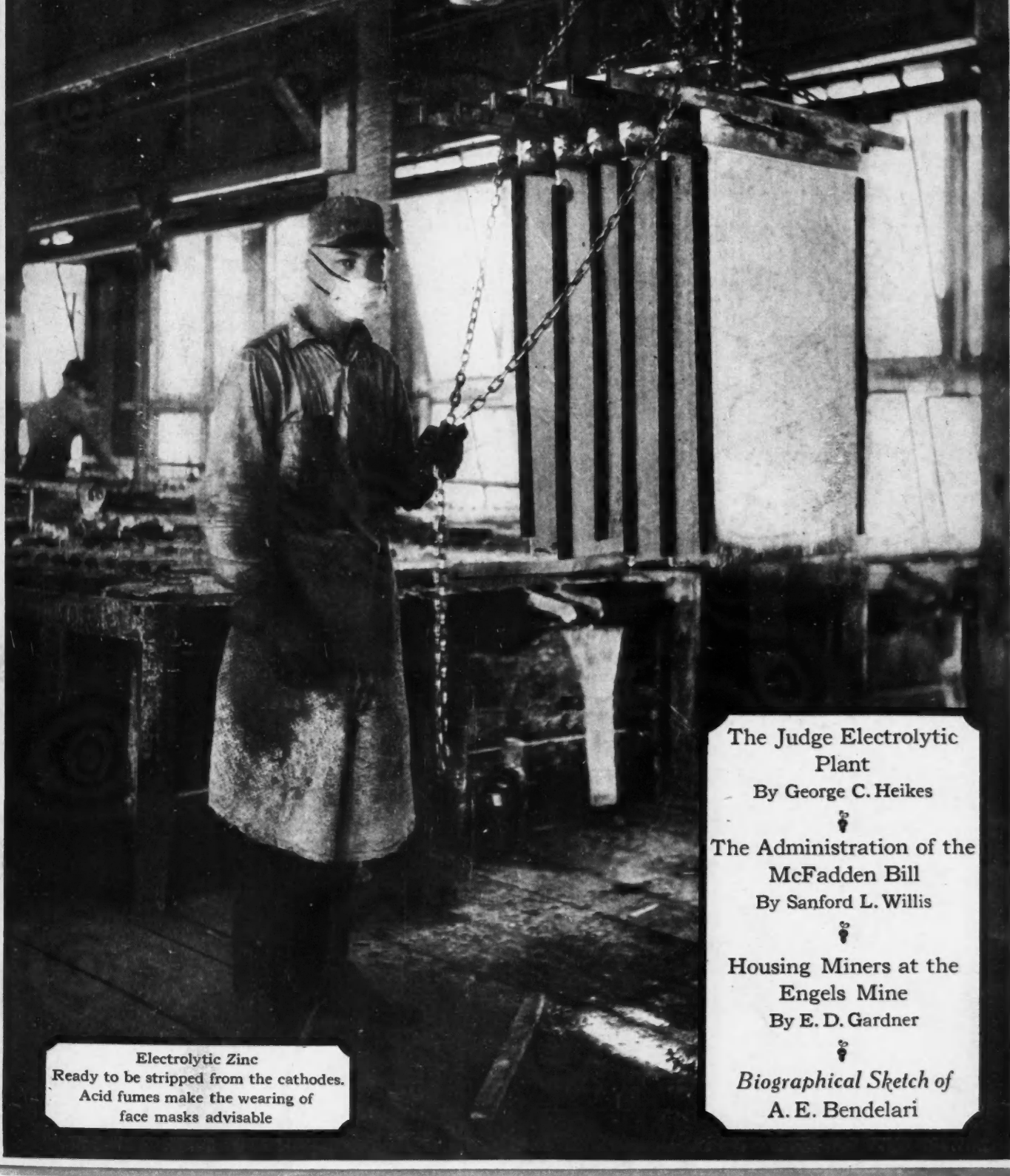


ENGINEERING AND MINING JOURNAL

December 1, 1920



Electrolytic Zinc
Ready to be stripped from the cathodes.
Acid fumes make the wearing of
face masks advisable

The Judge Electrolytic
Plant

By George C. Heikes



The Administration of the
McFadden Bill

By Sanford L. Willis



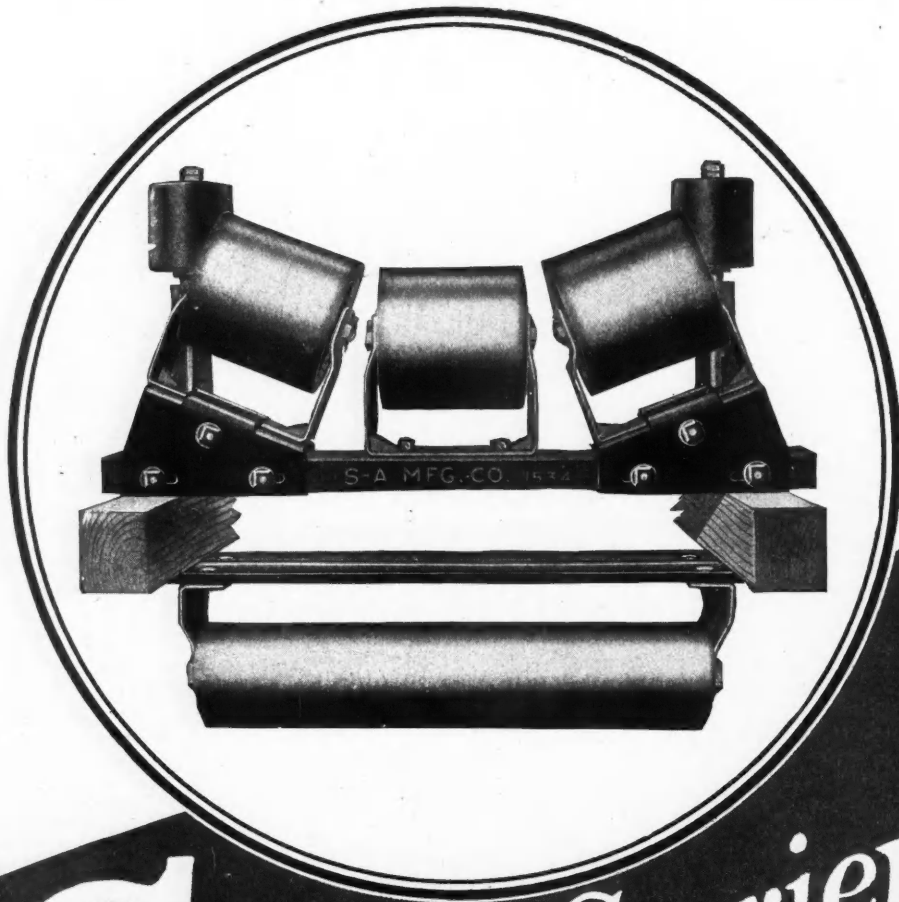
Housing Miners at the
Engels Mine

By E. D. Gardner



Biographical Sketch of
A. E. Bendelari

In Market Section: Curtailment in the Copper Industry



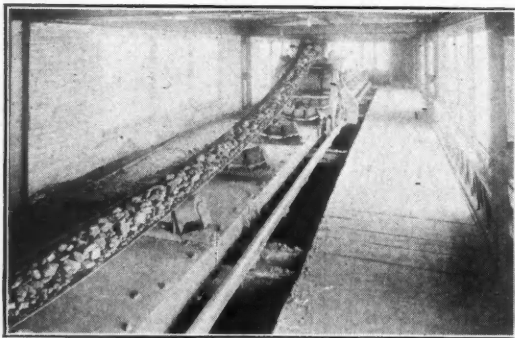
S-Unit Carriers - A

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A Weekly Journal of the Mining and Mineral Industries
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Special
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Volume 110

New York, December 11, 1920

Number 24

Existing Conditions a Challenge to Engineers

THE existing stagnation in the major metal markets, together with the partial curtailment in some of our important mining industries, is not, in our judgment, a reason for particular discouragement. The adjustment in prices in other important manufacturing industries has produced more or less uncertainty with respect to the immediate future. Nevertheless, the mining industry has had the advantage of other industries in that for the period succeeding the armistice it has been compelled to operate on a rock-bottom basis. There has been some bread and butter, but comparatively little butter. Some mining companies have been in a better financial condition than others, but all have made prompt readjustment to meet existing conditions. In some cases the readjustment has been superficial, in others fundamental.

We mean by this that some properties have simply curtailed, closed down, or taken the most obvious steps to decrease money outgo and conserve resources. This, in our opinion, is a superficial readjustment. By a fundamental readjustment we mean the thorough analysis of operating conditions with a view to putting them in such form as to meet present circumstances. This may mean a radical change in mining methods, the introduction of improved equipment or the complete overhauling of metallurgical methods and equipment. In our opinion, this getting down to the dregs of the problem is of vital importance to the mining industry.

Necessity is the mother of invention. Adverse economic conditions are in themselves a challenge to managers, superintendents, technical staff, and operating men. This fact is of importance to the mining industry. We venture to say that every live organization is getting down to cases.

We know of one mining engineer who has an important gold-producing property under his direction. War conditions practically eliminated all profit margin. Apparently there was nothing to be done except to shut down, which would have been a serious blow to the stockholders and the workers. Operations were, however, continued, and this engineer is calling all his ability into play to improve operating conditions and reduce his costs. He told us that he could not improve either mining or transportation methods, but that he had hopes of so changing milling operations as to cut his milling cost in two. We like the spirit of this man. He is asking no favors from anyone. He is putting his brain into his work.

American mining engineers and metallurgists have won an eminent position by reason of their courage in breaking away from precedent and building up the mining industry upon a substantial and low-cost basis. By meeting the present economic situation the mining industry will be in a stronger position to compete in the world's markets.

Reorganization for Washington

THIS is the open season for gunners who wish to reorganize the executive departments at Washington. We have had our little shot at this, and do not begrudge the sport to others. The most ambitious and thoroughgoing plan we have seen is that put forward by the Committee for Governmental Economy, representing a number of other weighty organizations. Here, apparently, is the last word in efficiency. We have only gotten far enough in the elaborate and complete chart of the new organization to see that the Geological Survey will be incorporated in the Department of Public Works, and the Bureau of Mines in the Department of Commerce. The War Minerals Relief Commission of the present Interior Department (the engineering and auditing staffs of this commission are under the Bureau of Mines) will be transferred to the Department of Public Works.

Read no further, gentle stranger.

Great is the reformer when he gets really serious and attempts to unscramble the egg, as in the present case, by making egg nog out of it. The mining industry—did the National Committee for Governmental Economy ever hear that the United States had a mining industry?—is thus hanged, drawn, and quartered. We think that, as they have gone that far, they should have so scattered the remains as to leave no clue to their crime. For example, the department of the Geological Survey that deals with the mineral resources of foreign countries should go to the Department of State, the Petroleum Division of the Bureau of Mines should go to the Shipping Board, the Division of Statistics in the Geological Survey should go to the Census Bureau, the Safety First work of the Bureau of Mines to the Bureau of Medicine and Surgery in the Navy Department. Dr. Cottrell should be assigned to the Patent Office and Dr. George Otis Smith to the Red Cross. A final grand disorganization banquet would be a proper and dignified finis.

The Opportunity of the Labor and Trade Unions

ATREND to the open shop in industry is going hand in hand with a gradually increasing labor supply. The tendency receives added impetus from the unpopularity of some of the strikes engineered by radicals among the unions, which have offset much of the good that has been accomplished by saner elements in labor groups during the last few years. The public has been quick to realize that in some cases where the closed shop has prevailed, too great opportunity is offered to squeeze out all the traffic will bear, regardless of agreements and contracts. Grafters, safely ensconced as union officials, not only demand blood money from employers, but sometimes also collect it from union members themselves. The disclosures in the building trades investigation in New York City exhibit a rottenness which shows to what lengths the vicious system may be carried.

The fairly conducted unions need have no fear of the open shop. If the union can offer any advantages to the worker he will join; if not, there is no excuse for its existence. Perhaps in no district has the open shop idea spread faster recently than in Montana, and more particularly in Butte. There, union and non-union men are now working side by side, and conditions are peaceful as compared with the time when the I. W. W.'s, or, as more commonly termed, "Wobblies," held control.

That some of the radical union activities have had an effect on public sentiment is also shown by the present unpopularity of the boycott. Striking placarded pickets wasting their time parading before their former employer's place of business are coming to be good advertisements and to engender a feeling that we must all stand together to protect ourselves from unjust demands.

The unions have done too much good to be allowed to be run into the ground. The open shop will give them a good opportunity to show what they can offer and how they can act, as compared with unorganized labor. With good leadership they should continue to prosper.

The Mines of Asia

ASIA has large mineral resources. Much of her mineral wealth has never been worked and what has been worked has never been exploited with that ravaging thoroughness and intensity which modern mining has invented, and which in the course of a few years guts from the richest mine its concentrated wealth of all past eternity. On such metallic framework, on metal so scientifically won, is our power built; and Asia will learn this among other secrets.

The urge toward mining in the East is already striking. Japan has a highly developed mining industry, especially in copper, where she ranks third among the world's nations. China is rich in coal and iron—possessing, after the deposits of the Eastern United States, and, second, the long-fought-for borderlands between France and Germany (including Alsace and Lorraine), the greatest coal and iron deposits in the world. If England's power depended largely upon her coal and iron, if the strength of France and Germany had this basis, if the great power and wealth of the United States rests mainly upon its being richest in coal and iron of all nations, what deduction may we draw from the future development of the wealth in coal and iron of China? Surely, that here will be concentrated the strength of the Pacific region. Whether it will be the Chinese, the Japanese, the Americans, the Russians or the British who will wield this power remains to be seen.

Struggling China would gladly have American capital and resourcefulness open up her mines, since in the co-operation by every other country, including Japan, she sees political conquest following upon the threatened commercial domination. British, American and French companies actually have large mining interests in China and in other countries of Eastern Asia, and at present an active movement is going on in this country looking toward further investigation and acquisition. None of these movements, however, have the strength and swiftness of that of Japan, which behind its commercial and competent technical enterprise has the force of a definite government policy. Japan, cramped and active, with discrimination against her race and her citizens by the United States, Canada, Australia and Europe, can hardly be expected to be

anything but unsympathetic to increase of Caucasian power in the Mongolian continent. The discrimination in question, as all fair thinkers must acknowledge, is based on purely economic grounds, rather than conceptions of fundamental racial superiority. What we have we would keep for ourselves, and without too strenuous a competition against the lean bellies of Asia or anywhere else.

The tin industry of Asia and Australasia is controlled, either by ownership or trade relations, by Great Britain—indeed, through this and other trade relations, and the possession of her own Cornwall tin mines, Great Britain substantially controls the tin of the world. The substantial petroleum supplies of the East Indies are controlled by British and Dutch capital, now apparently welded together under British direction. Tungsten is an important product of China and other Far Eastern countries, and Chinese antimony dominates the markets of the world. Till recently under British control, it has been under Chinese direction since the establishment in New York of a selling agency of the Wah Chang Co., which controls, through a government concession, the Chinese output. It is the only strictly Chinese-controlled mining industry in China.

India, not a great mining country, has important mines of manganese, and gold mines which are of some moment, and has, with Brazil, the most important deposits of monazite and zircon. Ceylon produces perhaps the best graphite in the world. It is probable that Siberia is, in respect to gold and many other metals, the richest undeveloped country on earth; and certainly the vast interior mountainous regions of Asia, now little explored, will yield much mineral wealth. The struggle over Asiatic Turkey and Persia is emphasizing the great resources of these countries, in petroleum, copper and many other minerals. England and France have agreed to divide the petroleum. France apparently has the approach to the main copper district, that of Diarbekir; and Greece and Italy are quarreling about the coastal belts of Asia Minor, rich in emery, chromite, and other minerals.

Above and back of all, like a formless cloud, a vast inchoate Russia threatens all: China, India and Persia; Mongolian and Caucasian.

Who will develop the mines of Asia?

Fair Play for the Mine Cost Sheet

THE closing down of certain mining properties and curtailment at others causes even the ordinary observer to question the reasons for such action. We have discussed the causes so frequently that our readers should know them by heart. In brief, surplus supplies of metal, a stagnant market, and high costs.

We have not been free to predict the time period of the depression, for the reason that many economic conditions necessarily have considerable bearing on the situation, and until the adjustment of these is completed the resumption of former activities cannot begin. However, there is little reason to believe that a delay is necessary in some quarters, and in view of the fact that we are beginning to see recessions in commodity prices, and even greater drops are predicted, it is reasonable to suppose that we may look for reductions in other markets.

A short time ago, in the same issue of one of the Western newspapers which announced the closing down of a prominent quicksilver mine, we noted with some

curiosity a statement of the earnings of a well-known powder company for the first nine months of 1920. The gross receipts showed an increase of over three hundred thousand dollars and the net earnings more than double that amount *above* the corresponding period for the year before.

The item "mining supplies" occupies no unimportant part on the cost sheet of any mine, and of the different charges that are included, blasting powder is by no means the smallest. Nor is the total amount of powder used in the mining industry of such insignificance that it compares unfavorably with that used in other fields. During the war the story was somewhat different, but, even though we are still, politically speaking, at war with Germany, the consumption of explosives for military purposes has slackened materially. So, as we have already remarked, it is interesting to observe that at this period, when all the mines are having such a difficult time, the powder companies are making net earnings twice as large as last year. In other words, notwithstanding the very low price of their raw materials, such as glycerine and other essential commodities, they are still charging war prices for their product.

Such a condition as this demands a remedy, and the sooner the better if the mining industry is to resume its former activity quickly.

A Siberian Incident

WASHINGTON D. VANDERLIP, stated to be a mining engineer, has recently figured considerably in international press dispatches, since he arrived in London with a mining concession for eastern Siberia, including Kamchatka, where, among other things, he is going to mine oil. Figuratively speaking, he laughs hoarsely at the United States for failing to recognize Soviet Russia, and get Russia's trade, and believes that England will beat us to the trough. Later dispatches state that Mr. Vanderlip was awarded Siberia by the Russian Soviet Government (our latest news is that this government does not control Siberia) because it supposed him to be a cousin of Frank A. Vanderlip.

Washington D. Vanderlip has a good front and rear name, and his middle initial is the same as John D's; also his business deals, as he himself admits in tones sufficient to be detected over two continents, are Napoleonic. We do not find him on the membership list of the American Institute of Mining and Metallurgical Engineers. We shall look for further news from Washington.

Botany Applied to Mining

THE letter of Mr. Wichman's on page 1116 brings up a subject which has never been properly treated—the relation of botany to geology, and the use of the former in the determination of facts appertaining to the latter. We recommend the subject as affording an appropriate thesis for some of our graduating university students.

As is well known, certain marine plants concentrate in their structures iodine from sea water, and potash; and are important commercial sources of these chemicals. Similarly, in Spain a plant which secretes soda was long cultivated and harvested for that chemical; the ash being known as *barilla*. A "mineral farm" therefore, is not necessarily an absurdity.

Students of geology are quite accustomed to the help of vegetation in following and mapping the broader

facts of that science. Frequently, in a series of limestones and shales, for example, a different type of vegetation, even diverse tree species, will be characteristic of the different outcropping zones, the variations being due in part to the different chemical character of the soil, and in part to the variable permeability of the rocks by water. Similarly, fault zones are often easily traceable with the eye, by a line of more luxuriant and greener vegetation, due to the fault being a natural watercourse. This may often be observed in the desert region, where the color and size of the desert shrubs may be striking. Similarly, certain veins may likewise be watercourses, as zones of persistent sheeting, and be traceable with the eye by differences in vegetation.

The relation of various plant species to the different chemical properties of the rocks out of which they grow, however, has not yet been thoroughly summarized. We hope to see it done.

Shoving the Queer

AS CHAMPIONS of the metal-mining industry, the editors of *Engineering and Mining Journal* are in the habit of securing, when possible, a few gold pieces from their respective banks, and putting them into circulation. Of course, they get right back to the banks and stay there, because the merchant hastens to bank them for fear that they may not be legal tender. However, some of our missionaries complain that they are regarded with more or less suspicion, first by the bankers and more especially by the merchants whom they pay in gold. The majority of the latter—or their clerks—say they have never seen a gold piece before, and hesitate to accept it.

New York has been defined as a place where a thousand people live on an acre of land which they never have seen. It is also a place where a thousand people do business on a few ounces of gold which they have never seen. But if the acre of land, or the few ounces of gold, should be withdrawn—what a cataclysm!

French Pronunciation of Bauxite

ALTHOUGH some time ago we closed the discussion as to the pronunciation of the word bauxite, the following communication is too important not to be added to the discussion:

Quebec, Nov. 17, 1920.

Monsieur le directeur:

Avec tous le égards dus à M. McDonald, je me permets de ne pas partager son opinion au sujet de la prononciation française de "bauxite." Je crois pouvoir l'assurer qu'en français l' "x" est toujours dur (ks.). Donc, nous avons toujours prononcé, prononçons maintenant, et prononcerons toujours "bokseet" et non "bozeet." THEO C. DENIS,
Service des Mines de la Province de Quebec.

Mr. Theo C. Denis, of the Quebec Mining Bureau, the writer of the above communication, informs us in it that the word is pronounced in French "bokseet," and not "bozeet."

In this connection, we may quote from a private letter recently received from a specialist on bauxite. He states that he has visited every working bauxite mine in the country, and that in all his field travels he has never heard the "French" pronunciation of the word. He continues "so that you can count me with those who pronounce the word 'boxite.'"

According to Mr. Denis, the difference between the Anglicized pronunciation and the proper French pronunciation is less than we have believed.

WHAT OTHERS THINK

The Forked Stick and Structural Geology

I have read with interest the occasional articles in which the divining rod as an indicator of water, mineral, or anything else has been held up to ridicule. The article in one of the late issues in which some Australians took a punch at it has shown that the matter is still open to discussion.

A few facts on the divining rod from personal investigation might be of interest to engineers. At the age of fourteen, with an extremely skeptical mind upon all subjects either material or spiritual, with a supreme contempt for anything savoring of the supernatural or magical, and a desire to smash all such things, I challenged a well smeller "to show me," and he did.

The forked stick worked better for me than it did for him. There was no question that it worked, and the psychological element was totally lacking. I had a desire that it would not work, it would not work in places where I wanted it to do so, and in fact my state of mind had nothing to do with it.

After I had satisfied myself of this beyond peradventure of a doubt I set to work to make a map of the indications obtained on about twenty acres covering the crest and side of a hill. I have the original of this map showing the lines and indications of supposed water-courses as indicated by the forked stick. At that time I had only an elementary knowledge of geology and little or none of the structure of the area covered.

There was one well on the property, and its water-course could be traced easily on the surface. Some years later I had to clean this well out. I then found that it was located on a slip or minor fault, the strike of which was identical with the bearing as traced on the surface. Later, a second well was dug on another of the indications, water was obtained, and another slip of identical bearing with surface indications was found. A third well was drilled on another, and in this instance a clear case of fault was encountered. Two other wells were put down, and these checked up the forked stick.

Upon my return after graduation from a technical school, I found this old plan, and set to work to ascertain the exact geological conditions of the area mapped. The result was that the forked stick had correctly located ten slips in the Cambrian shale and one large fault between the shale and the overlying limestone. This is a fact that can be verified.

