days it seemed that the majority of engineers had been in Mexico at one period or another and the number of engineers who had found their main livelihood in that country was very large. Although the mines of Mexico had been worked in part by the Spaniards since before the landing of the Pilgrims in New England, they had

not been intensively exploited, and still yielded large returns. Silver, copper, and lead were the chief products, although many others occurred; in silver, Mexico took the lead among the nations of the earth.

It is a difficult thing to understand the heart and problems of a nation, as foreign comments on America will serve to show us. The popular characterization is invariably a slanderous and false one. The crafty and dollar-worshipping Yankee, the stolid and insensitive Briton, the decadent and immoral Frenchman, the effeminate Turk, are all imaginary characterizations. So it is with the Mexicans. We hear the Mexican characterized as dirty, lazy, and treacherous. It is true that the great bulk of this people, to whom American popular sympathy should go out, are desperately poor, and, in consequence, dirty, especially in the arid plateau country. They are not lazy, but are patient and industrious workers and craftsmen; and they cannot honestly be classified broadly as treacherous. The border Mexican

who has mixed with the border American, and who has perhaps a strain of the northern Indian, is possibly the least attractive of his race, and the reputation of the Mexican has suffered in consequence.

Although Mexico adjoins us directly across the Rio Grande, it is more strange and foreign than any country of Europe which the tourist is accustomed to visit. Should happier days come, we would recommend Americans to travel more extensively in this quaint land, with its beautiful old churches, its picturesque towns, its quiet and soft-spoken dwellers, with their life and habits of a by-gone age, reaching back to the simplicity of Egyptian or Biblical times; and its varied and usually wonderful climate.

The fifteen to twenty million inhabitants of Mexico are what Carranza in his messages proudly terms Indo-Americans. They are Americans of primitive stock—not Latin-Americans as we obtusely like to classify them. They are the descendants of that populous aboriginal people whom the pirate crew of Cortez found—industrious, civilized, with a civilization strangely like that of the East—Persia, Arabia, Egypt, five thousand years ago; agriculturists, weavers of cloth, makers of pottery, builders of temples, skilled in hieroglyphic writing, and with a religion again recalling the East, before Judaism and the later Christianity and Mohammedanism. The Spanish domination left its imprint on these people, but did not alter their main characteristics nor their national consciousness.

The average Mexican is perhaps 10 per cent Spanish (or perhaps some other European blood) and 90 per cent aboriginal; and many Mexicans are pure blooded, and in many sections they speak only their aboriginal tongue. The educated Mexican is, as a rule, proud of his race and his ancient civilization and often resentful of the Spanish strain. The great national hero is Cuauhtemoc, the valiant chief who made a vain historic last stand against Cortez, and their other heroes are those who have emancipated them from foreign domination or from political domination of the Church.

Diaz was an "Indian" from Oaxaca; and many other prominent men have been pure-blooded natives, like their hero Juarez. Spaniards are yet unpopular and much disliked in Mexico; and Americans find it politic not to retain in Mexico the Castilian lisp which they have learned in college. Other Europeans and Americans, however, have until recent years at least been good-naturedly received, all more or less on a par with one another, and have been accepted for what they are worth. In parts of the country, some inexplicable animosity seems to have smoldered against the Chinese, as in the early days of our own West. The American negro, however, is well received.

The exploitation of this patient people has not ceased since the days of Cortez. The division of wealth—lands and mines—in large parcels among the chieftains of a winning cause is one that was carried down to the days of Diaz. It is precisely the feudal system of middle Europe. Diaz was no ex-

ception. He divided the country largely into great estates, which he gave to his followers, who dispossessed by fraud or force any previous small holders they found, so that the rest of the population became dependent upon these feudal barons. The system of many haciendas or great ranches was to involve the laborer (peon) in debt, but to advance him shelter and food against its payment. In that way he worked his life long in virtual slavery (peonage) for the bare materials to sustain life. Progress under such a system was, of course, as difficult as in Russia or any other country that retained the feudal system.

Diaz was a progressive and a just despot. He welcomed foreign or domestic capital and enterprise; and under his regime railroads were built, power plants and public buildings constructed, and Mexico became stable and prosperous. This prosperity, however, benefited mainly the few, whether domestic or foreign; the life and opportunity of the mass of the population were not greatly improved. Between these two classes, the upper and the lower, however, grew up a middle class of schooled Mexicans—store keepers, clerks, and the like—who, with a few idealists of the upper classes and a few leading spirits of the lower classes, looked forward to more uniform opportunity for all. This hoped-for revolution was usually planned as bloodless, and was staged to come when Diaz died, for they would suffer Diaz as a despot more willingly than any other; but when Diaz got so old that he lost his grip and fairness, the upheaval took place, under the leadership of Madero, an idealist of the upper or ruling classes.

Francisco Madero will, in future, always be counted as a martyred patriot; an idealist in the extreme, a teetotaler, and a vegetarian, he was, in a still more accentuated form, the Kerensky of the revolution, who failed to exercise a sufficiently stern rigor to suppress the foes of the government which he won. After his assassination there succeeded the bloody Huerta, a drunkard and a despot, without the virtues which made Diaz great. That so many Americans, knowing the crimes and character of Huerta, should have clamored for our Government to support him showed threateningly our own losses in true Americanism, in democracy, and in idealism. Only such a type, these Americans argued, could keep Mexicans peaceable.

Let us be fair and frank and say that the Mexicans endured patiently and philosophically for years conditions that Europeans could not endure for a year, nor Americans for five minutes. Let us be fair and say that many Mexican mining towns were more orderly and peaceful than many of our own mining and lumber camps in pre-prohibition days, and that alcohol was mainly responsible for vice and disturbances of the law and order in both cases. One thing America and Mexico alike should love President Wilson for—that he refused to recognize Huerta, and so precipitated his downfall.

Huerta's crime, in the assassination of Madero, was immediately denounced by many Mexican chieftains—especially in the north—and most immedi-

ately and fearlessly by Carranza, the Governor of Coahuila, who became the leader of the element which ultimately accomplished the overthrow of Huerta and the placing of Carranza in power in Mexico City.

Since the overthrow of Diaz, however, the whole country has never been brought under a single strong government; hence we find large though shifting areas controlled by independent feudal chieftains, who support their armed followers by levy and banditry. Most conspicuous among these is Villa, a bandit chief without education or promise, whose operations in the north have caused the United States much annoyance. When cornered his favorite game has been a foray across the border, with the idea of forcing American intervention and giving him a chance to assume the role of patriot rather than bandit.

The pseudo-patriotic, chauvinistic, or anti-American pose is, indeed, the common reliance of all parties for popularity. This explains why Carranza, recognized by the United States as the most respectable possibility, and given the support which enabled him to win, has shown himself so tactless, thankless, and disagreeable toward the hand that helped him. Just as it is the popular delusion in the United States that the Mexican is hopeless, so the Mexican believes that the United States intends to annex Mexico and can be held back only by fear. Hence the bluff and braggadocio. This theory of the imperialistic designs of the United States has some foundation in our early difficulties with Mexico, which resulted in the annexation of California and the Southwest and in the conquest of Texas by the Texas Americans. The theory was seized upon long before the Great War as a fertile field for German propaganda, and it is almost entirely to this propaganda that we may look for the present fear of the Mexicans and the belligerent and provocative attitude of Carranza. The result was that in the Great War the Carranza government was not with the United States and the Allies, but was as actively pro-German as it dared to be. German-Mexican schemes for the invasion of the United States failed to materialize only on account of sheer helpless impotency on the part of the intriguing parties.

Carranza is still under German influence. He is hostile and morbid as to the United States simply because of this German-bred delusion. Mexico is still unquiet and unsafe. Neither the foreigner nor the native can prosecute the mining business, or any other, undisturbed; and many of the laws passed are aimed at the standing of American property and interests in Mexico. It is much the same attitude which, on the part of the Boer Republic toward the foreigner, led to the Boer War. Like his predecessor Madero, Carranza finds it difficult to carry out the promised sweeping reforms, and this gives the bandit chiefs, like Villa, the chance to claim the role of deliverer.

What should be the attitude of the United States? When the Diaz government broke down, and anarchy

swept a country so full of Americans and American interests and acquired rights, our Government should at once have stepped in and helped the country to an early adjustment and the needed reforms and democratic government so far as the people can respond.

Can Mexico realize her ideal of democracy—the dream of so many Mexican patriots? Not soon, without help from a more experienced and stable country, we strongly believe. It is true, as the Mexicans point out, that we have our own troubles and defects; but our duty and custom is to attack these and remedy them with a direct and strong hand; and as a matter of fact one of our troubles and defects is our disorganized, antagonistic, and pro-German neighbor to the south of the Rio Grande.

Our Government did not take a hand in Mexico at the psychological moment. With strange provincialism and a complete reversal of the earlier policies of the nation, it disowned its citizens and their rights abroad and treated them as under suspicion. Since then the policy of the Government has been shifting and weak and not calculated to win the respect of the Mexicans.

It is a disagreeable problem for the United States—one among many which she should face. It is high time that the United States should straighten things out in Mexico or forever renounce such a purpose. With its Monroe Doctrine, which excites the suspicion of those whom it seeks to protect, intervention by the United States would be interpreted as a pretext for conquest and would antagonize those South American countries which speak the same Spanish or the similar Portuguese language. The fact is that we do not want Mexico. We have already acute trouble in our melting pot, and we can stand no more foreign mixtures. We should not admit the Mexicans if they so begged. They must work out their own salvation as a separate republic, but we should help them, whether they realize or not the necessity and our intentions.

We suggest that the United States propose to England and France a joint mediation and organization of Mexico; Mexico to be left autonomous and absolutely independent as she can show herself able to be self-governed—not on the old feudal and despotic plan, but with the free and equal opportunity for which her patriots have so long striven and still strive. This is the only attitude that even the firmest-minded American should take.

Are there those who imagine that American intervention would insure a return of the conditions of the Diaz regime? Such a thought is as vain as it is ungenerous. That stage is past, and Mexico must progress with our help. Domination by the United States is out of the question. We could not assimilate the Mexicans as citizens, and we are glad to say that they will never willingly become a subject race. The role of the English in India or Egypt is not one that we can play. Ours is rather that of the Americans in Cuba and the Philippines, acting altruistically as liberators and educators.

Prospecting Beneath Overburden or Caprock

IT has always been a difficult thing invariably to comply with the law that makes it necessary to discover ore before a claim may be staked. Under the usual conditions, this is proper and easy, but the exceptions are very numerous and important. Many classes of geologic conditions occur which mean the plunging of the orebodies beneath a covering of barren rock or gravel. One of the familiar examples exists in all the arid states, where the great sea of wash or gravel surrounds the naked hills on which the ore may be found to outcrop, and covers the possible extension of these orebodies or similar ones with an ever-thickening blanket. Another case, found also in many Western states, is where ore-bearing formations have been covered by subsequent rocks, usually later volcanic, and so effectively buried. Such is the situation, for example, at Tonopah, Nev. Again, the ore may be restricted for geological reasons to a certain horizon or horizons, as at Leadville, in Colorado, and may dip beneath the characteristically barren formations, inviting prospecting work to follow, at the same time that the increasing cost of engaging in a gamble tends to deter the attempts.

It is well known that the custom has necessarily grown up of twisting the regulations to fit the facts. Lands suspected of covering the buried extensions of orebodies have been taken up as mineral claims by the aid of "discoveries," made as plausible as possible by the locators, but, nevertheless, as a basis for the real motive of location, often purely fictitious. No fraud can be alleged in such cases, however; the practice and the necessity of it were thoroughly understood, and all were on the equal footing of having done their best to comply with the only law under which mineral lands could be taken up. Unfortunately, the question of expense often delays indefinitely the proving up of claims so taken up, although few are held except with the intention of so developing. If not, they are generally allowed to lapse. With the more exact classification of public lands by the Government, it finds itself unable, however, longer to approve of a mining claim located without any discovery of ore, although doubtless located in the belief and hope that mineral might be found underlying a barren overburden.

It is unquestionable that the heyday of new discoveries and developments in the metal mines is past in this country. Most of the easily accessible ore deposits which crop at the surface as rich ore have been located and worked, or are being worked. Much ore remains undiscovered, but it is largely because it is buried by overburden or barren overlying formations; and the problem of the future is to make it worth while to prospect in depth, increasing the risk of an always extremely hazardous class of enterprise. Primarily, this is a Government problem, and it involves devising measures of encouraging private capital to enter this field more actively than in the past, for it is only by private enterprise that this can be approached. An obvious inducement would be to give the prospector, whom we might call

on this scale the explorer, permission to dig or drill to prove whether or not land is mineral-bearing, and, if so, to grant him, as the result of a real mineral discovery, a larger holding than the twenty acres provided in the ordinary mineral claim, and this both on account of the expense of exploring and the expense of exploiting, which would necessitate operations on a large scale to be successful. It goes without saying that extralateral rights and the operation of the apex law should be withheld from such grants.

The above has been written in consideration of a bill which was introduced by Congressman Hayden, of Arizona, on Nov. 7, 1919, (H. R. 10433) and of which mention has already been made in the "Journal."¹ Mr. Hayden's bill, as it now stands, though it covers and provides for the problem above outlined, specifies only copper-bearing lands in Arizona, New Mexico, Nevada, and Utah. From any point of view, of course, it must be made to apply to other metals besides copper, and to other states; but with these and perhaps other modifications, it seems a common-sense plan for encouraging further necessary developments of our varied mineral lands on a simple, equitable, and legal basis.

The Price of Steel

THE price of steel in the United States is determined by the price at Pittsburgh, plus the rail freight charge from that city to the point where the steel is sold. The buyer in Duluth, Minn., for example, with the ore mined only sixty miles away and smelted at his door, is required to pay approximately the same price for the same steel as the consumer in Eastport, Me. This tends, of course, to make Pittsburgh the center of the fabricated-steel industry, as the raw material must be cheaper there than anywhere else in the country. The practice has naturally aroused the ire of users who have plants at a distance from the Pennsylvania city, and they have requested the Federal Trade Commission to assume jurisdiction and declare the system in violation of the Clayton Anti-trust law and the Federal Trade Commission law, as constituting illegal price discrimination and an unfair method of competition in interstate commerce. The commission has been sounding the producing and consuming interests of the country for expressions of opinion, and, of the seventy-nine companies approached, forty-three have opposed the abolition of the system and thirty-six have favored it. Knowing whether the company was a producer or a consumer, and the location of its plant, it would not be difficult for one to tell what answer would be given.

Some of the arguments of those favoring a change in the system are as follows: The arbitrary added charge of a fictitious freight rate from Pittsburgh is uneconomic, and gives to the producers excessive profits for which no commensurate service is rendered. Chicago consumers declare that one-fifth of all steel produced in the United States comes from a district within forty miles of that city, and

¹December 8 and 15, 1919, p. 783.

is, moreover, produced more cheaply than at Pittsburgh. They resent paying for Pittsburgh costs plus the charge for a five-hundred mile freight haul which never takes place. They charge that the Pittsburgh basing system is a tool for illegal price control. Consumers in Duluth feel the same as those in Chicago, only they have the added sting of being charged the rail freight rate from Pittsburgh, when, if the steel were ever shipped at all, it would be shipped by water at a cheaper rate.

Southern manufacturers and shipbuilders say they cannot compete with Northern and Eastern manufacturers, because of the high price they must pay for steel, although steel is produced in quantities at Birmingham, Ala., and at lower cost than at Pittsburgh. The entire manufacturing development of the South, is, they claim, being arrested. They make the point that there is no price competition in the steel industry, as all mills adopt the Pittsburgh price, plus freight.

So far, it seems to be a case of unalloyed wickedness; but let us look on the other side of the fence. Pittsburgh produces about 70 per cent of all the steel in the country. No other one district, it is argued, produces enough to meet its own demands, and the deficiency must be made up with Pittsburgh steel. Mills at other points could not be expected to take a lower price than that which they can get,—and with the overbalanced demand they can get up to the Pittsburgh price, because that is economically where they begin to meet the competitors' supply.

The result of selling f.o.b. the producing mill would, it is claimed, result in restricting the sales of each mill to the district immediately surrounding it, and thus competition would be reduced. Also, the change would merely take some of the profits away from the producers and give it to the fabricators, the consuming public paying the same as before. One of the largest Pittsburgh mills complains that many of the mills in that district would have to be torn down and rebuilt in other parts of the country, resulting in a great expense not only to the mill owners but to the proprietors of many other industries which depend on the mills for their market. In many parts of the country the Pittsburgh mills would not be able to compete at all.

Judge Gary has ventured the opinion that if the Federal Trade Commission decides to assume jurisdiction and endeavors to change the present system the result would probably develop "the greatest lawsuit in the history of the country." Considering the extent and power of the interests involved, the Judge is probably right. To us, the present system seems wrong, and yet we are not prepared to advise changing it, in view of the extensive and costly readjustment which would follow.

Vacations

DISSATISFIED workers are beginning to take "vacations," instead of going on strike. Is this an acknowledgment that strikes are becoming unpopular, or is it a notice served on the aristocracy

that the customary "two weeks with" is not the sole prerogative of the bourgeoisie? The vacationists have usually found two months more enjoyable than two weeks, and have finally come back with the idea of doing less work instead of more, just as regular vacationists often return tired. Truly, the only time a man really needs a vacation is when he has just returned from one.

"Many Shall Run To and Fro, And Knowledge Shall Be Increased"

VISITORS to the plant are of two principal kinds. In one class are those who know nothing about the process or the industry and merely want to look around out of curiosity. To guide such people about is ordinarily more or less of a bore, which we usually try to pass on to some one else. After being shown through the electrically-driven compressor plant, they are likely to ask to see the boilers which furnish the steam for the engines they have just inspected. Such visitors usually come in parties, so the guide picks out the most interesting member, and thereafter shows a friendly interest in what the home-folks think about prohibition or the latest fox-trot step, as the case may be.

But the technical man, the mill superintendent from Arizona or the metallurgist from British Columbia, receives a different welcome. Such a visitor can probably help us more than we can help him. We are glad to give him a part of our time. Much of the metallurgical development in this country in the last few years has been due to the freedom with which information is given to properly accredited visitors and to the technical press. We forge ahead by co-operation. If we keep off by ourselves, the band marches away, and we get out of step.

Unfortunately, some plant officials have yet to see the wisdom of this course. They believe they have a monopoly of a certain process. All plant data, whether bearing on the forbidden subject or not, are withheld, and visitors are de trop. They do not realize that if one really wanted to find out what was going on, there would be no great difficulty in so doing. They are always glad to see what is going on elsewhere; they are careful to subscribe to all the technical journals. Their attitude is that of the graduate whom the writer once interviewed in an attempt to secure a contribution to a university fund. "No," he said emphatically, "When I went to college I paid the tuition asked, and the account is settled."

But the type of person who hoards information, as well as the food hoarder, is becoming more and more unpopular. America is possibly more open in this way than other countries are. Recently an Englishman came across the Atlantic to investigate the application of pulverized coal, and on his return published in a British government report the following: "The writer confesses that he never realized that in any country would it be possible for a stranger to receive so frank a welcome as was given him during his brief stay of four months in the United States of America."

Mining in Colombia, South America



THE NEW TOWN OF SAN MIGUEL, AT THE JUNCTION OF ANAIME AND VERMELLON RIVERS. THE ROAD IN THE CENTER IS CUT IN LATER VOLCANIC TUFF.



PANORAMIC VIEW OF PART OF ANAIME RIVER VALLEY. EL RECREO MILL AND DWELLING HOUSE ON LOWER LEFT-HAND CORNER. ANAIME TOWN, RIGHT AND MIDDLE. WATER DITCHES OF RECREO MINE PLAINLY SEEN.



FLAT LYING OUTCROP OF GOLD-BEARING QUARTZ, COMPLETELY COVERED BY VOLCANIC TUFF. LA PAZ MINE (EXTENSION OF RECREO MINE), NEAR SAN MIGUEL, DEPARTMENT OF TOLIMA, REPUBLIC OF COLOMBIA



GROUP OF COLOMBIAN MINERS, EL RECREO MINE, NEAR SAN MIGUEL, DEPARTMENT OF TOLIMA, REPUBLIC OF COLOMBIA.

The Kelly Silver Mine, at Randsburg, California

Rich Silver Oreshoot Outcropping on Surface in Well-Known Mining Camp Making Important Production—Property Yet to be Developed—Many Lessees

Working Adjacent Ground

BY JAY A. CARPENTER
Mining Engineer

Written exclusively for *The Journal*

A MINE that paid \$96,000 in dividends from the sage-brush roots, that to 50-ft. depth had no dump, everything mined being shipped to the smelters and yielding \$96,000 in dividends to the owners, is a discovery of interest to the mining industry. This unusual development occurs in a district noted for its gold production from 1895 to 1915 and for its output of tungsten from 1915 to 1918, and now probably destined to become known for its silver production.

The Kelly silver mine is situated one and one-half miles east and south of Randsburg, Cal. Though Randsburg is in Kern County, and the principal owners of the mine are from Bakersfield, the county

tension line from the Sierras to Los Angeles. An eighth of a mile away the water company that supplies Randsburg had laid its pipeline leading from the pumps at Squaw Springs. Kern County had brought its paved roads around Randsburg to within a half mile of this spot. Two miles away by road is Randsburg, with abundant labor to work a mine and stores at which to supply materials. Though the region is a mountainous sage-brush covered country of 3,700 ft. elevation, less than 200 miles away by quick train service or good auto road are the orange groves and Los Angeles, the promised land of the successful Southern California prospectors.

At this spot, about the first of April of the present



LEFT, JOHN NOSSER. DISCOVERER OF KELLY MINE. RIGHT, LOOKING NORTH TOWARDS THE KELLY MINE

seat, the mine itself is just over the line in San Bernardino County. A branch line of the Sante Fe railroad runs past the mine to its terminal at Johannesburg, which is only a mile to the northwest. The station of Searles, on the Southern Pacific R. R., from which a branch goes to the potash fields at Trona, is only twelve miles away and connected by a good auto road. Not only is the rich Kelly mine fortunate as to its location near railroads, but its proximity to other advantages makes it like unto the mine upon which the prospector builds his fairy castles of sudden wealth, and like the mine that the engineer travels incessantly to find, but seldom sees.

Just a quarter of a mile below where, since the days of '49, the rich horn-silver ore of the Kelly mine has been tramped over but lay unnoticed, the Santa Fe road put in a siding years ago; and a half-mile away the Sierras Power Co. strung its high-

way, two prospectors, Hamp Williams and John Nosser, sat down to rest on their way back to Randsburg, little thinking how soon they or their backers, J. W. Kelly and Miss Edith Coons, would reap the rewards of two years' patient search for a mine. A chance piece of rock broken off by one of them led to a discussion as to whether it contained antimony or silver. Two samples of the croppings were mailed to Mr. Kelly at Bakersfield. The returns showed \$60 in gold and 436 oz. silver in one and \$30 in gold and 326 oz. silver per ton in the second. As the cropping proved to be on the end of an old claim worked years before because of a gold vein on it, but on which exemption of labor had been filed during the war years, Mr. Kelly obtained an option to buy the claim, known as the Juanita, for \$5,000, and Williams and Nosser located all the open ground available, giving them over a dozen claims. To make

the first shipments Williams and Nosser each sold a half of his quarter interest to compensate for his share of the expense. Alfred Harold, editor of the "Bakersfield Californian," was one of the fortunate purchasers of an eighth interest for \$1,000.

Phenomenal Preliminary Shipments

The first two cars shipped from the surface netted over \$40 per ton. By August 19, twenty-eight cars had been shipped from a hole 18 by 20 ft. by 50 ft. deep. As yet it was a mine without a dump. The 1,180 tons shipped contained 405 oz. of gold and 174,722 oz. of silver. Estimating gold at \$20 and silver at \$1.10 per oz., the gross value of the ore was over \$200,000, of which over one-half was clear gain to the owners. Two small cars had returned \$600 per ton net, one 50-ton car had brought a \$21,000 check, and the average value per ton shipped had been over \$168. The daily assay sheet for July 30 is remarkable in that the eight samples taken that day did not vary widely and averaged \$1,528 per sample.

While this remarkable record was being made, Hamp Williams and John Nosser again sold one-half

also, small, rich stringers. The immense glory hole of this mine is one of the sights of the district, and its production of millions bespeaks its importance in the history of California gold mines. Today a small mine crew is working under the direction of Mrs. Rose L. Barcham, one of the original owners, and seeking to get under another favorable surface showing in the large acreage held by the company.

About three miles away from the Yellow Aster, in the unaltered granite, are the tungsten mines of Atolia, noted for their pure scheelite ores. During the high price of tungsten from 1914 to 1919, Randsburg was filled to overflowing with prospectors, miners, and speculators. The old-time miners of Randsburg saw the "heavy spar" that had troubled them in their stamp batteries and on their plates for years make quick fortunes for those who first realized the value of the mineral. With this example still before them, 1919 found Randsburg without a custom assay office, and the miners depending on the gold pan for prospecting and assaying. Anyone traveling from Randsburg to Atolia could not fail



LOOKING SOUTHWEST TOWARD THE KELLY MINE

of their remaining interest in the mine to Bakersfield people, but this time for \$50,000 each. Mr. Kelly sold three-eighths of his interest for \$100,000 and Miss Coons one-quarter of her interest for \$66,000. Thus in the space of six months the two prospectors, the ex-sheriff and the ex-assessor of Kern County have amassed comfortable fortunes.

The mine is locally known as the Kelly mine. The first name chosen was the Rand Divide, as the mine is in the Rand district on the dividing line between Kern and San Bernardino counties. However, as another company of the same name was operating in the Divide district in Nevada, the incorporated name was changed to the California Rand Mines Co.

Description of the District

The country rock surrounding Randsburg is principally granite or a granite schist. The Yellow Aster mine, discovered in 1895, operated first a 30-stamp mill, then a 100-stamp mill for over twenty years in the treatment of the ore from a wide zone of enrichment in the granite schists that constituted a low-grade, amalgamable gold ore, but contained,

to observe on the left-hand side of the road a prominent quartz reef which lay unprospected except for gold. It was on this reef that Williams and Nosser made their discovery of rich silver ore, at a low point on the reef which had been a trail and road for years.

Character of the Deposit

The quartz reef is on the foot-wall side of a rhyolite dike, about 200 ft. wide, which outcrops through the granite schist on a $N. 19$ degrees E. course for nearly a mile. Dikes of white, fine-grained rhyolite are rather common in the district, but the others do not show as great width or as great silicification as does the one that led to the discovery of the Kelly mine. The cockscomb reef that shows up so plainly in the accompanying photograph is nearly all quartz. It is of a red color, due to iron oxides, but the clean quartz is very dense, hard and blue in color with considerable fine pyrites. This quartz is in sharp contrast to the great amount of white quartz found as float or in innumerable veins cutting through the granite schist in all directions. The white quartz

veins are as a rule barren, but many of them have been worked for free gold.