That the psychological element had nothing to do with it and that lack of slips meant no indications or negative evidence are proved by the fact that it was particularly desirable to obtain water at a certain place. I wanted to find it there, but the stick would not turn. The nearest point was four hundred feet away. An old quarry at the point I wanted to obtain the indication, when cleaned out at the time I made the geological examination, showed no signs of slip or fault whatever.

It has been ten years since I have tried the forked stick. In that case I worked out the geology first and then tried the forked stick and checked it in a search for water in Arizona. Water was obtained, but it was too alkaline to be of any use. I do not know if I could do it now, but it can be done.

This is no claim for the forked stick as an indicator of ore, but the statement of an indisputable fact that it did indicate structural geological conditions in rocks which were fully verified by independent study of the rocks themselves.

All of which goes to show that there are many things in heaven and earth that engineers never dreamed of or hypothesized about, and there is more fact and less guess with the forked stick than in many of the theories concerning the genesis of orebodies. J. H. EBY.

Spokane, Wash.

Botany Applied to Mining

I have read with much interest an article in *Engineering and Mining Journal* of Oct. 30, entitled "Desert Prospecting," by Leroy A. Palmer. His reference to the occurrence of gold invariably associated with a certain yellow flower reminds me of those divining-rod stories (or shall we call this a "Golden Rod" story?) which you have been printing recently.

However, I do not doubt Mr. Palmer's assertions in the slightest, except that I beg to differ with him in his theory that hematite in the rock is in any way responsible for the growth of the plant. I do not claim to be a botanist, but I do remember being taught once that plants required for their sustenance potassium, phosphorus, and nitrogen. All other elements are of secondary importance, but certain ones, particularly iron, have the property of rendering characteristic colors to fruits and flowers. All who have visited beautiful Grass Valley and Nevada City, Cal., in the late summer, have noticed the brilliant coloring of the normally yellow Bartlett pears which grow so abundantly in that locality. This has been attributed to the high percentage of iron in the decomposed granodiorite soil.

In my wanderings over the hills in search of dip and strike, I have often been impressed with the peculiar relationship between plant life and certain rocks. In an area comprised largely of hard limestone and quartzite it is often comparatively easy to trace the outcrop of a dike of basic or subsilicic rock by the heavy growth of vegetation overlying it.

This affinity of vegetation for certain types of rock may be due to one or several causes. The basic rocks usually weather and disintegrate more rapidly than the sedimentaries. The result is a deeper soil, which not only offers more favorable opportunity for root growth, but acts as a reservoir for water, the supply of which is being continually added to by drainage from surrounding areas into depressions on the surface where the outcrops have weathered.

Of still greater importance, however, is the fact that nearly all igneous rocks contain orthoclase, leucite or some other potash-bearing mineral, and apatite, the commonest of the phosphates. It is therefore reasonable to expect a more luxuriant growth on rocks containing such high plant food value than on the leaner quartzites and limestones.

If any of your readers are botanists as well as geologists it would be interesting to hear of their experience with flowers as divining rods. Anyway, if it comes to

a showdown, I'll bet on the little yellow flower against the "whip handle with a spring in it" any day.

Salt Lake City, Utah.

F. M. WICHMAN.

An Advocate of Bimetallism

I have read with much interest the comment of the *Engineering and Mining Journal* on the "McFadden Gold Bonus Bill," together with Mr. McFadden's arguments on other pages of your paper. I thoroughly appreciate your remarks regarding an "elementary knowledge of economics" as being "a dangerous thing," and for that reason wish to state before going further that I do not wish to open a discussion as an authority on the subject. However, the onlooker can often see things that those in the midst of a fight do not observe. Being accustomed to looking on all subjects with an analytical mind, and from both sides, I am taking the liberty of asking you a few direct questions regarding your stand, as well as Mr. McFadden's, on his gold bonus bill, as you state that mining men should uphold only such measures as would promote the national welfare.

Now, first, don't you think that our national welfare depends on international welfare? Yes, I know you do, when you say, "We can hardly expect a return to stable prosperity until Europe again becomes a buyer as largely as of old." Every word of the paragraph in which the above sentence is copied is true and an excellent argument for increased metallic money (page 891 of the *Engineering and Mining Journal*), but I contend that future gold production is limited. I further believe that even if the gold miners get a bonus, the increased production due to that fact would not materially help the situation of world financing. I believe that Mr. McFadden's argument giving as an example the increased production of gold on England's part, which he attributes to gold producers receiving the benefit of an exchange premium, is not based on facts altogether. Of course, the premium exchange would attract some attention to gold mining, however, and the financiers of England are wise enough to know that gold is one of their nation's biggest assets. With it they can buy silver at a much lower rate and use it as a medium of exchange in the East to much better advantage.

Mr. McFadden ends his argument by saying: "Are we going to continue to ignore the problem of gold production in the United States, thus permitting the British Empire to gain an unquestioned supremacy?" Natural resources alone determine this, and although a premium will help some, it will also disturb the only standard that we have today; and in the long run do more harm than good. I would like to ask how much longer the mining men and bankers of America are going to sit blindly by and let England control our silver market? The United States today is paying \$1 per ounce for silver England buys for about 80c. and when she trades it in India it is difficult to determine just what profit she makes, but every one has an idea.

This brings to the front the old so-called worn-out story of bimetallism, Bryan's hobby of a generation ago. Bryan's other two hobbies, prohibition and suffrage, never died. The only thing that killed bimetallism was that it could not be used permanently and successfully by any one or two nations. International bimetallism is the foremost issue before the world today. Why? Because, first, the gold supply is insufficient, and to increase the value of gold is like playing with fire.

Second, silver is recognized the world over as the next best metal for monetary purposes so far as its value and physical and chemical characteristics are concerned. Third, it is geographically more widely distributed by nature, and the mining of it in turn aids a larger number of people, and does not, as with gold, tend to favor a few. Fourth, through the findings of the international commission working recently in Brussels (see *Literary Digest* of Oct. 16, 1920, pages 20-21), we learn that steps and plans are under way for solving financial and monetary problems, indicating clearly the pressing need to increase the world's medium of exchange.

We read that the national debt of the ten leading nations of the world for 1920 totals \$210,000,000,000, more or less. In 1918 the gold and silver stocks, including those of practically all the nations of the world, were approximately \$8,000,000,000 in gold and \$1,500,000,000 in silver. Assume that in 1920 these figures increased to \$10,000,000,000, then the entire stocks of gold and silver of the world would only be about one-twentieth of the national debt of the ten leading nations, to say nothing of the debts of the nations aside from these ten. The payment of a premium for gold and the taxes on gold used for other purposes than money will probably increase the gold stocks to some extent. However, it seems apparent that this has its limit, and an insufficient one, even if carried out by all nations, as suggested by Mr. McFadden.

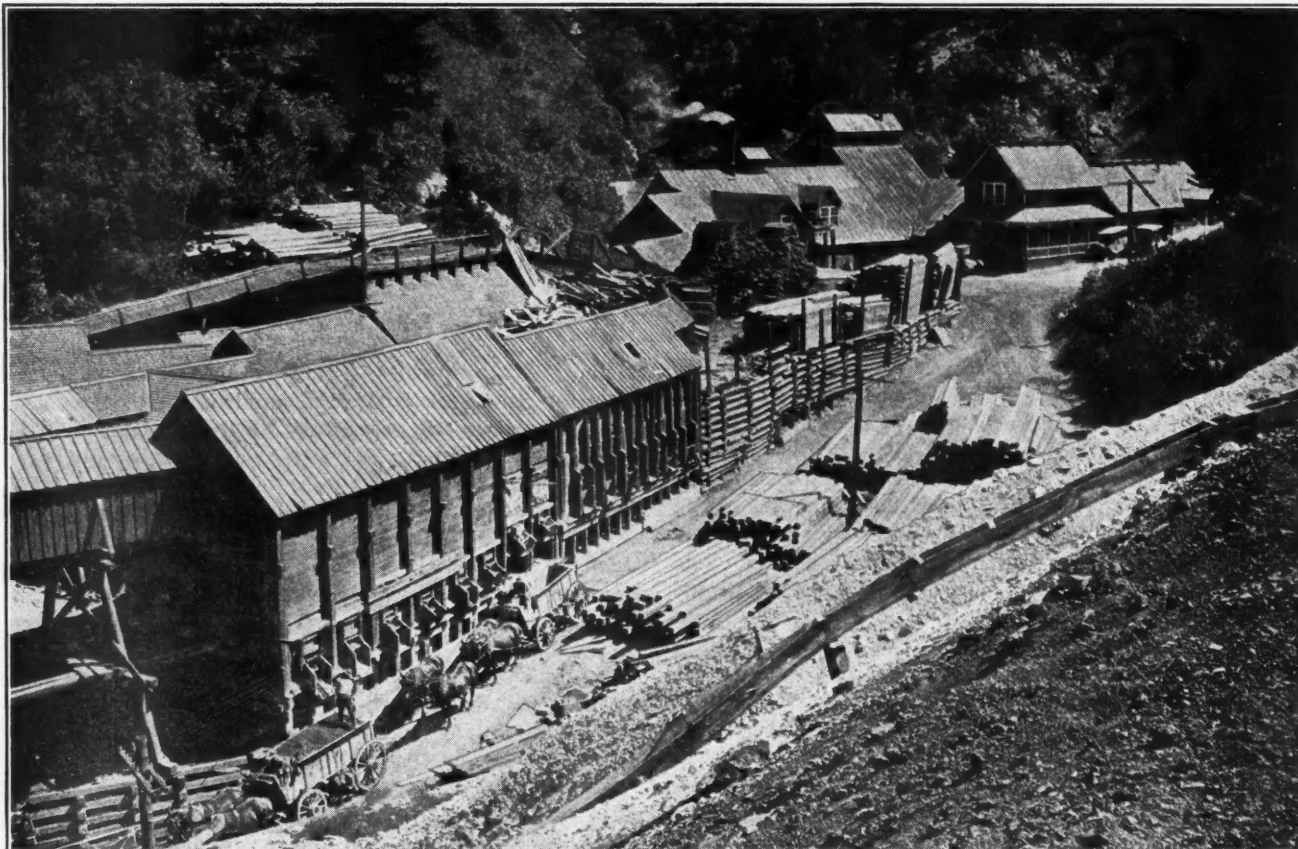
An international agreement to use silver at a definite ratio to gold, weight of pure metal for weight of pure metal, using a 900 fine alloy in every case, would eliminate at one stroke the trouble of international exchange, as, no matter what money of any nation one had in his possession, all that would be necessary would be throw it on the scales, figure 90 per cent of its content for the pure metal, and make the change accordingly. Of course the use of bulky and weighty silver coins has its handicaps, but this could be offset by the different nations issuing gold and silver certificates which would certify that the national vaults held the amount of silver specified, and these would in turn become international currency.

Mr. McFadden figures that the \$80,000,000 in gold withdrawn from a possible coinage for industrial purposes meant a contraction in the credit structure of \$1,600,000,000. It would be well to limit by international law this expansion to some definite ratio, as one financier has so thoughtlessly exposed the depravity of some of the banking institutions' credit expansions. Now let him figure how much of the approximately 13,000,000,000 ounces of silver which statistics show the world has produced could be turned back to coinage and what expansion this would mean in the credit structure, and the many advantages it would have over meddling with the gold standard or the favoring of one class.

Of course it would be hard for England to see the advantages of it. From a selfish "Rule or Ruin" point of view she would be against it. However, in the long run, by increase of trade with the Far East, she would carry on a safer and surer business, as well as with the whole world in general. Thus it comes to the point whether or not the different nations are going to work out a co-operative scheme of dealing with one another, to the benefit of mankind as a whole, or whether the old competitive system is going to be patched up in some way so that a few will reap the benefits of the toil of the many.

HUGO W. MILLER.

Nogales, Ariz.



SURFACE PLANT OF THE JUDGE MINING & SMELTING CO. IN EMPIRE CANYON

The Judge Electrolytic Zinc Plant

Main Features of the Process as Now Conducted—Concentrates Averaging About 38 Per Cent Zinc Roasted and Leached—Electrolyte Purified by Zinc Dust and Zinc Plated On Aluminum Sheets—Purified in Small Reverberatory

BY GEORGE C. HEIKES

Written for *Engineering and Mining Journal*

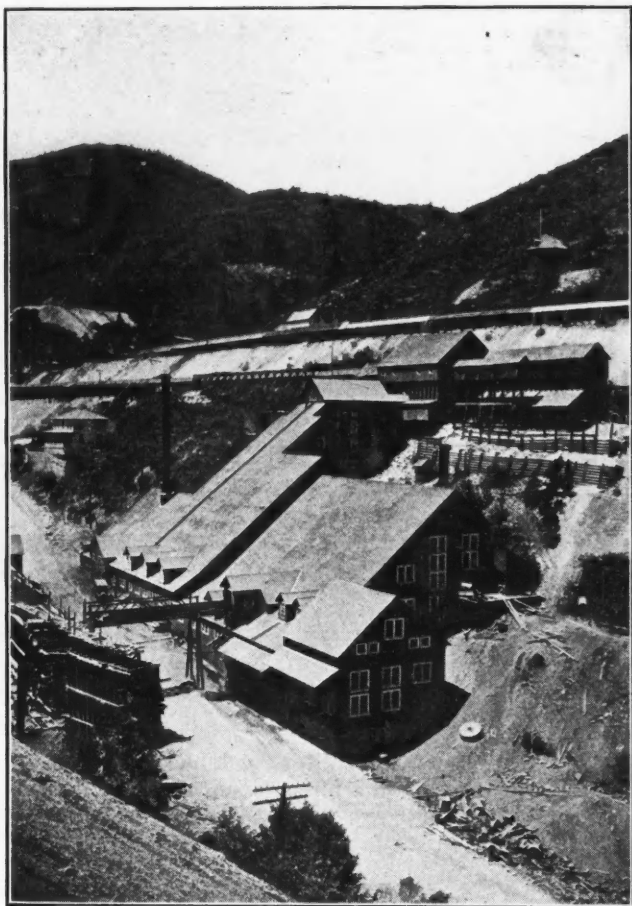
TO SEPARATE the zinc from the other metals contained in the concentrating ores from the mines of the Judge Mining & Smelting Co., Park City, Utah, has been found a difficult problem. These ores contain from 4 to 12 per cent of lead, 4 to 15 oz. of silver, 6 to 15 per cent of zinc, and from 4 to 10 per cent of iron. The oil flotation process has been tried recently on a small scale, but has not proved successful. At present,¹ gravity methods of wet concentration are used, the zinc concentrates, consisting of jig and table products, being roasted and leached, and the zinc recovered electrolytically. Gravity concentration separates the zinc blende from the galena, but does not separate the zinc blende from the chalcopryrite and pyrite, the differences in specific gravity being too slight. The lead concentrates are shipped to the Salt Lake smelters; so it is with the zinc product that this article will be concerned. A separate electrolytic zinc plant has been erected by the Judge company near the mines and mill, to which the zinc concentrates are hauled in wagons.

The zinc concentrates contain about 38 per cent of zinc, 3 to 5 per cent of lead, 9 to 10 oz. of silver, 30

per cent of sulphur, 8 per cent of iron, 0.2 per cent of manganese, and small quantities of antimony, copper, cadmium, and arsenic. The different sizes are kept in separate bins, as the jig product is too coarse for efficient roasting without crushing. The table concentrate is hoisted to the top of the roaster by a skip-hoist, which dumps it into a feed hopper. The flow is regulated by extensions on the rabble arms of the drying hearth pushing the desired amount of concentrate from the spout of the hopper onto the hearth. The jig product is carried from the bin by a belt conveyor to a cylindrical drier, and thence to a Hardinge ball mill, where it is ground fine enough to roast. It is hoisted to a bin above the roaster by a bucket elevator and fed onto the drying hearth of the roaster by a belt conveyor.

The roasting is done in a 25-ft. seven-hearth Wedge roaster, which is heated by two coal-fired combustion chambers situated at opposite sides of the roaster and entering the sixth hearth. The heats of the hearths average 700 deg. C. The rabble arms of the hottest hearths are cooled with water, whereas the remaining arms are cooled with air supplied from a motor-driven fan. The seventh hearth is used to partly cool the calcine before it flows by gravity to a Baker cooler. From

¹The plant was temporarily closed down last month, owing to the present low price of zinc being below cost of production.



THE JUDGE MILL IN EMPIRE CANYON

the cooler it is hoisted to a 400-ton storage bin by means of a bucket elevator, and from there in a skip-hoist to small charging bins built over Pachuca tanks.

There are three Pachuca tanks, made of 3-in. red-wood, 10 ft. in diameter and 22 ft. high, each holding thirty-five tons of solution. The tanks are filled with acid electrolyte and enough 60 deg. sulphuric acid to bring up the acid content to the right amount. Calcine is added until the acidity is about 1.5 gm. per liter. Pulverized lime rock is then used to neutralize any excess acid. Enough iron sulphate, from two small tanks where scrap iron is agitated with sulphuric acid, is added to bring the iron content in the solution up to 0.3 gm. per liter. Manganese dioxide is sometimes added in sufficient quantities to oxidize the ferrous iron to ferric iron. Calcium hydrate coagulates the solution and precipitates such impurities as antimony and arsenic. An agitation cycle generally requires about three hours to complete.

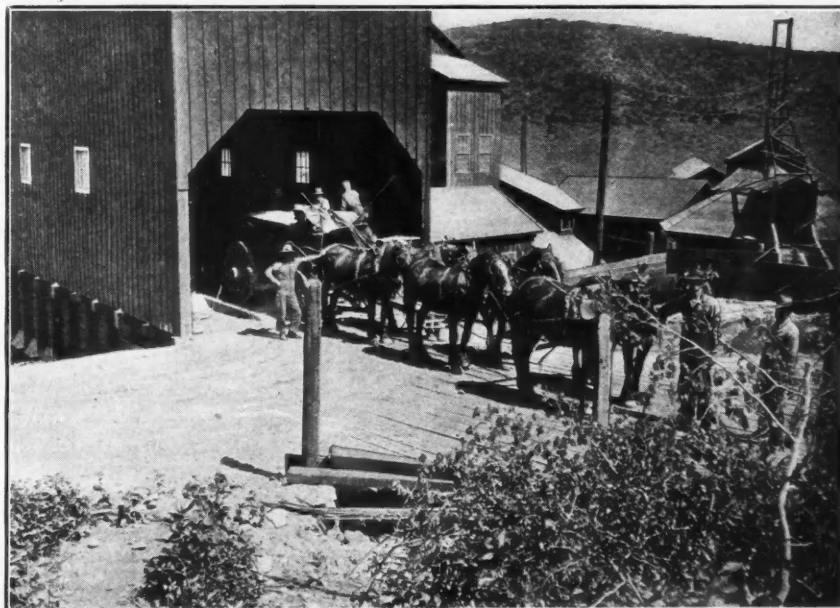
A centrifugal sand pump transfers the neutral pulp to a drag classifier. The sand from the classifier is washed with water and run by gravity to a smaller drag classifier that drops it into a storage bin for shipment to the smelter. The overflow from the large classifier goes to a

30-ft. Dorr thickener. When the thickener overflow becomes clear it is pumped into one of three purifying Pachuca tanks. The spigot product of the Dorr thickener is piped to an air lift, where it is raised and run into the hopper of an 11.5 x 6-ft. Oliver filter. The vacuum on the filter averages seventeen inches and the wash water nine gallons per minute. The filtrate is pumped back to the large Dorr thickener, which is used as a storage tank for the purifying Pachuca tanks.

The Oliver filter cake falls by gravity into a rectangular-shaped mixing trough, where it is mixed with an acid wash water to wash out the soluble zinc. The pulp is pushed along by paddles which are fastened to a rotating shaft running lengthways over the middle of the trough. The overflow from the mixer is pumped to a small Dorr thickener 20 ft. in diameter. By the time the washed cake has reached the overflow of the mixer it is neutral or preferably contains a small amount of acid. The overflow from the small Dorr thickener is pumped to the leaching Pachuca tanks.

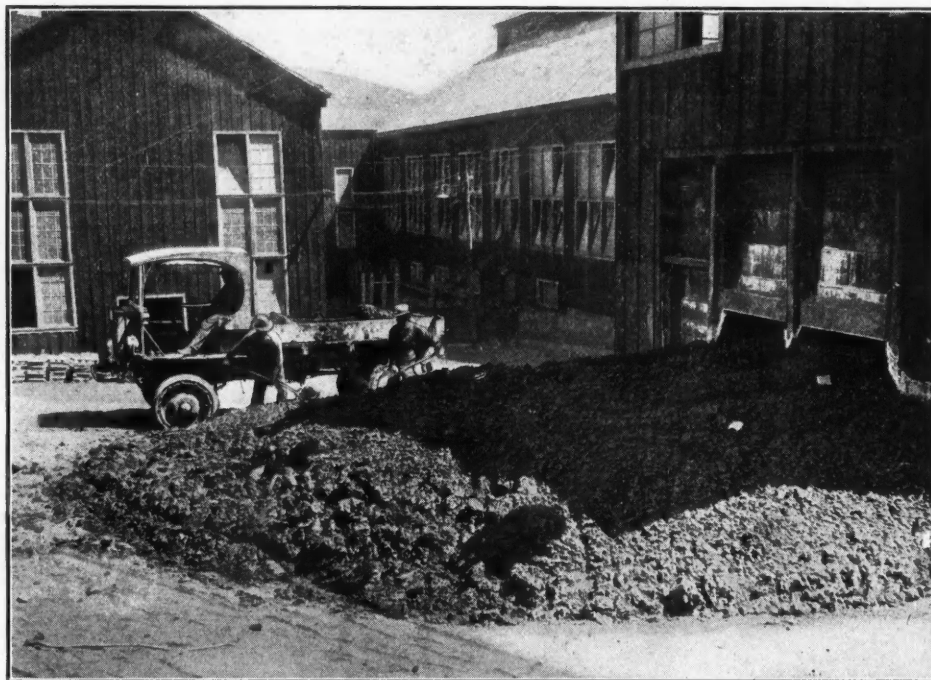
The spigot product flows to an acid-proof American filter, which was especially designed for this plant. It has three disks 6 ft. in diameter and a filter surface of 140 sq.ft. A good cake results when the pulp contains at least a trace of acid. The American filter cake drops onto a belt conveyor, which delivers it to a storage bin. The sand from the drag classifiers and the American filter cake are shipped to the lead smelters and contain 20 oz. of silver per ton, 10 to 20 per cent of zinc, and 8 per cent of lead. Trouble in filtering has resulted from zinc hydrate, calcium sulphate, and ferrous hydrate clogging the pores of the filter bags. This is partly remedied by using stronger acid in leaching to do away with the zinc hydrate, and by employing high air pressure on the filter bags to clean out the other insolubles.

Purification is carried on in the three purifying Pachuca tanks by agitating zinc dust with the solution. The quantity of zinc dust required depends upon the amount of impurities present in the solution, which are determined by analysis. On the average, 70 lb. of zinc dust is used for every twenty-five tons of solution. The zinc dust is made at the zinc plant by allowing a fine



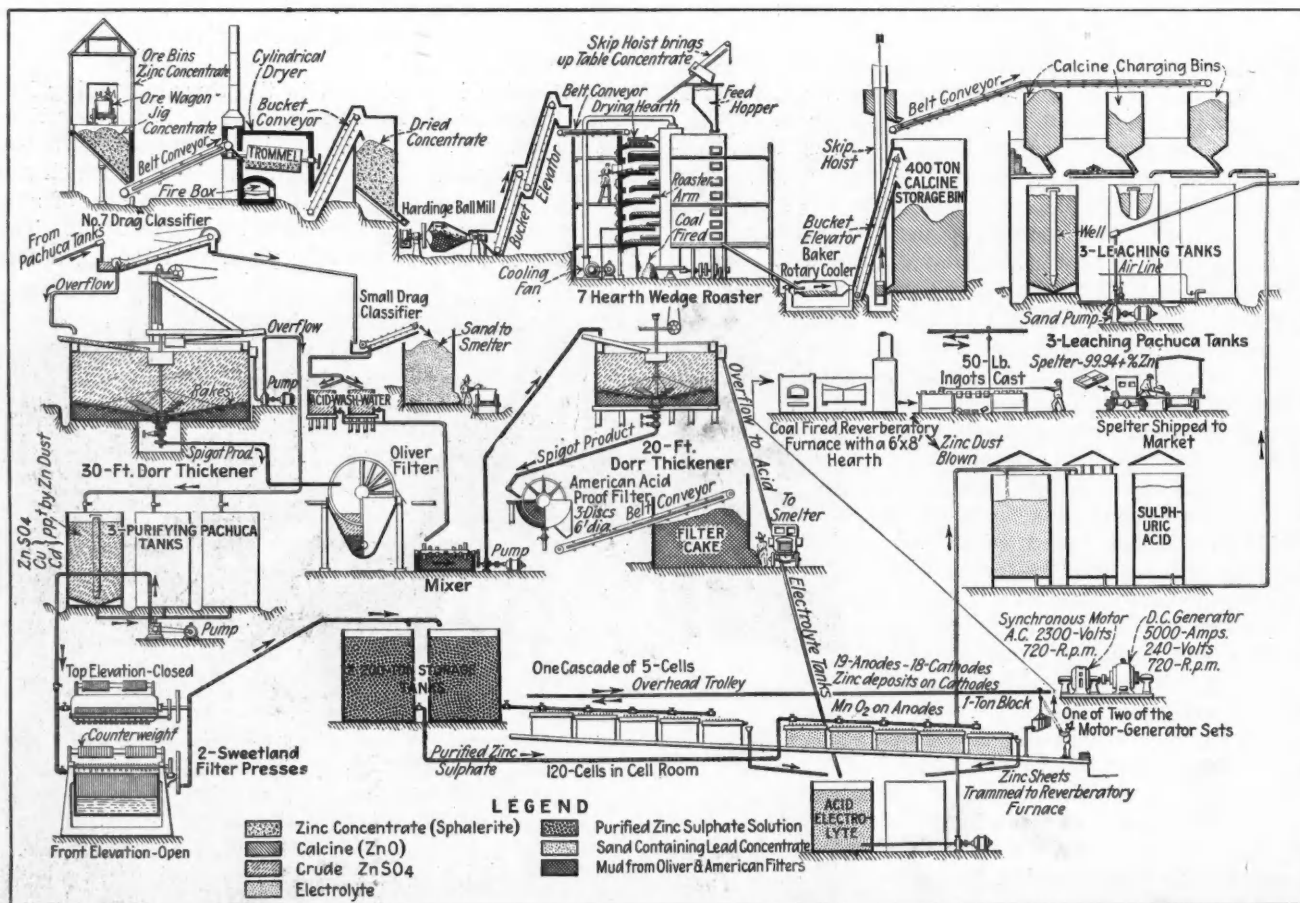
HAULING ZINC CONCENTRATES IN 7½-TON LOADS

stream of molten zinc metal to pass in front of a nozzle from which compressed air with at least 100 lb. pressure per square inch is being blown. The dust is collected in a tank-like, galvanized iron receptacle, sacked, and carried to the purifying department. The purifying cycle of each tank containing 25 tons is 45 minutes. It takes 40 minutes to pump the purified solution through two Sweetland filter presses. Each press has 36 leaves 3 ft. in diameter. The presses are opened, and cleaned every other day by water from a high-pressure line. The filtrate is nearly pure zinc sulphate and is pumped into two 200-ton storage tanks situated at the head of the cell room. The Sweetland filter cake is carried out and dumped into a field near the plant, where it is being stored for future refining, as it contains 30 to 50 per cent of zinc, 4 to 7 per cent of copper, and 3 to 6 per cent of cadmium. Effort is made to hold the solution in the cell room at 60 gm. per liter of zinc, and not over 0.002 gm. per liter of any other impurity. Any



SLIME CAKE RESIDUES BEING LOADED FOR SHIPMENT

solution from the various filters or tanks that overflows runs into a sump in the filter room, where it is saved and pumped to the large Dorr thickener. The floor of the filter room is washed with solution, either purified or unpurified, in order that all the solution and pulp may be saved.



DESCRIPTIVE FLOW SHEET OF THE ELECTROLYTIC ZINC PLANT OF THE JUDGE MINING & SMELTING CO., PARK CITY, UTAH

The cell room is divided into two sections of sixty cells each. The cells are made of 2-in. redwood, 4.5 ft. deep, 3 ft. wide, and 7 ft. long, and are arranged in cascade. Each cascade consists of five cells, which differ three inches in elevation. The overflow from each cell flows over a chemical sheet-lead chute which extends two inches past the end of the following cell and de-



CUTTING OUT CONDUCTOR BARS FROM SPENT ANODES

livers its flow one inch above the solution, which is kept two inches below the top of the cell. At the inlet end of each cell is a cooling coil made of 45 ft. of 1-in. chemical sheet-lead pipe and coiled into five 4-ft. loops. The coils are cooled by water, which is pumped through an outdoor spraying system to reduce its temperature.

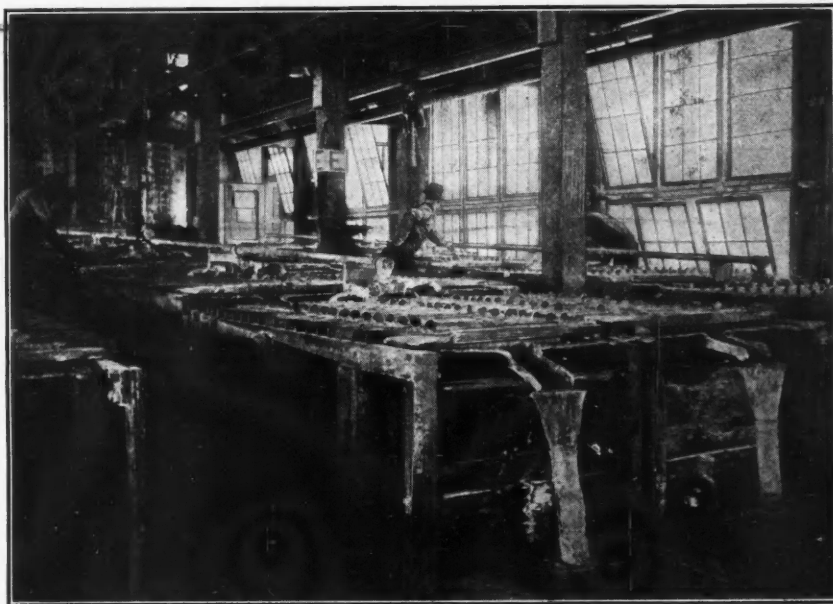
The zinc-sulphate solution is delivered to the head of each cascade by iron pipes, and the amount of flow regulated by gate valves. Provision is made for fresh solution to be run into each separate cell. The overflow from the last cell in each cascade is delivered to one of two acid electrolyte storage tanks situated outside the cell room, from which it is pumped to the acid storage tanks for use in the leaching process. Twenty grams of zinc per liter are left in the cell tailing solution. The manganese dioxide already mentioned as being used to precipitate the ferric iron becomes manganese sulphate in leaching and remains in solution with the zinc sulphate. The manganese deposits on the anodes in the form of manganese dioxide. The anodes are taken from the cells when the deposit becomes too thick for efficient use and scraped with small triangular steel scrapers. The residue scraped from the anodes, together with the manganese dioxide which has precipitated at the bottom of the cell, is collected in a bin outside of the cell room, where it is sacked and taken to the leach room to be used again.

Each cell has nineteen anodes and eighteen cathodes, which are kept two inches apart center to center. The anodes are cast at the zinc plant, of chemical lead $\frac{1}{2}$ in.

thick, 21 in. wide, and 34 in. long. They are cast over a 1-in. square rolled steel bar 41-in. long and a piece of tinned No. 00 copper wire which runs along the top of the supporting bar and through the bar close to the busbar end, where it is riveted to make a good contact. The iron bar is used for its supporting strength and the copper for its conductivity. The copper is tinned to prevent the zinc sulphate solution from creeping between the wire and the lead.

The cathodes are made of sheet aluminum $\frac{1}{8}$ in. thick, 23.5 in. wide, and 37 in. long, and are supported by two copper bars $\frac{3}{8}$ in. thick, 1.5 in. wide, and 44 in. long, which are riveted together with the aluminum sheet between. Two hook-shaped sheet-steel lugs are riveted between the copper bars at the edges of the aluminum sheet. These serve as a means to pull the cathode from the cell. Each square foot of the cathode area in the cell has a current density of twenty amperes. The cathodes are removed every twenty-four hours and average 210 lb. to the cell. The strippers pull six cathodes from the cell at one time by means of a one-ton chain block hooked to a frame which fits under the hook-shaped lugs and tightens up under them when the frame is raised. The "pull" of six cathodes, as it is called, is carried to a stationery steel stripping frame at the lower end of the cell room by means of the block running on an overhead steel trolley. The cathodes are held in the stripping frame while the stripper inserts a sharp chisel between the zinc and the aluminum cathode and peels off a sheet of zinc about $\frac{1}{8}$ in. thick. These sheets are piled near the stripper and then trammed to the furnace room. Wooden strips which stick tightly to the edges of the cathode are used to stop irregular deposits and make the zinc easier to handle.

Because the amount of current carried by the cell



THE TANK ROOM IN THE ZINC PLANT

busbars decreases with the increase in the number of anodes and increases with the number of cathodes, it is possible to save copper by tapering the busbars, and this has been done. The busbars are 1.25 in. thick, 4 in. wide, and taper to $\frac{1}{2}$ in. wide in the length of the cell. The busbars holding the electrodes are on the outside of the cell, the anode bar being on the inside



STRIPPING CATHODES IN THE ELECTROLYTIC ZINC PLANT



RABBLING THE DROSS IN A ZINC FURNACE

and one-half inch lower than the busbar for the cathodes. The busbars are insulated from each other and from the cell by means of heavy plate glass one inch thick. The opposite ends of the supporting bars of the electrodes rest on wooden strips insulated from the cell by pieces of $\frac{1}{4}$ -in. plate glass. At present, experiments are being made using the heavy forty-eight-hour sheet-zinc deposit as a cathode. It is planned to then melt the whole cathode. The sheet is held between two heavy pieces of copper wire and clamped. The wires are riveted to the same style of supporting bar now in use for cathodes. The main difficulty at this time is the breaking of the sheet zinc when the deposit becomes heavy; so this cathode is still an experiment.

The zinc sheets are trammed to the "melt" room, where they are weighed and thrown into a small coal-fired reverberatory furnace with a 6 x 8-ft. hearth. The temperature is kept between 600 and 750 deg. C. Every twenty-four hours dross is pulled. Ammonium chloride is added to the dross, the furnace doors are opened, and the dross is carefully raked into perforated wheelbarrows. More ammonium chloride is added and mixed with each wheelbarrow load while the dross is hoed back and forth in the wheelbarrow to push the metal through the holes. The remaining dross is weighed, screened, and hoisted into a storage bin by a bucket elevator. The metal which was pushed upon the floor is gathered together and thrown back into the furnace. When the bath is sufficiently hot, a small door at the back of the furnace is opened; this is just large enough to admit a ladle which will hold 150 lb. of zinc. The ladle is suspended by a steel rod from an overhead steel trolley, and the molten zinc poured into cast-iron molds. The average weight of the finished ingots is 50 lb. The zinc, analyzing 99.93+ per cent, with very

small amounts of cadmium, copper, iron, and lead, is weighed and shipped.

At present the plant is producing between seven and nine tons of zinc a day. The plant was originally planned for fifteen-ton daily capacity, but the roaster and the filters have not reached that tonnage.

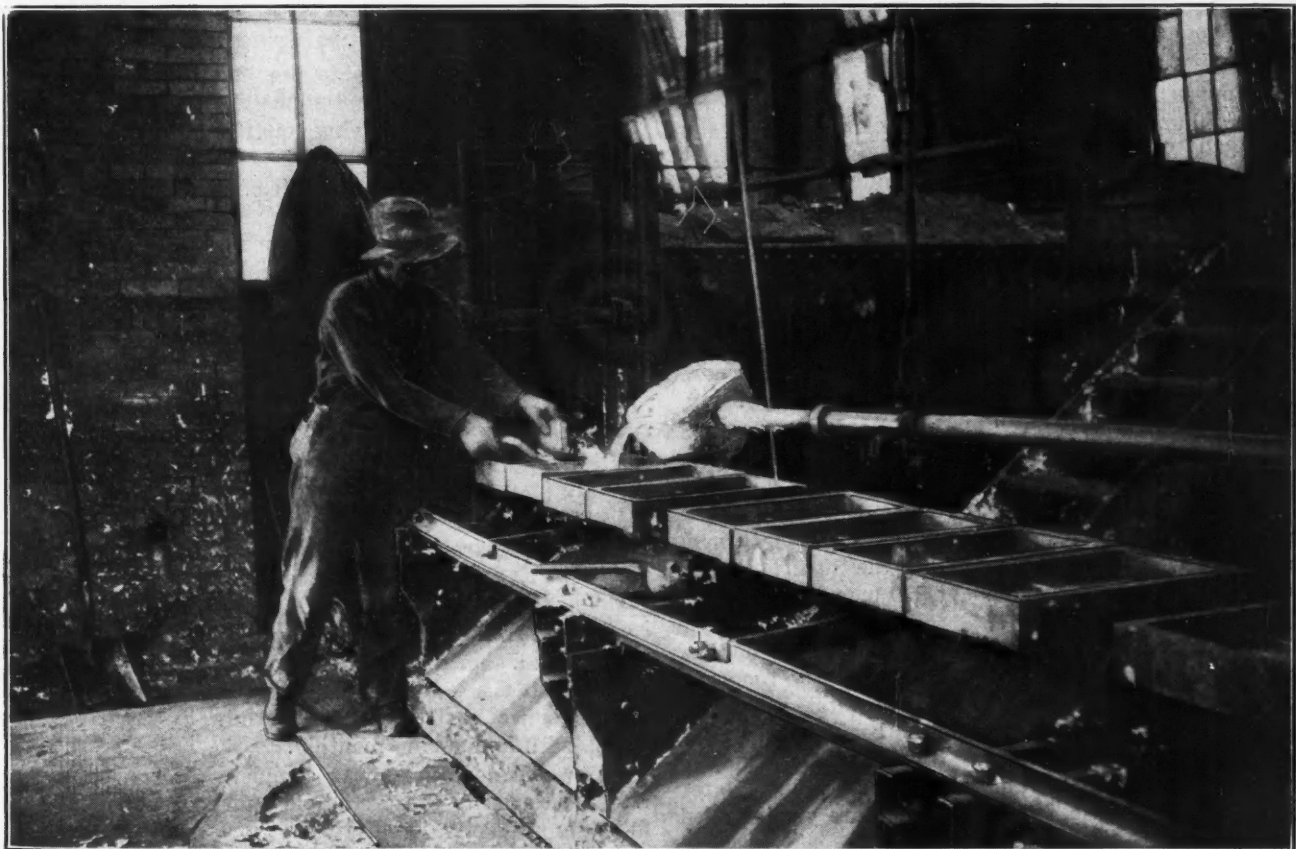
Two motor-generator sets are so arranged that either set may run on either side of sixty cells in the cell room.



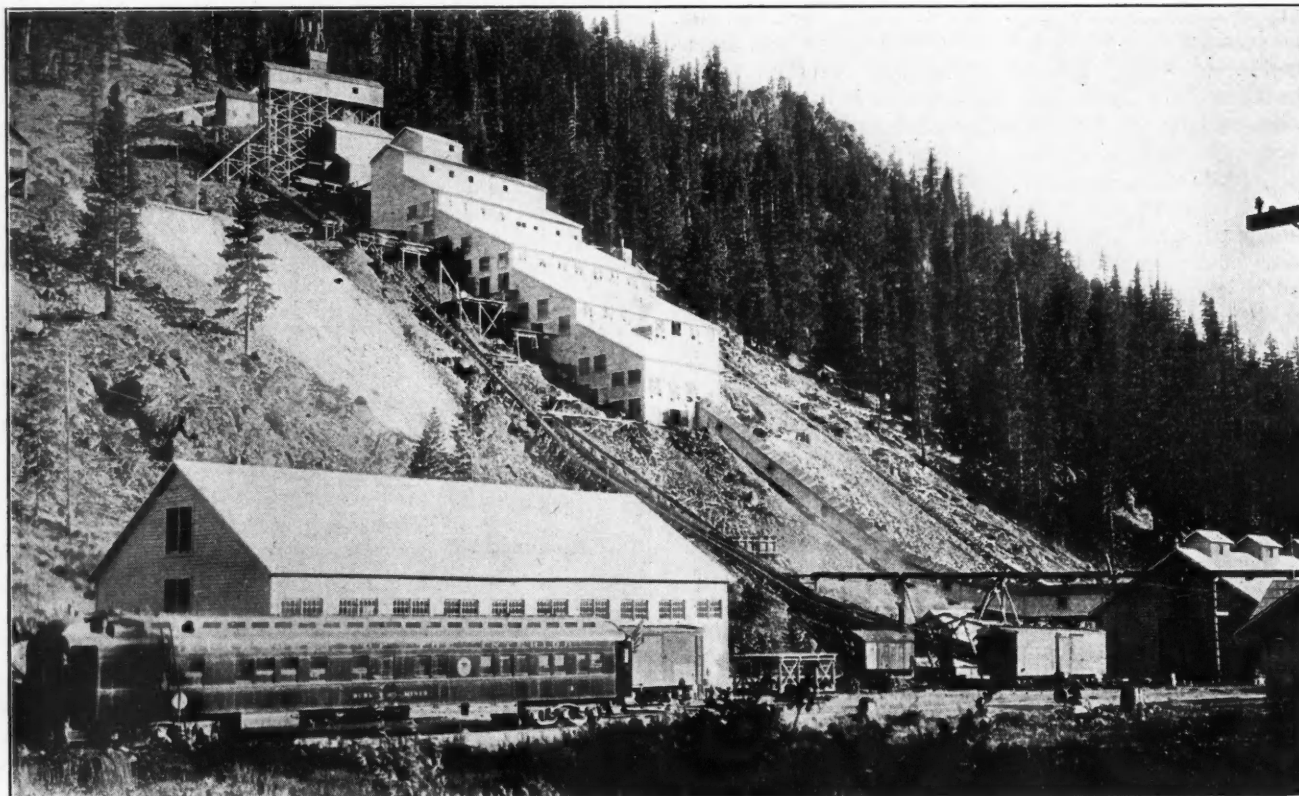
WORKING DROSS IN PERFORATED WHEELBARROWS

The cells are connected in series and the electrodes in parallel. Ten pounds of zinc is produced for every horsepower of electricity used and five tons of zinc for every ton of coal consumed.

My best thanks are due to G. W. Lambourne for permission to publish these notes and also to John T. Ellsworth for helping me obtain the data.



POURING ZINC INTO MOLDS AND SKIMMING



FLOTATION MILL OF ENGELS COPPER CO., ENGLEMINE, CAL.

Miners' Dormitories at the Engels Mine*

By E. G. GARDNER

Mining Engineer, U. S. Bureau of Mines Rescue Car No. 1

Written for *Engineering and Mining Journal*

THE Engels and Superior mines of the Engels Copper Mining Co. are situated in the mountains of Plumas County, Cal., at an elevation of 5,200 and 3,800 ft., respectively, above sea level. The Superior mine is at the end of the Indian Valley R.R., and the Engels about three miles up a canyon. The mill and general offices are at the lower mine.

The mining company officials are Elmer E. Paxton, general manager, Mills Building, San Francisco, Cal.; Robert A. Kinzie, supervising engineer, First National Bank Building, San Francisco, Cal.; W. R. Lindsay, superintendent, Engelmine, Cal.; J. J. Barrett, foreman, Engels mine, Engelmine, Cal.; W. E. Kyle, foreman, Superior mine, Engelmine, Cal., and W. I. Nelson, mill foreman, Engelmine, Cal.

The company is mining and milling about 450 tons from the Engels mine and 250 tons of ore from the Superior mine per day. One hundred and seventy men are employed in the Engels and 60 in the Superior mine. Including all on the payroll, about 200 men are employed at each camp.

At the upper camp there are twenty dwelling houses, six lodging houses containing a total of sixty rooms, a new dormitory, a boarding house, a hospital, a store, a club, and the foreman's residence, besides the mine buildings. The family houses contain three and five rooms and rent for \$6 and \$10 respectively. Water is piped to each house, but no bathtubs are yet installed

and the latrines are outside the buildings. Formerly the mine had bunk houses, but the present management, believing that better living quarters, with personal privacy, increase a man's self-respect and also attract a better class of workers, subdivided the bunk houses into rooms and installed on each floor a lavatory, with the necessary sanitary accommodations and shower baths. The sewage drains into a septic tank. The rooms in the bunk houses are 8 x 12 ft. in size, where occupied by one man, and 10 x 12 or 12 x 14 ft. where occupied by two. The company furnishes beds and mattresses, and the men supply their own bedding and take care of their own rooms. A janitor employed by the company takes general care of the buildings. The men are not charged rent. The management has also recently built the new thirty-three room dormitory, which is modern in every respect. The floor plans are simple and elevations free from architectural complication. The rooms are 12 x 14 ft. in size, are occupied by two men each, and are furnished with two single beds, tables, and chairs. The company furnishes bedding, linen, and janitor service, and makes a charge of 15c. per day per man. This building and all the lodging houses are steam heated. The buildings are kept free from vermin by treating the rooms with live steam, monthly.

After the dormitory was completed, for a time the miners seemed to prefer the old quarters, but now it is filled to capacity, and there is a waiting list of applicants.

*Published by permission of the Director, U. S. Bureau of Mines.

At the lower camp there are fifty-two five-room and eight three-room company houses, which are rented to the miners with families at \$6 and \$10, respectively, per month. At this camp the old bunk houses have also been remodeled and subdivided into rooms 8 x 16 and 12 x 14 ft. in size, which are occupied by two men. These rooms are furnished in a manner similar to those in the lodging houses at the upper camp, and no charge is made for them. Plans have been drawn for a dormitory like the one at the upper camp, and all the buildings are being improved and painted.



Photo by Bureau of Mines
STREET OF COMPANY HOUSES IN LOWER CAMP,
ENGLEMINE, CAL.

Board is furnished to 160 men in the lower camp at \$1 a day and to 135 men in the upper camp at the same rate. As it costs the company about \$1.60 a day to board a man, the company loses 60c. a day on each man's board.

The company maintains a store at each camp to supply the needs of the miners. No profit is desired by the company from this establishment, but the goods are marked to pay interest on the capital furnished. Men are not required to buy at the stores, and no discrimination is made against those who buy from mail-order houses.