The country around Randsburg and Johannesburg is dotted with headframes and small custom mills. The vein mined on the Juanita claim was of the free-gold variety. It strikes N.55 degrees W., and its projected point of intersection with the N.40 degrees E. quartz reef is just where the Kelly mine opened up its orebody.

Kelly Mine Thought to be on Juanita Vein

Many of the miners and engineers who have looked over the ground believe that the Kelly orebody is on the Juanita vein, and have taken leases or purchased claims along the strike of this vein. Other miners and engineers are as confident that it is on the reef vein, and as quartz containing a few ounces of silver has been found along the reef in a couple of places, these men have taken leases all along the reef both to the north and south of the ore body. Both sets of lessees have the unspoken fear that the main orebody may be a local enrichment at the intersection of the two veins; however, twenty-five sets of lessees are all sinking to depths of from 50 to 100 ft. and then crosscutting, each with the great hope that quick wealth lies just ahead.

Description of Kelly Orebody

The Kelly orebody by Oct. 1 had been opened to a depth of 100 ft. As the shaft was sunk in shipping ore it more nearly resembles a glory hole, being about 20 ft. wide and 30 ft. long at the surface; 20 ft. wide and 50 ft. long at the 50-ft. level, and 16 ft. wide by 22 ft. at the 100-ft. point. The length referred to above is along the N.10 degree E. line of the bucket skids, and coincides with the approximate strike of the reef. The most noticeable feature on going down the shaft is that the ore lies in nearly flat layers. The layers are very distinct and are horizontal north and south, but dip from 5 to 20 degrees to the east. They vary from hard blue quartz to oxidized soft quartz, all carrying silver, but the richest are the softer layers which are spotted through with horn silver.

This appearance of the ore, lying so flat, led many to believe at the start that the ore was a shallow surface deposit, or more of a blanket vein. However, the bucket skids to the 50-ft. level rest on a well-defined slip striking N. 30 degree E., and dipping 78 degrees to the east, both dip and strike being the same as the main reef. Short crosscuts to the west of this slip, on the ends of the 50-ft. level, go out of ore.

A careful scrutiny of the sides of the shaft shows vertical stringers of quartz cutting in a continuous line through the flat layers. The stringers are parallel and have the same strike and dip as the foot-wall slip. A crosscut to the east from the north end of the 50-ft. level station shows one of these stringers 30 ft. away from the foot wall. It has a width of nearly two feet, assays high in silver, and could be called a vein by itself. Beyond this point the crosscut shows decreasing mineral values to its present face. At the bottom of the shaft there is one of the vertical stringers nearly 3 ft. wide. It is

hard blue quartz which in places carries high values in silver sulphides, and right at the 100-ft. point an oxidized flat layer carries an exceptionally high gold and silver content.

Mineralized Solutions Ascended Along Fissuring

From the above observations it is reasonable to form the hypothesis that the mineralizing solutions ascended along fissuring within and parallel to the dike, and that these solutions also spread out horizontally along the horizontal fracturing of the rhyolite. If this hypothesis be tenable, then there is an excellent possibility of finding commercial ore at depth and along the strike of the reef.

The orebody now exposed seems to have no connection with the Juanita vein. The Juanita vein has a



HEADFRAME AT KELLY MINE

N.55 degrees W. strike and a flat dip of 35 degrees to the northeast. If the ore in the Kelly were on the junction of the two veins, the oreshoot should have a flat rake of 35 degrees from the horizontal toward the north. There is no evidence of such a rake to the north, and neither the hanging wall nor foot wall side of the shaft shows indication of any cross vein or fracturing. However, the nearness of this orebody to the projected intersection of the two veins might have had considerable to do with its exceptional richness.

The composition of the ore above the 50-ft. level is best given by a smelter analysis of the control sample of the nineteenth car shipped. The analysis is as follows: Gold, trace; silver, 0.97; arsenic, 0.22; antimony, 0.07; silica, 76.0; iron, 3.2; magnesia,

1.34; manganese, 0.21; alumina, 6.30; sodium and potassium oxides, 6.82 per cent. There was no trace of lead, copper, platinum, palladium, bismuth, zinc, cadmium, selenium, tellurium, barium, calcium, sulphur, or tungsten. The analysis shows that the deposit is a remarkably clean siliceous silver ore, except for a very small content of arsenic and antimony. Below the 50-ft. point in the shaft, the ore is changing rapidly to a sulphide, especially in the hard blue quartz ore, which shows solid chunks of antimony and silver sulphides as large as a man's fist.

The stibnite is often without the needle crystal form, and is not then easily distinguished from the silver sulphides. A sample of this may run as low as a few ounces of silver or up to a thousand ounces. The silver is probably in the form of argentite, proustite, pyrargirite, and stephanite. One sample containing black sulphides assayed 312 oz. gold and 3,368 oz. silver per ton. Other samples have a much higher gold ratio.

At present the higher-grade material from the shaft is sorted for shipment and the remainder is put on a mill dump. Up to Oct. 1, fifty cars had been shipped, thus giving ample funds, after a payment of the \$96,000 dividend mentioned before, to use for the development of the milling ore on the property. Outside of the shaft there was on the same date not over 50. ft. of development work in crosscutting, but no drifting. There is, therefore, a possibility for a large quantity of shipping ore, above and below the 50-ft. level, on the strike of the quartz feeders.

Leasing in the District

The liberal leases which the company has granted to within 400 ft. of the shaft have already resulted in considerable work near the surface. However, most of the leases are equipped with windlasses and have only from two to four men working. A half-dozen are installing small hoists, while the first lease to the north is making good progress crosscutting with machines on the 100-ft. level. Very little prospecting or development work is going on in the neighborhood to find or develop other parallel dikes. The town of Randsburg is quiet, and at present there is more of a spirit of pessimism than optimism.

This condition is a strange contrast to the seething excitement which would prevail if this strike had been made in the State of Nevada, 135 miles due east. The difference lies partly in the fact that mining in California, especially in San Bernardino County and Kern County, is eclipsed by the oil and agricultural interests, whereas in Nevada mining is the paramount industry. Another reason is the marked difference in the law governing mining incorporations. In California the blue-sky law, in order to protect investors, is so strict concerning the promoters' share of the capital stock, and as to the selling price of the treasury stock, that the promoters have no strong personal inducement to develop prospects of merit. On the contrary, in Nevada the promoter is given so much leeway that

prospects of no merit are developing in order to make a living for the promoter, while the investor suffers. Whatever may be the handicaps, the accidental finding of the rich Kelly mine will result eventually in a careful prospecting and development of the surrounding country, with the possibility that the district may become the principal silver-producing camp in California.

Differential Flotation of Zinc-Lead Sulphides Improved by Metallizing the Blende

C. C. Freeman, of Broken Hill, has been experimenting on the differential flotation of lead and zinc sulphides, the results of his work being embodied in U. S. Patent No. 1,301,551 dated Apr. 22, 1919. Dilute carbonate of soda solution used as a frothing agent was found to give indifferent results, but a great improvement was noted when the zinc sulphide particles had been superficially coated with certain other metals, as copper. The metallizing of the zinc sulphides is the result of electrolytic or other action when copper or one of its salts, or a metal electronegative to copper, is in contact with the flotation pulp. When the flotation is effected in apparatus constructed wholly of iron, or of other metal not electronegative to copper, or of wood, and if no copper or other metal electronegative to copper be present, e.g. either free or combined mercury or silver, a definitely preferential action for the flotation of lead sulphide is displayed. Metallizing of the blende takes place more readily at high temperature than at low.

Mr. Freeman secures differential flotation of the lead sulphide by first carrying on the operation in an iron or wooden machine, employing as a frothing agent a solution containing about 3 per cent of sodium carbonate. Most of the lead sulphide is raised, and this concentrate may be cleaned in a machine of similar type. Most of the blende and pyrite remains behind with the gangue. This is then refloatated, using a machine made of copper, or after the addition of copper salts; a small amount of an essential oil or other frothing agent is also added.

The results of several tests are given in the patent paper. A calcitic ore, for example, containing 15 per cent of lead and 9.7 per cent of zinc, was floated in an iron machine, giving a concentrate assaying 63.2 per cent lead and 8.6 per cent zinc. A refloatation of this product under the same conditions gave a product containing 73 per cent lead and 6.2 per cent zinc. The same pulp, treated in a copper machine, made concentrate containing 39.2 per cent lead and 27.8 per cent zinc. The presence of the copper in the machine is thus shown to destroy the differential effect. The results of several other tests are also given. Oil, the inventor says, is unnecessary in the first treatment, as it helps to float the blende along with the galena, thus fouling the lead concentrate. The process is claimed to be of particular commercial value when the zinc predominates in the ore or mixed concentrate and when removal of pyrite is necessary.

Notes on the Final Report of the South African Miners' Phthisis-Prevention Committee

Value of the Various Methods of Testing Samples of Air—Effects of Different Types of Drills on Dust Production and Diffusion—High Temperatures and Humidity

BY E. M. WESTON

Written exclusively for *The Journal*

THE Miners' Phthisis committee of South Africa has been in existence since 1912 and has spent directly £8,619. It is dissolved for the present, as it was felt that sufficient work had been done to point out the right lines of progress in the future. There has been considerable difference of opinion regarding methods of dust determination and the relative merits of the konimeter and sugar-tube processes. In dealing with this subject, the committee remarked that "as a 260-mesh screen is the finest that can be made, and as it will allow a particle of 40 microns (micron = 1/2500 in.) to pass, a single particle of this size weighs the same as 37,000 average-sized particles found in the siliceous lung."

The survival of the ordinary gravimetric method is due chiefly to the fact that in mine-air samples the percentage of really fine or injurious dust, under about ten microns by weight, is not extremely variable, being 33 per cent minimum in collaring and about 94 per cent in blasting maximum; but usually about 70 per cent. Ordinary samples may then be assumed to carry 70 per cent "injurious dust," i.e., a return of 7 mg. per cu.m. represents 4.6 mg. of injurious dust per cu.m., an amount corresponding to 400 to 600 dust particles per c.c. of air.

New Methods of Dust Determination

The committee deals with new methods for estimating dust, including the "bottle method," the photo-konimeter, and Kotze's konimeter, with full drawings and a detailed discussion on the correct adjustment, employment, and method of counting by means of microscope and micrometer.

Returning to the question of the relation between weight and number of dust particles, the committee states that "a gravimetric return of 2 mg. per c.m. may mean the presence of 400 particles of injurious dust per c.c., or as many as 100 million per cu.m." The dustiest street air never contains more than 100 particles per c.c., and normal wet rock drilling averages 200 to 300 per c.c. In the case of "collaring" of holes, dumping into ore bins, and other work where coarse dust is produced, gravimetric results exaggerate the danger.

The committee therefore abandoned the tentative standard once suggested of 5 mg. (gravimetric) per cu.m., as in cases this might be as high as 7 or lower than 2. The report states, "Our investigations have proved that in either case it is practicable to reduce the amount of dust below the limits given." The majority report then says:

"A standard based on the number of particles can at this stage be based only on what is readily at-

tainable in practice. Our results have shown that to reduce the dust, as determined by the Kotze konimeter, breathed by persons, below 300 particles is not difficult in any operation. Anything above this is classed as unsatisfactory. Between 200 and 300 may be considered as fair, between 200 and 100 as good.

"The gentlemen who have signed the report object to this clause on other grounds. In my judgement they are more intimately acquainted with the actual conditions pertaining underground, and have given due weight to the fact, far too much ignored generally, that the manipulation of dust-producing processes is in direct charge of ignorant natives, usually without direct skilled supervision, and that they are not greatly concerned about the amount of dust produced, but rather to finishing their tasks and earning their wages. These gentlemen write, 'inter alia':

"In our opinion, there has not been sufficient detailed work done by this committee with the konimeter for the purpose of ascertaining its reliability and accuracy as an instrument for determining the dust contents of mine air. . . . It is impossible to distinguish between siliceous and less injurious particles . . . and until more information is available as to the variations caused by the personal factor in counting the particles under the microscope, we consider that the fixing of any precise standard of the number of particles for this purpose of indicating good or bad dust conditions in a mine is premature. In February, 1917, the Transvaal Chamber of Mines Dust Inspectors first began the use of the konimeter. . . . The results secured, however, have shown such surprisingly great variations, discordances, and discrepancies that the value of estimates of dust by the konimeter is still imperfectly understood. . . . We quote a few mines that have been sampled by the two methods . . . and cannot understand, in the face of their results, how anyone can describe the standard of 300 particles per c.c. as being 'readily attainable in practice'."

The following are the results (average from seven mines):

Mine	Each Method No. of Samples	Sugar-Tube Dust mg. per cu.m., Average	Konimeter Counts, Average
1	7	1.5	510
2	6	1.1	460
3	7	1.0	310
4	5	1.8	450
5	7	2.4	470
6	8	1.6	420
7	8	1.1	540

"In view of the data, and reasons given above, we contend that the standard of 300 particles is not

readily attainable in practice and would suggest . . . that the general use of the konimeter as the only indicator of dust conditions in a mine is premature."

Mr. Muir, in his paper on the konimeter, and reply in the proceedings of the Chemical, Metallurgical and Mining Society of South Africa, has published a lot of valuable data on this subject. The truth seems to be that the two methods of estimating dust are complimentary to one another. It is necessary to estimate the danger to workers near the source of the dust, where it is most concentrated in the air. In such places the distribution of the dust is not uniform, and the very small sample taken by the konimeter leaves a large margin for error. It is invaluable in showing the character of the dust and interpreting gravimetric results obtained in such places. When dust distribution is even and the quantity (gravimetrically) small, it gives more useful results than the sugar-tube method.

Effects of Dust Inhalation

The report gives a most interesting comparison between the number of particles inhaled and the number actually found in the lungs: "A recent estimation of the dust in the lungs of a person who had died of phthisis shows that they contain about 13 gm. of siliceous dust. If a man at work breathes one cubic foot of air per minute containing 300 particles per c.c., assuming them all to be siliceous, and if he works 300 days of eight hours each in a year, it would take him sixteen years to inhale the 13 gm. mentioned. As the lungs are normally capable of dealing with some of the dust entering them, and as all the dust in the air does not reach the lungs, it is obvious that the period is much longer than sixteen years."

The committee sums up by stating that "for investigation work and for checking purposes it is felt that both methods of dust determination should be utilized, particular attention (if desired) being devoted to the amount of injurious dust present and chemical and microscopic methods being pressed into service; but that for routine work the konimeter is the handier."

The quantity of dust in the air rapidly decreases in distance from the point of production. In the face of a drive showing 19 mg. per cu.m. the amount 40 ft. back was 10 mg. This is due largely to settlement of heavier particles and to diffusion.

"The second important factor controlling the amount of dust . . . is the presence of fog or moisture in the supersaturated state showing itself as fog or mist. . . The fine globules of water appear to lay the dust very rapidly. . . The effect of this precipitation of moisture is clearly shown in the amounts of dust that come to the surface at fan drifts and through upcast shafts. Although heavy blasting may have been going on for an hour before, samples taken at the top of upcast shafts have only shown an average of 12 to 26 particles per c.c. . . When air from blasting has to pass through areas where precipitation of its moisture

takes place, it does not appear that any appreciable quantity of dust travels half a mile."

Importance of Clarifying Water Used in Drills

The committee lays stress on clarifying all water used in rock drilling machines which are liable to produce a spray, as otherwise dust may be introduced into the lungs. Ordinary lake or river water contains 200,000 to 1,000,000 particles per c.c., and it was found mine water used for drilling varied from 700,000 to 500,000,000 particles per c.c. Large settling surfaces or filter beds of clinker and ash are recommended.

The control of crusher-house dust is practicable by the use of adequate fans and spraying apparatus. In the underground crusher station at the New Modderfontein Gold Mining Co. the dust is removed by fans and passes through a brick chamber filled with leafy branches of gum trees sprayed with water. The escaping air contains only 120 particles per c.c. The committee is satisfied that great improvements have been made in dust prevention underground, and considers that the dust inhaled today is only one-tenth of that previously breathed.

For avoiding dust formed by blasting in stopes which may contain 62,000 particles per c.c., single-shift blasting and the use of fan ventilation is considered adequate, provided the men, after blasting, are not exposed to the dust-laden air before being hoisted. In development ends, immediately after blasting a cut, the dust may be as high as 86,000 particles per c.c., whereas the dust in the smoke coming back from a development end after passing two "apex" water blasts was found to be 290 particles per c.c.

Dust in Drilling

Regarding dust caused by drilling: In collaring holes, the committee notes that the important matter is to provide a volume of water from a hose when using non-water-feed machines.

Jack Hammer, Drills, Wet Type—These produce 100 to 150 particles per c.c. when drilling and more when collaring. **Dry Type**—If the water supply is not well maintained, these are very dangerous dust producers.

Leyner Drill Type—When running as it ought, this type of machine gives low dust results, rarely exceeding 200 particles per c.c., and generally considerably lower. The machine has a number of comparatively delicate internal parts, of which the arrangements and function are not readily understood, with the result that these are frequently out of order". . . The miner continues to use it when only a trickle of water is being fed through the pumper. The heavy fog produced by leaking air and water may, if the water is dirty, contain dangerous quantities of dust. "The character of the dust produced by the Leyner drill is, for some reason not yet adequately explained, of an unusually fine character," the report says. One mg. dust per cu. m. gravimetric may represent 250 particles per c.c. "The Leyner type drill cannot therefore be regarded as quite satisfactory."

It is necessary that supervision be strict, and the committee recommends that to use a machine with its water feed out of order be made illegal.

Swifts Water Feed Attachment for piston drills gives satisfactory results, showing an average of 120 particles per c.c. drilling upper holes.

Hand Drilling.—The dust is coarse and the number of particles generally low. Results of 2.5 to 3.6 mg. per cu.m. represent 41 to 120 particles per c.c. "Walkers'" blow pipe is described and illustrated as a useful tool for blowing out old sockets and wetting the sides of drives. The committee seems unaware that I invented the device and published a drawing of it in "Rock Drills" years ago.

Sampling.—Tests carried out at three mines showed results rarely exceeding 200 particles per c.c. in the air while samplers were cutting grooves.

In another mine the figures varied from 450 to 800 particles, of which 75 to 80 per cent was under 5 microns. The report states that as sampling is an essential operation in mining, and the accuracy and reliability of the results preclude the use of water or other dust-preventing devices, mine samplers would do well to wear a good type of respirator such as Weston's or Toombs." This matter will be referred to later.

Chemical Nature of Rand Bunket.—It has been calculated that an average sample would contain

	Per Cent		Per Cent
		Total silica (82% free).....	86.8
Ferrous oxide	0.6	Alumina	5.0
Titanium dioxide	0.5	Pyrite Fe S ₂	4.0
Oxides, Ca, Zn, Ni, Co, Ch, U ..	0.4	Magnesia	1.3
Combined water in silicates.....	0.6	Potash K ₂ O	0.8

Water Blast.—The apex water blast, a description of which has already been published in this journal, is described and recommended. Robertson & Moss' water blast is a tank device for supplying a limited quantity of spray to a winze and preventing flooding.

The committee refers also to respirators, and is now prepared, largely owing to my efforts and protests, to modify its former attitude regarding them. This will be dealt with more fully in another article dealing with my patent respirator.

Ventilation.—The committee carried out tests on the amount of air entering and leaving all the mines of Witwatersrand. "The result of the tests showed that, taken as a whole, the ventilation of the mines could be considered good; but in some mines it was unsatisfactory. The committee notes that at the City Deep Gold Mining Co. mine an upcast shaft 18 ft. in diameter and 2,271 ft. deep was sunk and equipped with a fan capable of exhausting 450,000 cu. ft. per min., at a cost of £60,000. At the Crown Mines a circular shaft 18 ft. in diameter and 3,089 ft. deep has been sunk for ventilation, and a fan of 250,000 cu. ft. per min. capacity installed at a cost of £61,000.

Delivering Air to Workings

Wooden bratticing used in vertical shaft sinking is now made air tight by the use of the cement gun. Generally the committee lays stress on the need of the application of the well-known principles governing coal-mine ventilation to Rand mining conditions,

the chief points being the proper splitting of the ventilation current, and that every endeavor should be made to deliver the air in an unsaturated condition to the lowest workings. The splits should be designed to deliver unsaturated air to each individual district. The report states: The use of water for wetting down all rock surfaces . . . for the purpose of dust laying has rendered the underground temperature atmosphere practically saturated. This condition is almost universal." In a saturated atmosphere at 85 degrees F. it is difficult to do strenuous physical work. The direct effect of these conditions, namely saturated air and high temperature, on the incidence of miners' phthisis is unknown; but there seems to be a relation between the death rate and temperature, as the following statistical statement for the years 1915-1916 shows the figures referring to native laborers:

Range of Temp., F., Degrees	No. of Mines	Total Death Rate	Pneumonia Death Rate	No. of Natives Underground
60-68	2	13.1	5.1	3,129
69-70	14	15.7	6.9	25,370
72-74	20	16.4	7.6	79,296
75-77	9	17.9	6.5	21,958
78-80	8	20.5	8.5	29,872

"Several mines have now reached the depth at which the natural rock temperature is 85 degrees or more, and it is essential . . . either to reduce the temperature of the air and leave it saturated or to allow it to remain high; by decreasing its humidity, the movement of the air in some degree ameliorates the conditions. Fortunately the surface air of the Transvaal has normally a very low degree of humidity and its evaporative and therefore heat-absorbing powers are great."

The following table shows the comparative statement of awards made to Europeans under the Miners Phthisis Act, 1916, 1917 and 1918:

	—Year Ending July 31—		
	1916	1917	1918
Primary silicosis	564	225	201
Secondary silicosis	222	37	150
Tuberculosis without silicosis		62	39
Tuberculosis and primary silicosis		60	49
Tuberculosis and secondary silicosis		134	80
Totals	786	518	619

* + — Tuberculosis.

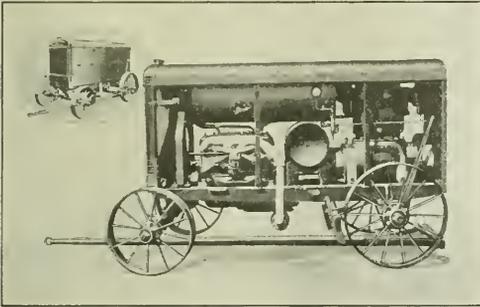
The report of the Miners' Phthisis Board and the Medical Bureau for year ending July 31 gives some additional figures. This board dealt with 3,267 applications for compensation during the year, leaving 522 outstanding, and at the end of the year there were 3,126 beneficiaries, drawing monthly allowances. The companies paid £120,000 to the compensation fund and the companies and employees paid £328,338 to the insurance fund, of which employees paid £109,446. The periodical examinations (every six months for all working underground) disclosed the presence of 700 miners with silicosis out of a total of 15,066. The prevalence rate was therefore 4.64 per 100,000, or 4.6 per cent compared with 5.04 per 100,000, or 5.0 per cent for 1917. This shows a definite decline. The number of cases of silicosis recognized as having originated during the year was 153. There are over 1,000 miners on the Rand who have worked ten years and are still free from silicosis. South African-born miners are apt to contract the disease at an earlier date than overseas-born men. These figures show that phthisis

is by no means stamped out on the Rand, and that there is a real need for additional protection from dust inhalation, such as would be afforded by a good respirator.

The committee suggests further additions and amendments to the mining regulations, and concludes with a generally hopeful survey of the position in the light of progress already made. Whether such optimism is justified in view of the continuous stream of applicants for compensation is a matter of opinion. There is no doubt that material progress has been made, but there is also no doubt that under average working conditions the miners (some classes more particularly) are during certain times and in certain places still exposed to the effects of breathing air containing dust particles in dangerous quantities, and until local protection can be given partially or wholly, phthisis will not be eradicated.

A New Portable Compressor

A novel portable air compressor, illustrated in the accompanying cut, is being introduced by the Ingersoll-Rand Co. Steel construction is used throughout, but the machine is not unduly heavy, the larger size, of 210 cu. ft. capacity, weighing 6,000 lb., and the smaller unit, designed to compress 118 cu. ft. per min., having a weight of about 4,000 lb. The compressor consists of duplex vertical cylinders driven by a four-cylinder, four-cycle, tractor type gasoline



210 CU. FT. IMPERIAL PORTABLE COMPRESSOR

motor. The mechanism may be entrusted to anyone familiar with the ordinary gasoline engine.

The mounting of the machines is a feature, particularly the swiveled front axle, which moves freely in both horizontal and vertical planes. This, with the rigidly attached rear axle, gives three-point suspension, and permits the outfit to pass over inequalities of the ground without racking effect or misalignment of the power plant.

The compressor should prove valuable to those who wish to use power drills for developing prospects rather than to do the work by hand.

Indian Mica.—There was a large increase in the output of mica in British India in 1918, according to the "Ironmonger," the amount being 51,572 cwt., as compared with 35,896 cwt. in 1917. This increase was almost entirely confined to the Bihar and Orissa fields, although the Madras field showed a slight advance.

The Still Engine

New Type Uses Steam on One Side of Piston and Oil or Gas on Other—Heat of Combustion Generates Necessary Steam

BY F. H. MASON
Victoria, British Columbia

CONSIDERABLE interest is being exhibited in England over the introduction of a new type of internal-combustion steam engine, in which the heat caused by the combustion within the cylinder is utilized to generate steam that is used on the side of the piston opposite to that on which the combustion takes place. The engines, several of which are in operation, were designed by W. J. Still, who has been assisted by the physicist, C. Vernon Boys.

Mr. Still has conceived the idea of employing a strong jacket, and surrounding the combustion end of the cylinder of the gas or oil engine with water at 350 deg. F. and under 120 lb. pressure. He has designed a special form of cylinder and piston. The latter is shaped like a handleless cup with straight, thick sides, that are half the length of the cylinder, the piston-rod being attached to the inside of the cup. The cylinder cover is shaped to fit the inside of the cup-like piston. Therefore this end of the cylinder, where the steam is employed, has a much smaller capacity than the other end, in which the combustion takes place. The steam end of the cylinder is surrounded by a steam-jacket, from which the steam enters through a port, which is opened and closed by a slide-valve operated by an eccentric.

The combustion end of the cylinder is surrounded by a water-jacket, which is connected at the lower end with the products of combustion cooler, which, in turn, is connected with the bottom of a small boiler. The upper end of the water-jacket is connected with the upper part of the boiler, the pipe entering just below the level of the water-line. The products-of-combustion cooler is really a small multi-tubular boiler, the gases passing through the tubes and then into a space occupied by a coiled pipe which supplies feed-water to the system through the products-of-combustion cooler. The gases enter the cooler at a temperature of 900 deg. F., and leave it at 150 deg.