Photo by Bureau of Mines
THE MEN'S CLUBHOUSE AT THE LOWER CAMP

About 35 per cent of the miners are Americans, 30 per cent Italian and Spanish, 30 per cent Mexicans, and 5 per cent other nationalities.

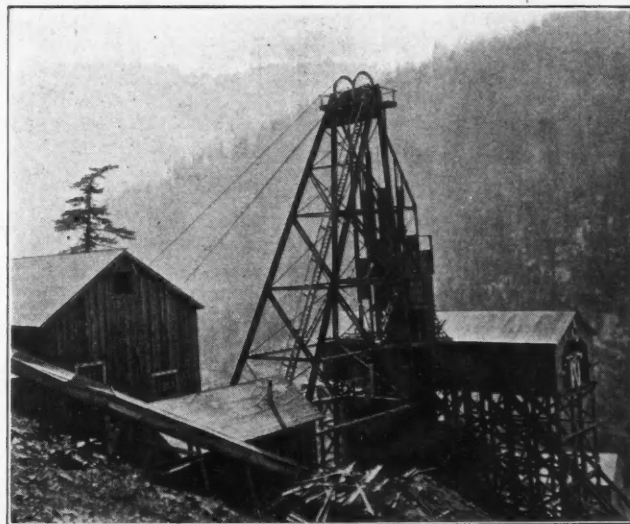
At each camp the company maintains a clubhouse, containing a reading room with papers and magazines, card and pool tables, barber shop, and soft-drink stand. No club dues are charged, and the rooms are open to all. The Plumas County Circulating Library has a branch at the camps. Moving-picture shows and dances are

given weekly. Mr. Baker, the manager of the store, is also in charge of the clubs. The boarding houses are run by a steward.

The company owns all of the town site and there are no private buildings in the camps.

The men at the upper camp work from 7:30 a.m. to 12 noon and from 1 p.m. to 4:30 p.m. on day shift, and from 6:15 p.m. to 11 p.m. and 11:45 p.m. to 3 a.m. on night shift. They come to the surface for a hot dinner or supper on their own time on each shift. Until recently the men carried a cold lunch in buckets on night shift, but the company offered to put a night shift in the boarding house if the men would come out to supper on their own time. This was agreeable to the men, and the change was made.

Wages at Engelman camp (August, 1920) are \$4.50 for shovelers and \$5 for miners. This compares favorably with the scale at the Nevada camps with which the mine competes for men. A miner at Tonopah, for instance, will pay \$60 per month for accommodations which are furnished at Engelman for \$30, and this lower rate of living costs offsets the difference of \$1 per day in wages.



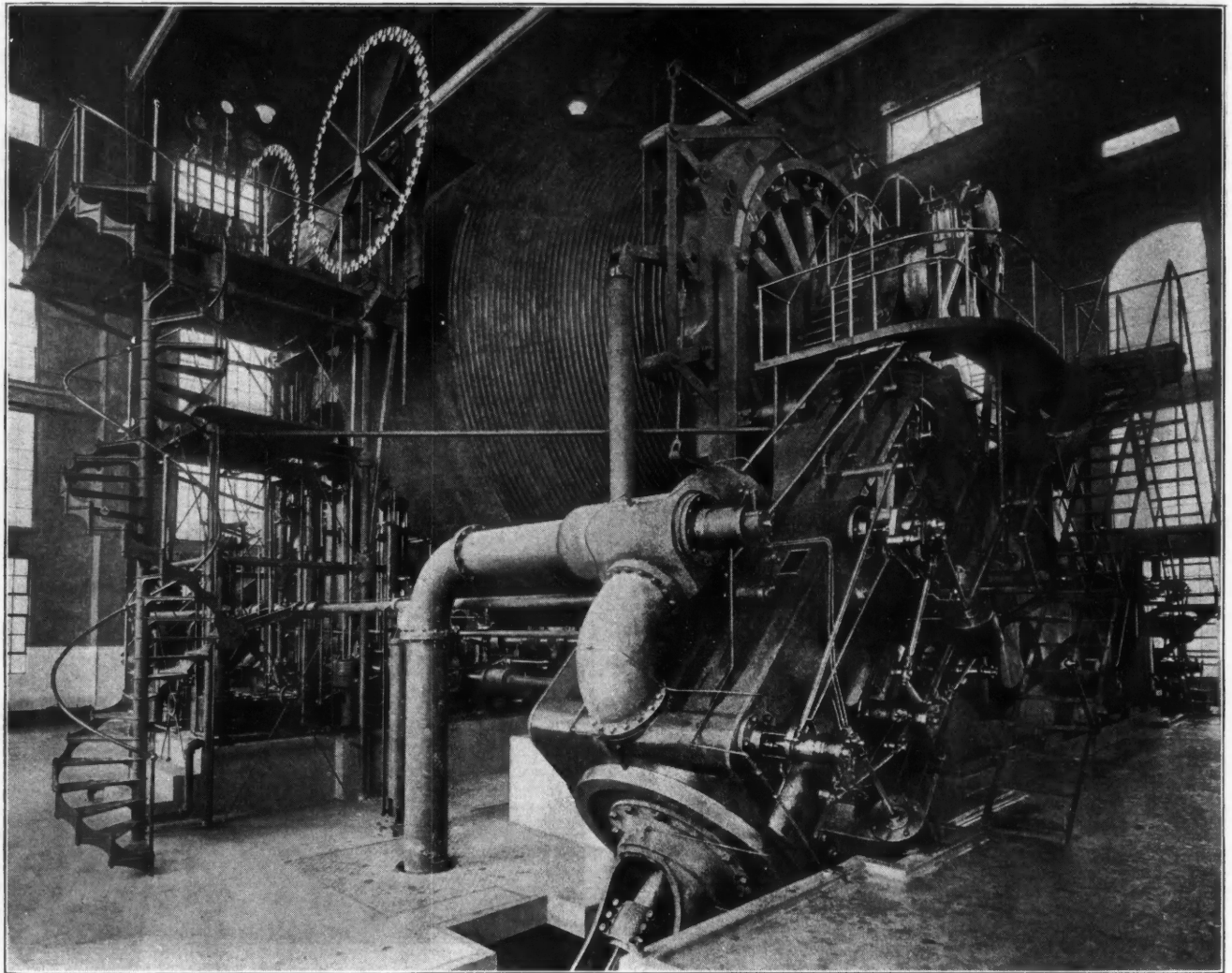
HEADFRAME AT SUPERIOR MINE OF ENGELS COPPER CO.

The efficiency of the men at the Engels mines is estimated at about 80 per cent by pre-war standards, which is very high. The labor turnover is comparatively small for these times. The mine has a full crew of laborers and shovelers, but is short of miners. The employment agents at Sacramento and San Francisco have a standing order for miners, who are shipped in at company expense. However, the labor shortage is not as serious as has been reported in most Nevada or Arizona camps.

Though the company's books show a loss on board, and it furnishes living quarters free or at a very reasonable cost, the lower living cost attracts men to the camp at a correspondingly lower wage than is offered in other camps, and when the cost of living comes down to a level more nearly normal, the loss in the boarding houses will decrease.

I believe that this camp is a good example of how consideration for the welfare of the men by the mine management is reflected in a lower cost of mining the ore, as well as more general satisfaction in operating conditions.

The Quincy Hoist



COMPOUND, CONDENSING STEAM-DRIVEN HOIST—A NOTABLE ACHIEVEMENT IN MECHANICAL ENGINEERING

AT THE Quincy company's No. 2 shaft at Hancock, Mich., the largest steam-driven hoist as yet constructed has just been completed. The hoist operates in balance and is designed to raise a load of ten tons of rock at a rope speed of 3,200 ft. per minute. The drum is of the cylindrical type, with a maximum diameter of 30 ft., minimum diameter 16 ft., and a rope capacity of 10,000 ft. of 1½-in. rope, sufficient to attain a vertical depth in the incline shaft of 6,600 ft. By winding the rope down on the opposite cone the rope capacity reaches 13,300 ft., equivalent to a vertical depth of 8,600 ft. The drum is carried by two main bearings 28 in. in diameter by 54 in. long, upon triangular-shaped castings, which, in turn, rest upon the concrete foundation and also support the four engine frames and cylinders.

A cross-compound steam engine, with two high-pressure and two low-pressure cylinders on each side respectively, is attached to the cranks of the drum. Each engine is set at 45 deg. to the vertical, and both engines on a side are attached to a common crank pin 15 x 15½ in. in diameter. High-pressure cylinders are 32 in. in diam-

eter, low-pressure 60 in., and stroke is 66 in. The low-pressure pistons are supported by crosshead and tail guides. High-pressure piston rods are 6 in. and low-pressure 10 in. in diameter. Crosshead pins are 8 x 12 in. Between each high-pressure and low-pressure cylinder a reheating receiver is placed, the pressure within which is under the control of the operator.

The condensing equipment is designed to handle 1,460 lb. of steam per trip of 10,000 ft. The low-pressure cylinders exhaust into a steam drum 8 ft. in diameter and 17 ft. long, from which the exhaust steam passes to the air pumps.

The hoisting drum weighs 516,000 lb., exclusive of the shaft. It is constructed in forty-eight sections, which are bolted together. Inner trussing prevents any deflection. Eight impulses per revolution together with the great mass of the hoist eliminate all pulsations in the rope. Post brakes of an improved type, 16 ft. in diameter, are attached to each end of the drum. Each pair of brake shoes is operated by an oil cylinder which receives its oil from a loaded accumulator. The oil cylinders are controlled

by special poppet valves, one controlling the lift and the other the drop of the piston, and so arranged that both valves cannot be opened at the same time. Throttle and reverse mechanism are handled in the same way.

All of the mechanism is operated by a floating lever gear and is under the control of the operator. By means of an improved safety stop the throttle can be automatically closed as the skip approaches the landing. Overwinding applies the brakes automatically, and the control is so arranged as to prevent starting the hoist in the wrong direction. A speed governor controlling the cut-off cams of the valve gear prevents overspeeding.

The total weight of the hoist with condensing equipment is 1,765,000 lb.; floor space covered is 60 x 54 ft., and vertical height from foundation to top of drum is 60 ft. The weight of 10,000 ft. of 1½-in. rope is 41,500 lb.; weight of skip, 10,000 lb.; time required for one trip of 10,000 ft., 4 min. 8 sec.

The Nordberg Manufacturing Co., of Milwaukee, Wis., designed and manufactured the hoist.

The Administration of the McFadden Bill

A Discussion of the Tax-Collection Problems in the Proposed Gold Bonus Act, the Possibility of Distributing Larger Premiums Than Taxes, and the Provisions Made for Export And Import Trade in Gold Used in the Arts

BY S. L. WILLIS

Written for *Engineering and Mining Journal*

DOMESTIC gold producers occupy a unique position as the only producers of a raw material who have not realized an increased price for their product as a result of the advance in the cost for labor and materials incident to the war. This fact, coupled with the exhaustion of many high-grade mines and rich placer deposits, has caused an alarming decrease in production, which, if permitted to continue, will undoubtedly result—and that in the near future—in an output so small that the arts will be obliged to import metal to supplement that obtained from domestic sources. The effect upon the domestic gold-mining industry will be disastrous, because many large, low-grade producers, with an assured long life under pre-war conditions, are even now facing the alternative of shutting down or continuing to operate at a loss. If the former course is pursued, cave-ins and water will terminate the careers of some of the nation's largest mines.

Foreign producers, situated in countries having a depreciated currency, are in a better position, because labor and materials are paid for in depreciated currency, and the product is sold at par. The resulting premium amounts to from 15 to 20 per cent in Canada, and even more in other countries.

Domestic gold producers assert that domestic manufacturers using gold in their product have been subsidized, in that the raw material has remained at a fixed price, permitting them to realize an increased profit on the finished product. Someone has certainly profited, but, leaving profiteering out of the discussion, the consumer has benefited rather than the manufacturer. Jewelers, gold beaters, and other consumers of gold have been subject to heavy exploitation on the part of their labor, this fact justifying larger price increases than were necessary in many industries. Wages in the gold-beating trade, for example, have increased from \$15 to \$44 per week, and advances in other trades have been in proportion.

It may be claimed by producing interests that the tax provisions of the McFadden Bill do not concern them directly, but as each objection creates opposition to the whole bill, a careful analysis of the tax provision is absolutely necessary if arguments of the consumers are to be met with any degree of success.

FEATURES OF THE MCFADDEN BILL

House Bill 13201, submitted by Mr. McFadden, aims to provide financial help for the gold-producing industry, by means of an excise tax levied upon all gold consumed in the arts and on all gold contained in imported articles of foreign manufacture. In an amendment, submitted at a later date, all gold contained in articles exported is exempted from payment of the tax. The premium and tax are equal, although figured on different units of weight; the tax being fixed at 50c. per penny-weight and the premium at \$10 per oz.

The bill provides explicit rules and conditions govern-

ing payment of the premium, but is vague regarding administration of tax provisions, that matter being left to the Treasury Department in general and the Collector of Internal Revenue in particular. It does provide, however, that materials, or packages containing them, shall be suitably stamped on payment of the tax, and all articles manufactured, but not in the hands of the ultimate consumer at that time, shall be so stamped before further sale.

Discussion of the McFadden Bill may be conveniently divided under seven heads:

First. Is the bill practical?

Second. Comparison between the probable tax receipts and premium requirements, as indicated by past production and consumption statistics.

Third. The best time for imposing the tax; whether at the mint on withdrawal, after the last manufacturing process, or when sold to the ultimate consumer.

Fourth. Treatment to be accorded old jewelry and worn-out material containing gold.

Fifth. Treatment to be accorded scrap metal produced during the manufacturing process.

Sixth. Tax administration upon manufactured material in the hands of wholesalers and retailers, and imported materials containing gold.

Seventh. Procedure for safeguarding our export trade by refund of the tax on materials exported.

It is well to state at this point that the writer owes allegiance to neither the gold producers nor to the industrial consumers, except that, as a mining engineer, he regrets that the proud record of the United States as a producer of gold is in danger of becoming a memory. The following remarks are based upon facts, and refer to the bill as framed, and not to the principle involved:

FIRST. IS THE BILL PRACTICAL?

France places an excise tax upon all gold consumed in the arts. No mention is made of gold contained in imports, and, so far as can be learned, that factor is covered by the normal tax upon imports. The French tax is for revenue purposes and amounts to a luxury tax, figured on a specific instead of an ad valorem basis. There is, therefore, no reason for assuming that legislation of this character cannot be enforced if properly drawn up.

SECOND. TAX VS. PREMIUM

Statistics for the domestic production of gold and its consumption in the arts, as combined in the following table, clearly demonstrate the fact that the bill in its present form will inevitably result in a steady and considerable drain upon the Treasury. In 1918, although the total apparent consumption of gold in the arts amounted to 76.3 per cent of the domestic production of new metal, 28.4 per cent, or more than a third of this, was old metal, largely manufacturers' scrap returned for refining. The value of this material must be deducted

from the apparent consumption when figuring the net amount of new gold used. The net consumption of new gold in the arts was therefore probably little more than 50 per cent of the domestic production of new metal. Assuming the bill to have been in force, the Treasury would have been drawn on to the extent of nearly eighteen million dollars in 1918, and this in a year when production was decreasing rapidly, and consumption was at a high peak, due to high wages throughout the country.

The figures for 1919 will probably be more favorable,

courages collection at these points. Collection when the metal is withdrawn from the mint can be easily and economically enforced, provided that rebates are allowed on returned manufacturers' scrap. Payment could safely be made to the manufacturer, because the tax would have been figured into his metal cost.

Dental-supply manufacturers produce pure gold products, such as gold dust, wire and foil, and gold teeth. They are able to consume all scrap produced, but the practicing dentist produces a certain amount of scrap which must be allowed for by rebate or other

RATIO BETWEEN DOMESTIC GOLD PRODUCTION AND THAT USED IN THE ARTS (a)

Year	Domestic Production	Consumption New Metal	Per Cent Production	Consumption Old Metal	Per Cent Production	Consumption Total	Per Cent Production	Probable Tax Def. (b)
1880	\$36,000,000	\$8,811,047	24.5	\$1,294,385	3.6	\$10,105,432	28.1	\$14,100,000
1885	31,801,000	9,653,650	30.4	2,171,092	6.8	11,824,742	37.2	11,050,000
1890	32,845,000	13,025,462	39.7	4,630,498	14.1	17,655,960	53.8	9,500,000
1895	46,610,000	10,954,419	23.5	4,474,666	9.6	15,429,085	33.1	17,800,000
1900	79,171,000	17,061,553	21.6	5,086,589	6.4	22,148,142	28.0	31,100,000
1905	88,180,700	25,475,192	28.9	7,733,423	8.8	33,208,615	37.7	31,350,000
1910	96,269,100	34,160,874	35.5	7,626,278	7.9	41,787,152	43.4	31,050,000
1915	101,035,700	29,599,507	29.3	8,220,520	8.1	37,820,027	37.4	35,700,000
1918	68,646,700	32,892,395	47.9	19,517,345	28.4	52,409,740	76.3	17,850,000
1919	58,488,800	.....	.....	.....	.....	.....	.....	.....

(a) Official figures from report of U. S. Mint, 1918.

(b) Assuming value of gold \$20 per oz., then deficit = $\frac{\text{domestic production} - \text{domestic consumption new metal}}{2}$

but when consideration is taken of the fact that any bonus would result in an immediate expansion of production, and that price increases on top of an already sluggish luxury market would result in decreased consumption, it will readily be seen that the 1918 ratio is probably representative of actual results.

The natural remedy lies in a decreased premium or increased tax, or both, and with Congress in its present economical mood, one course or the other must be resorted to if the bill is to receive serious consideration.

THIRD. METHODS OF IMPOSING THE TAX PROPER

The old milling axiom regarding recovery of the values at the earliest possible point in the manufacturing process is as true when applied to tax collection as it is when applied to ore concentration. Consumers, however, strenuously object on the ground that collection at the mint imposes a serious financial burden upon all the manufacturers involved.

The most important consumers of gold are jewelers, gold beaters, and dental supply and pottery manufacturers. Gold beaters and the manufacturers of solid gold jewelry know exactly how much gold is contained in every unit of product, because the gold value is a considerable part of the total cost. They make little or no waste in the process, and the tax could be collected with equal facility at any point, except that the cost of collection from retailers would be greater than it would be if collection were made at the mint.

Pottery and plated jewelry manufacturers, and gold-leaf consumers, buy the gold they use in the form of liquid gold, decalcomanias, gold-plated sheets and wire, and gold leaf, and figure their costs in terms of these products, rather than in terms of the actual gold content. In fact, it is extremely doubtful whether the average consumer of this class has even a general idea of his gold consumption. The situation is further complicated by the scrap metal produced in the manufacturing process. This must be exempt from tax (if the collection is made at the mint), or a rebate allowed when the material is returned for re-smelting.

The very small amount of gold present in the manufactured articles renders collection by the retailer difficult and expensive, and the large amount of scrap produced in intermediate manufacturing plants dis-

means when it is returned to the trade. Conditions in this case are not radically different from those obtaining in the jewelry industry, and collection of the tax at the mint is probably the most satisfactory method.

FOURTH. STATUS OF WORN-OUT MATERIAL CONTAINING GOLD

Old jewelry and other materials containing gold re-enter the trade in considerable quantities through the medium of pawnbrokers and other dealers in scrap stock. This material is not entitled to rebate of the tax, and all such receipts must be kept separate from manufacturers' scrap. This requirement imposes some hardship upon refiners, because it will be necessary to hold old metal in stock until sufficient is collected for a separate furnace run.

FIFTH. TREATMENT OF MANUFACTURERS' SCRAP

The text of the bill provides that the tax be paid on "weight of fine gold contained in all gold manufactured, used, or sold for other than monetary purposes." This phraseology permits of three interpretations of the tax provision, but if the tax is to bear equally upon all consumers, it must be levied on the gold content of the material as sold to the ultimate consumer. Any other interpretation would result in a marked advantage to large manufacturers who are equipped to re-treat all scrap produced in process. The small producer, forced to buy gold at \$30.67 per oz., and to sell his scrap at \$20.67 per oz., would be driven out of business. If, therefore, the tax is collected prior to the manufacturing process in which scrap is produced, a rebate must be allowed covering all gold returned in this way to the trade. If, as is often the case, the scrap is sold to the original producer, payment may be made by crediting the shipper, and the material will be reissued without a second passage through the mint. When the scrap is sold to an outside refiner, on the other hand, cash payment will be made, equivalent to the monetary value plus the tax, and less the treatment charge. The refined bullion may be resold to the arts, in which case no additional tax should be collected by the Government; but if it is sold to the mint, a rebate equivalent to the tax is due the refiner to recompense him for his payment to the manufacturer.

SIXTH. TAX COLLECTION ON MANUFACTURED STOCK AND IMPORTS

Gold plays a widely varying part in the value of the products in which it is used. Enumeration of the articles affected reads like a list of the products of the United States, and includes jewelry, chinaware, picture frames, gold teeth, chemical apparatus, textiles, books, and other articles in common use.

No difficulty will be experienced in collecting the tax by weight upon bulk gold leaf, and manufacturers' stocks of liquid gold, dental gold, and plated wire and sheet, because the gold content is a considerable part of the value and accurate records are kept of the consumption per unit of product.

When gold leaf is the only decoration used, a fair idea of the quantity of gold on an article may be obtained by figuring the area covered. This method is feasible, but would require a large amount of work, and as the weight of gold used per article is generally very small, the returns would hardly justify the expense involved.

The same reasoning applies to the collection of the tax upon chinaware. Some expensive ware contains an appreciable amount of gold, it is true, but the amount of metal used in plain gold-band decoration is infinitesimal, and cannot be ascertained with accuracy, if at all.

Jewelry falls into three classes: solid gold, gold-platinum, and plated ware. The amount of gold in domestic solid gold and gold-platinum products can be determined in most cases by consulting the manufacturer, because he keeps such information as a matter of cost accounting. Plated ware contains only a very small amount of gold, and as the manufacturers have at best only a vague idea of the actual gold content under present conditions, all hopes of determining the taxable value are lost if the pattern has become obsolete.

The same difficulties are encountered when taxing gold imports. The foreign jewelry manufacturers operate small shops; in fact, a large part of the production is made in the homes of the workers. The operators buy semi-finished materials and figure costs in these units. An added difficulty is presented by the fact that a large part of the manufacturing process, as practiced abroad, is hand work, and for this reason the gold content variation will be more than is found in machine-made goods.

It seems advisable, therefore, to change the tax on jewelry stocks and imports from a specific to an approximately equivalent ad valorem rate. The rates could be fixed by a careful determination of the gold content of a large number of articles in each class. This system would obviate dispute and eliminate the necessity of an enormous amount of labor and expense.

SEVENTH. PROCEDURE FOR SAFEGUARDING THE EXPORT TRADE

The jewelry industry is the only domestic consumer of gold vitally affected by the export provisions of the bill. Determination of the gold content of solid goods would require little extra expense on the part of the manufacturer, but plated-ware manufacturers would be forced to maintain carefully divided establishments, so that the net consumption of gold in exports can be figured to the satisfaction of the collector. This course is expensive, due to extra clerk hire and warehouse charges, and would seriously handicap the domestic industry in competition with foreign manufacturers.