To operate the engine, steam is raised in the boiler by auxiliary heat, which is then shut off, the waste heat from internal combustion maintaining the steam pressure. During compression, the incoming charge gains heat, causing more perfect combustion and greater expansion, and, as the walls of the cylinder are at an even temperature throughout the full length of the stroke, there is less friction. At the end of the stroke, steam enters the other end of the cylinder, the piston being pre-heated by the combustion stroke.

In trials, it was found that the steam added 29 per cent to the b.hp. efficiency of the shaft when the steam was not condensed and 40 per cent when it was condensed by a separately driven air pump.

Geology of the Michigan Copper District

Chance Mainly Responsible for the Discovery of Great Properties—Royale's Pig Find of Float Copper—Calumet & Hecla Projecting Extensive Geological Explorations

BY HOMER GUCK

FOR twenty years the theory commonly accepted in the Michigan copper country was based on the belief that no new copper deposits could be uncovered in this district, or in the United States for that matter; that geological experts and mineralogists had investigated and discredited every possible opportunity for discovering new copper; and that any new deposits that might be opened must necessarily come from South America, Africa, Siberia, or some territory which the geologists had not as yet dragged with their net.

With due respect to the work of the scientific and practical geologists (and their efforts have uncovered untold millions), the fact remains that the copper formations from which the greatest profits have been taken were found by pure luck. The further fact remains that this Michigan copper country, the oldest and the most profitable of all copper deposits in the United States, has today a greater opening for the economic geologist than any district in the world.

Luck Found Calumet

The Calumet conglomerate lode, which has paid dividends during its productivity amounting to \$145,000,000, and better than \$500,000,000 in wages, salaries, and operation of maintenance, was found by absolute luck. The story of the discovery of this famous lode by old man Royale's pig was a good story as far as it went, but a careful investigation conducted by George Agassiz, son of the late Alexander Agassiz, president of the company for many years, proved that the discovery of the conglomerate was without geological instigation at all.

In the early days of copper mining on the Keweenaw peninsula most of the effort was directed to locating float copper. That could easily be turned into real money. And Royale's pig did snoot up some float copper in the back yard of the old boarding house, at about the site where one of the active shaft houses now continues to hoist copper rock. Royale ran a half-way house to take care of the overland traffic between Houghton and Eagle River, two towns that had come into prominence through the discovery of mass copper and the opening of numerous mines.

The operators began to take out mass copper, and Mr. Agassiz's research seems to prove conclusively that it was copper that had been cached at this particular point, evidently by some pre-historic race. When the last of the mass copper had been removed from the pit where the Indians had evidently hidden it generations ago, it was found to rest upon a solid rock formation. That formation was later developed into the Calumet conglomerate lode. And the Calumet conglomerate lode was the richest continuous

formation of copper rock deposit found up to that time.

Shaft after shaft was opened on this formation. The original Alexander Agassiz had to make a plan to extract the copper, and there were other problems, but the richest copper mine in the world was found by plain luck.

Record of Development

How about the other mines that have opened in the Calumet field? Reasoning that if the Calumet & Hecla mine had a rich vein it ought to extend to the property adjoining, the Osceola was opened on the south. After mining a little corner of the conglomerate lode it ran out of copper in short order, until the Osceola lode, an amygdaloidal formation, having no direct connection with the Calumet conglomerate, was found. On the north the Schoolcraft, Centennial, and the Allouez spent millions opening the Calumet conglomerate and found it without merit. But in their efforts to find copper in the conglomerate they uncovered other lodes, the Kearsarge amygdaloid being the richest and most profitable. Mines like the Mohawk, Ahmeek, both Kearsarges, all were opened simply on the practical theory that there must be merit in a continuance of the lode that had made the Wolverine mine famous, and the Wolverine was a success only after it gave up trying to make the Calumet conglomerate pay and opened the Kearsarge.

Extent of Calumet Conglomerate

Now, this Calumet conglomerate has been identified at many points outside of the Calumet & Hecla property. Away down in Keweenaw County, at the old Clark mine, thirty-four miles from Calumet, the conglomerate is opened. It has everything excepting the copper. At the Delaware mine the conglomerate showed merit, some copper, but not enough to warrant operations under existing circumstances. Contrary to general opinion, the Mandan property opened the Mendota lode and found it promising in the upper levels, but later it petered out.

The same formation is identified, but without commercially profitable deposits of copper, at practically all of the operating mines in the district. At the same time there is a stretch of many acres, thousands in fact, now under the management of the Calumet & Hecla, where this conglomerate lode has never been subjected to anything but a most cursory examination. Diamond drill exploration of property, though it has been meritorious to a certain extent, is by no means satisfactory. Geologically there is a certainty that further investigation is worth while.

Owning or controlling 20,000 acres of mineral land, the Calumet & Hecla corporation has decided to make a most thorough geological exploration. This work

was decided upon two years ago, and L. C. Graton, economic geologist, was engaged to have charge of the operations. His services were desired by the United States Government for important war service, and he did not undertake the work as soon as anticipated. The first party of exploratory geologists is now here and at work. They will do considerable preliminary work before Mr. Graton assumes personal charge of the field operations.

Geologists differ as to the theory of deposition of the minerals from which the millions of copper have been taken. The commonly accepted one is that the copper was deposited in the rocks from the sea above, by precipitation. The mineralization is found between sandstone and appears in traps, amygdaloid and conglomerate, only occasionally in the traps. These, being basic rocks and unusually hard, ordinarily did not permit the intrusion of metal.

The possibilities of finding another mine of values in the Calumet conglomerate may be remote, but the extensive geological work which the Calumet & Hecla is now planning in this district will have a considerable and an important bearing on all future exploration operations, and will be quite as important to the entire district as to Calumet & Hecla interests.

Schneider Medal Presented

Mining and Metallurgical Society of America Honors
Head of Creusot Works for His Services]
in Ferro-Metallurgy
BY EDWARD H. ROBE

WITH the presentation of a gold medal to Mr. and Mrs. Hoover for their valuable work in translating Agricola, The Mining and Metallurgical Society of America initiated, in 1914, an annual custom of giving a testimonial to engineers who have made material contributions to the development of the mining and allied industries. In 1915 the medal was awarded to Robert H. Richards for his work in the realm of ore dressing; in 1916 to James F. Kemp, for distinguished achievement in the science of economic geology; in 1917 to E. P. Mathewson for his part in the advancement of non-ferrous metallurgy, and last year to Pope Yeatman for eminence as an administrator of mines. To Charles Eugene Schneider, the leading figure of the French iron and steel industry, and director of the famous Creusot Works, goes the 1919 medal for his achievements in ferro-metallurgy.

The Hoover presentation was made at the Biltmore in New York City, and on Nov. 24, 1919, the gilded banquet hall of that hotel was again the scene of the annual ceremony. About 250 were seated at the tables when the ever-present flashlight was exploded. The officials of the national societies of civil, mechanical, and electrical engineers joined with the mining and metallurgical engineers in the testimonial to Dr. Schneider, and the head table, which was placed along one side of the room, scintillated with prominent men. Many distinguished Frenchmen, members of the French Economic Mission, were

present, and snatches of the French language gave an international tinge to the conversation.

H. H. Knox, president of the Society, acted as toastmaster. Bradley Stoughton gave a short talk in his customary felicitous manner, and was followed by Dr. Henry M. Howe, who read an address in which the ingrained criminal nature of the Teuton beast was properly appraised. Then came Charles M. Schwab, who made his audience forget all need of artificial stimulation. It is a pleasure to listen to Mr. Schwab. Among his jocular references he mentioned a cartoon in "Life" depicting the sadness of the Kaiser in his realization that men with two such good names as Schwab and Schneider had



Courtesy Iron Trade Review
CHARLES EUGENE SCHNEIDER

caused him so much trouble. The name Schneider, is evidently, however, not pronounced like that of Rip Van Winkle's dog, but Mr. Schwab admitted his linguistic inability in this respect. Brigadier-General McCloskey was then introduced, (promoted from Colonel McCloskey on the souvenir program) and gave an entertaining talk on how some of the products of the Schneider works were employed in crushing Germany.

The medal was then presented in the conventional manner, after which Dr. Schneider made a fitting speech of acceptance. The present medalist is the first foreigner to be thus honored, if we may class as a foreigner one who can speak perfect English and without whose aid America's effective entry into the Great War would have been postponed many months. Dr. Schneider has just that accent which makes English, when spoken by a Frenchman, so alluring. Co-operation was his main theme. International co-operation was declared to be as important in peace as in war, for insuring the welfare of nations, and it is for the promotion of this idea that the French Economic Mission, of which Dr. Schneider is chairman, is visiting America.

Flotation at Picher, Okla.

Machines Operated Intermittently at Small Mine—Copper Sulphate Used to Obtain High Recovery of Lead-Zinc Sulphides

BY VAL LOTH

FLOTATION has proved its adaptability in the concentration of the lead-zinc sulphide ores of the district around Picher, Okla., as it has in many other parts of the world. The ore, or dirt, as it is called locally, is cherty, and much of the mineral is finely disseminated. Fairly coarse ore is jigged, the next finer product is tabled, and the very finest, preferably passing 80 or 100 mesh for the best results, is treated in a flotation machine of the mechanically-agitated type. Most of the mines are small, and for this reason continuous operation of a flotation plant is not always possible. The finely ground ore may, when necessary, be allowed to accumulate in a Dorr thickener, and the flotation machine run for several hours until the tank is emptied. The rakes of the thickener, of course, are stopped while it is filling, and should not be put in motion until everything is ready to start the flotation plant. The outlet of the tank can then be opened as soon as the mechanism is started.

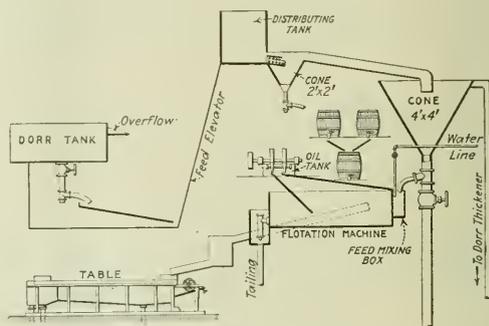
I have indicated in the accompanying sketch the flow sheet at one mill with which I am familiar. The faucet under the thickener is opened from one-third to full, depending on the moisture content of the tank product. The pulp is then elevated to a distributing box, from which it must pass through a box with 1-in. perforations to catch trash. The pulp from the distributing box is discharged into a 2 ft. cone, the outlet of which is kept slightly open. Material too coarse for flotation separates here and is sent to slime tables in the "sludge mill." The overflow from this cone passes to a 4-ft. cone, which discharges through a faucet to the mixing box of the flotation machine. Pulp in excess of that required by the flotation unit is returned to the Dorr thickener by the overflow from the cone. When the flotation machine is closed down the cone is drained through a 3-in. stopcock. Clear water may be admitted to the mixing box in order to dilute the pulp if too thick. The proper degree of dilution is obtained by regulating the supply of either the clear water or the pulp from the cone. Thick grayish froth usually indicates too thick a pulp; thin froth resembling soapsuds indicates that the pulp is too thin. When the dilution is right, fairly large golden bubbles will prevail at the intake end of the machine, shading down to fine whitish gray bubbles at the other end. The proper amount of pulp may be determined by looking at the 3-in. pipe overflow at the tailing end of the machine.

Wood creosote in connection with copper sulphate solution gives the best results on local ores, with the R. S. B. and K. & K. machines used. Each is dropped into the mixing box, though most of the creosote used is added to the spray water employed to break down the froth. This, in time, returns to the Dorr

thickener, so that it is not lost. Wood creosote by itself works well, but it has a tendency to bring up a lot of gangue, unless copper sulphate is added in large quantities. The latter chemical seems almost essential to secure good results on these ores. A dilute solution, 1 to 2 lb. to a barrel of water, is preferable to a saturated solution, as the flow is easier to regulate. The solution is made up alternately in two barrels.

In cold weather, steam is used in the mixing box. It is led through a 1/2- or 3/4-in. pipe, which passes inside the 1 1/4-in. pipe carrying the oil. This keeps the oil very thin, even in cold weather. The outlet of the steam pipe is about 3 in. below the pulp level in the mixing box.

The flotation concentrate is carried by a launder to a table, where the zinc and lead sulphides are separated, and any floated gangue is removed. Table middling is taken off over a length of from 2 to 3 ft., and is run back to the feed elevator leading to the distributing box. The tailing is returned to the Dorr



FLOTATION MILL FLOW SHEET

tank, carrying with it most of the oil used in breaking down the froth, which oil seems to be of distinct benefit at this point in two ways. The free sulphide particles suitable for flotation are oiled and sink to the bottom, where they are later drawn off ready to be floated. The finest slimes, possibly colloidal, which make trouble in the flotation machine, are floated off with the assistance of this oil, making the Dorr overflow cloudy. A cloudy overflow which gets rid of this troublesome exceedingly fine material is of great advantage, and it pays to circulate around through the thickener as much as possible the tailing from the table on which the froth is treated. Coal tar creosote is about the best oil to use for removing this colloidal matter, although I have found a mixture of two parts Du Pont wood oil and one part No. 2 wood creosote to be very good and to produce a high-grade concentrate.

The pulp should be kept as near to normal conditions as possible, and, when with proper regulation of the reagents, attention to the character of the froth and the amount of mineral in the tailing, and care to see that a cloudy overflow is maintained in the thickener, excellent results may be secured.

PETROLEUM SECTION

Engineering Notes and Equipment Details
Production Statistics — Progress
in Important Fields

Drilling in British Columbia Meets Fair Success

Oil prospecting has been rousing considerable interest throughout the southern coast section of the British Columbia mainland during the last few months. A number of companies are engaged in drilling, and in one instance some success is reported. The Boundary Bay Oil Co., which is operating near Boundary Bay, has been drilling since last August and is down about 750 ft. At 686 ft. a flow estimated at between six and eight barrels a day was struck, and it now is reported that oil is flowing at about twenty-five barrels a day. This latter is through a test hole of 2½-in. diameter, projected beyond the 16-in. hole, and it is expected that oil will be tapped in commercial quantities when the 16-in. pipe is through to the present depth of the test hole. The Empire Oil Company is drilling in the vicinity of Langley, B. C., and is down about 1,100 ft. A slight showing of oil is said to have been encountered. The Pitt Meadow Oil Co. has run a 6-in. test hole about 2,000 ft., and the Spartan Oil Co., in the Burnaby district, close to Vancouver, is down about 2,000 ft. with a test hole, and is reported to be planning the starting of a commercial-sized hole.

California Oil Statistics for November

Crude oil stocks in the California oilfields for the month of November showed a decrease of 898,145 bbl., a daily average of 29,938 bbl. compared with the shortage in October of 30,288 bbl. daily, according to statistics issued by the Independent Oil Producers' Agency at Los Angeles, California. The November decrease wipes out the slight surplus hitherto shown and becomes a shortage for the eleven months of 1919 of 853,461 bbl., which is 2,555 bbl. per day.

Production in November totaled 8,197,784 bbl., or 273,259 bbl. daily, compared with 278,594 bbl. per day produced in October, indicating a decrease in November of 5,335 bbl. daily. November shipments amounted to 9,095,929 bbl., or 303,197 bbl. daily, compared with October shipments of 308,832 bbl. daily, a decrease in shipments for November of 5,635 bbl. daily.

There were 54 well completions in November with an estimated initial daily yield of 7,050 bbl. as compared with 42 completions in October with an estimated daily production of 5,775 bbl., an increase in November of 12 wells and 1,275 bbl. daily production. During November 60 rigs were put up, which is 6 less than the number built in October, which totaled 66. Producing wells for November

totaled 8,972 compared with 8,910 producing in October, an increase of 62. The production per well per day in November was 30 bbl. Drilling wells the end of November totaled 345 compared with 346 strings the end of October, a decrease of 1 string. Fourteen wells were abandoned in November compared with 27 in October, a decrease of 13.

Oil Prospects in Northern Alberta

Several large oil companies are arranging to enter the Athabasca and Great Slave Lake oilfields of northern Alberta next spring. Preliminary investigations by prospectors and geologists have induced the belief that a rich oil reservoir awaits development. The Standard Oil Co. is reported to be preparing to send two outfits into the large areas it has leased on Great Slave Lake to make a thorough exploration of them. The Anglo-Canadian Co., a consolidation of British interests, has had survey parties at work in northern Alberta for four years, has leaseholds covering 240,000 acres and has made contracts for development work covering five years. A. R. Coyne and W. R. Martin, of Medicine Hat, and several others interested are now on their way to London for consultation with the British directors of the company. The Shell Oil Co., also controlled by British capital, which some time ago unsuccessfully endeavored to obtain exclusive rights in a large tract in the Athabasca district, is again looking for leases of oil-bearing land. A number of smaller companies have been prospecting in the Far North, and a period of great activity is expected in the spring.

Oil Refining in Mexico

The President of Mexico, according to the October Bulletin of the Pan American Union, has done everything possible to establish in that country the greatest possible number of petroleum refineries, as he maintains that such plants are the most important part of the petroleum industry. At present there are only four operating refineries in Mexico, but work will soon begin in those which are now being erected by the Texas Company of Mexico and the Atlantic Refining Company. The total capacity of those refineries so far established amounts to 90,000 bbl. per day, and 22 per cent of the total of the exported petroleum is represented by the refined article.

California Oil-Well Activity.—For the week ended Nov. 1, 1919, according to the Department of Oil and Gas of the California State Mining Bureau, there were 19 new oil wells started, bringing the yearly total to 567, as compared with 619 in 1918, at the same date. Tests for water shut-offs numbered 22, deepening or redrilling jobs amounted to 10, and 5 wells were abandoned.

ITEMS FROM TEXAS AND LOUISIANA OIL FIELDS

Homer Proving Wonderful Oil Field

Several 20,000-Bbl. Wells Brought In—Other Fields Also Add Considerably to Louisiana Production

The Homer Oil Field, in Claiborne Parish, on the northern edge of Louisiana, is proving to be one of the most important oil discoveries in the United States. Already several wells have been brought in, each producing more than 20,000 bbl. a day. The chief producing company in this field to date is the Standard Oil Co. of Louisiana, a subsidiary of the Standard Oil Co. of New Jersey. This company has recently completed a refinery at Baton Rouge, where all of its production from this field will be handled. The development at the Homer field has been so phenomenal and successful that oil men are already leaving the great producing fields of North Texas for the Homer field.

In addition to the Homer, the development of the Bull Bayou, Caddo, Gusher Bend, and Pine Island fields will greatly increase Louisiana's oil production. A new company to operate in Louisiana is the Eagle Petroleum Co., of Houston, Tex., which will drill in Claiborne and De Soto parishes.

Austin Correspondence New Pipe-Line Rules of Railroad Commission—Burk-Senator Dispute—Recent Charters—General Land Office Receipts

The new pipe-line rules issued by the oil division of the Texas Railroad Commission do not contain the clause requiring the obtaining of permission from the owner before laying lines over private land. This affords considerable satisfaction to the pipe-line companies. The permission of the commission, however, must be obtained; is good for only one year, and may be revoked at any time if it is shown that there is wastage of oil. Rule 37 prohibits the drilling of an oil well within 300 ft. of any other drilling or completed oil well on the same or other tract of ground, and also prohibits the drilling of a well within 150 ft. of a property line. The commission has authority to suspend this rule upon the proper showing of any company desiring to drill.

In the Burk-Senator oil land dispute, between Oklahoma and Texas, the latter state won what is considered to be the first point in the argument before the U. S. Supreme Court, when, on Nov. 30, the U. S. Attorney General's office refused to support Oklahoma's claim before that court. Frank K. Ne-

beker, Assistant Attorney General, will make a personal investigation of the boundary line. The land involved comprises 64,000 acres of the richest oil-producing area, and is now controlled by a receiver.

Oil Corporations Chartered recently are: Belle City Oil Co., of Cement, Okla.; capital stock, \$500,000; Texas headquarters, St. Jo, Montague County; James Wiley, agent. United American Oil & Gas Co., of Dover, Del.; capital stock, \$200,000; Texas headquarters, Wichita Falls; E. F. Johns, agent. National Petroleum & Refining Co., of Delaware; home office at Fort Worth, Tex.; capital stock, \$10,000,000; C. S. Woods, Fort Worth, agent. Allouette Oil Co., of Boston, Mass.; capital stock, \$2,300,000; Texas headquarters, Austin; I. D. White, agent. Perfection Oil Co., of Dallas, Tex.; capital stock, \$25,000; incorporators, C. D. Cain, Ewing Howell, and S. S. Hopkins. Dunlap-Delaney Oil Co., of Beaumont, Tex.; capital stock, \$75,000; incorporators, W. B. Dunlap, Ward Delaney, of Beaumont, and Kirck Hillyer, of Fort Bend, Tex. The Boger Oil Co., of Phoenix, Ariz.; capital stock, \$4,000,000; Texas headquarters, Dallas; C. D. Mims, Austin, Tex., agent.

The General Land Office receipts for the month of November were \$600,000. This money represents the principal and interest on land purchased, and payments for oil leases on state lands. This is the largest amount ever collected in one month by this office.

West Columbia Most Active Field in Brazoria Co., Tex.

The chief activity in Brazoria Co. is at West Columbia, where the production for the last week in November was about 19,000 bbl. daily. The larger producing companies are the Humble Oil & Refining Co., Texas Co., Crown Oil & Refining Co., and the Sun Oil Co. The important wells recently completed in this field are the Texas company's No. 21 Hogg, which produced only salt water at a depth of over 3,300 ft., and the Sun company's No. 3 Robinson, which came in making 7,000 bbl. per day, but which rapidly decreased to 4,000 bbl., with considerable water.

The Damon Mound Oil Co. will resume operations at Damon Mound in the near future.

The Gulf Pipe Line Co., of Houston, recently purchased considerable acreage in the old town of Quintana, below Freeport, Brazoria County, at the mouth of the Brazos River, where it will build an oil-loading dock for ocean-going tank steamers.

Goose Creek Field, Texas, Producing 15,000 Bbl. Daily

The Goose Creek field, in Harris County, is producing 15,000 bbl. per day. The larger companies are the Republic, the Gulf Production Co., and the E. F. Simms Oil Co.; the Gulf Co. producing over one-third of the total. No. 7 Jones-Stateland well, of the Humble Oil & Refining Co., is pumping 250 bbl. The No. 3 Hogg Island is bailing, and the No. 6 Gillette is arranging to pump; both belong to the Crown Oil & Refining Co.

In the Humble field, Harris County, a new well of importance is that of the Texas Co. on Hermann ground, flowing 800 bbl. daily from 3,300 ft. For some time only small pumpers have been obtained in this field, and this well may prompt new operations.

In the Sheldon district, Harris County, northeast of Houston, several wells are being drilled, the deepest being over 3,000 ft., but so far without results.

Three Companies Now Drilling in Markham Field, Texas

In Matagorda County three companies are drilling in the Markham field. The Texas Co. is down over 2,000 ft. in its No. 6 Hudson well, and indications are good. The Clem Oil Co. has cut off salt water at about 1,480 ft. in the Meyers well and will make a test. Dr. Griffith's Northern Irrigation well No. 6 was 1,650 ft. deep, at last reports. The only work elsewhere in the county is the Triumph well, on Hawkins ranch, which is ready to start drilling, and the Allen Oil Co., east of Gulf, recovering casing from its abandoned dry well, No. 1 Baer. Recently a wind storm blew over for the second time the derrick at this well. The Texas Gulf Sulphur Co., has filed an amendment to its charter, increasing its capitalization from \$5,000,000 to \$7,600,000.

The Cueba Oil & Gas Co. has contracted to have its first well drilled. The company owns a lease on 200 acres in Clay County, seven miles southeast of Petrolia.

7,000 Bbl. Daily From Hull Field

The Hull field, in Liberty County, is producing about 7,000 bbl. daily, with the Republic Production Co. and Gulf Production Co. making the most oil. A well recently brought in by the Sun Co. is said to be making a good production by flowing. Another development of interest here was the blowing out of the Empire Gas & Fuel Co.'s No. 1 Barngrover well, when considerable gas escaped. The Gulf Production Co. will at once drill an offset to this well.

Political and Commercial Geology Series

The Petroleum Resources of the World—Part I.

Oil, Most Often Found in Tertiary Rocks, Is Widely Distributed Throughout the World—United States Now Furnishes 66 Per Cent of the Total Consumption of All Countries

BY JOHN D. NORTHPROP
Former Geologist of the U. S. Geological Survey
Revised and abridged for "The Journal"

COMMERCIAL accumulations of petroleum are everywhere restricted to strata of sedimentary origin. In the United States, petroleum is produced commercially from strata of all periods, from Cambrian to Quaternary, the most prolific sources being in strata of the Carboniferous and Tertiary systems. The principal sources of petroleum production in each of the other oil-producing countries of the world are indicated in the following table.

GEOLOGICAL OCCURRENCE OF PETROLEUM

Country	System
North America	
Canada	Silurian and Devonian
Mexico	Cretaceous and basal Tertiary
Alaska	Tertiary (?)
West Indies	
Trinidad	Tertiary
Cuba	Cretaceous and pre-Cretaceous
South America	
Colombia	Cretaceous and Tertiary
Venezuela	Cretaceous and Tertiary
Peru	Tertiary
Argentina	Jurassic, Cretaceous and Tertiary
Europe	
Russia	Tertiary
Rumania	Tertiary
Galicia	Tertiary
Italy	Tertiary
Germany	Tertiary and pre-Tertiary
Asia	
India	Tertiary
Turkestan	Tertiary
Persia	Tertiary
Africa	
Algeria	Tertiary
Egypt	Tertiary
Oceania	
Japan	Tertiary
Dutch East Indies	Tertiary
New Zealand	Cretaceous and Tertiary

From the foregoing alignment the conclusion might appear justified that a direct relation exists between the distribution of Tertiary rocks and the world's petroleum supply, were it not for the fact that in the United States, where two-thirds of the world's current supply of this mineral is produced, and where the quest for petroleum has, under scientific direction, included the entire range of the stratigraphic column, petroleum is found in considerable quantities in the rocks of each geologic system younger than the Cambrian.

The fact that seeps and other surface indications of petroleum are generally more pronounced in the relatively younger Mesozoic strata than in the older Paleozoic formations, and the further fact that geologic exploration for oil and gas in countries other than the United States has been restricted in the main to areas containing the most pronounced indi-

cations of petroleum, tend on the one hand to account for the predominance of the Tertiary system in the foregoing table and on the other hand to indicate the fallacy of attempts to estimate the world's reserves of petroleum on stratigraphic evidence alone.