In conclusion, it may be said that the gold-mining industry needs and deserves financial help to combat the increased costs of labor and materials, and legislation of the type proposed is proved to be practical by foreign precedent. The McFadden Bill, as framed, however, will result in larger premiums than taxes collected. It proposes difficult conditions for tax collection, especially as regards finished stocks of manufactured articles and imports of those materials, and does not provide adequately for scrap material returned to the trade for manufacture. These tax provisions have created a powerful opposition from consumers of gold, which would be largely dissipated were the McFadden Bill revised to fit actual industrial conditions. The net result might be a smaller premium to the producer, but the chances of the bill becoming law would be greatly improved.

Recoveries of Metals by a Cottrell-Treater

According to tests recorded by A. B. Young in a recent paper presented to the A. I. M. E., the metal recoveries at the Tooele plant of the International Smelting Co. on the flue gases from the McDougall roasting furnaces by a Cottrell treater were: Copper, 98.2; lead, 81.2; silver, 96.5, and gold, 96.4 per cent. The total metal recovery amounted to 93.97 per cent. The velocity of gases through the treater (actual conditions of temperature and pressure) was 21.45 ft. per sec., and the volume under the same conditions was 146,004 cu.ft. per min. The temperature at the outlet averaged 260 deg. F. (127 deg. C.) and at the inlet 280 deg. F. (138 deg. C.).

Analyses of the precipitated dust in the successive hoppers of the flue showed an interesting relation. Copper, gold, silver, insoluble iron, and lime were in greatest percentage in the first two hoppers at the intake and diminished to a marked extent toward the outlet. Lead progressively increased in percentage and was highest at next to the last hopper. The power input to the treater could not be accurately stated, but for volumes from 125,000 to 150,000 cu.ft. per min. the average power approximated 8.4 kv-a. for the first electrical section and 5.5 kv-a. for the second.

The first section accounted for about 85 per cent and the second for 15 per cent of the dust. Sphere-gap peak voltages ranged from 30,000 to 35,000. Each section contains two 10-ft. banks of plates of an effective length of 20 ft. The treater consists of a flue 10 ft. high, 12 ft. wide and 61 ft. long. Four banks of No. 20 corrugated iron plates, placed vertically and running longitudinally, give an effective treater length of 40 ft. Spacing between rows of plates is 9½ in., giving sixteen rows of plates to a bank. Midway between the rows is a vertical row of ¼-in. pipes running longitudinally. The vertical spacing between them is 6 in. The plates are grounded and the pipes are connected to the feed wires.

America's Share of the World's Gold

Of a total accumulation through the ages of \$8,000,000,000 in monetary gold, the United States is estimated to hold \$2,500,000,000, or 30 per cent of the world's supply. Gold holdings were increased greatly during the war because of the heavy shipments of gold made by other nations to the United States in payment for commodities.

Mining Engineers of Note

A. E. Bendelari

BY P. R. COLDREN

Written for *Engineering and Mining Journal*

WHEN the late O. S. Picher, president of the Picher Lead Co., decided that his company, long exclusively engaged in lead smelting, ought to enter the mining branch of the industry, he appreciated the importance of selecting the best man available to become manager of mines. After careful consideration he employed A. E. Bendelari, of Joplin. The venture turned out to be a bigger undertaking than even Mr. Picher had imagined. The flat prairie land north of Commerce, Okla., where Mr. Bendelari started sinking five shafts on March 11, 1915, quickly became a modern mining camp of 10,000 persons. Mr. Bendelari, by virtue of his position with the Picher company, encouraged and guided this phenomenal development, being at all times at the very center of its activities. His task was mining development primarily, of course. The Picher company entered the mining game in no half-way manner. Within three years it had eight concentrating plants in operation in the new field, and today it is handling over a million tons of rock annually; and at all times its leasing and sub-leasing activities have extended over the entire section. But besides the executive ability required, it was also demanded of Mr. Bendelari that he assume the responsibility that naturally falls to the guiding spirit of a new and rapidly growing municipality, such as Picher. Mr. Bendelari measured up to this responsibility in a manner highly satisfactory not only to the far-seeing and broad-visioned man who had employed him, but also to the people of the community.

The Picher Lead Co. was consolidated with the Eagle Lead Co., of Cincinnati, in 1916, Mr. Picher becoming president of the new company, and the change meant only increased responsibilities for Mr. Bendelari. He continued as manager of mines in the Tri-state field, and in recent years has been supervising the company's zinc smelter at Henryetta, Okla., and the gas fields operated by his company near there. His record and ability were officially endorsed in February, 1920, when he was elected a vice-president of the Eagle-Picher company.

Mr. Bendelari has been engaged in the mining business since leaving college. He was born at Toronto, Ont., Nov. 23, 1879, and attended Upper Canada College there. He came to Joplin in 1900, and has been engaged in operating lead and zinc mines in this field ever since.

Immediately before accepting a post with the Picher Lead Co. he was with the Underwriters' Land Co., and it was while employed by the latter company that he operated the Yellow Dog mine, at Webb City, one of the best-paying properties opened in that camp. Like many successful men, Mr. Bendelari ascribes his achievements to his ability to surround himself with capable and loyal men. Some of his assistants have worked with him for more than ten years; six men now in the employ of his company have been his associates for sixteen years, and the Rev. Wesley Post, who is known from one end of the district to the other, has been with him for eighteen years. Mr. Post, who is pastor of a Picher church, where he preaches every Sunday, has charge of all the Eagle-Picher sludge mills. Oddly enough, Mr. Bendelari has two other



A. E. BENDELARI

ministers on his payroll, the Rev. Fred De Mier, who is in charge of the company's flotation plants, and the Rev. Frank Bray, who is ore weigher at the company's plants and is also Boy Scout Master for the Picher field. Each of these ministers has a church in Picher, and Mr. Bendelari thinks he is the only mine manager in the country employing three regular clergymen.

Mr. Bendelari is a member of the A. I. M. E. His development as a mining man has progressed parallel with the growth of the company that employed him, and he has shown his eminent fitness for the position he holds. He is quiet and unassuming in manner, but there is never any question as to his authority. There is nothing of the old-fashioned, blustery "boss" about him. Bendelari's success has come through his ability to keep close to his men to have things go as he wants them to go without seeming arbitrary or dictatorial. He is loved by his men, and his influence is steadily increasing in the Tri-state mining field.

BY THE WAY

Forty Redskins Bite the Dust

Foreign labor has generally been depended upon for underground work in this country. When scarce, Americans of foreign descent are mustered into service, but we had not heard of any real simon-pure Americans—American Indians—being engaged in such work, until recently. We understand, however, that forty full-blooded Navajo Indians have been employed in the Bullion tunnel workings of the Smuggler-Union Mining Co. at Telluride, Col. The management found labor so scarce that the experiment was decided on, and the redskins were persuaded to leave their homes in New Mexico. We await with interest the outcome, for the American Indian is particularly fond of the open air.

The Etymology of Siskiyou

A writer in the November *Sunset Magazine* relates how the rugged Siskiyou Mountains, the dividing line between Oregon and California, were so named. The story is substantiated by several old pioneer miners of Siskiyou County, Cal. These mountains recall the days when the only evidence of civilization in the Pacific northwest was represented by the old Hudson's Bay Company. It is said that the company had a trading post at the headwaters of the Sacramento River in California, where the stream was so narrow that it was crossed on six huge stepping stones. In the language of the French trapper, it was known as the post of the "six caillaux" (six stones), and the first American settlers quickly transformed the French word into American phonetic spelling as "Siskiyou."

Nature Still Supreme in Making Diamonds

Newspaper reports recently told of a German explosives firm which had secured the rights to a patent for the manufacture of diamonds and would produce several hundred carats daily. Later reports stated that the firm had found the diamonds were not equal to the natural product and had cancelled its contract with the discoverer. Artificial diamonds have been made, but only of microscopic size. However, the ruby, topaz, sapphire, amethyst and emerald, precious stones of the corundum class, are often made by artificial methods. The product is in many cases superior to the natural stone and of equal value in the market. When an imitation has all the qualities of the original it is no longer an imitation but the thing itself. Diamonds have so far been a stumbling block, owing to the difficulty of getting carbon into the liquid state from which the diamonds can crystallize. Even were a process discovered it is likely that its cost would be prohibitive.

Translating Mexican Prices

An easy way to convert Mexican prices per kilo into their American equivalent is given in *The Mexican Review*. Considering the rate of exchange as two pesos in Mexican coin equals one dollar in American coin, we have only to remember the magic number 23. For example: If frijoles are quoted at 35c. per kilo, their value per pound in American money would be 23 per cent of that, or 8.05c.

Wanted: A Shortstop To Mine Copper

Accomplished entertainers and skilled athletes are as welcome in most mining camps as in college fraternities. A dinky brakeman may have more knowledge of baseball than of railroad operation, and be hired for that reason. The following, which we clip from the *New York Sun*, illustrates the point:

"Can you play baseball, handle any musical instrument, or sing?"

This was the first question asked recently of an applicant for a position as a stenographer for a copper concern having mines in South America. The young man had the travel urge and was anxious to see something of the land to the south, but he looked dazed.

"Say, I want a job as a stenographer, not a ball player or a prima donna," he replied.

"Yes, yes, I know all that. But down there in Peru the men are living in a community separated from the rest of civilization by about one hundred miles of railroad track, running up the steepest grades in the world.

"To make good down there, where they have no amusements except the abilities of the men in the group, a man has to be able to do something else besides his job. There are movies, of course, and a club and occasional dances, but baseball and singing are the best forms of relaxation they get. And the superintendent wrote up last week and said he had lost the star shortstop for the upper mine team. He wants a man who can take his place."

"Well, now you put it in that light, I don't mind telling you," the applicant broke in, "that I do nothing else in my spare time but play baseball. That is, when I am not banging on the piano or singing in the glee club I formed in the last office I worked in."

He got the job.

Magnesium From Sea Water

That sea water contains small quantities of gold has been proved, and a large number of people, now sadder but wiser, have thought at various times that it could be profitably extracted. Gold will have to be worth considerably more than at present for this source to be utilized, but there is a possibility of other metals being obtained from sea water, magnesium for example. The new salt works which are now nearly ready for operation at Bergen, in Norway, it is said will produce 100 tons of metallic magnesium per year, the raw material being sea water, which contains about four-tenths of 1 per cent of magnesium chloride. In this country magnesium liquors obtained in the treatment of saline deposits have generally been wasted, as there was little demand for any product which could be made from them. Increased use of the metal in airplane construction, coupled with cheap electric power, no doubt induced the Norwegian company to undertake its manufacture. The company's "ore" reserves should be ample!

Stale News About the Weather

We have read a report of a certain rock in Mexico which changes color with the weather, thereby acting as a barometer for the neighborhood. The trouble with these color barometers is that they tell what we already know. When it is raining they say it will be wet, and when it is dry they indicate fair weather. It has also been our experience that ordinary barometers, as individual instruments, are poor weather forecasters. As the weather begins to look stormy, the barometer begins to go down. It is only when reports from different sections of the country can be compared that the reading is valuable. Even then the Weather Bureau has been known to make mistakes.

CONSULTATION

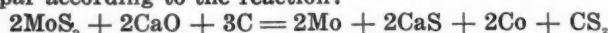
The Metallurgy of Ferromolybdenum

"Will you kindly tell me how ferromolybdenum and calcium molybdate are manufactured? Is there any literature upon the subject? Also, is there any market at this time for molybdenite concentrates containing 65 to 85 per cent MoS₂, and, if so, can you tell me where that market is, and what use is made of this ore, and about what price is obtained? What is the importance of the industry?"

Ferromolybdenum and calcium molybdate are generally manufactured in an electric furnace. During the early days of manufacture, the ferro-alloy was made from roasted molybdenite in a crucible, but this method has been superseded by reduction in the electric furnace. When the other source of molybdenum, wulfenite or lead molybdate is used, it is fused with soda ash and carbon to produce lead bullion and sodium molybdate slag. The slag is then treated in the electric furnace, carbon and suitable fluxes added, and the charge smelted to produce ferromolybdenum.

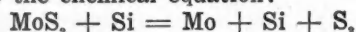
The principal methods of reducing molybdenum concentrates have been outlined by Keeney¹ thus:

1. Reducing the ore, concentrates running 60 to 70 per cent MoS₂ (molybdenite, wulfenite), or sodium molybdate slag, with carbon, excess of lime and fluor-spar according to the reaction:



The reaction works out closely to the theoretical, and there is no difficulty in making a product containing about 0.1 per cent sulphur; the product will contain 1.3 to 3 per cent carbon. The crude metal may be broken up and refined with an oxidizing slag of iron ore, if a lower carbon alloy is desired. The quantity of iron in the ferromolybdenum is varied by the addition of iron turnings in the smelting furnace or iron oxide in the refining furnace.

2. Silicon metal may be used as a reducing agent according to the chemical equation:



This method has been used in the production of 50 per cent ferromolybdenum, although when this grade of product is made ferrosilicon may be used. The addition of lime helps to slag the sulphur as calcium sulphide.

In using sodium molybdate slag to manufacture the alloy the following equation expresses the reaction:



According to Keeney, the use of sodium molybdate requires considerably more electric power than the other reactions, because very little reduction occurs until all free soda salts which may be in the slag are driven off. The regular grade of sodium molybdate slag used for this purpose contains 30 to 40 per cent MoO₃. The slag from the smelting of wulfenite crushed to about one-half inch pieces is smelted in a single-phase electric furnace of the Siemens type, lined with magnesite. Iron ore may be added to produce an alloy containing 60 to 65 per cent molybdenum.

¹"Manufacture of Ferro-Alloys," R. M. Keeney, *Transactions of the American Institute of Mining and Metallurgical Engineers*, Vol. LXII, pp. 28-32.

If the ferromolybdenum contains 80 per cent molybdenum and under 1 per cent carbon it cannot be regularly tapped from the electric furnace, because of its high melting point. For this grade of alloy, a furnace of the knock-down variety must be used to facilitate removal of the bullion—slag being tapped out first and the metal dug out. A 50 to 60 per cent low-carbon product can be tapped and a considerable quantity of this grade is made in tapping furnaces.

The largest producer of ferromolybdenum in the United States produces two grades of ferromolybdenum, both containing 50 to 60 per cent metallic molybdenum. The "Regular" grade is guaranteed to contain a maximum of 2 per cent carbon and the "Special" 0.5 per cent. The "Regular" grade is the commoner. The calcium molybdate produced contains about 42 per cent of metallic molybdenum, with no free carbon or sulphur, the remainder being lime.

Ferromolybdenum is usually packed in kegs containing about 400 lb. net, whereas calcium molybdate is packed in sheet-iron drums or sacks.

Ferromolybdenum is added to the steel as a fixed addition. Nearly all of the molybdenum remains in the steel. It has been stated that the addition of ferromolybdenum produces the same effect as the addition of ferrotungsten, with the important distinction that lesser amounts of molybdenum are necessary. A high-speed steel ordinarily containing 18 per cent tungsten may require only 6 to 9 per cent of molybdenum and have the same properties. Proper heat treatment of the alloy-steel is necessary.

The production and sale of molybdenum concentrates has increased tremendously during the last six years, as figures given by the U. S. Geological Survey indicate:

	Quantity Sold, Pounds	Value
1914.....	1,297	\$1,297
1915.....	181,769	114,866
1916.....	206,740	205,000
1917.....	350,200	495,350
1918.....	861,637	1,253,700
1919.....	(a)	(a)

(a) Survey not at liberty to publish figures, as there were less than three producers in 1919.

The molybdenum production of the United States is almost entirely confined to the large deposits of the Climax Molybdenum Co. at Climax, Col., near Leadville. The New York market for molybdenum at present is dull, and quotations made are purely nominal. Buyers maintain that 50c. is a reasonable market price for high-grade concentrates, whereas the seller's conception is 60c. per unit.

The literature on the metallurgy of molybdenum is scant. The article by R. M. Keeney, referred to elsewhere, is very informative. Bulletin 111 of the U. S. Bureau of Mines, "Molybdenum, Its Ores and Their Concentration," covers thoroughly the milling of molybdenum minerals, and contains a valuable and selected bibliography. It can be obtained for 30c. from the Superintendent of Documents, Washington, D. C. The U. S. Geological Survey in a pamphlet on molybdenum in 1918 gives a later bibliography upon the subject.

THE PETROLEUM INDUSTRY

The Diamond Drill as an Aid to Oil Prospecting

Methods Similar to Those Used in Determining the Extent and Value of Ore Deposits Offer Possibilities in the Petroleum Field—Considerable Saving Can Be Affected in Reducing the "Dry Hole" Hazard

BY ALBERT H. FAY

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Written for *Engineering and Mining Journal*

THE diamond drill has been successfully used in prospecting for coal, iron, and copper deposits, and has made it possible to estimate closely the quantity, value, and actual dimensions of ore deposits having no surface outcrop. Therefore, why not use the diamond drill that has proved so successful in metal mining to locate geologic structures capable of containing oil?

The production of oil is rapidly approaching the stage where the best engineering talent must be brought into play. In the matter of recovery of oil from oil-bearing sands this industry lags far behind either coal or metal mining. Principles and methods that have been successful in actual mining must be extended to petroleum mining, so that the ultimate recovery shall be 90 per cent, instead of 15 or 20 per cent, as at present. Production costs per unit must be lowered by increased efficiency. Development costs can be lowered by reducing the number of needless dry "wildcat" wells, and this may be done by utilizing the diamond drill of the iron or copper country.

LACK OF SURFACE INDICATIONS HAMPERS EXPLORATION

The geologist and engineer realize the difficulty of tracing anticlines, domes, or terraces where surface outcrops are few or possibly not in evidence at all, as in the Red Bed country of Oklahoma, where the Red Beds are from a few hundred to 3,000 ft. thick. The oil companies also realize the excessive expense involved in thoroughly drilling a country so destitute of reliable surface indications as is central and western Oklahoma.

In checking up the logs of a few wells drilled in the Red Beds, it is noticeable that at varying depths of 300 to 800 ft. there is usually some one stratum that is sufficiently developed to be used as a horizon marker, at least over a small area, of four or five square miles, and perhaps as much as a township.

As examples of these reasonably reliable formations, may be cited the following: A well at Mulhall, Logan County, Okla., where 28 ft. of limestone was found at a depth of 335 ft.; near Oklahoma City, in Sec. 5-11-2, there is a 4-ft. bed of gypsum at 512 ft. and a 5-ft. bed of gypsum at 585 ft.; at Clinton, in Custer County, 12 ft. of gypsum was found at 102 ft. and 10 ft. at 402 ft.; in Sec. 23-18-4, Payne County, there is a 4-ft. stratum of hard limestone at 714 ft., and 10 ft. of hard limestone at 770 ft.; at Gate, Beaver County, is a gypsif-

erous limestone at 395 ft. followed by 12 ft. of white limestone; at Enid there is a limestone 2 ft. thick at a depth of 830 ft. Other instances could be cited, but the above data are sufficient.

LOGS OF STANDARD AND ROTARY DRILLERS DIFFER

It is not unreasonable to suppose that such distinct strata as are indicated above may cover an area of one to three miles in any direction from the drill hole as a center. However, other holes put down in the same section by a different driller may not show the same formation, by reason of lack of uniformity in the way drillers report their logs. A rotary driller would call gypsum a "soft" rock, whereas a standard driller would likely term it a "hard" or "tough" rock. Gypsum, being soft, cuts readily with the rotary type of drill, whereas with the standard tools progress depends upon the percussive effect of the drill upon the rock. A gypsum bed does not lend itself to shattering when struck, and especially so when confined under pressure, as in its original bedding. The true character of the rock may be established beyond doubt by the use of the diamond drill and a thorough study of the core which it is possible to obtain. There can be no mistake in the identification of rock specimens as obtained from drill cores; they are large enough to contain fossils if any are present and of sufficient size to be determined readily by the naked eye. Should this fail, the high-powered microscope will tell the truth, and the chemical laboratory may be used as a last resort. The diamond drill makes available a complete core from the surface to the bottom of the hole, except possibly where the formation is soft.

How can this be applied to structure study? A standard or rotary drill hole, at an enormous cost, reveals, at a depth of 3,000 ft., one of two things—a dry hole or an oil well. No structure is defined, for the hole represents only one point in a plane and a certain sand or rock at a specified depth. A second well near by may be a little deeper or shallower to show the same information. The two holes may indicate a monocline, or one limb of an anticline. It therefore requires at least another well of about equal depth to possibly show a structure, and the true structure may not be determined unless six or eight wells are drilled.

As pointed out in an excellent paper by George E. Burton, of the Oklahoma Geological Survey, the money

spent for a standard or rotary drill hole 3,000 ft. deep is sufficient to put down twelve diamond-drill holes to a depth of 800 ft. This number of holes, judiciously placed, would determine with a reasonable degree of accuracy whether any well-defined structure existed, whereas with the churn drill it would be necessary to put down several additional deep holes to prove the territory good or bad. It will be seen, therefore, that by properly using the diamond drill for determining underground structure, a comparatively large area can be mapped at the cost of one deep test by standard or rotary drills.

Once a structure is outlined the standard or rotary drill would be brought into service and holes drilled according to underground conditions. It is not likely that the diamond drill would be used in drilling production wells, although the manufacturers are confident it is possible to make drills large enough to utilize a 3-in. casing at depths which extend from 3,000 to 5,000 ft.

DRILL HOLES IDENTIFY STRATUM

The geologist should not relax his studies based on surface indications, but should assemble every evidence available that would indicate the possibility of a sub-surface structure. This possible structure being partly identified, a series of four or five holes at intervals of 500 to 1,000 ft. apart, placed across the supposed structure, would be drilled by diamond drill to a stratum that

could be considered as a reliable datum plane. The correct elevation of the horizon marker would be ascertained in each diamond-drill hole, and from these a fairly reliable contour or contours could be drawn and the structure defined. Two elevations would usually indicate an inclined structure, as a monocline or one limb of an anticline or syncline, and three or more would indicate the existence of an arch or dome. The stratum would, by reason of a good core, be identified absolutely, and the true structure indicated. If desired, holes at lesser intervals could be placed to determine still more detail and possibly identify and locate the crest of the structure, when production drilling would be initiated.

Diamond-drill work of this nature is being done in Illinois by some of the large companies, in co-operation with and under the direct supervision of the state geologist. It would seem that much money would be saved by adopting this method of prospecting instead of putting down so many "wildcat" wells where surface indications are unreliable. The Geological Survey of Oklahoma is collecting data on this subject by making a study of diamond-drill operations in exploring coal beds in the eastern part of the state. The Survey believes that such information will soon be of much value to the oil industry.

The sooner the operators realize the value of the diamond drill, just that soon will they reduce the "dry-hole" hazard, and thereby reduce development and production costs.

October Oil Production in U. S. Reaches Top Mark

THE following statistics of the production of petroleum in the United States east of California in October, 1920, and the two preceding months, based on reports filed with the U. S. Geological Survey, show the quantity of oil received from producers by pipe-line and other marketing companies and by refineries that receive petroleum through private pipe lines or in tank cars directly from the wells. Data concerning oil consumed on the leases and producers' storage cannot be obtained in time for use in the monthly reports, but are used in compiling the annual figures showing production. The production reported for California is the average shown by figures collected by the Standard Oil Co. and by the Independent Producers' Agency, and includes all petroleum brought to the surface.