Estimates of National Petroleum Resources Hazardous

Despite the broad geologic range of petroleum, its occurrence in specific members, formations, groups, series, or systems is by no means universal, being restricted rather to specific localities in which are fulfilled certain variable relations, as yet little understood, involving (1) the constitution, sequence, and content of organic matter of the sediments; (2) the nature and degree of metamorphism they have undergone; (3) their structure; and (4) their degree of saturation with salt water. Because of the fact that the most detailed geologic work is insufficient to provide a basis for the appropriate evaluation of the numerous factors involved, and because only a relatively small percentage of the areas of sedimentary rocks in the world have been examined geologically in any appreciable detail, any estimate of the future supply of petroleum in the world is peculiarly hazardous.

Geographical Distribution Wide

The geographical distribution of petroleum is as wide relatively as its geologic range. The oil fields of present commercial significance are situated, in the order of their importance as contributors to the world's production of petroleum in 1917, in the United States, Russia, Galicia, Mexico, Dutch East Indies, India, Persia, Japan and Formosa, Rumania, Peru, Trinidad, Argentina, Egypt, Germany, Canada, Venezuela, and Italy. Small quantities of petroleum have also been reported from Guatemala, Honduras, Costa Rica, Panama, Haiti, Porto Rico, Bolivia, Chile, Spain, Arabia, China, Australia, Papua, Philippine Islands, Nigeria, Belgian Congo, Gold Coast, Madagascar, and elsewhere.

In the opinion of the author the most conspicuous developments affecting the sources of the world's supply of petroleum in the next decade will take place in the countries that border the Caribbean Sea and the Gulf of Mexico. Within the last four years the annual production of petroleum in Mexico has increased from 21,000,000 bbl. to 56,000,000 bbl., and the potentialities of future production in that country have been demonstrated to be almost beyond comprehension. Its product, originally considered valuable only as a source of fuel oil, is now yielding, by modern refining methods, increasingly important

*The basis of this article by Mr. Northrop was issued in mimeographed form for government use only, as one of the Political and Commercial Control series prepared under the direction of J. E. Spurr, and after the armistice the remaining copies were released to the general public. In this article of Mr. Northrop's the Editor has incorporated certain later notes and additions; as, for example, information furnished by E. Russell Floyd, of the U. S. Geological Survey; A. G. White, and W. E. Perdue, of the Bureau of Mines, and others.—J. E. S.

percentages of illuminating oils and gasoline. The only obstacles to enormously increased production are unsettled political conditions and inadequate facilities for marine transportation. These obstacles will doubtless be overcome within the next few years, and barring unforeseen contingencies, Mexico will probably rank second among the oil-producing countries of the world in 1919, if not in 1918.

Resources of Colombia and Venezuela

Judged by the results of exploratory work already done in Venezuela and Colombia, both of those countries are destined to become appreciable contributors to the world's supply of petroleum within the next decade. Within recent months Colombia has furnished sufficient evidence of its ability to supply high-grade petroleum from wells of large individual capacity to warrant the large interests holding concessions there in exerting every effort to overcome the adverse natural conditions that have so long barred the way to exploitation of Colombia's petroleum resources. Enough drilling has already been done in Venezuela to demonstrate that the resources of heavy-gravity asphalt-base petroleum in that country are large, and the recent installation of a modern petroleum refinery for the treatment of these oils on the island of Curacao, off the Venezuelan coast, has provided the market necessary to active field development.

In Trinidad the production of petroleum, which is at a rate in excess of 1,500,000 bbl. a year, has doubled in the last four years, and with the increased facilities for ocean transport of petroleum that will be available at the end of the war in Europe, its further increase is assured.

Cuba is not expected to become an important producer of petroleum, and present knowledge concerning the petroleum resources of the Central American countries is not such as to warrant the belief that oil fields of material consequence will be developed in any of them.

United States Production Now a Maximum

Petroleum production in the United States is expected to reach its maximum this year and to decline steadily hereafter, though this country is expected to remain the leading oil-producing country of the world for the greater part, if not all, of the coming decade. With regard to the oil-producing countries of North and South America not already mentioned, no significant changes in their present status are now anticipated.

The petroleum resources of Russia (including Asiatic Russia) are believed sufficient to assure for that country its position as the leading producer of petroleum in the Eastern Hemisphere far beyond the next decade. Its production in the last four years has been obtained under great difficulties, and as a consequence has been no measure either of its present productive capacity or its potentialities. Concerning the future of Russia as a source of petroleum, Arnold¹ says: "Such large areas, both in European and Asiatic Russia, yield such unmistak-

able evidence of the presence of oil in large quantities that it is to this country, among those of Europe and Asia, to which the future must look for a supply."

Endowed as Russia is with petroleum reserves, both proved and prospective, of great magnitude, the ultimate position of Russia as the leading oil-producer of the world seems reasonably assured. Its immediate future is too intimately involved in the chaos of political Russia to warrant forecast.

Rumanian Fields Declining

The oil fields both of Rumania and Galicia are believed to have passed their maximum yield, and the possibilities of opening new fields of consequence in those countries are not considered sufficiently great to justify a forecast of anything but a moderate decline in production in future years. No material change in the status of the negligible oil fields of Italy or of Germany is anticipated at any time in the future.

With regard to the situation in Asia, it is believed that the next decade will witness a steady increase

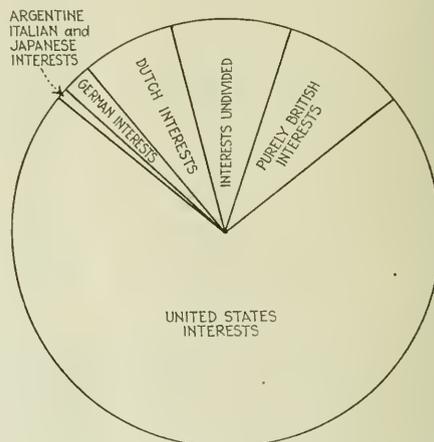


FIG. 1. POLITICAL CONTROL OF THE WORLD'S PRODUCTION OF PETROLEUM IN 1917

in petroleum production in India, and the probable development of one or more important oil fields in Persia and possibly in Asia Minor, Turkestan, and China. In Oceania, the same period will doubtless record material increase in the production of petroleum in Japan and Formosa and in the Dutch East Indies, together with the possible opening of new fields in Papua. Africa will probably receive considerable attention from oil operators in the next ten years, but on the basis of available evidence the results obtained in that period will hardly be of sufficient consequence to affect the world situation respecting petroleum.

The political control of the world's production of petroleum in 1917 is shown by the following table, and Fig. 1 shows the proportion of the world's production of petroleum contributed annually by each

¹Arnold, Ralph, "The World's Oil Supply." Report Am. Min. Cong., 19th Annl. Session, pp. 485-486, 1917.

of the principal producing countries in each of the last ten years.

POLITICAL CONTROL OF THE WORLD'S PRODUCTION OF PETROLEUM IN 1917

Source of Production	Quantity of Production (Barrels)	Percentage of Total	Country Exercising Political Control
United States	335,815,601	66.17	United States
Russia	69,000,000	13.62	Russia
Mexico	55,292,770	10.81	Mexico
Dutch East Indies	12,928,955	2.55	Holland
India	8,078,843	1.59	Great Britain
Persia	6,856,063	1.36	Persia
Galicia	5,965,447	1.18	Poland (?)
Japan and Formosa	2,898,654	.57	Japan
Rumania	2,681,870	.55	Rumania
Peru	2,533,417	.50	Peru
Trinidad	1,599,455	.32	Great Britain
Argentina	1,144,737	.23	Argentina
Egypt	1,008,750	.20	Great Britain
Germany	995,764	.20	Germany
Canada	205,332	.04	Great Britain
Venezuela	127,743	.03	Venezuela
Italy	50,334	.01	Italy
Cuba	19,167		Cuba
Total.	506,702,902	100.00	

Aside from the control exercised by Great Britain by virtue of its protectorate relation over the petroleum resources of Egypt, political control of the petroleum resources of the various countries is mainly by virtue of state sovereignty. This political control is strong in proportion to the strength of the government in the country exercising such control. The recent developments whereby the British government becomes the majority stockholder of a corporation controlling the oil resources of Persia, practically transfers political as well as commercial control of Persian petroleum from Persia to England.

Mexico's recently attempted firm political control of her vast petroleum resources depends for its success upon her diplomatic ability in dealing with the stronger governments of England and the United States, whose nationals have acquired commercial control which is threatened by Mexico's new and decided nationalistic policy.

California Oil-Well Records

State Mining Bureau Requires Complete Reports of All Drilling, and Advises Operators Concerning the Best Methods to Employ
BY SETH S. LANGLEY

SUPERVISION of field operations in the oil and gas industry by the State of California is the outgrowth of co-operative action by the large operators. Following the boom days of the Midway-Sunset field, it became apparent that, as the gas pressure was lowered by waste, water was entering the sands, and the future promised little encouragement. With the hope that the evils of gas waste and water encroachment might be controlled, the large operators formed the Kern County Protective Association in 1913. The members contributed to the employment of inspectors, or water commissioners, whose business was to supervise the field operations and, as the association's members controlled the pipe lines, it was possible to make non-members and sometimes antagonistic members abide by the judgment of the association. Similar organizations in other fields were formed about the same time, and in August, 1915, the State Mining Bureau took over the entire work.

The power given the bureau by the state legislature is broader in scope than the operators thought necessary, and even today some complaints are heard, but the work is honestly and skillfully done, with no political interference.

The Scope and Procedure of the Supervision

The notice of intention to drill is made out on a printed form (No. 105), and gives the location and description of the strings of casing which it is proposed to use. A reply is received, either approving or amending the proposal. All notices and reports are addressed to the Deputy State Oil and Gas Supervisor in charge of the district where the well is located. Should the well be in wildcat territory, the bureau will request a copy of the weekly progress reports. If the Well is to be drilled in productive territory, and the bureau has not the necessary data by which to check the proposed depths of shut-off, this information will be requested from the operator and his neighbors.

When the first string of casing has been cemented for water shut-off, notice of the fact is sent to the supervisor on another form (No. 106).¹ The operator allows the cement to stand several days and then makes a test. If this test is satisfactory, the Mining Bureau is requested to send an inspector to witness a second test. If this test is also satisfactory, the deputy later mails a statement of approval.

Should the test be a failure, it is usual for the operator and bureau to confer and decide upon a remedy. This remedy is incorporated in a supplementary proposal to the bureau on Form 123, and the approval is mailed to the operator, although the work may be, and probably is, finished before the correspondence is completed. Should it be found necessary to abandon the well for any reason, notice is given on Form 108, stating the present condition of the well and the proposed work. This is acknowledged and notification of the time of location and settling of the cement plugs, if such are used, is requested so that this work can be witnessed and approved.

Whatever the results of the drilling may be, a dry hole, producer, or mechanical trouble, the Mining Bureau is supplied with a complete log, as is given on Form 100, and also, a complete record of all work done since the last notice of test of water shut-off, or supplementary notice. This is done on Form 103; on Form 102, the history of the abandonment is furnished.

The foregoing procedure is a fair example of the close supervision exercised by the Mining Bureau. It may seem to the operator in other fields that there is an unnecessary amount of red tape attached to the California field operations. To the operator in a boom field, these restrictions would seem intolerable, but the monthly production reports of the next ten years depend upon a mechanically good well, and are of greater importance to the stockholders than the flush production of today or next month.

¹Copies of these forms may be secured from the California State Mining Bureau, Sacramento, Cal.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War Minerals Summarized

A summary of the work of the War-Minerals Relief Commission has been made to Congress in conformity with the provision of its organic act. The following tabulation summarizes the work and the expenditures of the Commission up to Nov. 29:

WORK AND EXPENDITURES OF WAR-MINERALS RELIEF COMMISSION UP TO NOV. 29.	
Total number of claims originally filed.....	1,203
Number recommended for action to Nov. 29, 1919.....	472
Number of claims remaining to be considered.....	731
Total amount of all claims.....	\$16,655,481.94
Amount of the 472 claims already considered.....	\$3,245,486.95
Amount of claims remaining to be considered.....	\$13,309,994.99
Total number of claims recommended for disallowance.....	442
Amount claimed in those disallowed.....	\$1,946,374.23
Total number of claims recommended for partial allowance.....	30
Amount claimed in those partially allowed.....	\$1,399,112.72
Amount recommended to be allowed.....	\$418,502.79
RECAPITULATION	
Amount of appropriation.....	\$8,500,000.00
Amount of awards recommended.....	\$418,502.79
Administrative expenses to Nov. 29, 1919.....	\$147,431.25
Balance.....	\$7,934,066.96

The relatively large proportion of disallowances up to the time of the report should not be taken as an index for the future, it is pointed out, for the following reasons:

First. The commission naturally eliminated initially, as far as possible, claims which on their face admitted no request or demand.

Second. Some of the largest and most complex claims, requiring establishment of principles, demanded an excessive amount of time and study.

Third. The examinations by engineers and auditors of most of the claims on which some award must be made are not yet complete.

Although the commission does not attempt to foretell that the average allowance on claims will continue to be 30 per cent of the amount asked, the unqualified statement is made that the appropriation of \$8,500,000 will be ample for the adjustment of all of the valid claims.

Pittsburgh as Basing Point for Steel

The general conviction that there will be no abolition of the long-established practice of using Pittsburgh as a steel price basing point has been strengthened as a result of the arguments which have been presented in a hearing before the Federal Trade Commission. John S. Miller presented the arguments for the Western Association of Rolled Steel Consumers and the other complaining interests. His argument was based on the allegation that the single price basing point is a violation of the Clayton Act.

Steel fabricators in the Chicago district, he declared, are debarred from competing eastward because they must pay \$5.40 a ton fictitious freight rate on fictitious transportation from Pittsburgh on steel produced in the Chicago district. On the other hand, Eastern fabricators now place most of their products in the Chicago market on an even competi-

tive basis with the Chicago fabricators. For that reason, he pointed out, the Chicago fabricators lose the natural benefits of nearness to market.

R. V. Lindabury, general counsel for the United States Steel Corporation, defended the Pittsburgh base. As Chicago producers can supply only one-half of the Chicago demand, he asserted, Pittsburgh, which supplies the other half; necessarily dominates the price. Frank H. Scott, of the Steel & Tube Co. of America, said that the 6,000,000 tons of steel produced in the Chicago district cannot supply the demand of that district. L. A. Manchester, of the Youngstown Sheet & Tube Co., described the Pittsburgh base as a unit of measuring prices, just as there are standards of weights and measures.

Horace Pomeroy Appointed to War-Minerals Relief Commission

Horace Pomeroy, of Palo Alto, Cal., has been designated by the Secretary of the Interior as a member of the War-Minerals Relief Commission to fill the vacancy caused by the death of Dr. M. D. Foster. Mr. Pomeroy is a mining engineer with a long practical experience. He was born in Mercer, Pa., but obtained his early education in public schools in Oregon. He was graduated from Leland Stanford University in 1897 and then returned to Oregon to assist his father, also a mining engineer. Soon after obtaining his engineer's degree, Mr. Pomeroy was engaged in contract work in Oregon mines. In 1902 he was appointed engineer at the King of Arizona mine, at Kofa, Ariz., becoming general superintendent in 1903, in which position he continued until 1908, when he resigned to become general manager of the Banco de Oro property at Magdalena, Sonora, Mexico. After two and a half years in Mexico, Mr. Pomeroy returned to the United States to follow general consulting work. In addition to such work, he has also been general manager of the Mammoth Development Co., Ariz., for the last two and a half years.

Government Sells Brass

Practically all of the supply of surplus brass of a non-commercial size held by the Ordnance Department was sold Dec. 10 to the Van Dyke Smelting & Refining Co., of New York. The sale, which comprises 5,000,000 lb. of brass in the form of 60-40 rods, in sizes of 1¼ in. and larger, was negotiated on the basis of \$13.11 per 100 lb., f.o.b. cars in the present location. Most of the material is in the Boston district. On the basis of the value of the metal content of the material sold, the price of \$13.11 per 100 lb., according to Government officials in charge of the sale, represented a satisfactory return to the Ordnance Department. The price paid the Government for the material was \$721,050.

Northwest Magnesite Manager Testifies at Tariff Hearing

The principal witness appearing before the subcommittee of the Senate Committee on Finance during the hearing of arguments for a tariff on magnesite was Roy N. Bishop, general manager of the Northwest Magnesite Co., of Chewelah, Wash. Mr. Bishop thought that the House Committee had fixed its rates on magnesite without accurate knowledge as to costs of producing magnesite in Austria. He supplied more accurate information in that connection by filing with the committee a cable dispatch from the American Consul General at Vienna setting forth that the cost of magnesite laid down at Trieste is \$12.30 per ton. Of that amount labor represents \$2.39 per ton. He pointed out in addition to the lower production costs there is also the important matter of the rate of exchange. Mr. Bishop explained how the fall in exchange operates as a bounty on Austrian production. During the course of his remarks, he made the following statement:

Because we put three-quarters of a million dollars into a plant and develop magnesite, so badly needed by the country during the war, we were charged in the hearings before the Ways and Means Committee with being a monopoly. A complete refutation of that is that we only own one-eighth of the raw material in the United States. We never have produced more than 35 per cent of the magnesite produced in the United States, and as soon as a tariff is placed on magnesite those who own the other seven-eighths of the raw material will become very active competitors.

We have been producing from five kilns and can produce about 9,000 tons a month. We have increased our plant since the war by adding one kiln. We got an average price of \$29 a ton at the plant. The cost of production is a little over \$21 a ton.

We sold magnesite during the war at that same price, but those to whom we sold it, the refractories people, who in turn sold it to the steel companies, sold it with an addition of about \$10 a ton on our price, so that for practically endorsing the bill of lading, they made a greater profit out of the magnesite than we did. The agreement with the refractories companies has expired. Since the hearings before the Ways and Means Committee, I have sold magnesite up to \$30 a ton, depending upon the quantity the buyer takes, and have specified that if these buyers sell it for over \$32.50 a ton, that I would cease selling to them and quote magnesite direct to the trade. Although I do not care to go into the retail business, I did that to protect the steel companies.

In a reference to the War-Minerals Relief Act, Mr. Bishop said: "If we had waited until the government realized the necessity for magnesite, and perhaps called us slackers, we then would have come within the provisions of the relief measure and have been remunerated for our losses. But we did not come in under that because we anticipated the shortage of the material and went ahead before the government urged us to do so."

Would Continue Explosives Control

Extension until June 30, 1920, of the war-time law regulating the manufacture and sale of explosives was recommended to the Senate Dec. 23 by President Wilson. The President transmitted a letter

from Secretary Lane saying he thought this advisable because of "the present conditions of economic unrest."

Anti-Dumping Bill Passes House Ways and Means Committee

Though the Fordney anti-dumping bill is a composite of several proposed measures, and had the approval of several Government agencies concerned, the chances are that the measure will be changed considerably by the Senate. The plan of the House bill is outlined substantially in Section 9 of its bill, which reads as follows:

That whenever merchandise, whether dutiable or free, is exported to the United States of the class or kind provided for in this act, and the sales price is less than the foreign home value, or in the absence of such value is less than the value to countries other than the United States, or in the absence of such value is less than the cost of production, there shall be levied and collected, in addition to the duties on imported merchandise prescribed by law, a special duty in an amount equal to the difference between the sales price and the foreign home value or the value to countries other than the United States or the cost of production, as the case may be.

To the above section was added the following amendment suggested by the Democratic floor leader and approved by the majority members of the committee: "This section shall not apply to any article imported, the like of which is not produced in substantial quantities in the United States, the same to be ascertained, determined, and promulgated by the Secretary of the Treasury.

The bill had the approval of all members of the Ways and Means Committee, and the bill was passed without a rollcall. It is believed that the bill, when it emerges from the Senate, will embody in it certain requisites desired by the Tariff Commission which will make its enforcement easier. This is one of the great difficulties of such legislation, it being a hard matter to obtain proof of dumping.

New Regulations Cover Borax Content of Potash and Other Fertilizer

Drastic regulations were put into effect by the Department of Agriculture on Dec. 9 with regard to the borax content of fertilizer. It is expected that these regulations will have a decided effect on the domestic potash industry, particularly from the fact that the matter of tariff rates for imported potash is now under consideration by Congress. The Department states officially that apparently most of the potash salts available for fertilizer use in the spring of 1920 contain more or less borax. It also has been discovered that nitrate of soda as imported contains some borax.

Fertilizer containing more than one-tenth of 1 per cent of borax cannot be used safely, the department finds, when the seeds or plants come into virtual contact with the fertilizer. In cases where the fertilizer is broadcasted, and thoroughly mixed with the soil, as much as 10 lb. per acre of borax may be applied without menace to plant life.

Fertilizer manufacturers and others handling their product must indicate plainly on the container the amount of borax content when it exceeds 2 lb. per ton.

Tariff on Chrome Ores

Representative Kahn, of California, has introduced a bill to levy a protective tariff duty on imports of chrome ores and their products. The proposed duty is itemized as follows:

First, on crude chrome ores and chromium ores and concentrates thereof, the sum of 60c. per unit of Cr_2O_3 content therein contained, a unit being defined as being 1 per cent of Cr_2O_3 contained in a net ton of 2,000 lb.

Second, upon ferrochrome, and other metallic alloys containing chrome, 11½c. for each pound of metallic chromium contained therein.

Third, upon refractory brick and material used for refractory purposes containing chrome, the sum of 65c. per unit of Cr_2O_3 ; a unit being defined as being 1 per cent Cr_2O_3 contained in a net ton of 2,000 lb.

Fourth, upon chemical compounds and articles manufactured therefrom containing chrome or chromite, 90c. per unit of chromium content; a unit being defined as being 1 per cent of chromium contained in a net ton of 2,000 lb.

War Department to Sell Acid

Sulphuric acid to the extent of 43,880,000 lb. has been declared surplus by the War Department. Proposals for its purchase were received by the Director of Sales up to Dec. 23. In addition to the sulphuric acid, other acids have been declared surplus as follows: Nitric acid, 829,000 lb.; mixed acid, 17,138,000 lb.; oleum, 6,153,000 lb., and acetic acid, 65,000 pounds.

Oldest Survey Member Dies

J. D. McChesney, one of the oldest members of the U. S. Geological Survey, died in Washington recently. With the death of Mr. McChesney, only one of the original thirty-nine members of the Survey remains in active service. That one is John H. Renshaw, the geographer at the head of the inspection division of the topographic branch.

Colorado Section, A. I. M. E.

The regular meeting of the Colorado Section of the American Institute of Mining and Metallurgical Engineers, held at the Colorado School of Mines, in Golden, on Dec. 11, was one of the most successful meetings ever held by the chapter. Forty-five members from Denver and vicinity and eighty-five junior members and guests attended. An excellent dinner was served, after which short talks were given by active and junior members. George J. Bancroft reviewed an interesting paper on the Great Granite Batholith of Central Idaho. The junior associate members of the Colorado School of Mines spoke of the relationship between the school and the Institute. The following facts were brought forth: There are seventy-five junior members in the school and forty-five applications are ready to be handed Mr. Stoughton. The total enrollment of the school is 425, an excess of fifty over any previous attendance.

The cosmopolitan nature of the school was shown, and talks were made by students of several nationalities. In the student body there are South Americans, Mexicans, Filipinos, Chinese, Hawaiians, English, Canadians, Javanese, Germans, Japanese, and Armenians.

By the end of the school year it is expected that there will be 250 junior members of the institute in the school.

The chief speaker of the evening, Bradley Stoughton, because of delayed trains was unable to be present. As one of the chief purposes of the meeting was to enable students in the Colorado School of Mines, junior members of the institute, to meet Mr. Stoughton, his absence was deeply regretted, and the announcement that he would speak to the entire student body of the school on the following morning was greeted with cheers.

Much credit is due Professor J. C. Roberts for his untiring efforts in behalf of the institute, and in making this meeting an unqualified success.

San Francisco Section of A. I. M. E.

SAN FRANCISCO CORRESPONDENCE

TWO wise men from the East galvanized the San Francisco section of the American Institute of Mining and Metallurgical Engineers into activity and a meeting following a dinner was held on the evening of Dec. 22 at the Engineers' Club. Horace V. Winchell, president of the institute, and Bradley Stoughton, secretary, did the trick. They were introduced by the chairman, Frederick W. Bradley, to the members of the institute and guests from other technical societies to the number of eighty or more.

Mr. Winchell brought greetings from the founder of engineering societies to the local sections and expressed their kind wishes to and keen interest in the activities of the local sections. In brief, Mr. Winchell's remarks were as follows:

"I feel it a privilege to be in a state which is known so widely for its products, climate and men and which has a long and honored history of mines. You have opportunities here not only for tired workers but for untired workers. I congratulate you on the fact that one of your greatest men and engineers, Herbert Hoover, will be the next president of the American Institute of Mining and Metallurgical Engineers.

"We as engineers have devoted ourselves too closely to engineering and in so doing it is perhaps true that the engineer has surrounded himself with an atmosphere somewhat circumscribed. I want to bring more prominently to you the need for co-operation. Engineers as a whole have not co-operated in solving problems of general interest to the community. There is the present need of co-operating with the local engineering societies and of co-operation between different sections of each state. There is a change to be noted in the sentiment towards such co-operation. Engineers of all classes have common interests in broad questions affecting communities as a whole. We need co-operation together

with constructive ideas and constructive ideas are best developed by the friction of discussion arising in local meetings.

"Important public questions are already before us and engineers are doing their share in solving our present difficulties. As a specific instance, take the national income tax. The mining industry is called upon to pay an immense income tax. Every mining company has prepared a report and 35,000 of these reports have been presented in which every single company wants special treatment from the federal officials. The Treasury Department, confronted by this task, has requested the American Institute of Mining and Metallurgical Engineers to appoint a committee to confer with the Treasury department. A committee was appointed and twenty-five engineers dropped their work, paid their own expenses and journeyed to Washington. With their assistants and legal advisers, over fifty met in a two-day conference at Washington and arranged to meet later at Atlantic City. I was told by a representative of the Treasury Department that they were impressed by the fine response of these men who went to Washington. It seems to me that in this we are rendering a practical service.

"In the relations of capital and labor there is a field for the engineer. Many of our labor troubles are due to ignorance. Opportunities are overlooked daily for discussing difficulties that arise between workers and management. Where can the engineer use his knowledge to better advantage than in the education of the workers and operators to a better understanding? In Americanization there is another line of endeavor for engineers. Foreigners are revolutionists by birth and do not know the differences that exist in this country as compared with their own. There is need of more education along lines of Americanization.

"In the effort to persuade Congress to take an interest in governmental economy and the Department of Public Works, the engineer is undertaking a work of great public importance.

"If we are successful in our efforts to co-operate, the outcome will have an equally beneficial effect upon the engineer himself. The need for this co-operation is vital. We are too modest. We are not public speakers. We are workers. We don't want to express our opinions or volunteer our views. We wait until they are asked. What better right has the engineer than to assume leadership and bring his ideas out for the benefit of the public as a whole?

"There is something for us to do and do all the time. The engineer is in a favorable position to adjust the differences between capital and labor. We are in contact with both. We neglect our duty if we do not explain, bring together and smooth over difficulties. Thus may we lead in designing, constructing and building a bridge over the turbulent currents and whirlpools of human selfishness to industrial and country-wide peace and prosperity, so may we aid in the erection of the structure of an ideal democracy wherein are encouraged the development

of the individual and in which are realized the age-long aspirations of the multitude."

Secretary Stoughton discussed the get-together activity of engineers in all parts of the country. He said that every effort is being made on the part of the institute to support local sections. He briefly reviewed the co-operative effort of engineers at Denver, Spokane, St. Louis, Chicago, Pittsburgh, Washington, Birmingham, Atlanta and Philadelphia and in Minnesota. The get-together movement may be characterized as being nation-wide. There is a feeling, he said, that we must have some organized patriotism to overcome organized anarchy.

In commenting on licensing laws for engineers, Mr. Stoughton said that this subject was being discussed in different states and that there were a number of such laws already in force but most of them were bad laws. The Engineering Council has had the subject under discussion and has promised a good law. The mining engineers object to any license law at all. The importance of this subject was made clear to the members present.

The engineering societies are co-operating much more actively than ever before with governmental departments and the National Research Council. To correct a misunderstanding concerning the employment department of the institute, Mr. Stoughton explained that at present the four founder societies have co-operated in the establishment of a central employment organization under the direction of a board of directors consisting of the secretaries of the respective societies. The service is to be extended to every engineer whether a member of a society or not. The cost of the employment service amounted to \$14,000 in 1919 and \$12,000 had been appropriated for this work in 1920.

Mr. Stoughton next briefly discussed the American Association of Engineers and the relation existing between that organization and the four founder societies. He made it clear that there would be co-ordinated co-operation between the organizations but that there could be no division in the existing work of the founder societies.

Both addresses were exceedingly well received and at the conclusion of Mr. Stoughton's remarks, C. E. Grunsky, A. C. Lawson, T. A. Rickard, D. M. Riordan and F. W. Bradley expressed in short addresses the appreciation and concurrence in opinion of the members present with the speakers' views.

Trade With Germany

In a recent issue of Commerce Reports it was stated that on Dec. 1 the Minister of Economics of Germany issued a proclamation designating certain articles the exportation of which without special permit is punishable by imprisonment. Among these articles are the following: Iron ores, manganese ores, ferro-manganese, and ferrosilicates; iron, pig iron, steel, iron blocks, old iron, iron and steel scrap, and foundry products; anthracite and bituminous coal, briquets, and coke; lime, plaster, and cement; soda, potash, alkaloids, sulphate of sodium.

BY THE WAY

The Golden Rule

A pair of surveyor's boots, a Stetson hat and a corduroy suit do not make a mining engineer any more than a desk and two inkwells make an executive. The aforesaid articles of raiment together with much technical knowledge plus common sense and experience do often enter into the make-up of the successful engineer, but for all that, the clothing is but an incident. A knowledge of dynamite and a proper respect for its powers are among those things that even the undergraduate of a mining school is supposed to possess. The bohunk in charge of a muck stick generally knows something about dynamite, but frequently is lacking in respect for it, sometimes to his own undoing. Here is where the undergraduate supposedly differs from the bohunk. But the recent escapade of students of the Colorado School of Mines, as a result of which serious damage was done to the buildings of the University of Denver and loss of life might have easily occurred, leads one to suspect that the Golden boys are paying more attention to their clothing than they are to their studies. Doubtless the members of the faculty of this excellent school have of late years been often reminded of the story about the old professor who posted the notice that he "would lecture to his classes at 2 p. m." A facetious student erased the first letter of "classes," but the professor, chancing to note the change, went the wit one better by erasing the "l" as well, so that the bulletin read, "Professor A. will lecture to his asses at 2 p. m." Golden will do well to note that the war is over and high explosives are no longer in fashion.

Oil and Water

In the West Columbia oil field in Brazoria County, Tex., considerable trouble is encountered, due to some of the wells producing from 20 to 50 per cent of water along with the oil. Not far away in a water well drilled to a depth of 800 ft., the water has been found to be contaminated with oil, and as the well is sunk deeper more oil is encountered. We do not know whether this is considered hard luck or not. Many strange things pass as potable fluids nowadays, and oily water may not be such a bad drink provided enough oil can be separated to buy a suitable chaser. We are reminded of Bret Harte's poem "Dow's Flat," wherein is told the story of a hard-luck prospector who also dug a water well and found a gold mine. The last lines as we remember them were:

"It was water the durn cuss was seeking,
And his luck made him certain to miss it."

The old rule that oil and water won't mix may also have to be modified. Another popular misconception is that water will not run up hill. Engineers have proved that it will, but it costs money to make it do so.

A Leeching System

"Nature faking again," one exclaims, as he reads the advertisement of a mining company in Cheyenne, Wyo., in which it is stated that "Nature has built on our property a natural leeching system." The company, it is stated, is incorporated under the blue sky laws of Wyoming. But whatever confidence this fact creates, if any, is immediately destroyed by the legend in half-inch letters "We Simply Can't Lose, Invest With Us." The prospective purchaser is urged to write or wire his order because "Silver and copper are higher now than ever before. Our assays show value at \$119 per ton. Only five miles to railroad with a down hill haul." The descent to Avernus is easy. But it is the geological aspect of this bonanza that is most appealing. "The soft formation that forms the main substance of the claims," runs the ad, "will make it the fastest developed proposition of its kind in the West. Nature has built on our property a natural leeching system. For the past hundreds of years the surface water from rains and snows has been carrying down these veins the values they contained, and deposited them at a "cross fault" which crosses the main veins at the foot of the hill. Think of the concentrated values with only 300 ft. depth to go! Thus, as in many another case, we are impressed with the truth of the Scriptures declaring that all things work together for good to them that love righteousness.

Dies Irae

With December 17 safely passed and doomsday yet to come, we are all in position to scoff at the false prophecy of the self-styled meteorologist of San Francisco who saw in the planets a sign of coming disaster for the earth. It would have been unfortunate, indeed, to have had this happen with the holidays so near and the Journal's Annual Review Number in course of preparation. So much of interest would have thus been missed, so much labor wasted. And what a blow to geologists, who in a twinkling would have seen their strata, anticlines, faults and all, disappear in the final cataclysm! All of us would have been thrown out of work, at least, far more so than any combination of strikes could effect, but we opine that the geologist would suffer most of all. The world of ideas and ideals might still exist, but that of hard rocks, hot or cold, would have ceased to be. But it is more interesting to speculate as to the viewpoint of some of those who in anxiety awaited the last trump. It is reported, for instance, that several mines in the Miami zinc and lead field of Oklahoma closed down on December 17 because the miners refused to go underground with the prospect of the world crumbling to pieces while they were at work. One would imagine that for the miner, and especially for the smelterman, the hereafter would have the fewest terrors of all, as far as physical fear is concerned. Perhaps it was only healthy curiosity to see a great spectacle that made these men remain on surface. But, whatever the reason, another day of production was lost.

THE MINING NEWS

New York, December 27, 1919

Homestake Mills Start Three Hundred Stamps Out of 1020 in Commission—Mine Fire Extinguished

Two mills of 300 stamps of the Homestake Mining Co., Lead, S. D., were placed in commission on Dec. 9, following the recent mine fire which was declared extinguished on Dec. 1. Other stamps will start dropping as the unwatering of the flooded workings progresses. Ore is being hoisted from the upper levels of the mine which was flooded to the 500 level. Unwatering will probably be delayed, however, unless a supply of coal can be obtained. Mine rescue car No. 5 of the U. S. Bu-

reau of Mines it was a camp of some prominence. The Endowment, Black Hawk and other lesser known mines have a reputed production of some millions. The ore came from high-grade silver-lead deposits occurring usually in narrow streaks. The deepest of the old workings is said to be not over 500 ft.

There has been some work going on periodically ever since the old days, but since the Divide boom and the return of high-price silver the activity has been much greater, with the probability that the camp will be quite lively during the coming year.—J. L. Giroux, a local mine operator, is credited

with having acquired pitchblende property in Butt Township, Ont., preparatory to active exploration. The Elliott Syndicate, of Chicago, owners of the discovery claim, are pushing exploration work and assays of the ore obtained by them are stated to show 600 milligrams of radium per ton of pitchblende and 70 per cent of uranium oxide. It has not yet been ascertained how much pitchblende can be extracted from each ton of rock, as the mineral occurs in small particles scattered through the pegmatite. Owing to the weight of the pitchblende, which is about four times as great as that of the rock containing it, concentration is a comparatively easy process.



CYANIDE PLANT OF TROJAN MINING CO. AT TROJAN, S. D. NEXT TO THE HOMESTAKE PLANT. THIS IS THE LARGEST IN THE BLACK HILLS

reau of Mines has proceeded to Rapid City, S. D., where instruction will be given to the students of the State School of Mines in mine-rescue and first-aid work.

Control of Chrome, N. J., Plant Changes

It was announced on Dec. 15 that the U. S. Smelting Co.'s Chrome, N. J., plant has passed to the control of L. Vogelestein & Co. Further details will be published in subsequent issues of the "Journal."

Silver Mining Again Active at Marietta, Nevada

Marietta is in the Excelsior Mountains, about twelve miles northeast of Belleville, which is about the same distance northeast of Candelaria. About forty years ago during the days of

with the purchase of the old townsite with all the houses and buildings thereon, as well as some 400 or 500 acres of mineral ground in the vicinity. His plans have not been announced.—C. E. Noble and associates recently took over the Skinner property, which the latter has been working for some years and making occasional shipments.—D. B. Shepard, who is said to be associated with parties connected with the Crocker National Bank of San Francisco, is operating one of the mines and is said to be taking out some good ore. Miller brothers are working steadily and are also said to be taking out good ore.

Activity in Butt Township, Ont., Following Pitchblende Strike

The Mining Corporation of Canada is erecting buildings on its recently ac-

Utah-Apex Suit Continues

Testimony in the Utah Consolidated-Utah Apex controversy as affecting the first part of the suit regarding the Highland Boy limestone has been completed by both litigants, and the second part of the suit regarding the Yampa limestone is in progress. The point at issue is much the same as in the former case, involving the questions as to whether the limestone—in the present instance the Yampa limestone, apexing in the Utah Consolidated—is the lode, or as to whether the orebodies in the limestone are connected with the fissures, which apex in the Utah Apex. Perry G. Harrison, and Reno H. Sales, of the Anaconda Copper Co., have been on the stand recently testifying for the Utah Consolidated.

Federal M. & S. Co. Files Action Against Hecla Company

Hecla To Answer Only in Court—
Declares its Regular Dividend

Formal action has been filed by the Federal Mining & Smelting Co. against the Hecla Mining Co, Wallace, Idaho, in which the Federal company claims the apex of the east Hecla vein in the Russell claim and therefore all the ore in and heretofore extracted from the said vein on its dip under the surface of various claims owned by the Hecla between vertical planes representing the end lines of the Russell claim extended. Quoting the complaint the Federal company alleges "that the said defendant in extending the said workings from the Hecla mine into the Russell mine and into the veins therein, and in extracting and removing the ores therefrom, has done so wilfully and knowingly, secretly and wrongfully, and by such acts has carried away ore, the property of the plaintiff, exceeding in value the sum of \$6,000,000." The plaintiff asks judgment affirming its title to the Russell claim and to the Russell vein as described in the complaint; that the defendant and its employees be restrained from entering upon the Russell vein during the pendency of this suit and removing therefrom any ore, earth or rock; that a final decree be entered perpetually enjoining and restraining the defendant from entering upon the Russell claim or into or upon the Russell vein and removing therefrom any ore or substance whatever; and that the defendant be required to account for all ore heretofore extracted, and that the plaintiff have judgment for the full value of the same, together with interest and costs.

The action was filed in the U. S. District Court for the district of Idaho, northern division, at Coeur d'Alene, Idaho. John A. Marshall, of Salt Lake City, and A. H. Featherstone, of Wallace, Idaho, appear as attorneys for the Federal. John P. Gray, of Coeur d'Alene, Idaho, has been retained by the Hecla company.

In a letter to stockholders, dated Nov. 29, the Hecla company states: "Our answer to their (the Federal company's) complaint will be made only in court at the proper time. We may state, however, that the ore involved is only what is known as our East orebody and cannot affect the main orebody nor the Ore-or-No-Go, and that all ore mined by us has been taken from within our own lines. There is a great deal of misinformation being published on this subject—exaggerating the amounts involved and the probable effect on dividends. You are hereby notified that a dividend of 15c. per share will be paid from this office on Dec. 28, 1919, to

stockholders of record at the close of business on Dec. 1, 1919."

In the 1916 annual report of James F. McCarthy, manager for the Hecla company, it is stated: "This ore (of the East orebody) is remote from natural ventilation and not much can be done in the way of production until ventilation is provided. It requires a raise of approximately 1,400 ft. to reach the surface. One thousand feet of this raise is now completed and we should reach daylight in April. We have undercut this ore on the 900 level, which is 2,300 ft. below the surface, and have drifted upon it 150 ft. So far as one can judge from the small development, the ore is narrower than it was above and contains somewhat lower value in silver."

It is not likely that the case will come to trial until next summer or fall, as much time will be required by both companies in preparation, particularly the Federal, which must make a showing to connect its alleged apex with the Hecla workings.

Utah Employer Responsible for Workman's Insurance

A recent decision of the Utah Industrial Commission puts the workman's insurance, as required by the Workmen's Compensation Act, at the risk of the employing company taking out the insurance. Insolvency on the part of the insurance company does not relieve the employer of responsibility under the Compensation Act. The case in point was that of the American Fuel Co., which has been held responsible for compensation under the law, although the Guardian Casualty & Guarantee Co. is in the hands of a receiver and is unable to make a payment.

New Wage Scale Agreed Upon by Rochester Nevada Silver Co.

The Rochester Nevada Silver Mines Co. has entered into a new wage agreement with its employees which is to be effective until May 1, 1920. The present scale is \$5 for ordinary miners and \$5.50 for machine men, but under the new agreement the company will grant a bonus based on the average price of silver for each month as shown by the "Engineering and Mining Journal," subject to the following conditions:

(a) When the average price of silver for any month has been \$1.20 or less per oz., no bonus shall be paid and the regular wage scale will apply.

(b) When the average price for any month has been not less than \$1.21, and not more than \$1.25 per oz., a bonus of 25c. per shift will be paid.

(c) When the average price for any month has been not less than \$1.25 per oz., an additional bonus of 25c. per shift, or a total of 50c. per shift, will be paid.

Butte & Superior Accounting Filed

Company Maintains Sum Involved Is Not Properly Recoverable by Plaintiff

The Butte & Superior Mining Co. in accordance with the order of the federal court has filed with the United States District Court, in Butte, its accounting of the ores mined and milled during the time it has been adjudged to have been guilty of an infringement of the oil flotation process of the Minerals Separation Co. In this is shown valuation of \$451,096.96, which it is stated, includes total profits, gains and advantages. It also includes, the statement says, all ores mined and milled by the Butte & Superior Co. from the property of the Clark Realty Co., operating the Black Rock mine.

The statement says that the defendant is not to be regarded as admitting that the amounts are properly and legally recoverable by the plaintiff under the decree in the suit. It is stated that the defendant will prove that a large share of the apparent gains, profits and advantages are legally attributable to the work of the defendant's officers, employees and others in the development of the process and in the application of the same to such ores as the defendant has mined. There is also a statement to the effect that the account covers all ores mined and milled by the defendant without waiving any rights which defendant may have with respect to the subrogation of the ores or otherwise.

It is also stated that the defendant has not used a fraction of 1 per cent of oil on the ore in its flotation operations since June 4, 1919. During the period between June 5 and Sept. 30, 1919, the defendant, the statement says, has always used more than 1 per cent of oil. It is added that the books of the defendant show that the metallurgical results obtained by defendant by the use of more than 1 per cent of oil are at least as good as those obtainable by the use of fractions of 1 per cent of oil. It is claimed by the defendant that the apparent advantage to the defendant of its infringing acts is the difference in cost and that this difference will give the apparent profits, gains and advantages of the defendant from infringing acts. It is admitted that the cost of grinding is greater in the free process than in the infringing process, but defendant claims that the cost of heating in the free process is less than in the infringing process.

There is a table attached to the accounting statement which places the total cost of infringing operations from 1911 to 1919 at \$647,763. Additional costs which would have been incurred if the free process had been used are

set at \$545,736.08. Claiming that the cost of heating is less in the free process than in the infringing process, the defendant subtracts a heating credit of \$94,639.12 from the additional costs of the free process, so making the net difference in cost \$451,096.96.

The account is brought to infringing dates when Butte & Superior used less than 1 per cent of oil and has nothing to do with present operations, the Butte & Superior claiming that it is now and has been for a long time using more than 1 per cent oil.

Copies of the accounting have been given to the Minerals Separation Co.'s representatives and in due time an answer is expected. When the preliminary matters have been settled between the two concerns the accounting will come up in the federal court in Butte for final adjudication.

Seeks to Revive Hydraulic Mining in California

California Debris Commission Asks Increased Appropriation

An increase in appropriation has been asked by the California Debris Commission so that hydraulic mining may be resumed to a greater extent without injury to navigable streams. It is believed that a plan can be worked out for co-operative dam sites for the restraint of debris which would allow more hydraulic mines and an increase in the operations of quartz mines in the district without permitting tailings to find their way into navigable streams. It is also necessary to do additional work so that gold-dredging operations may be guided more intelligently.

The commission has received the following applications to mine by the hydraulic method: From B. S. Taylor, Old Channel mine near Gravel Range in Sections 33 and 34, Tp. 23 N., R. 7 E., and Section 3, Tp. 22 N., R. 7 E., M. D. B. & M., Plumas County. Tailings are to be impounded in Scotchman's Creek, one mile below the mine, and draining into the Middle Fork of the Feather River. From H. L. Berkey, New Council Hill mine, two miles south of Scales, Sierra County, who will impound tailings in the worked-out Council Hill mining pit, and draining into Canyon Creek. From Marysville & Nevada Power & Water Co.; the Grizzley Hill hydraulic mine, near Brandy City, Yuba County, Cal., to impound tailings in the North Fork of the Yuba River about one and a half miles below Bullard's Bar, draining into Cherokee Creek, and thence into North Fork of the Yuba River. It is to be hoped that these applications will be favorably acted on, and that the enterprises themselves will be successful ones, thereby helping to revive hydraulic mining in California.

Schwab Gets Control of United Zinc Smelting Corp.

Charles M. Schwab, chairman of the board of directors of the Bethlehem Steel Corporation, has acquired control of the United Zinc Smelting Corp., and plans are under way for the immediate development of the plant and its facilities. Further than this nothing has been given out regarding the transaction. Mr. Schwab has been elected a director of the company, B. Lissberger has been elected president, Otto Proelss, vice-president and general manager, and H. W. Lohman, treasurer.

The United Zinc Smelting Corp. was organized under the laws of New York in May, 1916, and owns 98 per cent of the common stock of the Kinefinck Zinc Co., as well as all of the capital stock of the Pearlman Co., Inc., which in turn owns the Clarksburg Zinc Co. Five zinc mines are owned through subsidiary concerns which produce a high grade of zinc concentrates, and the smelting corporation operates two large smelters and refineries, one at Clarksburg and the other at Moundsville, W. Va.

The capital stock of the corporation is 600,000 shares of capital stock without nominal or par value, a part of which was offered for public subscription at \$12.50 a share in 1916, and there is a bonded debt of approximately \$350,000 in 8 per cent serial bonds.

Coal Shortage Affects Operations in Birmingham District

Half the coal of the furnace companies of the Birmingham district, now going to the coke ovens, is to be diverted to commercial and domestic uses, it was announced during the first week of December. This will probably cut down coke supplies to such an extent as to cause the banking of fires at several of the furnaces in this district.

The demand for pig iron is very strong, in fact exceeds the output of furnaces of the Birmingham district and some companies have been forced to withdraw from the market, while others have sold through the first quarter of 1920. Very little business is being accepted as yet for the second quarter delivery.

Several furnaces were banked at the beginning of the coal miners' strike as a conservation measure, a long period of idleness it was believed being ahead of some of the coal mines. Since the beginning of the strike the Alabama company has blown in a furnace at Gadsden, Alabama. Just how long this furnace will be able to run is not known for at the time it went back into operation coal production in spite of the strike was nearly normal but since has dropped to an alarmingly low figure.

Minerals Separation, Ltd., Increases Capitalization Business Expansion and Proposed New Plants Given as Reason—John Ballot Resigns

The capitalization of Minerals Separation, Ltd., has been increased to £500,000 by the creation of 450,000 shares of £1 each. Of these 50,000 shares are to be offered to shareholders at a premium of £1 per share pro rata to their holdings. This action was taken at a special meeting held recently in London, under the chairmanship of Francis L. Gibbs.

As reasons for the increase in capitalization Mr. Gibbs gave the recent world-wide expansion of the corporation's business, as well as the fact that the company has acquired options on two large mineral deposits, on one of which it has already begun extensive drilling operations. This, Mr. Gibbs stated, is a copper deposit in Spain. The second is a large silver proposition containing a large body of rich silver ore available for immediate treatment by flotation. It was also stated that the company must spend large sums in the near future in erecting plants to prove on a commercial scale the value of certain other deposits acquired.

The policy of Minerals Separation, Ltd., according to Mr. Gibbs, is to acquire raw material on a large scale for treatment by the company's processes. The company, however, does not intend to relax its efforts to deal with other business on a royalty basis. On the contrary, it is expected that this part of the company's business will greatly increase.

Mr. Gibbs also announced that the company had recently made two important discoveries, both of which had been protected by patents. He refrained from divulging the nature of these discoveries but said that they cover a field not hitherto dreamed of as forming a part of the company's accustomed operations.

The resignation of John Ballot as chairman of Minerals Separation, Ltd., was accepted at this meeting. Mr. Ballot has resigned, it was stated, in order that he may devote his entire time to his duties as chairman of Minerals Separation North American Corporation.

Boston & Montana Development Co. Prepares to Erect Mill

Grading for the construction of the 500-ton flotation mill at the Elkhorn mines of the Boston & Montana Development Co., will undoubtedly be completed soon when the pouring of concrete will commence. This mill will have a base measurement of 430 x 156 ft. Seventy-five men are at work and it is proposed to increase this number

as soon as possible. The company is cutting its own lumber for the plant, the first carload of which is on the ground and it is estimated that it will be able to get all of its timber from nearby forests along the right-of-way of its recently constructed Montana Southern Ry. It will be necessary to ship in from the outside only about 25,000 cu. ft. of lumber.

Coal Supply Ample at Iron Mines on Michigan Ranges

Output of Hydro-Electric Plants Reduced by Water Shortage

The Marquette and Menominee Range mines, in Michigan, are well supplied with coal for the winter months, and there is some speculation regarding whether or not the fuel administration will ask to have some of the fuel transferred elsewhere. Agents went over the coal piles at mines on the Marquette Range and made estimates of the amounts in stock and then secured figures as to the requirements of the companies. The operators get in their coal during the period of navigation on the lakes, usually stocking enough at the mines to last until navigation opens in the spring.

Since the installation of hydro-electric plants on the two ranges the coal requirements have been greatly reduced and practically all machinery at some mines is electrically driven. The Cleveland-Cliffs Iron Co., the largest operator on either range, has five hydro-electric plants, all of which are in operation, but it is impossible to generate the normal amount of current at this time because of the scarcity of water. The long dry spell of the past summer caused heavy demands to be made on the reserve supply of water and only the normal flow of the streams is now available for the turbines. The coal shortage will have no effect on the mines of the two ranges unless the authorities decide to move some of the stocks on hand to other localities.

Canadian Cyanide Tested at Haileybury School

Tests of the low-grade cyanide manufactured in Canada, which have been made at the laboratory of the Haileybury Mining School, Haileybury, Ont., are stated to have been satisfactory so far as its use for the treatment of silver ore is concerned. During recent months a considerable tonnage of this cyanide has been used in the Cobalt mills, replacing to some extent the imported high-grade article. Another test shortly will be made to ascertain whether it can be successfully used for the treatment of the gold ores of Porcupine and other gold camps. The American Cyanide Co. of Niagara Falls, Ont., has improved the grade of its product.

Plans of Bully Hill Co., of California, To Be Announced

The publication in local and San Francisco papers of the intention of Bully Hill Mines, Inc., to erect a \$600,000 zinc smelter at its mines in Shasta County, Cal., is premature. This company has expended over \$500,000 in mine development during 1918-19 and has succeeded in developing a large reserve of zinc ore as well as copper ores in both the Rising Star and Bully Hill mines. During 1918, 30,000 tons of 6 per cent copper ore was shipped to the Tacoma smelter. The company's plans for the local treatment of its ores will be announced in the future. R. E. Beale is general manager and Walter Arnstein, of San Francisco, is president.

Cave In at Hunter Mine, Mullan, Idaho, Imprisons Two

Entombed in a stope of the Hunter mine, near Mullan, for two weeks and finally rescued without serious injury, is the unique experience of P. P. Grant and Emil Sayko, two miners employed by the Gold Hunter Mining & Smelting Co. Hearing the noise of a cave in, the two men took refuge in a crosscut just in time to save themselves from being caught. When the crush subsided they found that they were imprisoned. A raise was started by the company through filled ground to reach them, and on the second day the workmen noticed that the sound of their hammers was being answered from above. The ground is difficult to hold, and on the third day it got away from them, a slide closing up the raise and catching two more of the workmen, who were rescued with only slight injury about eighteen hours later. In the meantime a diamond drill hole was started through solid rock from a tunnel above, in the hope of establishing communication so that food and water could be sent to the imprisoned men.

The men had their lunch buckets with them and a little water, but had been without food for five days and without water for four. Food, a quantity of silk for warmth and an electric light bulb were all sent down the drill hole, also newspapers containing accounts of the occurrence. With the men made as comfortable as it was possible to make them through the small drill hole, the rescuers started to sink a shaft through the solid rock, but this soon had to be abandoned because the blasts jarred the rock dangerously. A 90-ft. raise in solid rock was then started, because although this would take longer, it would not endanger the men. The raise broke through on Saturday morning, Nov. 29, and at 3 p. m. Grant and Sayko were removed from the mine, having been entombed exactly two weeks and four hours.