Production of petroleum in the United States during

October reached the highest mark yet attained, being nearly 40 million barrels, or 6½ million barrels more than in October, 1919. The daily average production exceeded that of September by more than 22,000 barrels. This increase in domestic production, however, was nearly offset by a decrease in net imports of Mexican oil, even though these exceeded 10½ million barrels. Fortunately, however, there was also a decrease in the daily rate of consumption, which resulted in an appreciable addition to stocks, amounting to more than half a million barrels during October. This net increase was nearly all in domestic stocks, the large losses in stocks of California, North Louisiana and Lima-Indiana grades being more than counterbalanced by increases in stocks of Oklahoma-Kansas and North Texas grades.

The production of Texas during October, amounting

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

State	(Barrels of 42 U. S. Gallons)					
	August, 1920		September, 1920		October, 1920	
	Total	Daily Average	Total	Daily Average	Total	Daily Average
California.....	8,997,000	290,226	9,128,000	304,267	9,459,000	305,129
Oklahoma.....	9,371,000	302,291	9,093,000	303,100	9,345,000	301,452
Central and Northern Texas.....	(b) 6,148,000	198,322	5,743,000	191,433	6,654,000	214,645
Coastal Texas.....	2,264,000	73,033	2,144,000	71,467	2,615,000	84,355
Kansas.....	3,721,000	120,032	3,615,000	120,500	3,605,000	116,290
Northern Louisiana.....	(b) 3,371,000	108,742	2,644,000	88,133	2,508,000	80,903
Coastal Louisiana.....	144,000	4,645	132,000	4,400	150,000	4,839
Wyoming.....	1,524,000	49,161	1,573,000	52,433	1,693,000	54,613
Illinois.....	924,000	29,806	903,000	30,100	870,000	28,064
Kentucky and Tennessee.....	775,000	25,000	766,000	25,533	760,000	24,516
West Virginia.....	688,000	22,194	672,000	22,400	673,000	21,710
Pennsylvania.....	640,000	20,645	626,000	20,867	646,000	20,839
Central and Eastern Ohio.....	469,000	15,129	453,000	15,100	446,000	14,387
Northwestern Ohio.....	189,000	6,097	187,000	6,233	182,000	5,871
Indiana.....	77,000	2,484	86,000	2,867	85,000	2,742
New York.....	76,000	2,451	78,000	2,600	82,000	2,645
Montana.....	(c) 9,000	290	37,000	1,233	56,000	1,807
Colorado.....	10,000	323	9,000	300	9,000	290
Total.....	39,397,000	1,270,871	37,889,000	1,262,966	39,838,000	1,285,097

(a) Revised. (b) Includes some petroleum drawn from producers' storage, which was produced in previous months, but not heretofore credited to production. (c) Cat Creek field not included.

to 9,269,000 barrels, a daily average of 299,000 barrels, makes that state a close third in rank as compared with Oklahoma, whose daily average was 301,000 barrels, and California, with 305,000 barrels. Production increased during October in California, Wyoming, Montana, and New York as well as in Texas. Slightly decreased daily average production is reported for the other states.

Method for Determining Water in Petroleum*

The Pittsburgh petroleum laboratory of the Bureau of Mines has recently developed an improved method for the determination of water in petroleum emulsions which has been described in detail in an article entitled "A Convenient Method for the Determination of Water in Petroleum and Other Organic Emulsions," by E. W. Dean and D. D. Stark (*Jour. Ind. and Eng. Chem.*, Vol. 12, May, 1920, p. 486). It is a modification of the familiar procedure of "distillation with an immiscible solvent," the improvement consisting of the use of apparatus that is much more convenient than any previously employed. The method has been extensively employed for determining the water content of heavy fuel oils, but has been applied also to several other types of emulsions, including shale oils, tars derived from coal, greases, and mixtures of powdered coal, oil and water.

The equipment is, with the exception of two items, made of parts that are obtainable from the ordinary stock of chemical supply houses. The two exceptions are, (1) The so-called "distilling tube receiver," and (2) the electric heater. The former is an essential part of the equipment; the latter is a convenient accessory, but it can if necessary be replaced by a gas burner.

Evaporation of Petroleum Stored in Tanks

The results obtained from the many tank experiments, according to A. R. Elliott in the October number of *Reports of Investigations*, U. S. Bureau of Mines, emphasize the fact that evaporation of oil depends on its temperature and the amount of disturbance to which it is subjected. In open tanks much more oil will evaporate on a cool windy day than on a hot still day. A so-called "gas-tight" metal roof is better than one made of timber, because it is a better retainer of the gases that arise from the oil. The atmosphere above the oil in a tank is always saturated with oil vapors and absorbs more vapors only at the rate at which they are escaping through the roof. Therefore, in a tank with a gas-tight roof, as soon as the space above the oil becomes saturated, no more evaporation takes place.

When the sun heats the outside of an unprotected tank the oil and gas inside expand rapidly. In fact, in many of the oil fields the temperature is sufficient to distill the higher fractions from the oil while it is in the tank. This high temperature causes the expansion of the oil and gas and the generation of more gas, which in turn causes a pressure on the roof, resulting in the escape of gases through every accessible hole at a greatly increased rate of speed.

For maintaining a low temperature, the lagged or shedded tank was demonstrated to be the best protection, as it was surrounded by still air that made an excellent insulation. This tank, in consequence, also showed the least amount of loss by evaporation. The other kinds of protected tanks in the order of their low

temperatures and decreased rates of evaporation were: (a) The water-sprinkled, white painted tank; (b) the water-sprinkled, black painted tank; (c) the glossy white painted tank; (d) the water-topped tank; (e) the black painted tank; (f) the oil-stained, loose-roofed tank. The rate of evaporation, it was noticed, decreased with the decrease in temperature of the oil under ordinary conditions.

The part of the oil that evaporates is gasoline, which is at the present time the most valuable part of the crude. Such data as were collected show the annual losses in large tankage to range from 5 per cent to as much as 25 per cent.

Recoverable Oil in Byproduct Sands*

A survey of the oil districts of California has been made by the Bureau of Mines, to ascertain whether the visible masses of wasted oil-bearing sands would be a profitable source of supply. From the data collected, it is estimated that 2,359,100 bbl. of oil, valued at more than \$3,500,000, could be obtained from the sand piles about producing wells and from the outcroppings in the vicinity of the fields. Also, many times that amount of oil, scattered over nearly the total oil-producing area, might be recovered from seepage. Seepage, in this case, is the oil that is permitted to return into the ground or remain on the surface of oil-saturated ground.

As possible means of recovering a large amount of oil from these wastes, the following should be considered: Recovering oil left in the sand that is produced with the oil; reclaiming the oil that seeps into the ground through waste in production; and mining and treating the material in oil-bearing outcrops and asphalt beds that occur in some parts of the state.

Some Geography Maps Misleading

Geographers have long realized the advantages of making a series of maps of the world on a uniform scale. It is unfortunate for school children that the geographies do not show all countries by maps on a single, uniform scale, for unless a student observes carefully the figures showing the scale of each map or those showing the area of the country mapped, he is likely to get the impression that distant lands, which are generally mapped on a small scale, are smaller than those with which he is most familiar. For example, in maps of Australia most geographies show the country on a small scale—about one-third as large as that used for the map of the United States; yet Australia is in fact nearly as large as the United States—only about one-fortieth (2½ per cent) smaller. China is generally shown smaller in area than the United States, yet it is about one-third larger.

The preparation of maps of the entire world on a uniform scale of one to one million—that is, maps on which one unit (any unit—inch, centimeter, millimeter) represents one million like units on the ground—has been under way for several years, and the U. S. Geological Survey has made considerable progress in its work on the parts of this map that were assigned to the United States. The principle used in preparing these maps, if adopted by the publishers of school books, will make it possible to present to the student an accurate impression of the relative sizes of the countries of the world.

*Abstract of a paper by E. W. Dean and W. A. Jacobs in Bureau of Mines *Reports of Investigations*.

*Abstract of a paper by A. R. Elliott appearing in Bureau of Mines *Reports of Investigations*.

NEWS FROM THE OIL FIELDS

New Field in Texas Attracting Attention

From Our Special Correspondent

North Texas oil production is decreasing, the largest falling off being in the Burkburnett district and in Iowa Park, followed by Desdemona. This decrease is partly offset by an increase in the Eastland-Ranger district and by the new shallow wells in the Kemp-Munger-Allen section of Wichita County. These wells are only 1,500 to 1,600 ft. deep while the older wells produced from a sand at 1,750 ft. The new South Bend field in Young County is also producing, but has no pipe-line connections yet. Recently the No. 3 McClausky well of the Panhandle Oil & Refining Co. and the M. K. Graham well of the Oklahoma Petroleum Co. were completed, both making 800 to 1,000 bbl. per day. The McClausky No. 2 well is making 25,000,000 cu.ft. of gas daily. About 30 rigs are in place, several of them drilling. More than one sand is said to occur in this field between 1,875 and 2,250 ft.

The total production of the Texas Gulf Coast fields has decreased 20,000 bbl. from its peak of a few weeks ago. The major part of this decrease is in the West Columbia field. The big wells there are not only producing less oil but showing some salt water for the first time. The Hogg No. 49 well of the Texas Co. is making about 21,000 bbl., of which 25 per cent is salt water and sediment. All the wells in the Jackson 50-acre tract, or what is known as the north extension of the West Columbia field, are showing more or less salt water. The far east side of the old field continues to look good; there the production is found at about 3,600 ft. Productions from Hull and Goose Creek have also fallen off because no new wells have been brought in recently to offset the normal decrease. In general, development work on the Gulf coast is greatly hindered by wet weather and extremely bad roads.

Rock Creek, Wyo., Field Has 15 Producing Wells

From Our Special Correspondent

Well No. 4 of the Elk Basin-Ohio Oil Co. in the Rock Creek field came in recently making 600 bbl. and increased later to 1,200 bbl. This well is on Sec. 34, on land leased from the state. The field now has fifteen producing wells, four from the top sand, five from the middle, and six from the deepest sand, which is likewise the best producing.

The pipe line to Laramie is now carrying an average of 6,000 bbl. per day.

The Iowa-Wyoming Oil Co., now has a daily output of 1,000 bbl. from the

Bolton Creek field south of Casper. Four more wells are being drilled by this company and four additional wells will be spudded in soon.

The Buck Creek well No. 29 in the Lance Creek field, at one time the largest producer in the field, gradually ceased flowing. Examination of the casing showed it to be choked with paraffin, and upon removal of this obstruction it began flowing again. A new joint well is being drilled here by the Buck Creek, the Ohio and the Western States Oil companies.

New producers have been completed recently in the Osage field by the Sinclair Co., Chugwater Oil & Gas Co., and the Arksarben Oil & Gas Co. The completion of the pipe line of the Illinois Pipe Line Co. has solved the transportation problem, and refining companies are now bidding for the field's production.

Mexican Oil Activities

From Our Special Correspondent

Another of Mexico's big producing wells have gone into the discard, Well No. 1 of the Empire Co. on Lot 114, Chinampa. This well has been showing a trace of sediment lately and on Nov. 21 went to 25 per cent salt water. The well was brought into production the later part of July this year and has been producing at the rate of 25,000 bbl. per day ever since that time. On the same day "Deacon" Thompson brought in his third well on Lot 114, Chinampa. This well is within eight hundred feet of the Empire well and will probably last about two months. The pay was struck at about 1,950 ft. When the lime was first encountered the well flowed under heads at irregular intervals, but at the end of four hours it was flowing quite steadily, throwing the oil several feet over the top of the derrick. The well was then shut in and a pipe line connected up to take the production at once. The well is good for a production of about 30,000 bbl. a day.

The Aguila Co.'s well on Lot 245, Amatlan, has been pinched in due to the showing of salt water. This well was good for 30,000 bbl. but is now flowing at the rate of 10,000 bbl. per day.

The Mexican Gulf Co. have the tools jammed in the hole on Lot 146, Amatlan, and it will be necessary to pull all the casing to withdraw the tools. The company was about ready to bring the well in when this accident happened. It will cause a delay of about a month in getting the production from the well, which will be a great handicap, as the Aguila Co. has a hole going down offsetting this well and the Cortez Corporation has a hole down 1,800 ft. on Lot 148 adjoining.

Lee County Leads in Kentucky Production

From Our Special Correspondent

A total of 746,818.61 bbl. of oil was produced in Kentucky during the month of October, according to a report recently issued by the Kentucky Oil Men's Association. This is the first complete report for one month's production that has been made in Kentucky, so no comparative estimate is possible. It is believed, however, that this represents the highest mark in production in the state thus far. Lee County led the list with 440,912.69 bbl.

Beverley & Ramsey struck a flow of gas on the Roberts farm in Johnson County and are nearing the sand with every indication for a big well. The well of J. K. Charles and associates on the Rice farm is in the sand with a good showing.

The well on the Waller lease, Warren County, is flowing at a rate of one and one-half barrels a minute. This lease is located southeast of the Madison lease. The Big Boone Oil Co. reports a good well on the Tarrants lease. The well flowed 400 bbl. the first twenty-four hours. Cramer and associates have drilled in their No. 2 well on the Bud Taylor lease, estimated at 100 bbl.

The Velvet Oil Co.'s No. 2 on the W. T. Bertram lease, Wayne County, came in and is estimated to be a 500-bbl. producer. This is the fifth big well that has been drilled in this territory in the past few weeks.

Heavy Flow Expected in Cat Creek Well

From Our Special Correspondent

West Dome Oil Co. financed by Con F. Kelley, president of the Anaconda Copper Mining Co., has brought in a production in the Cat Creek field of 350 bbl. daily, although the sands have not yet been reached. First reports were that the sands have been encountered, the oil rising to a height of 1,000 ft. in the casing. The bottom of the well is heaving heavily under the pressure shown and it is expected that the sands will be reached within 40 ft. Precautions are being taken to receive a heavy oil flow and until these are completed the sands will not be drilled into.

The Frantz Corporation, a subsidiary of the Elk Basin Consolidated, brought in its No. 4 well recently in the Cat Creek field, with an estimated production of more than 1,000 bbl. Some estimates placed its flush output as high as 2,500 bbl.

Ohio Oil Co., a subsidiary of the Standard Oil of Indiana, drilling in the Ragged Point field, southwest of the Cat Creek, has struck a heavy flow of wet gas.

Book Reviews

Political and Commercial Geology and the World's Mineral Resources. Edited by J. E. Spurr. First edition; cloth; 9½ x 6; pp. 562. New York. McGraw-Hill Book Co., Inc., 1920. Price, \$5.

This compilation is the fruit of a systematic, carefully thought out and applied study of the world's chief metal and mineral products, and of the political, industrial, and commercial factors controlling their production and distribution. The respective papers are by specialists in the technical subjects covered. In each chapter, the uses, geological distribution, geographical distribution, political and commercial control, and position of the leading nations are treated with respect to the metal or mineral discussed. During the war, the lack of such information in concrete, available form was keenly realized, and an effort was made under the direction of Mr. Spurr to compile the needed data. A series of confidential papers on the governmental and financial control of the world's mineral resources was published, but the information was not available to the general public. After the conclusion of hostilities, the papers were edited and condensed by Mr. Spurr, and are now published in this compact form.

Anyone who has had occasion, say, to investigate exactly what portion of the world's production of manganese Brazil is responsible for, or what the chief copper-producing interests in the United States are, or how deeply foreign capital is interested in Mexican lead production, has usually been forced to conduct exhaustive and time-consuming search in an effort to obtain such information; for most books, pamphlets, papers, and bulletins upon such subjects have failed singularly to give an all-inclusive and broad view. Usually, the information presented is of a dry statistical nature, and its correlation to the wider aspect of a world survey has ordinarily been disregarded.

The mineral resources of the world are presented in Mr. Spurr's book in logical order. First, a study of petroleum, an extraordinarily important fuel, is followed by coal and iron, "the backbone of all our mechanical achievements." Then come the metals used in steel making—chromium, manganese, and the rarer substances of the ferro-alloys. The major metals (exclusive of iron)—copper, lead, zinc, tin, antimony, and aluminum—follow. Next are presented the non-metallics, abrasives, and refractories—magnesite, corundum, mica, graphite, and others—followed by the important fertilizer group—phosphate, nitrogen, potash, pyrite, and sulphur. Last, but not least, the precious metals—gold, silver, and platinum—are treated; and a final survey, "Who Owns the Earth?" by Mr. Spurr, completes the volume.

The outstanding features of the book

are its practicability and usefulness. With a minimum amount of effort at research, the business man or any one else interested in the world's mineral resources can quickly ascertain the principal economic features of any general mineral situation. It is a sound attempt at a practical adaptation of economic geology to commercial and general business uses, and it is unquestionably the only work of its kind extant. It should be upon the reference shelf or table of every man whose business or financial interests or professional needs require condensed and authoritative data on important commercial and financial matters with relation to the subjects treated, the volume being patently designed to serve both the commercial and professional requirements of all interested in the production, marketing, and utilization of commercially important metals and minerals, and in the political and commercial developments incident to the recurrent and recent attempts to direct their exploitation and control.

As with all pioneering, the hewing of a path is difficult, and it is only after the course has been definitely mapped and retraced that its roughness disappears. "Political and Commercial Geology" is essentially an initial attempt in a field untouched collectively by American authors, and for any minor shortcomings that the volume may possess, no apology is properly to be required.

No doubt, some users of the book may feel the need of a bibliography upon each subject, and others a few pages on minor minerals whose treatment is, by design, omitted in this first edition; or the lack of further information on an important subdivision of an article. To them, the brief notation on the title page of the work, "Royalties received from the sale of this book will be assigned to an institution of learning to finance further studies along the lines followed in this volume," should prove enlightening, as it furnishes an earnest that means will be provided for perpetuating the studies suggested by the work. F. E. W.

Industrial Oil Engineering. By John Rome Battle. Limp binding, 5½ x 7½, pp. 1,131. J. B. Lippincott Co., Philadelphia, Pa. Price, \$10 plus postage.

This book is a handbook of industrial oil engineering. It also deals with the practice of lubrication. Like many other handbooks, there is assembled in the volume a considerable amount of useful information related to the field. Of special interest to the mining industry are chapters on air compressors, mine-car lubrication, mine pumps, and air drills. Necessarily concise, treatment of these subjects is not sufficiently thorough to be of use in any more than a general way. It is a book, however, that should be of interest to the master mechanic as well as to the mechanical engineer. G. J. Y.

Technical Papers

Colloids in Metallurgy—Chemical Engineering and Mining Review for October (90 William St., Melbourne, price 11d.) contains the first installment (three pages) of an article entitled "Metallurgy From the Colloid Chemical Standpoint." Colloids are of more importance in physical chemistry than in metallurgy, but the author points out, among other things, the manner in which a study of this degree of dispersion of matter may help in reducing slag losses.

World's Zinc Trade—The November number of Commerce Monthly published by the National Bank of Commerce, New York, contains a six-page article on the "Zinc Trade of the World." America has become the world's chief source of zinc since Germany and Belgium have been practically eliminated.

Ontario Mining—Part III of the twenty-ninth annual report of the Ontario Department of Mines, Toronto, ninety-five pages, is devoted to the Ben Nevis Gold Area, the West Shiningtree Cold Area, the Matachewan Gold Area, the Argonaut Gold Mine and the Gowganda Silver Area. It is obtainable on request. Colored geological maps of the Argonaut Mine and West Shiningtree district are included.

Petroleum Bibliography — Bulletin 180 of the Bureau of Mines (for sale by the Superintendent of Documents, Washington, D. C., for 25c.) is a bibliography of petroleum and allied substances for 1917. The arrangement is similar to that of Bulletins 149 and 165 for the two preceding years, and includes references to published articles and patents throughout the world.

Alaskan Mineral Resources—U. S. Geological Survey Bulletin No. 712, 204 pages, obtainable upon request from the Survey, is a report of the investigations into the mineral resources of Alaska conducted in 1918. The first part of the book discusses the mineral production from the various fields in the years under review. Decreases are generally noted from the figures of preceding years. Other chapters are devoted to water-power investigations in southeastern Alaska; the Copper River nickel deposits; chromite on the Kenai peninsula; the Matanuska coal field; lode developments in the Willow Creek district; placer mining in the Tolovana district, and mining in northwestern Alaska. A few sketch maps are included.

Sewage Disposal—Bulletin No. 6 of the Purdue University Engineering Experiment Station (Lafayette, Ind.) is a thirty-five-page pamphlet discussing sewage disposal for small or isolated dwellings and small institutions. The information has a valuable application in many small mining camps.

ECHOES FROM THE FRATERNITY

Concrete Mixing Studies Summarized

Water Must Be Carefully Chosen and Proportioned—Thorough Mixing and Protection Early Demanded

[Lieut.-Col. H. C. Boyden's address to the Engineers' Club of San Francisco on "Recent Developments in Concrete" held the interest of so many engineers that we here present an all too brief abstract of his report on experiments in mixing concrete.]

The studies indicate that it is best to consider concrete's ingredients as cement, aggregate, and water. There is no particular advantage in dividing the aggregate into "fine" and "coarse," and it would be much better to consider the aggregate as a whole, with proper proportions of various sizes. The fine aggregate should be "hard" rather than sharp, as sharp sands give lower results than rounded or smooth sands. It is of great importance that the aggregate is actually clean, and free from vegetable matter. An appropriate test should be applied to determine this condition. Again fine sand behaves as coarse sand except that it requires more water to produce a plastic workable mixture. The excess of water reduces the strength of the concrete. Concrete with the same quantity of water, providing a plastic mix is obtained, would be of the same strength whatever the grading of the sand.

When studying the characteristics of the coarse aggregate one conclusion has been brought out sharply; namely, that the hardness of the aggregate is a secondary consideration as compared with other factors in developing high crushing strength in concrete, and of less importance than ordinarily supposed in developing wearing qualities.

The reason for high compressive results where a light, soft aggregate is used, is the reduced water content, due to the porosity of the aggregate. The water content is found to be the governing factor.

The remaining ingredient, water, is of equal importance with the cement in obtaining good concrete, and yet it is generally not mentioned in specifications and frequently not even reported in test data. It is safe to say, however, that strongly alkaline waters should not be used and marsh water should be looked upon with suspicion until tested in concrete and found satisfactory.

The temperature of the mixing water was found to have very little to do with the strength of the concrete at seven days to one year. Hot water may be safely used in removing frost from the aggregate.

Proportioning

The present method of using arbitrary volumes is wrong. There is one single proportion which will give the

best results with a certain mixture of given fine and coarse aggregate. The water-ratio, the ratio of volume of water to the volume of cement, is the most important element of a concrete mix. If one cubic foot of water (7.5 gal.) is used for each sack of cement, the water ratio is 1:1. The use of more cement in a batch does not produce any beneficial effect except to reduce the water ratio for a workable mix.

Fineness Modulus

The fineness modulus is a very simple function of the sieve analysis of the aggregate used for any particular concrete. The sand and stone are analyzed with a set of Tyler standard sieves, each one of which has a clear opening double the width of the next smaller. The following sizes are used: 100, 48, 28, 14, 8, 4, $\frac{3}{8}$ in., $\frac{1}{2}$ in. and $\frac{3}{4}$ in. The percentages (by volume or by weight) of the total aggregate coarser than each sieve are added together, the sum of these percentages is divided by 100 and the result is the fineness modulus. The fineness modulus of any combination of the fine and coarse aggregates may be found in exactly the same manner.