Mexico Raises Export Tax on Silver Without Warning New Rate Levied on Sliding Scale Based on New York Market—May Deter Capital from Entering

A federal decree increasing silver taxes by about 50 per cent, has been received at Aqua Prieta, Sonora, from Mexico City. The tax is assessed on all silver content, whether in the form of bullion, concentrates, precipitates or ore, and is based upon a sliding scale, increasing or decreasing according to the market price of the metal. With silver at \$1 per troy ounce, the tax rate will be 7 per cent; from \$1 to \$1.10, 8 per cent; \$1.10 to \$1.20, 9 per cent; \$1.20 to \$1.30, 10 per cent; \$1.30 to \$1.40, 11 per cent; \$1.40 and over, 12 per cent. The tax is to be collected in accordance with New York metal quotation on the day the silver is presented to the customs house for export, plus the cost of sight exchange in New York. The government has reserved the right to buy any silver presented at Mexico City at New York market, plus 1 per cent, less all duties, taxes and usual export charges. This decree has had a bad effect in so far as new interests entering the Mexican field were concerned, because it puts a sudden increase of 50 per cent on silver export duties without warning to the operators. In the opinion of mining men in this district it will not decrease the scale of operations in Sonora, but may prevent new interests entering the field at present.

Edna May Mine in Westonia Field Worked Out

Property in Western Australia Exhausts Payable Reserves in Seven Years

Mining operations at the Edna May gold mines at Westonia, Western Australia, ceased on Oct. 19, the payable ore reserves having been worked out. The Edna May pumps, which drained the Edna May Central mine also, will be kept going on the latter company's behalf, the whole of the pumping equipment being under offer to the Central company. The Edna May's career lasted only about seven years, but the results were very successful, for dividends totaled £325,660 on a paid up capital of £21,425 (in 42,850 issued shares of 10s. each) or £7-12-0 per share. The highest price reached by the shares was £9-18-0 in 1915. So far none of the other mines has met with the high-grade ore which the Edna May Co. was fortunate enough to strike and therefore the prospects of the field cannot be said to be very encouraging. It would have been advantageous for the field (although not for the promoters) if the three principal properties had been controlled by one company as nature intended.

PROGRESS OF MINING OPERATIONS

ALASKA

The Kennecott Copper Co. produced 9,789,320 lb. (including output of Braden Copper Co.) in November, and 9,928,000 in October.

ARIZONA

GENERAL CONDITIONS IN STATE—COPPER QUEEN AND C & A REDUCE OUTPUT—PORPHYRY CONSOLIDATED TO DRILL FOR EXTENSION OF INSPIRATION OREBODY

Phoenix—Arizona mining operators generally are looking toward a gradual shrinkage of the state's copper production till the present overstock has been disposed of. None of the larger copper companies of the Southwest are running anywhere near capacity. The Phelps Dodge Copper Queen is on a two-thirds basis, its Nacoziari branch on

consciousness. The unions, in a meeting of their state federation, lately censured their officers for alleged sympathy with I. W. W. aims. In the meantime, while the copper situation is adjusting itself, there is likely to be much more activity in Arizona silver, lead and zinc mines than ever known before. The principal gold producers are showing no special enthusiasm over their own situation.

Globe—Frank P. Knight, president of the Iron Cap Copper Co. has advised stockholders that they need not fear the apex suit of the Arizona Commercial Mining Co., in that no surface showing can be established by the claimant. He hints also that his company can

shut down, cutting the smeltery down to about 50 per cent of its capacity. Copper Queen is exploring old ground in the Czar section, finding ore in the vicinity of some of its pioneer workings.

Bisbee—Calumet & Arizona produced 6,320,000 lb. copper in November, of which 4,466,000 was available for the company. New Cornelia's November output was 4,236 lb. Shattuck Arizona produced in November 238,969 lb. copper, 697,783 lb. lead, 2,182 oz. of silver and 29.84 oz. gold.

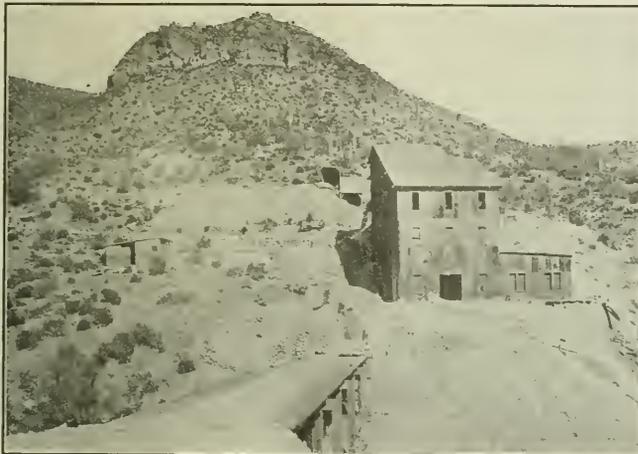
Miami—The management of the Porphyry Consolidated Copper Co. believes that the Inspiration orebody is to be developed at much greater depth on its property, and has decided to bore to at least 1,200 ft. A churn-drill hole will be sunk from the bottom of the old Barney No. 2 300-ft. shaft, and a second from the surface. Diamond drilling will be done from the 650 level, to determine the extent of an orebody already cut.—Inspiration produced 7,000,000 lb. copper in November, the same as in October.

Tucson—A. L. Pellegrin, owner of the Arizona-Mirage mine, is building roads to reach his properties in the Tucson Mountains, five miles from the city.—At the Stratton mine a geological survey is being made by J. Carter Anderson, of Colorado. A tunnel is to be driven 1,400 ft. to strike the main vein.

Mammoth—Magma Chief Co.'s operations at the Sombrero Butte mine after nearly a year are reported very encouraging. Drifting is to be started on 300 level.—The mill of U. S. Vanadium Development Co., of Kelvin, is to resume work, with an improved process for handling oxides. Ben S. Wilson is in charge.—The Armour Copper mine, fifteen miles northeast of Florence, reports bismuth ore discovery in 18-in. vein.

Patagonia—The Patagonia-Superior Mines & Development Co. has made a power contract with a Nogales electric company. The projected exploration will include much drilling, to define known orebodies.—The Bluenose mine is reported showing ore of good grade in silver and lead on the 160 level. The owner, James M. Layman, of Jerome, is directing the exploration and is considering building a concentrator.

Crown King—The Nelson Mining Co. has exposed 12 ft. of gold ore at the end of its tunnel, now 3,800 ft. long. This ore will be milled by the Bradshaw Reduction Co. or in a new concentrator. A 6-ft. vein of free-milling ore was also cut in the same tunnel.—From



MILL OF U. S. VANADIUM DEVELOPMENT CO., KELVIN, ARIZ., WHICH IS ABOUT TO RESUME OPERATIONS

one-half and the Morenci and Tyrone camps are closed. Similar disinclination toward production is shown at Clifton, Ray, Miami, Ajo and Jerome. Almost every company is adding to or improving its plant, with an eye especially to the installation of improved and cheaper processes. Managers are disinclined to shut down or even to turn off any considerable number of their workmen, fearing disorganization when the men again are needed and when they may have turned to other branches of industry now almost equally well paid. So development work is being planned everywhere. Moreover, not for years has the industrial situation in Arizona been as quiet as now, possibly owing to changed political conditions, in which the state no longer sustains the doctrine of class

institute a similar action against its neighbor. Iron Cap now is making a monthly profit of about \$22,000.—In the mine of the Superior & Boston Copper Co. the footwall vein at 400 ft., is producing ore sampling 15 per cent copper and 99 oz. silver. In the vein is 4 ft. of glance that assays better than 24 per cent copper and 90 oz. silver.—Old Dominion smelter produced 2,261,400 lb. copper in November and 2,365,000 lb. in October.

Douglas—General, though gradual, reduction of output has been announced by both the Copper Queen and the Calumet & Arizona mining companies. One of the former's blast furnaces at the Douglas plant has been drawn and the bullion output will be lessened by 1,500,000 lb. a month. At least one of the Calumet & Arizona reverberatories is to be

the Silver Belt property, near Prescott, Superintendent Ben Rybow is shipping high-grade silver ore to El Paso. He is mining an 18-in. vein of high-grade silver ore on the 400 level, and a recent cave opened a new 4-ft. orebody of almost as high-grade.—The Bullard mine near Wenden in southwestern Yavapai County, is being operated by Abbott & Bryant, who are sinking two shafts and shipping ore to the Hayden smelter. They are planning a mill.

Jerome—Alexander Mackay, president of the Dundee-Arizona Copper Co., together with his son Capt. F. B. Mackay, both of Dundee, Scotland, have made an inspection of the property of the company at Jerome, Ariz. It was determined to resume sinking early in December and to build leaching works for handling a great surface blanket of carbonates in the event the Consolidated Arizona Smelting Co., at Humboldt, will not take Dundee shipments for its new process works.

CALIFORNIA

KENNEDY HAS 60 STAMPS DROPPING—OLD EUREKA TO DEEPEN SHAFT—JUNIPER MINE ERECTING MILL

Amador City—The Keystone Mining Co. has ceased milling because the tailings storage basin is filled and the dam must be raised to prevent sands washing over. Some prospecting is being done in the mine and the shaft is being kept in repair.

Jackson—The Kennedy Mining & Milling Co. now has 60 stamps dropping on rock from the rich orebodies developed on the lowest levels. Recently 5 or 10 stamps only were at work for a short period.

Sutter Creek—The old Eureka company recently let a contract to sink the shaft an additional 550 ft., in the hope of striking better ore. The price to be paid is \$29 per ft., contractors furnishing their own explosives.—For the week ending Nov. 22, the Central Eureka Mining Co. reports the 3,510 drift as in 282 ft., with 7 ft. of good ore next to the foot-wall. The 3,700 north drift is in 144 ft. with 6 ft. of good ore in the face. The 3,700 south drift is 246 ft. south from station crosscut. The north raise is through and connected with the winze. The south raise will soon hole through to the 3,600 drift. On the 3,700 level, 360 lin. ft. of ore shoots have been developed, of which 200 ft. is south, and 160 ft. north from the crosscut station. The northern limit of the latter ore shoot has not yet been reached. The Central Eureka Mining Co. declared a regular 3c. and an extra 2c. dividend payable Jan. 12, 1920. The company is also placing a 4c. per share reserve fund aside at each dividend declared.

The Juniper mine at Hayden Hill has the equipment for a 10-stamp mill now

on the ground and has completed preliminary work for the installment of the mill.—The Bishop Creek mine at Bishop is installing a new ball mill of 150 to 170 tons capacity, and should have the mill ready by Jan. 1. It is expected to continue operations throughout the winter.—Electric power to operate the Kate Hardy mine, at Forrest, was turned on Nov. 22. A new double air compressor has been installed.

Masonic—Several shipments of high-grade ore, sorted from a vein that is 20 ft. wide in places, have been made from the Kibble-Cook lease on Cheming claim at Masonic. Shaft is down 87 ft. and oreshoot comes to surface.

Angels Camp—Machinery is being installed at the Angels Deep for 20-stamp mill. Operations expected to start in sixty days.

Bishop—The Wilshire Bishop Creek Mining Co. expects to have its entire plant in operation the early part of January.

Grass Valley—The Grass Valley Bounding Mining Co., which took over the Woodville, Gambler, Cabin Flat, Upper Scadden Flat, and part of Peabody mining properties, is reported to have struck a subsidiary vein in the incline shaft on the Woodville vein. The ore contains free gold.

Washington—Transfer of the El Capitan, New England, and Morning Star quartz locations has been made from A. A. McGee, of Emigrant Gap, to C. T. Worthley, of Nevada City.

Spring Garden—The Walker Mining Co. is building a nine-mile tram to connect its copper mine in Grizzly Valley with the Western Pacific at Spring Garden. The tram will carry copper concentrates for shipment to the smelters. A rich ledge, measuring 7 ft. in width, and carrying a large percentage of copper, was reported intersected by a crosscut in the mine.

Wintrop—The Bully Hill Mines Co. has cut its force from 70 to 25 men. This action was taken as development work will be discontinued for the present, enough zinc and copper ore having been blocked out to keep the contemplated reduction plant in ore for fifteen years.

COLORADO

GREATER ACTIVITY IN RED MOUNTAIN DISTRICT—PLATINUM FOUND IN OGDEN PROPERTY AT WARD

Ouray—The high price of silver is stimulating increased activity in the once famous Red Mountain mining district, which is credited with a gross output of over \$25,000,000. Many old-time operators who were familiar with some of the old mines from 1880, when they were opened, until 1893, when they were closed, are returning to the district to work some of the small ore

shoots that they left.—R. M. White, of Leadville, backed by D. E. Golyar & Co., has taken over the Kentucky Giant. He will fully equip it and commence deeper development.—The Genesee-Vanderbilt mill which was operated in connection with the Yankee Girl mine, was closed down recently, because of the change in character of the ore in the lower levels. The management has decided to erect a new combination concentration, flotation and cyanide mill next spring.

Idaho Springs—W. O. Reynolds and associates of Denver have acquired the Refugee group, consisting of two lode claims and a placer claim, situated southwest from the Shafter. An active development campaign is planned under the direction of Lt. A. P. Arundel. The property will be worked through the Big Five tunnel.—Nineteen assays were made from various parts of the Ogden property at Ward, and the ore was found to average 4 oz. of platinum. No other details are at present obtainable.

Colorado Springs—The Golden Cycle mill, which was closed down recently owing to a shortage of coal, has resumed operations and will continue to treat ores from the Cripple Creek and Boulder mining districts.—In the Alma-Sacramento mining district in Summit County several of the old silver-gold properties which have been idle for many years are again being operated. Many old properties are under development, and by spring a steady production should be made.

IDAHO

FURTHER DEVELOPMENT TO BE DONE AT NATIONAL MINE—POSSIBLE PLACER GROUND OPTIONED AT ELK CITY

Mullan—The directors of the National mine, conforming to the urgent request of the stockholders, are preparing to do certain development work that promises to disclose a new and important orebody. The mine was shut down and practically abandoned a few months ago, the copper ore being too low-grade to yield a profit. It has long been contended by many familiar with the property that the main orebody had never been reached, and as the company has over \$50,000 in the treasury, the stockholders insisted that some of this money be spent in an effort to find it.—Work was suspended three months ago at Carbonate Hill mine through lack of funds, after developing a fine shoot of lead-silver ore 6 ft. wide and 100 ft. long on the 400 level. The mine was unwatered and examined recently by an engineer and it is expected that his report will result in financial arrangements to resume development before spring.

Bellevue—Hand-sorted ore from the Edris mine is running 100 oz. silver and

60 per cent lead. Ore is found on both sides of a dike. The mine was formerly known as the Hawk. J. F. Pasold, Spokane, is the owner.—The Federal Mining & Smelting Co. has its 5,000-ft. tunnel nearly completed to connect Independence and North Star mines and give easy delivery of Independence ore to the North Star mill.—Utah Bellevue Mines Co. has its main tunnel in 470 ft., following the direction of the vein. The ore occurs in the contact between granite and porphyry; 2 ft. solid galena on the foot-wall and 2 to 4 ft. of zinc. Silver ore is being stocked at the mine.

Elk City District—Thousands of acres of ground are being taken under option along the Elk and American Creeks by unknown parties. Tests on a large scale are said to be contemplated to determine the value of the holdings for placer dredging. This will make the fourth time this ground has been worked. It is said \$18,000,000 was taken from this district by the men who went there in 1860 and the following years. Later it was worked by Chinamen, and about 10 years ago a small part of the field was worked by a small dredge.

MICHIGAN

SURFACE SINKING AT AHMEEK ENDANGERING PLANT—SENECA'S SHIPMENTS STILL HELD UP

Calumet—The Osceola Consolidated Mining Co. produced 59,000 tons of ore in November. Most of this came from North Kearsarge branch, and runs 16 lb. copper per ton. The output is showing no increase and now averages 900,000 lb. monthly.—Possible danger at the Ahmeek mine arises from surface sinking of land between No. 1 and No. 2 shaft, due to working out of Kearsarge lode mineral content. Conditions may require the removal of part of the plant of the corporation. The ore output for November was 69,000 tons compared with 68,000 tons in October. The yield maintained is better than 24 lb.—At the Allouez mine of the Calumet & Hecla company production of ore in November was 18,000 tons. The Centennial produced 7,000 tons, and the Superior and the La Salle got out simply the small production that necessarily extracted in the course of development.—The Seneca Mining Co. is not yet shipping ore as arrangements with the Government for railway accommodations have not been completed.

Houghton—At the Isle Royale Copper Co.'s mine production of ore dropped from 68,000 tons to 65,000 in November, but the yield is getting better all the time.—The Mass Consolidated Mining Co., Mass, Mich., produced 14,000 tons of ore in November which is normal. There was considerable production of mass and barrel stuff.

Iron District

ODGERS MINE RESUMES OPERATIONS—CLEVELAND-CLIFFS' NEW SHAFT HOUSES ALMOST COMPLETE

Menominee Range—The Odgers Mining Co. at Crystal Falls, has ordered resumption of operations; this being the third property in the Crystal Falls district to re-open recently.

Marquette Range—The Cleveland-Cliffs Iron Co. has shipped almost all the iron ore they had in stock. The Mackinaw-Gardner is now producing at a good rate; but the Stephenson mine is still idle on account of recent flooding. Unwatering is in progress, and in 1920 this mine will again be a producer.—The new concrete shaft houses of the Cliffs shaft at Ishpeming, are about complete. They stand 98.9 ft. high, weigh 1,700 tons each, and were cast around the old wooden head-frames without causing a moment's delay in hoisting. They are well reinforced with steel bar, and regarded as cheaper than steel shaft houses in the long run, as the upkeep cost will be very small. They are considered the finest shaft houses in the Lake Superior region.—At the Republic and at the Cliffs shaft mines considerable ore will be carried over the winter owing to the light demand for crushed hard ore.

Gogebic Range—The Newport Mining Co. will install an electric-driven pump on the 26th level of the Bonnie shaft at Ironwood. The pump will have a capacity of 600 gal. per min., and a head of over 2,300 ft. A lander at the Woodbury shaft was killed by falling into the shaft while changing the rope from cage to skip.—The Republic Iron & Steel Co. has bought an interest in the lease of the Townsite property and will continue to operate it. The fee is owned by the Longyear people. The property was formerly known as the Norrie mine, and was the most famous mine on the range.—At the Fabst mine the sinking of the "H" shaft has been resumed with a full crew. The shaft will be sunk 210 ft. from its present depth of 1,850 ft., and two stations cut, at depths of 1,865 ft. and 1,970 ft. When this work is completed the new surface equipment should be ready and the work of developing the 1,760 level in the orebody will begin.—Jones & Loughlin, Wakefield, have done considerable exploratory work with diamond drills east and north of the Morgan mine during the past summer. Results were more encouraging than the drilling on the Morgan which was done a few years ago.

MINNESOTA

LEONIDAS CONCRETING MAIN SHAFT—INLAND STEEL SURRENDERS THOMPSON LEASE

Mesabi Range—The Leonidas Mining Co. is concreting its main 10 x 18-ft.

shaft to a depth of 438 ft. on steel frames. The men are working three shifts and expect to finish the job before navigation opens in 1920.—The Susquehanna Carlson Exploration Co. is operating two drills to determine the rock limits on the south side of the pit for the Rogers-Brown Iron Co.

Cuyuna Range—The Inland Steel Co. has surrendered the lease to the Thompson property at Crosby, which since 1912 has shipped 900,000 tons. The lease reverts to the Maple Leaf Mining Co.—The location of the corner of the Rowe and the Sagamore mines and the Riverton Townsite, which has been in litigation has been fixed by court decision.

MONTANA

COAL SITUATION PREVENTS GREAT FALLS ZINC PLANT FROM RESUMING AS PLANNED—TUOLUMNE MAY ISSUE BONDS

Butte—The Great Falls zinc plant of the Anaconda Copper Mining Co., which shut down in mid-summer on account of the shortage of power, was to have started the second week in November, but did not on account of the coal strike. The zinc plant requires the entire output of one power house to secure best results and therefore could not tap other than its regular source when power became limited on account of water shortage. The coal strike affected it only because coal is required to haul concentrates and for auxiliary operations in Butte. On Dec. 3 all departments at Great Falls were down except the rod and wire mill. The temperature was 30 deg. below zero, causing much suffering. Anaconda produced 14,120,000 lb. of copper in November and 15,000,000 in October.

Butte & Superior in November produced 11,500 lb. of zinc in concentrates and 200,000 oz. of silver as compared with 11,000,000 lb. of zinc and 210,000 oz. of silver in October. The tonnage mined during November was 40,000 as compared with approximately the same tonnage the previous month. Ten thousand tons of concentrates were milled. Crude ore averaged more than 15 per cent zinc and about 6.5 oz. of silver.

The Pittsmtont smelter production of the East Butte Copper Co. for November was 1,902,580 lb. of copper and 56,834 oz. of silver as compared with 2,027,340 lb. of copper and 71,317 oz. of silver in October.

A special meeting of the stockholders of the Tuolumne Copper Mining Co. has been called for Dec. 30, 1919, at Phoenix, Ariz., for the purpose of authorizing a \$500,000 bond issue to provide funds for an aggressive development program. Details of the issue are to be worked out after the stockholders have ordered it. It is said, however, that the plan calls for 6 per cent bonds

of a convertible character, with the conversion figure at \$2 for the stock.

Crosscutting is under way on the 1,200 level of Tuolumne's Main Range mine and it is expected to reach the Spread Delight vein within 10 days. A Cameron centrifugal pump of 500 gal. capacity is being installed on the 1,200 level and when this is in commission sinking to the 2,000 level will begin. This pump is the first of its kind in the Butte district. Tuolumne will cross-cut all its fissures on the 2,000 level, including a number of "northwest" veins. The vein system of the Main Range mine particularly is pronounced, the Spread Delight fissure showing a width of more than 200 ft. on the 1,000 level. The Rory O'More vein, opened on the 700 level, shows a width of 30 ft., averaging 6 oz. of silver, of which 10 ft. runs up to 16 oz. The Rory O'More ledge has not been opened below the 700-level.

NEVADA

Elko—A large body of ore running 4 per cent copper, besides gold and silver values, has been opened up at the camp of Contact, in the extreme north-eastern portion of Nevada. Twenty-two men are engaged in developing.—The Bull's Head Mining Co.'s 50-ton smelter at the mine in the Spruce Mountain district near Tobar was completed and an initial run made the last week in November. The smelter is said to work satisfactorily, but severe weather in that section has forced a shutdown until spring.

Virginia City—Consolidated Virginia Mining Co. while drifting on the 2,150 level, which has been following ore going from \$18 to \$41 per ton, has opened ore assaying \$300 per ton, according to an official report. An old bonanza shoot in this mine extended from the 1,167 to the 1,800 levels, and was 300 ft. wide.

Battle Mountain—With considerable good-grade ore in sight, the Quicksilver Mines Co. will make regular shipments from its mine south of Battle Mountain. The last shipment was of 13 flasks.

Arrowhead—The shaft of the Arrowhead Extension mine is being sunk by contract and good progress is being made. The sulphide zone is expected to appear at 75 ft. and the vein seems to dip toward the shaft.—The old Gila silver mine, about three miles south of the Arrowhead, is now under option. It is hoped to inaugurate a large development campaign there. Its extension on the north is said to be under option to Tonopah and Ely parties. Reports state that many other properties in its vicinity are also involved in various deals.—From the Arrowhead Annex mine come reports of two good ledges

discovered.—The Arrowhead Bonanza Mining Co., E. J. Ramsay, secretary, is endeavoring to obtain \$50,000 from a San Francisco syndicate, to be used in development.—The Arrowhead Consolidated Mining Co., J. Henry Goodman president, has completed such arrangements and has purchased a large mechanical outfit. The shaft is to be enlarged as soon as the latter is installed. The shaft is now in the sulphide zone, though only 70 ft. deep, and has encouraging silver showings.—The Arrowhead Signal, between the Arrowhead and the Arrowhead Extension, is doing considerable development; and the Arrowhead Syndicate is reported to

the hill. They should be met within the next 200 ft. of drifting. Alterations and additions also have been made in the 15-stamp mill.

Manhattan—White Caps has shut down its mill and it is announced that ore will be shipped to a plant near Chicago where the treatment will save the arsenic. Auto trucks will be used to haul the ore to Tonopah.

Tonopah—The West End Consolidated Mining Co. has reached normal conditions at both mine and mill. Tonopah Extension has put on a full crew at its mill, and is also busy installing foundations for a compressor, erecting accommodations for men, and with



JIM BUTLER SHAFT, TONOPAH, NEV.

have let a contract for sinking their shaft to the 100 level. Many buildings, timber and supplies are being taken to Arrowhead from Tonopah, Ely and Goldfield, and the camp has made application for a post office. Some people expect the population to reach 2,000 by next spring.

Pioneer—The Reorganized Pioneer Mines Co. which owns 11 claims, 9 patented, and valuable water rights, is developing the Pioneer mine and has installed a large driving engine. The main working shaft is to be sunk to the 800 level where crosscuts will be driven to the orebodies. About \$500,000 worth of ore has already been produced by this mine from above the 300 level.—A close neighbor is the Consolidated Mayflower Mines Co. which is carrying on thorough development work, particularly on the 2d, 3d, 4th, and 5th levels. A drift northward on the 3d level is now out 1,000 ft. and is to develop orebodies higher up on

other preparations for general resumption of development work.—At the Tonopah Belmont Development Co. property the electric haulage system has been completed and adjusted to running conditions. This company is milling the ore mined by the Tonopah Mining Co. which has been working various stopes in the Silver Top, Mizpah and Sandgrass sections; most of the ore comes from the caved stope on the 500 level in the Mizpah shaft. The West End Mining Co. has continued its development work in the Ohio section of the mine and also in No. 2 shaft of the older section. Production has been from the Ohio section as in the past, and tonnages have increased steadily since work was resumed on Oct. 4. The Ohio shaft 802 crosscut is progressing, the face now is in West End rhyolite. Three other crosscuts are also going satisfactorily. One drift on the 832 level is showing good ore, and two new drifts, in low-grade ore

at present, have been started on the same level. Six stopes are working and in fair-grade ore. A raise in Mizpah trachyte is making limited headway, as is the drift started on the 536 level last week. In the older sections the regular stopes are being worked in ore of the previous average grade.—The Tonopah Mining Co. has bought the Silver Rule mine in the Kingston Mountains at Goodsprings from John Chamberlain.—Frank Stall and Jos. H. Hutchinson have been shipping about two carloads per week from the works of the New California Tonopah Mining Co. The ore is of the best grade among Tonopah ores. North Star mine is extending its workings on the 900, 950 and 1,050 levels. The MacNamara mine is also developing steadily, and its mill is fully occupied with the ores supplied, together with custom work from Tonopah Divide, Divide Extension, Hasbrouck, etc.

Mina—The Candelaria mines are installing two compressor plants and plans are being prepared for a 500-ton mill to treat the oxidized ores, of which it is estimated there are 500,000 tons on dumps or in sight in mines. International Nickel interests own control and Chas. D. Kaeding is general manager.

Imlay—A much better grade of ore has been opened up in the tin zone of the Majuba Hill Silver, Tin & Copper Mines Co., twenty miles west of Imlay. Management will not give out assays until extent of high-grade shoot has been better determined.

Winncucca—According to Manager Geo. B. Williams, Nevada Harmony Mines Co. has secured ample funds for 3-drill compressor and pumping plant, which will be installed at once. A heavy flow of water was encountered in the workings three months ago.

A hoist and compressor plant have been installed on Amalgamator property at camp of Dun Glen.

Wonder—Unless an unlooked-for find is made, the mill of the Nevada Wonder will probably cease operations this month. The mine has been worked thirteen years, has paid \$1,549,000 in dividends, and the company now has over \$400,000 in assets above all liabilities.

Tuscarora—It has been announced that the Holden M. & M. Co. will build a 250-ton mill at Tuscarora to replace a smaller one recently burnt. Work will start in spring. David J. Cook, manager, is reported as saying that the burnt mill was deliberately set on fire.

Midas—The drifts on 300 level of Missing Link claim of Big Chief Cons. Co. in the Gold Circle district are in even richer ore than was recently encountered on the 200 level.

SOUTH DAKOTA

TROJAN SINKING ON NEW GROUND—TUNNELING FOR IRON HILLS WORKINGS HALF COMPLETE

Trojan—Normal production is being continued in the Trojan company's plant in the Bald Mountain district. Sinking of a shaft has been started on newly acquired ground west of the present operations.

Carbonate District—The tunnel that is being driven to tap the old Iron Hills workings by eastern interests under the direction of W. S. Elder, of Deadwood, is in over 700 ft., a trifle over half the distance to be driven. The severe weather conditions have somewhat interfered with the delivery of supplies and retarded the work.

CANADA

Ontario

MINING CORP. OF CANADA PASSES DIVIDEND—HOLLINGER SHOWING WELL—PEERLESS AT BOSTON CREEK HAS UNIQUE ORE

Cobalt—The directors of the Mining Corporation of Canada, Cobalt, have decided to pass the regular quarterly dividend, but intimate that dividend payments will be resumed next year. The action taken was on account of the loss of revenue due to the strike and because of the purchase of the Foster lease and also a 70 per cent interest in the Buffalo mine. The La Rose is meeting with success in its development of the University property which it recently re-opened. Last week a new high-grade vein, one-inch wide, was encountered and the prospects are that this property will provide a considerable tonnage. The Princess mine, operated by the same company, is also showing up well. The Northern Customs Concentrators which recently purchased 24 acres of Chambers Ferland ground is putting up a head frame and installing machinery and will develop underground. The Trethewey has encountered a good vein of high-grade ore on the Gowganda property which it recently purchased. During the year ended Oct. 31 the Coniagas produced 900,000 oz. notwithstanding almost two months shutdown on account of the strike.

Boston Creek—The Peerless Co. in Boston Creek is installing a boiler and compressor plant. The ore is unique in this country being a bismuth sulphide carrying high gold values, in quartz. Pieces of the solid mineral run as high as \$3,000 to \$4,000 to the ton.—An important gold discovery is stated to have been made on the Manley Reilly claims in Skead township.

Porcupine—The Hollinger Consolidated Gold Mines continues to show good results and the dividend will no doubt be increased before long. The declaration of a 25c. dividend on Dome has helped to restore confidence in this venture. The development of the Dome

Extension is such that there seems little reason to doubt it will be taken over in March when the option expires.

Sudbury—Starting with the first of December the International Nickel Co. has increased its output to 3,500 tons of matte a month which is nearly up to its pre-war production. It is expected that before long it will be up to 4,000 tons. While the large copper companies are decreasing production the nickel companies are increasing and the demand is almost entirely for domestic consumption. The British-America Nickel Co. will start production this month and will begin at the rate of about 750 tons of matte a month.

Mine Center—The Foley mine, situated six miles south of the Canadian National Ry., at Mine Centre, Ont., has been sold to the Swedish-Canadian Gold Mining Corporation. About 1,000 ft. of sinking, and 2,000 ft. of drifting has been done on the property, which has developed a large ore reserve, averaging \$14 per ton. There is a 20-stamp mill on the property. A cyaniding plant will be installed, that is expected to effect a recovery of 95 per cent, as against 55 per cent under the old operations. Construction work on a 1,600-ft. aerial tramway will be commenced on Jan. 15, 1920.—The Mikado mine, situated at Shoal Lake, Lake of the Woods, has been sold to a Chicago syndicate, headed by Robert Wachman.

MEXICO

Northern Sonora

LA MINA MEXICO TO BE REOPENED—PREPARING TO ERECT MILL AT SAN JULIAN—BUENA VISTA'S CUPELING FURNACE COMPLETED

Agua Prieta—The ore exports through this port for the month of November showed a heavy decrease from the previous month. This was due chiefly to the heavy rains of the last ten days of the month which turned roads leading to Nacoziari into a quagmire. A flood on Nov. 24 swept through Nacoziari Canyon washing out several miles of road; a number of freight outfits in the canyon had a narrow escape from death. The Yaqui Indian trouble in the south end of the district early in the month also caused shipments to cease almost entirely, freighters fearing to take the road. The reduction in copper shipments, general throughout the southwest and Sonora, also was a strong factor. A total of 197 carloads of ore, of 9,648 tons, valued at \$1,655,000, was exported here. The shippers were: Nacoziari (including all the properties in this district, but chiefly the Mctezuma Copper Co.), 177 cars, 8,910 tons; El Tigre, 15 cars, 549 tons; Estrella, 3 cars, 126 tons; Las Chispas, 1 car, 36 tons; Monte Cristo and Norte Potosi, 1 car of 27 tons.

La Mina Mexico—La Mina Mexico, owned by the Potter Palmer estate of Chicago, will be re-opened in the near future, according to announcement made by the management, following inspection. The property has been closed for four years as a result of revolutionary troubles. Underground the mine was found in surprisingly good condition considering the period of idleness. Comparatively little work will be needed to put it in shape for production. The surface plant also was in good condition. Both above and underground a force of mechanics are working getting the mine and machinery plant ready for operation. E. P. Ryan, manager, and C. D. Cline, consulting engineer, made inspection and then returned to El Paso. It is intended to secure at once a 50-ton flotation mill, machinery for which will arrive at the border at

the past, though some of its packers have been killed from time to time. The product formerly was sent by way of Tonichi, but the revolutionary troubles and Yaqui warfare which destroyed the greater part of the Tonichi branch of the Southern Pacific de Mexico R. R. between Tonichi and Torin, caused pack trains to be employed to bring ore to Nacozeni for shipment to the United States.

Progreso — The Progreso Silver Mines Co. has been operating on its usual scale and has accumulated a considerable tonnage of concentrates and precipitates which will be shipped as soon as roads are repaired sufficiently to allow the use of the company's fleet of motor trucks between the mine and Nacozeni.

Buena Vista—The cupeling furnace on which work has been concentrated

of the property, who went to Nogales, Ariz., for that purpose.

Caborca—A placer gold discovery on the shores of the Gulf of California, a few miles from Caborca, Sonora, has caused a rush of considerable proportions to the field. While numerous rumors have been received relative to the richness of the placers, little authentic information has been obtainable. However, the excitement is high and many Mexicans and foreigners are going in to stake claims.

Cananea—Greene Cananea produced 3,900,000 lb. copper in November and 4,000,000 in October. Silver produced in November was 164,300 oz. and gold 800 oz.

PERU

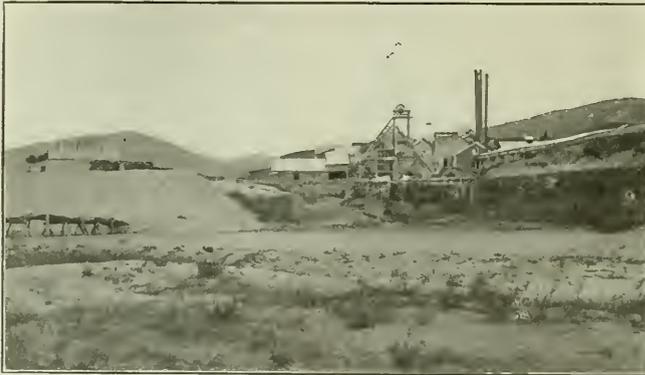
The Cerro de Pasco Copper Corp. produced 4,752,000 lb. of copper in November and 5,652,000 in October.

CHOSEN (KOREA)

The Oriental Consolidated Mining Co., Unsan, Korea, had the first unit in its Suribong power house ready for operation on Oct. 28. On Oct. 31 the load was brought up to nearly full capacity by making the unit drive the Tabowie and Taracol mills, Taracol shops and Taracol cyanide plant. This load has been carried continuously ever since without the slightest trouble. The unit is working smoothly, the load being approximately 640 hp. The second unit is being made ready. The Chorrie hydro-electric plant is now driving the hoist and pump motors in the mines, except the surface hoists at Taracol and Tabowie, which are steam driven at present.

The cholera situation is improving in Manchuria and the northern and central parts of Korea. The newspapers report that the number of deaths shows no decrease in southern Korea as yet. Statistics compiled by the police authorities show that at the end of October more than 12,000 cases of cholera had been observed in Korea this year with more than 8,000 deaths. There is little or no danger of the cholera invading the Unsan district as cold weather has set in.

The cost of native foodstuffs continues excessive; the company will probably have to buy millet and rice to sell to workmen at cost or below cost. Labor is scarce and inefficient. Many industrial undertakings are now under way in Korea, absorbing much labor. Chinese labor continues hard to obtain, because the Mexican dollar is worth between Yen 1.80 and Yen 2 and when the Chinaman converts the savings from his yen wages into Mexican dollars, he gets so little that he is better off working at home in China. The November clean-up was \$112,900 against \$100,000 in October.



MAIBONG MINE, ORIENTAL CONSOLIDATED MINING CO., KOREA

Douglas, Ariz., about Jan. 1. Assembling of pack and wagon trains has been started to haul this south. The inspection proved that part of the machinery in the old mill could be used in conjunction with the flotation process. The smelter probably will not be operated at present. Road building between the mine and the Progreso road near Suaqui will be started at once. It has not been announced whether the ore would be packed up to Nacozeni for shipment by rail or motor haulage would be adopted from Suaqui.

San Julian—The San Julian property in the Sahuaripa district is operating under the management of George Fast, assisted by his son, Frank, and M. E. Blome. It is a high-grade molybdenum property. The work of installing a 30-ton concentrator will be started at once. The first pack train carrying disassembled parts of the mill, left Moctezuma recently. Although in the heart of the so-called Yaqui Indian district this property has not been molested in

for several weeks now is complete, and the first run on silver-lead matte is reported to be under way, preparatory to making a test shipment to the refineries in the United States. The Buena Vista is fortunate in having within its holdings all the necessary elements for a perfect flux. By shipping matte the management counts upon eliminating much of the high cost hitherto attaching to getting its product to the market. The property is owned and managed by Wendler & Barney.

San Nicolas—Additional thickeners and one additional flotation machine have been purchased by the San Nicolas mine, which is operated by Douglas, Ariz., interests. When installed these will increase the mill capacity to approximately 100 tons daily. At present about 60 tons is the daily run. The machinery is expected to reach the border at Douglas in December and be on the ground early in January. The purchase of the machinery was arranged by H. W. Kaanta, mill superintendent

PERSONALS

Herbert Hoover is in California.

R. B. Whiteside is in the Louisiana-Texas oil district where he has interests.

G. M. Colvocoresses is in New York, having recently returned from a trip to Canada.

A. W. Allen, who has been in Chile, expects to be in New York the middle of January.

D. C. Jackling and R. C. Gemmell are inspecting the properties of the Utah Copper Co.

Horace W. Winchell and Bradley Stoughton left San Francisco for Los Angeles on Dec. 26.

S. M. Summerhays, general manager of the Bluestone Mining & Smelting Co., was in Reno on Dec. 18.

Colonel Ralph Stokes has returned from North Russia and will resume his mining work early next year.

Capt. John M. Goldsworthy of the East Norrie mine is recovering from a very serious spinal operation.

Jasper T. Robertson, mining engineer of San Francisco, recently examined the Simon mine for New York clients.

H. M. Alley, recently mill superintendent of the Nevada Wonder mill, at Wonder, Nev., is in San Francisco.

Andrew W. Newberry has opened an office at 66 Broadway, New York, for the examination of mining properties.

B. C. Yates, superintendent of the Homestake mine, has been in Chicago on business connected with his company.

R. C. Gemmell, general manager of the Utah Copper Co., has returned from a trip to Duluth in the interests of the Mesaba Syndicate.

Charles M. Schwab has been elected a director and member of the executive committee of the United Zinc Smelting Corporation.

George H. Carnahan, chairman of the Penyon Syndicate, has recently returned from an inspection of the syndicate's properties in Chile.

Ellsworth Bennett, who is in charge of the Tonopah School of Mines, recently made a geological examination of the La Toska mine, near Oreana.

Frank E. Lathe, formerly with the Anaconda and Chile Copper companies, is chief chemist of the British-America Nickel Corporation at Sudbury, Ontario.

A. P. Anderson, consulting mining engineer of the U. S. Smelting, Refining & Mining Co., is in San Francisco, having recently arrived from Pachuca, Mexico.

Eugene P. McCrorken has resigned from the editorial staff of the "Engineering and Mining Journal" to become managing editor of "Compressed Air."

Joseph T. Singewald, Jr., professor of economic geology at Johns Hopkins University, has been granted leave of absence to do geologic work in north-western Peru.

E. J. W. Donahue, representing the Gloria Mining Co., Cuyuna Range, has returned from Washington where he attended the sessions of the War Minerals Relief Commission.

W. G. Mather, president, and W. P. Belden, chief counsel, of the Cleveland-Cliffs Iron Co., of Cleveland, Ohio, have been inspecting the company's holdings on the Marquette Range.



Harris and Ewing

C. E. LESHER

C. E. Leshler has resigned as chief of the Division of Mineral Fuels of the U. S. Geological Survey, to take charge of the new statistical division of the National Coal Association. Mr. Leshler joined the Geological Survey nine years ago. He will be succeeded by F. G. Tryon.

Albert Burch, former manager of the Goldfield Cons., was in Reno on Dec. 15 on his way to the Simon mine, for which the firm of Burch, Hershey & White are consulting engineers.

T. M. Owen has returned from Australia after an absence of seven months. He has been appointed assistant general manager for the Federal Mining & Smelting Co., Wallace, Idaho.

Colby Dodge, of Los Angeles, has returned to Nevada after a trip to his home city. Mr. Dodge is doing some work on a promising property eight miles from Rochester in the East Range.

J. B. Tyrrell, mining engineer and geologist of Toronto, was in New York Dec. 12, on his way to England. Mr.

Tyrrell has for many years been one of the most active field geologists of Canada.

W. H. Taylor, of the E. J. Longyear Co., who was stationed for some time at Brainerd, Minn., has left for Southern Louisiana where he will have charge of the sinking of a 600-ft. shaft at a salt mine.

W. S. Miller, chairman of the board of directors of the Standard Oil Co. (California), will retire from active business on Jan. 1, 1920, after thirty years of service with the Standard Oil Co. of California.

W. H. Lawrence, mining engineer of New York, recently returned to Reno, Nev., from the Yale mining district in British Columbia where he made arrangements for the resumption of work on the Empress group.

Frank M. Manson, manager of the Western Ore Purchasing Co. and director in the Candelaria, Rochester and other mining companies, has returned to his home in Reno after a six-weeks' business trip to the East.

E. J. David is in charge of the electrolytic refineries and silver department of the Raritan Copper Works, succeeding M. H. Merriss. Mr. David also takes Mr. Merriss' place as a member of the General Safety Committee.

Charles W. Plumb, who has been assistant superintendent of the Mammoth mine for several years, will be transferred on Jan. 1, by the U. S. Smelting, Mining & Refining Co., to Utah, where he will be superintendent of a mine belonging to the company.

Carl B. Anderson, formerly with the Illinois Geological Survey and the Gulf Oil Corporation, has joined the staff of Rogers, Mayer & Ball, of New York and Boston, who announce that their facilities for the examination and appraisal of oil properties will be extended.

OBITUARY

J. M. Francis, for years manager of the Tom Reed mines and mill at Oatman, Ariz., died recently in a Los Angeles hospital. Interment was at Kingman, Ariz.

F. A. Wilde, who died recently in Oshkosh, Wis., aged 76, had been a pioneer silver miner at Ouray, Col. In 1890 he became identified with the Nordberg Manufacturing Co. of Milwaukee. A year later he moved to Kingman, Ariz., to install the plant of the Desert Power & Water Co., which now supplies electric energy to the larger

camps of the Mohave County. He became the principal stockholder of the enterprise and had been its president since its inauguration.

L. G. Bonesteel, superintendent of the western Mesabi interests of the Interstate Mining Co., died at Coleraine, Minn., on Dec. 5, following a hurried operation for appendicitis. He was thirty years old and engaged for several years in mining work in South Dakota before coming to the Mesabi.

Louis Valentine Pirsson, professor of physical geology in the Sheffield Scientific School since 1897, died at his home in New Haven, Conn., Dec. 8, aged fifty-nine years, while on a year's leave of absence owing to ill health. For more than twenty years Professor Pirsson was associate editor of the "American Journal of Science." He was the author of many scientific memoirs, textbooks, and papers on geological and mineralogical subjects, and was connected with the U. S. Geological Survey for a number of years.

G. S. Rogers, of the U. S. Geological Survey, died Nov. 18, in Colombia, South America. Mr. Rogers, who had been with the Geological Survey since 1911 in the capacity of oil and gas geologist, was on leave of absence from the Survey at the time of his death, making a survey of oils in Colombia. He met his death at the mouth of the Malotto River, when a canoe, in which he was attempting to cross the river was overturned. Mr. Rogers recently completed bulletins on "The Occurrence of Helium in the Crust of the Earth," and "Helium Resources of the United States," which are now in course of publication.

SOCIETIES

American Electrochemical Society, New York Section, held a meeting in New York on Dec. 12. The subject of discussion was "Labor and Industrial Conditions Abroad and Their Influence on the United States."

Iron and Steel Institute—Dr. J. E. Stead has consented to be nominated for the presidency to succeed Eugene Schneider, whose term will expire in May, 1920. Dr. Stead joined the Iron and Steel Institute in 1873, became a member of the Council in 1895, and was elected vice-president in 1910. It is proposed to hold the autumn meeting of the Institute next year in France, where it would probably have taken place in 1915 had not the war intervened. This will be the first foreign meeting since the notable gathering business in Jenkins valves abroad,

ing at Brussels in 1913, and, in fact, the first conference held out of London since that year.

American Mining Congress—In general the old officers of the Arizona Chapter were re-elected at the annual meeting at Phoenix. Norman Carmichael is governor, and the vice-governors are G. M. Colvocoresses, F. W. MacLennan and John C. Greenway. To the directorate, which has fourteen members, were added the names of W. S. Boyd, succeeding L. S. Cates, who has removed to Utah, and F. W. MacLennan, to succeed B. Britton Gottsberger.

INDUSTRIAL NEWS

Roger Woodbridge has been appointed Lake Superior representative of the Chicago Pneumatic Tool Co.

Fairbanks, Morse & Co. will start the erection of a modern foundry next year. This will be situated at Beloit, Wis., will be 900 ft. long, 550 ft. wide, and will contain 495,000 sq. ft. of floor space. The ultimate capacity will be 350 to 400 tons of gray iron daily.

Marchant Calculating Machine Co. plant at Emeryville, Oakland, Cal., which was partially destroyed by fire, caused by a defective heating system, on Nov. 29, is already being rebuilt and in sixty days' time will again be operating. The most important tools, dies and jigs were saved, enabling the company to start production at once.

Gasoline Engines. The U. S. Director of Sales is offering for sale 121 fifty-horsepower, and 192 thirty-five-horsepower gasoline engines with clutches, located at the Army Reserve Depot, Columbus, Ohio, the price being \$700 each for the fifty-horsepower, and \$640 each for the thirty-five horsepower. A special 15 per cent reduction in the fixed prices will be made to purchasers of ten or more of these engines.

Specifications and further information relative to the sale of these engines may be obtained from the Surplus Property Division, Munitions Building, Washington, D. C.

Jenkins Bros. announce that they will in the near future increase their manufacturing facilities by owning and operating a plant at Bridgeport, Conn. This plant will be devoted entirely to the manufacture of the Jenkins valve. The manufacture of the Jenkins discs, sheet packings, pump valves and other mechanical rubber goods will be continued at Elizabeth, N. J.

To take care of the rapidly increasing Canadian branch, Jenkins Bros.,

Ltd., of Montreal, have recently completed alterations and additions to their brass valve department, and now have in course of construction a new 192 x 80-ft. iron valve foundry. The Canadian branch supplies Jenkins valves throughout Canada and foreign countries, while the Bridgeport plant will make valves for use in the United States and insular possessions.

Chicago Pneumatic Tool Co. reports orders booked during the month of October in excess of any previous month since the armistice. The same is true of its English and German subsidiaries.

While the German subsidiary was seized by German government and has been run under "compulsory administration" since the United States participation in the war, compulsory administration has now been abolished and management is being transferred back to the Chicago Pneumatic Tool Co. through the courts of commerce, according to cable reports just received from the company's representative. Reports show the German company well managed during the war and is now operating on a satisfactory basis. Arrangements have been made to materially increase production.

NEW PATENTS

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

Alloy—Electric-Resistance Element and Alloy Therefor. Frank L. Driver, Jr., assignor to Driver-Harris Co. (1,321,294; Nov. 11, 1919.)

Alloy of Magnesium, Silicon and Manganese. Frederick M. Becket, assignor to Electro Metallurgical Co. (1,322,158; Nov. 18, 1919.)

Casting—Art of Casting Molten Metal. Arthur R. Earnshaw. (1,323,583; Dec. 2, 1919.)

Concentrator—Centrifugal Concentrator. Charles Schifferle. (1,322,139; Nov. 18, 1919.)

Crusher—Oliver J. Williams, assignor to Williams Patent Crusher & Pulverizer Co. (1,322,211; Nov. 18, 1919.)

Crushing—Reducing Mill. Harold M. Plaisted, assignor to Williams Patent Crusher & Pulverizer Co. (1,322,339; Nov. 18, 1919.)

Flotation of Minerals. Clement L. Perkins, assignor to Metals Recovery Co. (1,322,816; Nov. 25, 1919.)

Fuel—Fuel-Feeder for Pulverized Fuel. Joseph F. Townsend. (1,321,262; Nov. 11, 1919.)

Nitrogen Fixation, Furnace for. Azariah Foster Crowell, Jr., assignor to Nitrogen Products Co. (1,321,892; Nov. 18, 1919.)

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver		Dec.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
18	379 ³ / ₄	134	78 ³ / ₄	22	381	133 ¹ / ₂	77 ³ / ₄
19	371	133	78 ¹ / ₂	23	382	133 ¹ / ₂	77 ¹ / ₄
20	379	133 ¹ / ₂	77 ³ / ₄	24	383	133	77 ¹ / 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.

Daily Prices of Metals in New York

Dec.	Copper		Lead		Zinc
	Electrolytic	in Spot	N. Y.	St. L.	St. L.
18	18 ³ / ₄	53 ³ / ₄	7 22 ¹ / ₂ @7.27 ¹ / ₂	6.90@7	8 20@8.25
19	18 ³ / ₄	53 ³ / ₄	7 25 @7.35	6.95@7	8 20@8.25
20	18.40	53 ³ / ₄ @54	7 32 ¹ / ₂ @7.37 ¹ / ₂	6.95@7.05	8 25@8 ³ / ₄
22	18.45	54 ³ / ₄	7 32 ¹ / ₂ @7.37 ¹ / ₂	7.05@7.10	8 ³ / ₄ @8 ¹ / ₂
23	18.50	54 ³ / ₄	7 37 ¹ / ₂ @7.42 ¹ / ₂	7.10@7.15	8.45@8.50
24	18.55	54 ³ / ₄	7 45 @7.55	7.15@7.20	8 45@8.55

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

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

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Dec.	Copper			Tin		Lead		Zinc	
	Spot	3 M.	Electrolytic	Spot	3 M.	Spot	3 M.	Spot	3 M.
18	103 ³ / ₄	105 ¹ / ₄	115	318	319 ¹ / ₂	40 ¹ / ₄	40 ¹ / ₄	52 ¹ / ₂	53 ¹ / ₄
19	104	105 ³ / ₄	115	322 ³ / ₄	323	41 ¹ / ₂	41 ¹ / ₂	53 ¹ / ₄	54
20									
22	104	105 ³ / ₄	115	325 ¹ / ₄	326 ³ / ₄	43 ³ / ₄	44 ¹ / ₄	53 ³ / ₄	54 ¹ / ₂
23	104 ¹ / ₄	105 ³ / ₄	115	324 ¹ / ₄	325 ³ / ₄	44	44 ¹ / ₄	54 ¹ / ₄	55
24	106 ¹ / ₂	108 ¹ / ₄	115	329 ¹ / ₄	331	44 ¹ / ₂	44 ³ / ₄	55 ³ / ₄	56 ¹ / ₂

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

METAL MARKETS

New York, Dec. 24, 1919

A further sharp advance in lead, a smart recovery in zinc, and a firming tendency in the copper market were the features of this week.

Transatlantic freights were unchanged, but exhibited a slightly easier tone. Transpacific freights continued unchanged at \$12 from San Francisco to Hongkong and Kobe.

Gold sold in London at 108s. 9d. on Dec. 17; at 107s. 7d. on Dec. 18, and at 110s. 6d. on Dec. 19.

Copper

A pretty good domestic business was done, wire-drawers, brass makers and rollers all being buyers, but especially the first-mentioned. We quote the market on averages, for there was a range

of prices at all times, not only among different offices but also in the same office. The major part of the business of the week was done at 18¹/₂c., delivered, but during the second half of the week 18³/₄c. became more general, although copper was still obtainable at 18¹/₂c. at the close. Copper was sold for export at 19c.

The Export Association did a moderate business, selling some copper to Germany and a considerable quantity to Japan.

Copper Sheets—28¹/₂c. per lb. Wire 21¹/₂c., f.o.b. factory, and 22c. f.a.s. N. Y.; quiet. Market stronger.

Tin

There was rather active business at advancing prices. However, buying was largely of speculative character.

Spot Straits in this market was quoted at 55¹/₂@55³/₄c. at the beginning of the week and at 57c. at the close.