In order to make this more easily available to the engineers of the country, Prof. D. A. Abrams has worked out a table¹ containing 135 proportions with different combinations of aggregates, which if used with materials acceptable as to quality, will give a concrete with a compressive strength, at twenty-eight days, of approximately 3,000 lb. per square inch. In conformity with present practice, the aggregate is divided in the table into fine and coarse, and covers combinations of five classes of fine aggregates with twenty-seven classes of coarse aggregates. This table shows a considerable reduction in the amount of cement required as compared with previously published tables, especially when combined with the larger sizes of aggregates.

Water Content

A study of the water content has brought the most radical change in the design of concrete mixtures. There is probably no other one factor which has so great an effect upon the strength as the water content. It has been found that the less water used, down to a certain point, the stronger will be the concrete, but in actual construction one may not reduce it to the point giving the maximum strength shown in laboratory tests. The workability of the mix must also be considered, and in general terms the lowest amount of water should be used that will give a workable mix. In a one-bag batch the addition of one pint of water more than is necessary to give a workable mix pro-

duces the same loss in strength as if we had left out two or three pounds of cement. On the other hand a very lean mix with a small amount of water will not give as strong a concrete as a rich mix with the same amount of water. This is because it will require a higher water ratio to produce a workable mix with the lean mixture, thereby causing a loss in strength.

The very wet, sloppy mixtures that are being used in building construction are extremely wasteful, 50 to 60 per cent of the possible strength of the concrete being thrown away. By cutting down the water to the proper ratio, a factor of safety of five or six can be secured, and the allowable unit stress raised.

Slump Test

A simple method for determining the proper consistency in the field is the slump test. A frustum of a cone 4 in. at the top, 8 in. at the bottom and 12 in. high has been adopted as a standard. This cone is filled with the concrete to be tested, which is carefully worked with a metal rod while it is being placed, the form is immediately lifted off, and the amount of settling or slump measured. The proper slump for a mixture to be used for a concrete road surface is from $\frac{1}{2}$ to 1 in.; for mass work, from 1 to 1 $\frac{1}{2}$ in., and for walls with reinforcing bars, 1 $\frac{1}{2}$ to 2 in. In some classes of reinforced concrete work it may be deemed advisable to sacrifice a portion of the compressive strength of the concrete in order to obtain increased plasticity, in which case a slump of from 4 to 6 in. may be used, but in no case should it exceed 6 in.

Manipulation of Ingredients

It is necessary to mix the concrete at least sixty-five seconds. There is no question as to the advisability of using a batch meter on the mixer, provided one can be found that cannot be tampered with, in order to avoid controversy over the time of mixing and to insure a full minute mix for all ingredients together. The speed of the mixer within limits of 12 to 25 r.p.m. has but slight importance.

The time that can be allowed between the time of mixing and the time of placing has not as yet been made the subject of extensive tests at the laboratory. It is undoubtedly governed to a certain extent by the kind of cement used, by the temperature of the ingredients, and by the temperature of the mixed concrete. The economical haul for the job will be the governing factor rather than the fixing of a time limit.

Protection

The proper protection of concrete during the early hardening period is too often overlooked and frequently indifferently carried out. The essential re-

¹These tables are issued by Portland Cement Association, 111 West Washington St., Chicago, Ill.

quirements for proper hardening are warmth and the presence of moisture, especially the latter. The tests showed a less increase in wearing resistance and strength after twenty-one days have elapsed, and a constant rate of increase during this period. The forms and all exposed surfaces should be kept thoroughly wet, or at least very moist continuously for not less than fourteen days, and whenever possible for twenty-one days or more.

Barytes Market in England

Harrison Watson, Canadian Trade Commissioner in London, in reply to inquiries from Nova Scotia as to the feasibility of shipping Canadian barytes to Great Britain, states that several firms have expressed a willingness to handle Canadian barytes of a quality suited to the market, if prices are competitive. Before the war the chief source of supply was Germany, and though home manufacturers have since largely increased their output the domestic supply is far below the demand. Imports during 1919 amounted to 408,248 cwts., valued at £241,896, the principal sources of supply being Spain and the United States. The demand is solely for the ground and refined article, and although there are considerable deposits stated to be of high quality in the Maritime provinces and others parts of Canada development and production have so far been small. Were the industry developed competition in the British market at present prices is considered feasible, but with a drop in prices the cost of transportation would make it difficult for Canadian barytes to be laid down in England at a profit to shippers.

Geologic Instruction in Demand at Oklahoma University

The session of 1920-21 at the University of Oklahoma promises to be a banner year for the Department of Geologic Engineering, which reports an enrollment of a thousand students and the addition of three teachers to its faculty. Both laboratory and classroom space has become altogether too cramped for the purposes of good instruction. Additional accommodations will have to be provided in the immediate future if students are not to be inconvenienced. The quality of work is being improved in all courses this year, and new special courses are being offered. Director Joseph B. Umpleby announces, among other important innovations, instruction in special microscopic study of oil-well cuttings. The Roxanna Oil Co. has contributed a large number of cuttings from the Healdton field, and it is hoped to secure material from other fields through other companies. New courses by new instructors are the economic geography of the United States, Oklahoma, and Latin America, by C. J. Bollinger; economic geology and mineralogy, by O. F. Evans; and stratigraphy, by R. A. Wilson.

Eastern Canadian Provinces Desire Control of Natural Resources

The question of transferring to the Provinces of Manitoba, Alberta and Saskatchewan the control of their natural resources, now exercised by the Dominion government, is being brought prominently forward, and unless settled in the meantime will become an issue at the next general election. The Dominion government has expressed its readiness to make the transfer as soon as the terms can be agreed upon by the other provinces. The eastern provinces contend that they have an interest in the matter, having paid for the lands when they were taken over from the Hudson Bay Co., and that the western provinces now receive annual cash subsidies from the Dominion as compensation for the revenue which would otherwise be derived from the public domain. They claim that if the western provinces are granted control of their natural resources the subsidies received by the other provinces should be increased. Several inter-provincial conferences held from time to time have considered the question without coming to an agreement, and it is intimated that another conference will be called, in view of the action of the government of Alberta, which is preparing to press its claims by a law suit.

Mica from South America

The imports of mica from South America prior to the war were practically negligible, according to *The World's Markets*, relatively and as an item of trade exchange, but the war stimulus directed attention to the possibilities of securing regularly a part of the large imports of this special raw material from this new source of supply. The principal countries which are now known to have available deposits of mica of desirable quality and size for import are Brazil and Argentina. In Brazil the deposits, mainly in the contiguous states of Bahia, Goyaz, Minas Geraes, and Sao Paulo, are extensive and are now fairly accessible to railroads for transport to the ports. The quality is good and compares well with the Indian mica. Some of the large plates are 20 x 10 in., and large supplies of material 6 x 6 in. are procurable.

In the interior Province of Goyaz mica is so plentiful that the natives have used it for window panes from time immemorial. The output of the Brazilian mines is steadily increasing. The proportion coming to the United States has always been large and is becoming greater. There is a prospect of a steady and increasing supply of good mica from Brazil if the American buyers will take the trouble to encourage the relation and to seek out the producers, who are not well advised as to market requirements.

The Argentine mica deposits are mostly in the mountain provinces of Cordoba and San Luis. They are not

systematically developed, and the shipments so far made have not been of so good a quality as those from Brazil.

Brazil produced from 1902 to 1913 about 113 short tones of mica. In 1916 the production was 59 tons; in 1917 106 tons, and in 1918 and 1919 the output was estimated at 135 tons yearly. The Argentine production began in 1908 and increased to 70 tons in 1917 and to 80 tons in 1918.

Small shipments of mica from Peru were made during the war, and irregular shipments have come from Guatemala for a number of years. The product of the latter country has a green shade and is not so desired for some purposes as other grades in the market.

Institute of Mining & Metallurgy Awards Two Medals

"In recognition of his eminent services in the advancement of metallurgical science, with special reference to the metallurgy of gold," writes C. McDermid, secretary, "the gold medal of the Institute of Mining & Metallurgy, London, England, has been awarded to Sir Thomas Kirke Rose, D.Sc., Assoc. R.S.M., M. Inst. M. M. This is the highest distinction in the power of the council to bestow.

"The gold medal and premium of forty guineas founded by the Consolidated Rand Gold Fields of South Africa, Ltd., the council has awarded to H. Livingstone Sulman for his paper 'A Contribution to the Study of Flotation,' which was published in the Transactions of the Institute, Vol. 29, 1919-20, and discussed in the Bulletin in 1919 and 1920."

Brief Course for Highway Engineers Offered by U. of P.

In anticipation of a greatly increased demand for engineers, as a result of the many millions of dollars now becoming available for highway construction, Towne Scientific School, of the University of Pennsylvania, is offering a "Brief Course in Highway Engineering," for men who have had experience in highway construction, and who desire to become familiar with recent methods in design, construction, and material testing. This course will be given from Jan. 24 to Feb. 11, 1921. The first two weeks of the course will be devoted to intensive instruction in highway engineering, a study of engineering materials, the design and construction of highway structures, and the testing of materials used in road construction. The third week of the course will be devoted to a Highway Engineering Conference, at which papers will be given by eminent specialists on all the phases of the design and construction of roads. A copy of the bulletin describing the course may be secured by addressing Prof. M. S. Ketchum, Department of Civil Engineering, University of Pennsylvania, Philadelphia, Pa. The program of the conference will be ready about Dec. 15.

MEN YOU SHOULD KNOW ABOUT

Representative Marion E. Rhodes of Potosi, Mo., has been selected as chairman of the Committee on Mines and Mining.

H. R. Robbins has been visiting iron-ore dressing plants in Minnesota, Ontario, and Pennsylvania.

J. M. Libbey, manager of the Arizona United Mining Co., has gone to Mexico to examine mining property.

Capt. C. G. Collins has been examining the C. Amory Stevens ferromanganese property at Silver City, N. M.

M. W. von Bernewitz has rejoined W. H. Weed in compiling Vol. 15 of "The Mines Handbook," at Tuckahoe, N. Y.

A. R. Gordon, manager of the New York & Honduras-Rosario Mining Co., San Juancito, Honduras, is in New York City.

Col. John C. Greenway, of the Calumet & Arizona, is inspecting recent developments at the 85 Mine, at Lordsburg, N. M.

H. Foster Bain, mining engineer, landed in San Francisco, Cal., on Nov. 27, and was expected to reach Washington, D. C., early in December.

James W. Swent, mining engineer of the State of Coahuila, Mexico, is surveying new claims in the San Dimas district for E. H. Townsend.

Errol MacBoyle, mining engineer, of San Francisco, Cal., went to Mexico early in November. He will examine a number of mining properties.

Robert Linton, president of North Butte Mining Co., who has been in Butte, Mont., looking over the properties of the company, has returned to the East.

Alfredo Frey, mining engineer, formerly of Mapimi, Mexico, has moved with his family to San Juan de Guadalupe. He is operating mines in the Reyes district.

Henry Hinds, petroleum geologist, formerly with the Geological Survey and more recently with the Sinclair Oil Co., is now with the Pantoteck Oil Co. of New York City.

G. F. Loughlin, head of the division of Mineral Resources of the U. S. Geological Survey, has completed a reconnaissance of the recent development in the Tintic district of Utah.

Andrew White Newberry, mining engineer, of New York City, is on a brief visit to his home prior to an early departure for Nicaragua, where he will examine some mining properties.

Enoch Henderson, superintendent of the Franklin Mining Co., has returned to Houghton, Mich., from Detroit, where he was temporarily connected with the Rockwood Silica Sand Co.

Rush T. and Harley A. Sill, mining engineers of Los Angeles, Cal., have gone to Arizona and Mexico to examine

several properties. They expect to return to Los Angeles about Jan. 1.

F. W. Sperr, professor of mining engineering, Michigan College of Mines, has been selected as chairman of the recently formed informal organization of Copper Country mining engineers.

Lyman F. Barber, recently of Prescott, Ariz., is now in charge of the construction of the C. O. D. Mining Co.'s new mill at Kingman, Ariz., where he should be addressed, care of P. O. Box 173.

C. B. Holmes, formerly chief auditor for the War Mineral Relief Commission, has formed the firm of C. B. Holmes & Co., consulting mine, mill, and smelter accountants. His office is 434 Continental Trust Building, Washington, D. C.

Bradley Stoughton, of New York City, spent Nov. 28, 29, and 30 in Houghton, Mich., where he addressed a meeting of mining engineers at the Houghton Club. L. D. Cooper, of Minneapolis, Minn., accompanied Mr. Stoughton.

A. W. Tucker, consulting mining engineer, of Salisbury, N. C., has completed his work with the Bureau of Mines in connection with the War Minerals Relief claims, and is resuming private practice in matters relative to mineral deposits of the Southern Appalachians.

J. C. Hartness, formerly superintendent for the Bowe-Burke Mining Co., has resigned his position and will open an office in Eveleth, Minn., as a consulting engineer. For the last two years Mr. Hartness has had charge of the Burns, Moriska, and Morrow mines for the Bowe-Burke company.

Arthur Howe Carpenter, formerly of Denver, who was for some years assistant research chemist for the American Vanadium Co., Pittsburgh, Pa., and more recently metallurgist for the Colorado Vanadium Corporation, Sawpit, Col., has accepted a position as professor of metallurgy at the Armour Institute of Technology, Chicago, Ill.

Fritz J. Frank, vice-president of Iron Age Publishing Co., has been elected its president, following William H. Taylor, president and general manager for more than ten years, who is resigning because of ill-health.

William H. Taylor came to *Iron Age* as general manager when it was sold by David Williams. Mr. Taylor already had fifteen years' experience with trade and engineering publications. For a time he was vice-president of the McGraw Publishing Co., and, later, president of the Taylor Publishing Co., of Chicago, which consolidated *The Engineer* and *Steam Engineering*. He and his associates, on acquiring *Iron Age*, elevated the hardware department of that journal into *Hardware Age*.

Fritz J. Frank, who succeeds Mr. Taylor, has been with the Iron Age Publishing Co. since 1910, after an active association with other trade publications, including *Colliery Engineer* and *Mining & Scientific Press*.

SOCIETY MEETINGS

The Society of Economic Geologists holds its first annual meeting at Chicago, Ill., Dec. 28 to 30, 1920, in conjunction with the meeting of the Geological Society of America. Society headquarters and a registration book will be at Rosenwald Hall, University of Chicago.

OBITUARY

Emilio Stalknecht, mining engineer, of Parral, Mexico, and widely known throughout northern Mexico, died there the third week in November. Mr. Stalknecht had held important positions with various mining companies in Mexico, but met with a serious mine accident several years ago, injuring his health and eventually causing his death.

Regis Chauvenet, mining engineer and president emeritus of Colorado State School of Mines, died on Dec. 5, at Denver, Col., in his seventy-ninth year. Professor Chauvenet, who was born at Philadelphia, Oct. 7, 1842, graduated with the B.S. degree from Harvard in 1867; became chemist to the Missouri Geological Survey in 1872, and took the chair of chemistry and metallurgy at the Colorado School of Mines in 1883. From 1883 to 1902 he also served that school as its president, resigning in the latter year to resume private practice as mining engineer. In 1911 he published his volume "Chemical and Metallurgical Calculations."

While engaged in geologic work in northwestern India for S. Pearson & Son of London, Ralph W. Howell, formerly with the Land Classification Board of U. S. Geological Survey, was killed by savages in the Baluchistan-Punjab district. The British authorities have offered a reward of \$5,000 for the arrest of those responsible for Mr. Howell's death. Mr. Howell served with the Geological Survey from 1913 to 1919. In October, 1919, he had been granted a leave of absence to accept a position offered him by the British oil concern, and had worked for them with D. Dale Condit, oil geologist, in British North Borneo early in the present year. Mr. Howell was a native of Washington, D. C., and the only son of the late Edwin E. Howell, a naturalist and geologist distinguished for his geologic relief maps of the chief physical features of the United States. Young Howell was a past student of Columbian College (George Washington University), at Washington, and was only thirty-four years old at the time of his death.

It is understood that D. Dale Condit, chief of Mr. Howell's party at the time of the attack, has escaped to safety.

THE MINING NEWS

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

LEADING EVENTS

Annual Report of the Mint

Decrease in World's Gold and Silver Production—Mints of the Country Made a Record Coinage in 1919-1920

The annual report of the Director of the Mint, just made public, states that during the fiscal year ended June 30, 1920, the mints of the United States manufactured more coin than during any other year in their history; and Mr. Baker states that they are still running twenty-four hours a day to keep up with the enormous demand. The total number of pieces executed in the last fiscal year was over 809½ million, of which about 76 million pieces were for foreign governments, the balance, over 733½ million pieces, being domestic. The total exceeded by 43 million pieces the previous high record, made in the fiscal year 1918; it exceeded the record of 1915, a normal year, when 148 million pieces were made, by 446 per cent.

The seigniorage (profit incident to greater face value of coin than cost of metal contained) on silver coin below the dollar piece amounted to over \$3,896,000, and on five-cent and one-cent pieces exceeded \$8,218,000, giving total profits on coinage during the fiscal year of over \$12,114,000. No silver dollars have been made since 1904. Gold coin to the value of \$16,990,000 was made last year, this being the first domestic gold coin (other than memorial issues) minted since 1916.

The world production of gold during the calendar year 1919 is estimated by the Director of the Mint to have been \$365,166,077, a reduction from that of 1918 by about \$18,500,000. The production of the United States was \$60,333,400, or about \$8,000,000 less than in 1918. The gold consumed in the arts and industries of the United States during 1919 is stated to have been \$75,490,349, of which \$56,135,951 was new material. By far the larger part of gold consumed in domestic industries is purchased from the New York Assay Office, New York being the center for industries using gold. The electrolytic refineries of the Mint and Assay Service produce metal of very high fineness, above 999/1000 pure, much desired by industrial users.

The world production of silver in the calendar year 1919 is estimated to have been 174,517,414 oz., a reduction from that of 1918 by about 23,600,000 oz.; domestic production of the United States was 56,682,445 oz., a reduction

WEEKLY RÉSUMÉ

The annual report of the Director of the Mint estimated the world's gold production at \$365,166,077 and silver production at 174,517,414 oz. in 1919, a decrease from the previous year. The mints of the country have been running to capacity. A labor and power shortage combined with low metal prices has caused a slump in Cobalt mining activities. The Temiskaming mine has ceased operations. The Lake shipping season is practically complete, and few boats remain to be loaded. The International Nickel Co. intends to cut production of bessemer matte to 2,000 tons monthly. The Minnesota Fair-Tax Association will protest the tonnage tax in Minnesota. Congress is being petitioned by Colorado miners to increase the time for completing assessment work. International Mining Congress to meet in Portland early next year.

Unemployment is creating a problem in Arizona. Salt has been discovered in Northern Alberta. The students of the University of Utah have organized a mining society.

A Congressional effort is to be made to reduce the needlessly large number of Federal Agents in Alaska. The War Minerals Relief Commission is expected to conclude its work in three months, with an unappropriated balance of over \$5,000,000. The Bureau of Mines and Geological Survey ask increased appropriations for the fiscal year 1921. Manufacturing and interest in the non-metallies is increasing in the West. American capital is urged to seize in foreign lands opportunities that are being captured by other countries.

of over 11,000,000 oz. from the output of 1918. It will be noted from the above that the United States produces about one-third the world's silver. Domestic silver consumption in the industries continues high, over 26½ million ounces of new metal having been used during 1919.

The gold monetary stocks of the principal countries of the world at the end of 1919, as compiled from data available to the Director of the Mint, aggregate \$8,339,185,000; silver totals \$1,877,691,000; and unclassified metal, \$576,208,000. Paper currency stock totals \$69,929,698,000.

I. C. C. Holds Up Increased Sulphur Freight Rates

Proposed increases in the rates on sulphur in carloads from Sulphur Mine, La., to the principal points of shipment have been held up by the Interstate Commerce Commission pending an investigation of the proposed increases. The proposed schedule reduces the minimum weight from 80,000 lb. to 40,000 lb. The increase amounts to 10c. per hundred pounds to representative destinations.

Slump Noticeable at Cobalt

Labor and Power Shortage, Combined With Low Metal Price, Causes Curtailment in Canadian Camp

The recent decline in the price of silver has had a serious effect on the Cobalt camp, and this, together with the shortage of power, is already showing results. The Temiskaming mine has ceased operations until spring. The company had developed a considerable tonnage of medium-grade ore, which was profitable at higher prices of silver, but which cannot be handled at a profit under present conditions.

The directors of the Mining Corporation have passed the regular quarterly dividend of 12½c. per share, which would ordinarily have been paid on Dec. 15. The directors issued a statement in which they said that the net earnings from Jan. 1 to the end of September were slightly less than the amount disbursed in dividends during the period and that the earnings for the current quarter would not be sufficient to justify paying a dividend for the quarter. The reduced earnings were due to a shortage of labor for the first nine months of the year and to a shortage of power in the last three months; also to a heavy decline in the price of silver without any decrease of the cost of production.

The McKinley-Darragh has also passed the regular quarterly dividend of 3 per cent, which would ordinarily have been paid on Jan. 1. This company has sold no bullion since last June, and, as a consequence, a considerable portion of the cash surplus has been tied up in this manner.

With the surplus of labor there has been a marked increase in efficiency, which has helped, to some extent, to offset present conditions, but, unfortunately, not enough to make operations at most of the mines profitable. As a matter of fact, probably not more than three mining companies in Cobalt can operate at a profit under present conditions.

Lake Shipping Season Practically Complete

The ore season is practically over for the Lake Superior iron mines, as few boats remain to be loaded at any of the docks. All insurance expires for the boats on Nov. 30, which officially closes navigation on the Great Lakes, although indications are that the closing of the season may be postponed for a period of ten days or more. Ex-

tension of insurance on Lake carriers depends upon weather conditions at the close of the official season.

At the Missabe docks of the Duluth and Superior harbor the last boat cleared on Nov. 30. Only three boats remain to be loaded at the Allouez docks of the Great Northern. The Northern Pacific and Soo docks in Superior have already closed their seasons. The Ashland, Wis., ore docks of the North-Western are still loading, and at present have fifteen boats to load before the close of the season. The boats of the Pittsburg Steel Co. generally close their season Nov. 15, but owing to the heavy demand for ore at the blast furnaces they are pushing their vessels later than usual. It is reported that the North-Western docks will keep their ore supply moving as long as boats can get in and out of the harbor. The Duluth & Iron Range docks at Two Harbors closed on Nov. 27.

The amount of ore handled this season at the Allouez docks of the Great Northern R.R., according to the officials of the Peppard and Fulton contracting firm, which handles the ore for the railroad, has been one of the greatest in the history of local maritime circles. The tonnage will exceed 12,500,000 of ore shipped during the season, exceeding the 1919 shipments by more than 3,500,000.

Extensive repairs and new construction are to be carried on this winter on the Allouez docks. The outer portions of dock No. 3 are being rebuilt and a new approach to dock No. 1 is under construction.

Further Cut in Production at Copper Cliff, Ont.

The International Nickel Co., Copper Cliff, Ont., has decided to curtail operations further. About a month ago the production of bessemer matte was cut from 4,000 to 3,000 tons per month and it is now to be reduced to 2,000 tons. Two blast furnaces will be operated, in addition to the one reverberatory. Curtailment will also be made at the Creighton mine to accord with the reduced smelter production. Labor is no longer scarce and the company is releasing the less desirable workmen. A great increase in labor efficiency has been noted since the supply became more plentiful.