Singapore quoted c.i.f., London, £317 on Dec. 18; £321 on the 19th; £322 on the 22d; £331 on the 23d; and £330 on the 24th.

Lead

The A. S. & R. Co. advanced its price to 7.15c. on Dec. 18, but the open market was already above that figure, large business having been done at 7.25c. During the following days the market advanced almost without interruption, and quotations represent transactions in blocks of 250 to 500 tons. Supplies of lead have now become very scarce, the situation is acute, and the prospects are that the market will go higher.

A large business was done in Mexican lead for export, Germany, Great Britain, and Belgium being buyers.

Zinc

Following the reaction of the previous week on renewed buying for export, zinc available for delivery west of the Mississippi River being especially in demand and commanding higher prices than those for which consumers could buy east of the river.

Zinc Sheets—\$11.50 per 100 lb. less 8 per cent on carload lots. Slightly higher prices for export.

Silver and Platinum

Silver—Market continues quiet. Efforts are, however, being made to deliver as much silver as possible for shipment from San Francisco in December for China, to arrive at destination before the Chinese New Year, which is in the latter part of February.

The general stock of money in the United States on Dec. 1 totalled \$7,783,144,476; of this \$2,833,221,135 was gold coin and bullion, \$308,145,759 in standard silver dollars, and \$246,540,741 in subsidiary silver. The money in circulation on Dec. 1 was \$5,929,874,791, or \$55.65 per capita.

Mexican dollars at New York: Dec. 18, 101¹/₂; Dec. 19, 101¹/₂; Dec. 20, 101¹/₂; Dec. 22, 101¹/₂; Dec. 23, 101¹/₂; Dec. 24, 101¹/₂.

Platinum—Refined ingot, \$150@155.

Palladium—Scarce at \$130@135.

Aluminum—33c. per lb.

Antimony—Spot was quoted at 9¹/₂@9³/₄c., fair business being done. Futures

were quoted at 9½c. Chinese houses report shutting down of works in China on account of political disturbances.

Bismuth—\$2.65 per lb. for 500 lb. lots. Price ranges from \$2.60@2.80 per lb., depending on quantity purchased.

Cadmium—\$1.40 per lb.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c.

Quicksilver—Quotation remained steady at \$100 until this morning, when it dropped to \$85. It is reported that arrangements have been made between the Italian government and the Rothschilds, of London, whereby the latter will have control of the output of the formerly Austrian quicksilver mines. San Francisco telegraphs \$90, steady, this telegram being dated Dec. 22.

Other Ores

Tungsten Ore—A little more pressure on the part of sellers was exhibited. Chinese wolframite was quoted at \$6.75, Bolivian, at \$9, and domestic scheelite, at \$15.

Molybdenum Ore—Quoted nominally at 75c. per unit. Nothing doing.

Chromite Ore—In considerable demand. Quoted at 65@85c. per unit.

Other Minerals

Graphite—Ceylon grades are quoted: Lump, 15@16c.; chip, 11@12c.; dust, 8@9c. The recent increase has been owing to the increase of premium on rupee exchange and higher freight rates.

Feldspar is quoted from \$13.50 to \$17 per ton, according to quality. Labor difficulties are hindering producers in increasing production.

Fluorspar—Lump ore containing 85 per cent CaF₂ and not over 5 per cent SiO₂ is quoted at \$16 f.o.b. mines at Tonico, N. M. Freight to Chicago, \$7.50; to New York, \$15. Prices quoted f.o.b. Kentucky and Illinois mines are about \$25 for washed gravel grade.

Nitrate—Spot supplies are quoted at \$3@3.02 per cwt. for carload lots. Contracts for delivery during first six months of 1920 are stipulating \$3.05@3.07½. Shortage and good demand.

Pyrites—Spanish pyrites is quoted at 17c. per unit for furnace-size ore, free from fines, c.i.f. New York or other Atlantic ports. Markets slow and unsettled.

Sulphur—Prices remain unchanged at \$20 for export delivery and \$18 for domestic delivery, per ton f.o.b. mines at Freeport, Tex., and Sulphur Mine, La.

Zinc and Lead Ore Market

Joplin, Mo., Dec. 20—Zinc blende, per ton, high, \$53.50; basis 60 per cent zinc, premium, \$51; Prime Western, \$50; slimes and fines, \$47.50@45; calamine, basis 40 per cent zinc, \$35. Average settling prices: Blende, \$49; calamine, \$36; all zinc ores, \$48.90.

Lead, high, \$92.75; basis 80 per cent lead, \$90. Average settling price, all grades of lead \$88.70 per ton.

Shipments the week: Blende, 9,238; calamine, 68; lead, 1,791 tons. Value, all ores the week, \$614,260.

Following heavy buying last week, few buyers were bidding for ore this week, offering unchanged prices when sellers proffered any ore. For thirty-five years demand has usually dropped at the year-end. Not always a decline in price, but a decidedly short demand is the rule. Since coal cars have been called upon for coal shipments, little over half the demand for cars for ore is supplied.

Platteville, Wis., Dec. 20—No open market sales of premium or Prime Western grades of blende are reported. Lead ore, basis 80 per cent lead, \$86 per ton. Snowdrifts impeded shipments at several points, the tonnage reported for the week being 1,794 tons blende, 115 tons galena, and 30 tons sulphur ore. For the year to date the totals are: 98,899 tons blende and carbonate, 6,739 tons galena, and 17,791 tons sulphur ore. During the week, 2323 tons blende was shipped to separating plants.

Iron Trade Review

Pittsburgh, Dec. 23, 1919

The steel industry is now operating at a shade heavier rate than just before the coal shortage began to close plants and departments, as there has been resumption at most of the plants in the Wheeling district, which had persisted in the strike when nearly everywhere else the great body of the strikers had returned to work. The two pipe mills at Wheeling are now operating at a moderate rate, together with the Mingo steel works, and the Bellaire works would be running were it not for lack of coke, caused by car shortage in the Connellsville region.

At the majority of steel works and in many finishing mills outputs are unsatisfactory, there being three causes, shortage of men, low morale of the workers, and unfamiliarity with the work, there being some entirely new men, and many have shifted in employment. Conditions are likely to grow better steadily.

The steel market has been quieter in the last week than for several weeks. In part this is no doubt a reflection of the usual holiday dullness, but in addition there is the factor that the mills have sold almost as much material as they intend to sell. Some, and the Steel Corporation subsidiaries in particular, have obligated themselves for nearly all the material they can produce to the middle of 1920. Others, including many of the smaller independents, have

sold little, and do not intend to sell for a while yet, feeling that when they are carrying over nearly three months' work from their 1919 obligations there is no occasion to obligate themselves for the second quarter.

There has been much paying of premiums by consumers who have no regular mill connection or desire material in addition to what they will receive on regular contracts. There is room for suspicion that some consumers are more alarmed than they really need to be as to prospective supplies, having too readily assumed that the steel mills have lost forever the art of operating at capacity, as they used to do before the war when the condition of order books permitted. In no calendar year between 1906 and 1916 did the steel mills operate at capacity throughout, the deficiency when it existed being due entirely to lack of orders.

Pig Iron—The market has been quiet in steel-making grades and much less active in foundry grades. Sales of foundry iron, however, have lately been made for second quarter delivery alone at \$38, Valley, a price formerly well established only for early and first quarter delivery. Whether the pig iron market will resume its activity and advancing tendency after the holidays is really a question, though sellers do not admit having doubts on the subject. All the merchant furnaces in western Pennsylvania are now either operative or scheduled to blow in as soon as coke is available, with the exception of Rebecca, at Kittanning, about which no announcement has been made. Coke is still scarce, and several furnaces are banked or operating at reduced rate. The market is as follows: Bessemer, \$36; basic, \$35; foundry, \$38, f.o.b. Valley furnaces.

Steel—Though the Steel Corporation and a few independents are covering their regular customers at March 21 prices as well as they can, many sales are being made at premiums, even for delivery through first quarter if not second quarter, and thus the market stands at approximately the following ranges: Billets, \$38.50@45; small billets, \$42@48; sheet bars \$42@55; slabs, \$41@45; rods, \$52@66.

Ferromanganese—There have been some fair-sized sales of domestic ferromanganese at the regular quotation of \$120, delivered, and some English is reported to have sold at \$110, c.i.f., with \$120 now quoted. Spiegeleisen is stronger at \$40@42, furnace.

Ferrosilicon—The market is relatively quiet at the moment, with the following quotation ruling: Electrolytic, 50 per cent, \$90 and 75 per cent, \$140@150, delivered Pittsburgh.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

	Large Mill Lots		San Francisco		New York—One Yr. Ago	
	Pittsburgh	St. Louis	Chicago	San Francisco	Current	Yr. Ago
Blue Annealed	3.55	4.64	4.57	5.80	4.82	5.52
No. 10	3.60	4.69	4.62	5.75	4.87	5.57
No. 12	3.65	4.74	4.67	5.90	4.67	5.595
No. 14						
Black:						
Nos. 18 and 20	4.15	5.24	5.42	6.75	5.30	6.295
Nos. 22 and 24	4.20	5.29	5.47	6.80	5.25	6.347
No. 26	4.25	5.34	5.52	6.95	5.40	6.395
No. 28	4.35	5.67	5.62	7.05	6.00	6.52
Galvanized:						
No. 10	4.70	5.79	5.97		6.15	6.87
No. 12	4.80	5.89	6.07	7.30	6.20	6.92
No. 14	4.80	5.89	6.07	7.30	6.25	6.97
Nos. 18 and 20	5.10	6.19	6.37	7.60	6.55	7.27
Nos. 22 and 24	5.25	6.34	6.52	7.75	6.70	7.52
No. 26	5.40	6.49	6.67	7.90	6.85	7.47
No. 28	5.70	7.04	6.97	8.20	7.25	7.77

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	\$45.00	\$55.00	\$45.00	\$65.00
Standard openhearth rails	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb.	2.58 1/2	3.36*	2.58 1/2	3.865*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.54*	3.09*
Light rails, 25 to 45 lb.	2.45*	3.00*	2.45*	3.00*

*Per 100 lb.

TRUCK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Francisco
	Current	One Year Ago			
Standard railroad spikes, 1/2 in. and larger	\$3.35	\$3.90	\$4.27	\$4.44	\$5.65
Track bolts, 1/2 in.	4.35	4.90	5.17	Premium	6.65
Standard section angle bars	2.75	3.25	2.75	Premium	4.60

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York		Chi-cago	St. Louis	Chi-cago
		Cur-rent	One Year Ago	Cur-rent	St. Louis	Chi-cago
Beams, 3 to 15 in.	\$2.45	\$3.47	\$4.27	\$3.54	\$3.47	\$3.47
Channels, 3 to 15 in.	2.45	3.47	4.27	3.54	3.47	3.47
Angles, 3 to 6 in., 1/2 in. thick	2.45	3.47	4.27	3.54	3.47	3.47
I-bees, 3 in. and larger	2.45	3.47	4.27	3.54	3.47	3.47
Plates	2.65	3.67	4.52	3.54	3.67	3.67

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

	Current	One Month Ago	One Year Ago
	\$2.65	\$2.55	\$4.5

RIVETS—The following quotations are per 100 lb.:

	New York		Warehouse			
	Cur-rent	One Year Ago	Chi-cago	St. Louis	San Francisco	Dallas
1 in. and larger	\$4.20	\$5.65	\$4.72	\$4.72	\$6.05	\$7.50
CONCRETE HEAD BOILER						
1 in. and larger	4.30	5.10	5.75	4.82	4.89	6.15
1 1/2 in.	4.45	5.25	5.90	4.97	5.04	6.30
2 in.	4.70	5.50	6.25	5.32	5.29	6.65

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis	
	Current	One Year Ago
Hercules red strand, all constructions	20%	
Patent flattened strand special and cast steel	20%	
Patent flattened strand iron rope	20%	
Flow steel round strand rope	35%	
Special steel round strand rope	30%	
Cast steel round strand rope	22 1/2%	
Iron strand and iron tiller	20%	
Galvanized iron rigging and guy rope	+1 1/2%	

San Francisco: Galvanized, less 5%, bright, less 25%. Chicago, +5 on galvanized, 30-25 off on bright.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Chi-cago	St. Louis	Denver	Birm-ingham
Straight	\$5.75	\$6.50	\$7.00	\$8.15	\$7.00
Assorted	5.85	7.50	6.50-7.00	7.25	8.40

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh: Iron bars \$3.00 Steel bars \$2.50

COAL BIT STEEL—Warehouse price per pound is as follows:

	New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
No. 12	\$0.12	\$0.16 1/2	\$0.18	\$0.11	\$0.18 1/2	\$0.14 1/2

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	14c.	13c.	15c.	15c.
Hollow	18c.			22c.

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing cars of National Tube Co. for steel pipe, Cardy A. M. Byer's for iron, both dated Mar. 21, 1919.

Inches	STEEL		IRON	
	Black	Galvanized	Black	Galvanized
1 to 3	57 1/2	44	39 1/2	23 1/2
2	50 1/2	38	24 1/2	9 1/2
2 1/2	50 1/2	37	24 1/2	17 1/2
3	50 1/2	41	24 1/2	18 1/2
3 1/2 and 4	41	31	24 1/2	21 1/2
4 1/2	38 1/2	28	24 1/2	18 1/2

BUTT WELD, EXTRA STRONG, PLAIN ENDS

Inches	Black	Galvanized
1 1/2 and 2	46 1/2	29
2 1/2	51 1/2	39
3	55 1/2	43
4	58 1/2	44

LAP WELD, EXTRA STRONG PLAIN ENDS

Inches	Black	Galvanized
2 1/2 to 4	48 1/2	37
4 1/2 to 6	50 1/2	9
7 to 8	46 1/2	33
9 to 12	41 1/2	28

From warehouses at the places named the following discounts hold for steel pipe:

	New York	Black Cleveland	Chicago
1 1/2 to 3 in. butt welded	47%	43 1/2%	57 1/2%
3 1/2 to 6 in. lap welded	42%	45 1/2%	53 1/2%

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	\$1.50	\$2.50	\$2.25	\$1.40	\$1.85	\$2.00
Hot pressed hexagon	1.50	2.50	2.25	1.20	1.85	2.00
Cold punched square	1.50	2.50	2.25	.75	1.30	1.30
Cold punched hexagon	1.50	2.50	2.25	.75	1.30	1.30

Semi-finished nuts sell at the following discounts from list price:

	New York	Current	One Year Ago
New York	50%	50%	50%
Chicago	50%	50%	50%
Cleveland	60-100%	50%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
1/2 by 4 in. and smaller	30%	40%	40-50%
Larger and longer up to 1 in. by 30 in.	30%	40%	40-50%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

	New York	Cleveland	Chicago
For wrought-iron washers:	\$1.25	\$3.75	\$3.00
For cast-iron washers the base price per 100 lb. is as follows:			
New York	\$7.00	\$3.75	\$4.25

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots		Less Than Carload Lots	
	N. Y.	Chicago	N. Y.	Chicago
Tar felt (14 lb. per square of 100 sq ft.)	\$60.00	\$60.50	\$61.00	\$61.50
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37.50	37.50
Asphalt felt	63.00	63.00	67.50	67.50

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

No. 1 grade	1-Ply		2-Ply		3-Ply	
	c. l.	l. c.	c. l.	l. c.	c. l.	l. c.
	\$1.50	\$1.75	\$3.00	\$2.15	\$2.30	\$2.55
No. 2 grade	1.35	1.60	1.70	1.95	2.05	2.30

Asbestos asphalt-saturated felt (14 lb. per square) cost \$1.56 per ton. Shingles, red and green slate finish, cost \$5.00 per square in carloads \$6.25 smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul.....	\$0.087	\$0.158	\$0.248
Seattle.....	.09	.175	.30
Los Angeles.....	.082	.154	.256
New Orleans.....	.165	.22	.325
Cincinnati.....	.08	.15	.215
Birmingham.....	.072	.135	.25
St. Louis.....	.08	.15	.....

LUMBER—Price per M in carload lots:

	8 x 12 x 12		12 x 12 x 12	
	P	Fir	Hemlock	Spruce
Boston.....	\$60.00	\$55.00	\$52.00	\$55.00
Kansas City.....	49.00	49.50	49.50	49.50
Seattle.....	45.00	30.00	.....	.....
New Orleans.....	60.00	59.00	59.00	46.00
Atlanta.....	62.50	64.50	66.00	76.00
Baltimore.....	48.00	.....	.....	.....
Cincinnati.....	50.00	50.00	47.00	.....
Montreal.....	60.00	65.00	65.00	60.00
Los Angeles*.....	50.00	.....	.....	.....
Denver.....	40.00	.....	.....	.....

	1 in. Rough, 10 in. x 16 Ft. and Under		12 x 12-In. 20 Ft. and Under	
	P	Fir	Hemlock	Spruce
Boston.....	\$50.00	\$52.00	\$52.00	\$55.00
Kansas City.....	89.50	81.75	81.75	84.25
Seattle.....	33.50	.....	.....	.....
New Orleans.....	54.00	.....	.....	.....
St. Paul.....	53.00	53.00	53.00	55.50
Atlanta.....	85.00	90.00	.....	.....
Baltimore (box).....	40-42.00	.....	.....	.....
Cincinnati.....	50.00	48.00	47.00	50.00
Montreal.....	65.00	65.00	65.00	66.00
Los Angeles*.....	45.00	.....	.....	.....
Denver.....	43.00	43.00	.....	.....

* Base price, 2 x 4s, is \$45, Los Angeles. T. Montreal—Up to 32 ft., over which, \$3 per M. increase up to 36 ft. Detroit—2x4x16 Y.P. is \$48. For other sizes, add freight to Chicago quotations.

NAILS—The following quotations are per keg from warehouse:

	Mill	St. Louis	Pittsburgh	Louis	Dallas	Chicago	San Francisco
Wire.....	\$3.50	\$3.90	\$6.90	.....	.....	Nostock	\$3.00
Cut.....	4.25	5.85	6.40	.....	.....	Nostock	6.65

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago
New York (delivered).....	\$2.80	\$2.30	\$4.00
Jersey City (delivered).....	2.47	2.27	3.64
Boston.....	2.42	2.42	3.67
Chicago.....	2.00	2.00	3.45
Pittsburgh.....	2.05	2.05	2.55
Cleveland.....	2.32	2.32	2.72
Denver.....	3.12	3.12	3.67

NOTE—Charge for bags is generally 15c. each, 60c. per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200 lb. Barrel	
	Finished	Common	Finished	Common
New York.....	\$17.50	\$14.50	\$2.90	\$2.65
Kansas City.....	21.00	21.00	2.30	2.20
Chicago.....	18.00	17.00	1.80	1.10
St. Louis.....	22.00	18.00	.....	2.00
Boston.....	.....	.....	3.70*	3.40*
Dallas.....	30.00	.....	2.75	.....
San Francisco.....	30.00	.....	2.80†	.....
St. Paul.....	23.00	20.00	1.60	1.50
New Orleans.....	.....	17.50	.....	2.20
Atlanta.....	.....	1.90 (bbl.)	1.80	1.95
Denver.....	.....	26.25	.....	2.50

* 300-lb. barrels. † 180-lb. barrels.

NOTE—Refund of \$0.10 per barrel.

LINED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots).....	\$1.75	\$1.90	\$1.92	\$2.05
5-gal. cans.....	1.90	2.00	2.07	2.25

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red				White			
	Current	One Year Ago						
100-lb. keg.....	13.00	14.50	14.00	14.50	13.00	14.00	13.00	14.00
25- and 50-lb. kegs.....	13.25	14.75	14.25	14.75	13.25	14.20	13.25	14.20
12 1/2-lb. keg.....	13.50	15.00	14.50	15.00	13.50	14.50	13.50	14.50
5-lb. cans.....	15.00	16.50	.....	.....	15.00	16.00	15.00	16.00
1-lb. cans.....	16.00	17.50	.....	.....	16.00	17.00	.....	.....

MINING AND MILLING SUPPLIES

	FIRE	50-Ft. Lengths
Underwriters' 2 1/2 in.....	\$0.75 per ft.
Common, 2 1/2 in.....40

	First Grade	Second Grade	Third Grade
1-in. per ft.....	\$0.50	\$0.33	\$0.22

STEAM—DISCOUNTS FROM LIST
 First grade..... 30% Second grade..... 40% Third grade..... 45%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York.....	4 1/2%	3 1/2%
St. Louis.....	4 1/2%	3 1/2%
Chicago.....	4 1/2%	3 1/2%
Birmingham.....	5 1/2%	3 1/2%
Denver.....	3 1/2%	3 1/2%
Cincinnati.....	5 1/2%	4 1/2%

RAWID DE LACING—30% off from list. \$0.62 per sq. ft. for side lacing.

MANILA ROPE—For rope smaller than 1-in. the price is 1 to \$0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of \$0.01. The number of feet per pound for the various sizes is as follows: 1-in., 8 ft. 1/2-in., 6; 3/4-in., 4; 1/2-in., 14-in., 2 ft. 10-in.; 1 1/2-in., 2 ft. 4-in. Following is price per pound for 1-in. and larger, in 1200-ft. coils:
 Boston..... \$0.275
 New York..... .27
 Cincinnati..... .27
 Chicago..... .263
 St. Paul..... .26
 San Francisco..... .24
 Denver..... \$0.271
 Kansas City..... .27
 New Orleans..... .253
 Seattle..... .25
 St. Louis..... .264
 Atlanta..... .294

PACKING—Prices per pound:
 Rubber and duck for low-pressure steam..... \$0.90
 Asbestos for high-pressure steam..... 1.50
 Duck and rubber for piston packing..... 1.00
 Flax, regular..... 1.20
 Flax, waterproofed..... 1.60
 Compressed asbestos sheet..... 1.50
 Wire insertion asbestos sheet..... 1.10
 Rubber sheet..... .50
 Rubber sheet, wire insertion..... .50
 Rubber sheet, duck insertion..... .50
 Rubber sheet, cloth insertion..... .70
 Asbestos packing, twisted or braided and graphited, for valve stems and abutting boxes..... 1.20
 Asbestos work, 1- and 1 1/2-lb. rolls..... .85

REFRATORIES—Following prices are f.o.b. works:
 Chrome brick..... net ton \$90-\$100 at Chester, Penn.
 Chrome cement..... net ton 45-50 at Chester, Penn.
 Clay brick, 1st quality fireclay..... 1000 36-45 at Clearfield, Penn.
 Clay brick, 2nd quality..... 1000 30-35 at Clearfield, Penn.
 Magnesite, dead burned..... net ton 32-50 at Chester, Penn.
 Magnesite brick, 9x4 1/2x2 1/2 in..... net ton 80-90 at Chester, Penn.
 Silica brick, 1000 41-45 at Mt. Union, Penn.
 Standard size fire brick, 9x4 1/2x2 1/2 in. The second quality is \$4 to \$5 cheaper per 1000.
 St. Louis Fire-clay, \$30 to \$40.
 Birmingham—Fire clay, \$41-\$44; silica, \$46.50-\$51.50; magnesite, \$80-\$85; chrome, \$80 to \$90.
 Chicago—Second quality, \$25 per ton.
 Denver—Silica is \$35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 in. x 9 in.	6 in. x 8 in.
Chicago—Plain.....	\$1.48	\$1.33
San Francisco—Douglas fir, green.....	1.42	1.00
St. Francisco—Douglas fir, green.....	2.12	2.00

Prices per tie at Missouri mill; St. Louis price is about 25c. higher.
 Untreated A Grade White Oak..... Untreated A Grade Red Oak

	6x8x8	No. 1	No. 2	No. 3	No. 4	No. 5
No. 1.....	\$0.70	.....	.....	.....	.....	.....
No. 2.....	.80	.....	.....	.....	.....	.....
No. 3.....	.90	.....	.....	.....	.....	.....
No. 4.....	.98	.....	.....	.....	.....	.....
7x9 1/2 white oak, No. 4.....	.80	.....	.....	.....	.....	.....

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago	Denver
Pure steam-distilled pine oil, sp.gr. 0.925-0.94.....	\$1.10	\$1.05	\$1.00
Pure distrectively distilled pine oil.....	.96	.95	.90
Fine tar oil, sp.gr. 1.02-1.035.....	.45	.36	.55-
Crude turpentine.....	.85	.68	1.68
Hardwood creosote, sp.gr. 0.96-0.99*.....	.....	.....	2.50-3.30

* F. O. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	Current	One Year Ago	Cleveland	Chicago
White.....	13.00	11.00	14.00	11.00 to 14.00
Colored mixed.....	9.00 to 12.00	8.50-12.00	11.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 100 is as follows:

	13x13	13 1/2x13 1/2
Cleveland.....	\$52.00	\$58.00
Chicago.....	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing	.....	.....	.....	Black Powder
New York.....	\$0.225	2425	2675	\$0.300	2.20
Boston.....	.185	2275	2325	.29	2.20
Kansas.....	2375*	2275	2475	.....	.....
New Orleans.....	1375	180	2050	2475	1.70
Seattle.....	1825	2075	25	2925	2.15
Chicago.....	185	2275	2325	2.25	2.25
St. Paul.....	185	2275	2325	2950	1.80
St. Louis.....	1725	215	240	2875	2.25
Denver.....	.....	.....	.....	342	2.75
Dallas.....	25	30	288	.....	.....
Los Angeles.....	22	245	265	.....	.....
Atlanta.....	19	231	281	30	2.35
Baltimore.....	1825	2075	2275	.....	.....
Cincinnati.....	28	31	34	38	3.90

* For 50%.

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Denver, 37c.; Chicago, 31c.; St. Louis, 31c.

SODIUM SULPHIDE—New York price is 31c. per lb. for concentrated, 3c. for crystals. Denver price is 7c. for crystals. Chicago, 5c. for concentrated, 3c. for crystals. Concentrated cyanide in 500-lb. drums or crystals in 40-cb. bbl.

ZINC DUST—For 350 mesh the New York price is 11c. per lb.; Chicago, 12c.; Denver, 22c.; St. Louis, 15c.

ALUMINUM DUST—Chicago price is \$1.10 per lb.

MINERS' LAMP CARBIDE—Prices in f.o.b. cans at warehouse points:

	Union	Carno	Unin
100-Lb. Drums	100-Lb. Drums	100-Lb. Drums	25-Lb. Per Ton
Per Ton	Per Ton	Per Ton	Per Ton
East of the Mississippi, North of Chattanooga.....	\$106.00	\$101.00	\$1.52
Southeastern part in U. S. A.....	115.50	110.50	1.63
Texas (except El Paso).....	124.00	119.00	1.74
El Paso, Texas.....	126.00	121.00	1.77
Denver, Colo.....	124.00	119.00	1.74
West Coast.....	129.00	124.00	1.81

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