Association To Protest Tonnage Tax in Minnesota

A strenuous campaign has been mapped out by the Minnesota Fair Tax Association, in southern Minnesota, to convince that part of the state that a tonnage tax is unjust and unfair to the entire state. G. H. Lommen, of Biwabik, Minn., is presenting arguments against the tonnage tax and meeting with various organizations in the southern part of the state, and it is the plan of the association to conduct an aggressive campaign until the Legislature meets. To this end a large force of speakers will be in the field in the near future throughout the lower half of the state.

Occurrence of Salt Proved in Northern Alberta

Drilling operations carried on under the direction of the Alberta government at Fort McMurray in the northern part of the province have definitely proved the occurrence of an extensive bed of high-grade salt, the well having been sunk through 30 ft. of pure salt at a depth of 650 ft. The well was begun about twelve months ago but the work has all along been attended with mechanical difficulties. At the present time with the drill in the salt vein to a depth of 35 ft. work has again been halted owing to trouble with the equipment. The strike bears out the opinion of geologists that a large field of salt occurs along the Athabasca River in the McMurray region.

Colorado Miners Petition for More Time

Petitions are being circulated and signed by mining claim owners in Colorado, asking Congress to extend the time for completing assessment work from Jan. 1, 1921, to June 1, 1921. It appears that it has been particularly difficult this year to secure miners to perform the necessary work to keep mining claim locations in good standing, because the men find it more congenial to work at lower altitudes, and where high wages are offered for less strenuous work. For example, coal-mining companies have been paying wages of \$10 per day, and even more in some cases, and, as a result, the metal-mine operators have been unable to secure the men for assessment work. Metal mine owners do not ask for exemption from assessment work, but simply sufficient extension of time to protect their properties against mining claim jumpers, who are likely to be active in many localities under the present circumstances. It is understood that Congressman W. N. Vaile will prepare and introduce a resolution designed to secure relief.

Unemployment a Problem in Arizona

The local smelting plants at Douglas, Ariz., are receiving little custom ores, either in copper or silver. Small properties throughout southern Arizona are stopping operations, being unable to pay expenses on any but the best of ores, such as ordinarily would not be taken out in the course of development. All over the state a general shrinkage of mining operations is noticeable. For the first time in years unemployment has become a problem, hundreds of miners having been dropped in a season when there can be no relief further north. In Sonora the unemployment problem would be a serious one had not there been a draft of about 12,000 laborers for the cotton fields of the Salt River Valley and other Arizona points.

The Dolores and La Paz mines in San Luis Potosi, Mex., have been obliged to close, owing to a lack of fuel.

International Mining Congress Organized

Organization of the executive committee for the International Mining Convention to be held at Portland, Ore., early in 1921 has been completed. Henry M. Parks, director of the Oregon Bureau of Mines and Geology, is general chairman, and Robert M. Betts, general manager of the Cornucopia Mines Co., is secretary. The following sectional representatives have been chosen: Western British Columbia, Hon. William Sloan, Minister of Mines; A. M. Whiteside and Nichol Thompson; eastern British Columbia, S. S. Fowler, of Riondel; Fred A. Starkey, of Nelson, and J. P. McFadden, Sandon. Alaska is represented by G. T. Jackson, of Juneau, and Col. B. F. Millard; eastern Washington by L. K. Armstrong, of Spokane; western Washington, M. J. Carrigan, of Seattle; northern Idaho, Stanly Easton, of Kellogg; and southern Idaho, by Robert N. Bell. Chairman Parks in a communication says that exact dates have not been set, but early April may be selected.

Utah Students Organize Mining Society

Students of the school of mines of the University of Utah and the department of geology have organized a society, which is to be known as the Utah Mining and Metallurgical society. The organization will petition for affiliation with the American Institute of Mining and Metallurgical Engineers. Thomas P. Walsh, a junior associate member of the American Institute of Mining and Metallurgical Engineers, was elected president; John F. Byrne, vice-president; and R. R. Hall, secretary and treasurer. An executive committee was formed, consisting of Dr. R. H. Bradford, of the metallurgical department; Dr. F. J. Pack, of the geological department; Prof. R. S. Lewis, of the mining department; Thomas Varley, superintendent of the Salt Lake station of the United States Bureau of Mines; J. T. Norton, ore dressing engineer, Salt Lake station.

Alberta Coal Mine Quadruples Tonnage

It is understood that the developments at the Blue Diamond coal mines, in Alberta, which were purchased recently by the McIntyre and Temiskaming companies, have been satisfactory. Within three months of taking over the property improvements made have resulted in the daily tonnage being increased from 200 to between 700 and 800 tons. It is understood that early in the new year the output will be increased to about 1,500 tons per day. New machinery is being installed and surface buildings and housing accommodation are being provided.

A vanadium property in Sinaloa, Mex., belonging to ex-governor Ramon F. Iturbe, and known as the "Chichi," is under option to capitalists in Mexico City.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

To Eliminate Red Tape in Alaska Congressional Effort Is To Be Made To Reduce the Needlessly Large Num- ber of Federal Agents

Much of the red tape which is hampering Alaska's development is to be done away with, in the opinion of Representative Charles F. Curry, of California. Mr. Curry is a chairman of the House Committee charged with the consideration of Alaskan matters. Mr. Curry says that thirty-five different Government agencies have jurisdiction over Alaskan interests of one kind or another, and as result the greatest difficulty is experienced, he declares, in establishing any type of enterprise large or small. Before a farmer can make sure of his title, an expenditure entirely beyond the resources of the average farmer is required, to make preliminary arrangements with the different bureaus. The same is true of the large enterprises, Mr. Curry says, and he cites an instance of an American wood-pulp manufacturing concern investing large capital in Canada after having become discouraged in its efforts to obtain a working arrangement in Alaska. Mr. Curry predicts the enactment of legislation at the extra session, if not during the short session, which will eliminate most of the existing red tape.

Mr. Curry is in favor of placing the government of Alaska in the hands of a board to be appointed by the President, but composed of residents of the territory. He says he is opposed to a continuation of a government of Alaska by Federal agents.

Increase in Manufactures in the West

Trend Believed To Be Partly Due to High Freight Rates

The West is emerging from the mining and agricultural stage of its development. Manufacturing is beginning to play an important part in its commercial activities. Present plans everywhere throughout the West include enlargement of manufacturing facilities. These are the observations of G. F. Loughlin, the head of the Mineral Resources section of the U. S. Geological Survey. Mr. Loughlin just has returned to Washington after an extended trip through the West. Though Mr. Loughlin believes this is due largely to the natural evolution in the development of the West, he thinks it is being hastened by various changes brought about by the new economic situation, the least of which is not the increase in freight rates.

The coming of many new manufacturing plants, Mr. Loughlin believes, will stimulate both mining and agriculture.

Throughout the West, Mr. Loughlin found many signs of underlying strength in the position of the mineral-mining districts, induced largely by the decreases in commodity prices. The trend toward manufacture has aroused widespread interest in non-metallic resources. For the most part, the work of the Federal Government in the Western States has been on its metals. Now, with the promised rise of chemical industries and activities in connection with the construction industry, there is need for a more definite knowledge of the non-metals. In fact, the Los Angeles Chamber of Commerce has made a formal request that the Survey undertake a thorough study of the non-metals in the region tributary to that city. Mr. Loughlin is convinced that this work would be helpful to the public, and he will recommend that it be undertaken.

American Capital Urged To Enter Foreign Fields

Although throughout the world cards are falling in a new deal, American capital and American mining engineers, for the most part, are preoccupied with efforts to devise methods to make lower-grade ores pay and to increase operating efficiencies, to the exclusion of the opportunities that are offered in foreign fields. This seems to be the conclusion of numerous students of the present situation as it affects the mining industry. So far as oil is concerned, much is heard of the efforts of foreign countries and certain foreign governments to extend their acquisitions of petroleum lands.

Rapid progress is being made by English, Japanese, French and even Belgian capital in the acquisition of such deposits in China, Siberia, continental Russia, Africa, and even South America. Where one American dollar is looking for a foreign mineral investment, hundreds of foreign dollars are being exchanged for valuable mineral rights.

Some go so far as to predict that, within fifteen years, we shall lose our pre-eminent position in copper. Another prediction is that the next decade will make necessary a high import tariff, if our iron-mining operations are to continue at anything like their present scale. Lead and zinc are placed in practically the same category. To hold its own, it is declared, American capital must acquire rights and prepare to conduct large-scale mineral operations in those countries having practically virgin deposits, as well as proved properties, but whose present economic necessities have placed those resources on the bargain counter.

W. M. R. Commission Soon To Complete Awards

If Present Rate of Adjustment Is Carried to a Conclusion an Unused Balance of \$5,500,000 of the Appropriation Will Remain

Two awards were recommended by the War Minerals Relief Commission during the week ended Nov. 22. The total of awards was \$20,557.59. In the claim of the Mount Tory Mining Co., the award was \$11,007.89. This was 25 per cent of the amount claimed. The company was engaged in a manganese operation. Another manganese claim was that of the Eagle Mine. In that claim \$9,549.70 was awarded. This was 89 per cent of the amount claimed.

Up to Nov. 27, 1920, the War Minerals Relief Commission had made recommendations in 1,124 cases out of 1,203 legally before it, leaving 83 claims remaining for consideration. It has recommended awards of \$2,357,491.35.

The total appropriation.....	\$8,500,000.00
Awards and expenses	2,687,092.42

Balance	\$5,812,907.58
The amount asked in the 83 claims yet remaining.....	802,703.83

Apparent balance	\$5,010,203.75
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If the same ratio of award (32.9 per cent) shall obtain in the 83 cases yet to be dealt with, as in the past, the amount yet to be awarded will be \$272,412.76, in which event an unused balance of about \$5,500,000 will remain.

The commission expects to complete its work within sixty to ninety days. The administrative expenses of the commission have been 2.07 per cent of the amount involved in the claims settled.

Bureau of Mines and U. S. Geological Survey Ask Increased Appropriations

Congress has been requested by the Bureau of Mines and the U. S. Geological Survey to appropriate \$5,938,778 for their activities during the coming fiscal year. The total of the appropriations requested by the Bureau of Mines is \$3,469,638. The Geological Survey's total is \$2,469,140. The principal subdivisions of the Bureau of Mines appropriations are as follows:

For investigations as to the causes of mine explosions, methods of mining appliances best adapted to prevent accidents, improvements of conditions under which mining operations are carried on, the use of explosives and electricity and other inquiries and technologic investigations pertinent to the mining industry, \$551,353. This is an increase of \$142,288 over the amount appropriated for the current fiscal year.

For inquiries and technologic investi-

gations concerning the mining, preparation, treatment, and utilization of ores and other mineral substances, with a view to improving health conditions and increasing safety, efficiency, economic development and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries, and to inquire into the economic conditions affecting these industries, \$352,271. This is an increase of \$227,271 over the appropriation which was made for similar purposes during the current fiscal year.

For inquiries and investigations concerning the mining, preparation, treatment and utilization of petroleum and

natural gas, \$453,840. This is an increase of \$318,840.

Expenses mining experiment stations, \$270,000. This is an increase of \$70,000 over the appropriation allowed for the current fiscal year.

Operating mine rescue cars, \$198,650. This is an increase of \$43,983 over the current appropriation. In addition, \$45,000 is asked for the purchase and equipment of an additional mine rescue car.

For supervision of mining on the public domain, \$132,390 is asked.

The subdivisions of the Survey estimates which apply directly to the mining industry are as follows:

Geologic surveys, \$500,000. This is

an increase of \$148,000 over the appropriation for the current fiscal year.

For continuation of the investigation of the mineral resources of Alaska, \$190,000. This is an increase of \$115,000 over the current appropriation.

For preparation of the report of the mineral resources of the United States, \$200,000. This is an increase of \$75,000 over the current appropriation.

For chemical and physical researches relating to the geology of the United States, including researches with a view of determining geological conditions favorable to the presence of deposits of potash salts, \$60,000. This is an increase of \$20,000 over the money appropriated for the current year.

NEWS BY MINING DISTRICTS

Special London Letter

Shadow of Politics Brings Gloom to Mining Interests—Cornish Miners Migrating—Cape Copper Co. Floating 8 Per Cents at Par

BY W. A. DOMAN

London, Nov. 23.—Political and financial influences are upsetting the business world. It is scarcely credible that Russian, Greek, and Irish affairs should in any way affect the mining community; but such is the case. There is nothing whatever to engender confidence at the moment. Prices of metals are tumbling because of the slackness of trade and the difficulty of getting banking accommodation, and in the case of some metals because of the excessive stocks, the Allied governments apparently not having disposed of all they had contracted for while the war was in progress. Tin in one day fell £8 10s. per ton, and at the time of writing is quoted at £231 5s. At such a figure some of the Cornish mines find it very difficult to work at a profit. In fact, Cornwall seems to be getting in a bad way, and some of the tin miners are migrating to other and better-paid fields—to South Wales for coal mining, for instance. Various schemes are being worked out to set the tin-mining industry of the duchy on its legs again. One of them is a return to the old cost-book system, and another is an amalgamation of different companies in different districts, so as to avoid heavy overhead charges, and to introduce various economies that may be possible under certain combinations of big business.

The Cape Copper Co., which has invested a large amount of capital in a copper property in the Rakha Hills in India, has appealed for £120,000 in registered convertible 8 per cent debentures of £100 each at par. This is one of the few companies, whether mining or commercial, that has had the temerity to ask par for its new issue. The value of the assets in India is approximately £440,000, whereas the £120,000

of debentures offered to the public are covered by the Briton Ferry Smelting Works in South Wales alone. The issue deserves to be successful. Already there are proved in the reserves 11,370 tons of copper. Just at present, of course, the red metal is not the thing to conjure with as it was a few years ago. But there is a good local market that can take care of most if not all of the production.

The Nundydroog, another Indian mining company, has got its reconstruction scheme through. One of its neighbors, the Ooregum, is said to be considering additional capital outlay, but that the money will be found apart from reconstruction. The price of the shares, of course, has been unfavorably affected.

Since the Burma Corporation has become an Indian registered company, its shares have gradually fallen away in price, until now they are under 10s. Previous to conversion they reached £14, and at the time of conversion stood at £9 15s., the holders receiving 14 of the rupee shares as the allotted basis of the exchange.

As a star *Esperanzas* has faded for the time being. Speculators rushed up the price of the shares unthinkingly, and the public, ever keen on a gamble, got in and is now nursing the baby. Had it not been for the high *Descubridora* values, *Esperanzas*, in all probability, would be quoted above the present figure. But, once disappointed, the public is not keen to come along again.

The South African market is being upset not only by foreign selling but also by realization of enemy-owned shares, these latter being peddled out by the Public Trustee on this side and the Custodian of Enemy Property at Capetown. There would be no difficulty in forming a syndicate to relieve the officials of the shares, but apparently those gentlemen think they can do better by trickling them out. Each day means that they set the market against themselves still further and thus forestall a good margin of profit.

Austrian Industries Need Upper Silesian Coal

Germany Would Supply This If Abundant Saar Production Was Shared With Her

From Our Vienna Correspondent

Vienna, Austria, Nov. 10.—Recent reports have been to the effect that England was trying to persuade France to release coal from the Saar district for the use of German industries. This would enable Germany to deliver large quantities of coal to Austria from the fields of Upper Silesia. Arrangements with the Polish government are being discussed, also, with the object of furnishing from Austria the machinery and operating supplies needed by the still inactive Polish mines, that the latter may increase their yield. These are the only practical methods for relieving the coal situation in Germany so that the latter can deliver large supplies of coal to Austria.

So far, Germany has faithfully fulfilled her part in the Spa agreement, and as a result of the German coal deliveries to the Entente in recent months, her own industries have had to substitute large quantities of lignite for the missing coal. Of course the full amount of this loss can not be made up. Dispatches at hand indicate that France enjoys a superfluity of coal supply, and that the coal situation in Paris is particularly favorable. Thus it would be possible at any time for France to release coal to German industries from the steadily improving deliveries from the Saar district, thereby releasing larger supplies of Upper Silesian coal to Austria.

France's domestic coal production also is increasing, amounting to 2.40 million tonnes in September, as against 2.37 million in August, which is already at the annual rate of two-thirds of the normal peace-time yield. Furthermore, the conditions in the wrecked mines of northern France are steadily improving. The coal supplies now being taken out of the Saar mines by the French

amounted to 702,680 tonnes in August, to 860,108 tonnes in July (the decrease was due to the railway strikes), to 811,314 tonnes in September, 1920, and is steadily rising. In January, 1920, the deliveries amounted to only 727,465 tonnes. The Saar district needs but little coal for its own industries and disposes of nearly the whole yield by sale and export monthly, so that it is clear that the present coal situation in France permits that country to dispense with the greater portion of the Saar coal. In fact, several hundred thousand center of coal are left monthly at the depots of the Saar district, which shows that France is not actually in urgent need of the Saar coal.

The prices of Saar coal for France, Luxemburg and Switzerland have been greatly reduced since Oct. 1, 1920, another fact testifying to the favorable condition of that district and its ability to support exportations. The prices are given below.

PRICES OF SAAR COAL SINCE OCT. 1, 1920, COMPARED WITH EARLIER QUOTATIONS

Kind	Today, Francs	Former Prices, Francs
Washed, lump.....	124 to 105	136 to 115
Nut, No. 1.....	124 to 100	136 to 110
Nut, No. 2.....	118 to 93	130 to 110
Unwashed, lump.....	116 to 93	128 to 108
Run-of-mine.....	85 and 75	83
Coke, broken.....	150	160

Concerning Poland, Austria could indeed aid in increasing the Polish coal yield by supplying machinery and blasting supplies, whereby there would also result advantages to the Austrian supply of coal.

MEXICO

Annual Production of Durango Listed—Encouraging Reports From Cusi-huirachi—New Export Duties Lower

City of Mexico—One of the last official acts of President de la Huerta was to sign the decree lowering export duties on all classes of minerals and also reducing the taxation on pertenencias (claims) as an immediate aid to the industry, which has been hard put these last weeks because of the low prices on silver, copper, zinc and lead. The new tax is not a fixed one but is applied differently in distinct camps and also according to the value of ores. It was devised with the assistance of committees from various mining centers, and it is believed that it will at least relieve the situation.

The new administration has under study a complete revision of the mining laws (including petroleum), but it will probably not reach Congress before the first weeks of the new year.

Chihuahua

Concepcion de Oro—It is claimed here that over 500 smaller mining properties have recently been obliged to close because of the low price of silver. Half of this number is in the Concepcion de Oro district. Within a radius of twelve miles of the center of this district there are not fewer than 300 mines, with an abundance of silver ores,

but low grade, running from 6 to 900 gr. to the ton. At this assay 80c. silver produces only 45.80 (Mexican) per ton, and the miners claim that the actual cost of mining treatment and shipment amounts to 45.60. In addition to this dismal situation 540 other properties in this same district are about to be forfeited for failure to pay taxes. The owners apparently prefer to abandon their holdings under the circumstances.

Cusi-huirachi—On the other hand, reports from Batopilas, Santo Domingo, San Juan and the Cusi Consolidated, in the Cusi-huirachi district, are very satisfactory. All are high-grade ores. Increased activity is reported likewise from Parral and at San Pascual de las Adargas, near Jimenez, where a number of American companies are going in.

Durango

The state government has recently issued some interesting statistics regarding the mineral resources of that section, giving the following properties now in operation, with their approximate annual production in gold, silver, copper and lead (in thousands of pesos):

Penoles	4,796
Velardena	2,600
San Andreas	742
Promontorio	651
Avino	559
Vacas	494
Bacis	457
Candelaria	433
Soto	267
Ventanas	248
New Australia	240
Hilario Lozoya	183
Lustre	180
Nuevo Porvenir	179
Fundidora de Coahuila	150
Descubridora	134
Ambrosius Hermanos	127
Salvador Lopes Suc	122
Huahuapan	120
San Luis Mining Co.	113
Carmen Copper Co.	106
Fundidora Mapimi	76
La Trinidad	72
Luis Guerrero	52
Animas	41
San Luis	40
El Potrillo	40
San Juan	37
Siderita	37

These with twenty-eight other properties running from 18,000 to 30,000 pesos make a total production of gold 1,664,000; silver, 11,031,000; copper, 864,000, and lead, 237,000 pesos. Many other mines are being prepared for development, but there has been a temporary let-up owing to the coal strikes and inability to get material or transportation. Expert opinion holds that with a reasonable restoration in the price of silver and other metals and with labor troubles settled the production ought to be doubled in 1921.

Guanacevi—Reports from this district are encouraging also. There are about a thousand tax-paying claims in this camp, twelve mills (in operation before the revolution) and enormous dumps of ore which, it is claimed, are profitable for treatment.

Topia—The Mines Selection Co., a development syndicate, including C. L. Despard, Frederick G. Corning, George B. Hutchings, all of New York City, and W. J. Loring, of San Francisco, has taken an option on La Perla mine, in

the Topia district, Durango. This property is owned by a company in which Bernard and M. E. MacDonald, formerly extensive operators in Mexico, are largely interested.

Coahuila

Torreon—The Cia. Minerales & Metales, owner of the local Torreon smelter, has purchased a large portion of the Mercado iron mountain in Durango, the consideration being several million dollars. It is probable that a new smelter will be erected at the base of the mountain.

Owing to the low price of silver, high taxation of low-grade ores, and a general shortage of fuel, nearly every smelter in Mexico will be closed by the first of the year. As a natural consequence practically all of the producing mines will be forced to suspend operations. There are only a few smelters now in operation. Over six hundred producing mines in the northern part of the republic closed down during November.

David G. Farias, a prominent attorney of Torreon, has filed a group of silver-lead mines in the San Juan del Rio district. The properties adjoin the old producing mines La Palma, Otilia and El Chaiz.

J. P. Steele has suspended operations on the Trovador mine in the San Diego district. He has several cars of ore on the platform at Trinidad station and a large tonnage on the dump. His properties will remain idle until the smelters resume operations.

San Juan de Guadalupe—The district continues to add new shippers to its list and seems to feel no ill effects from the coal shortage or low price of silver. The ores carry considerable values in gold and are being received by the smelters regardless of the fact they are not operating at the present time. The most recent property taken up in this district is the Plateros group, in the Ramirez Mountains, which is being worked by Alejandro Gaitan.

Zacatecas

Zacatecas—In the mining agency at Concepcion del Oro 540 mining properties are listed for forfeiture on account of non-payment of taxes. Many of these delinquent mines are capable of producing large quantities of low-grade silver-lead ores which cannot be mined under the present conditions of the low price of silver and exorbitant taxation.

A number of new properties have been taken up in the Reyes district, in the northern part of the state, by Luis Campa. The mines are contiguous to the Escondida, which has produced large quantities of high-grade gold and silver ores.

Word has been received here from Mexico announcing an immediate reduction of taxes on low-grade ores as well as other advantages to be given the mining industry. Unless the coal mines in the State of Coahuila are operated within the near future the government will permit the importation of coal and coke free of duty.

CALIFORNIA

**Another Gold Dredge Sent to Mexico—
Yankee Hill Dredge at Work on
the Stanislaus—Good Ledge
at the South Star**

Sonora—The Yankee Hill Mining Co. has placed a dredger in operation on the Stanislaus River between Oakdale and Knight's Landing. The company has about ten miles of the river channel under lease, and thorough tests made by the management show considerable gold.

Angels Camp—Work of unwatering the Victor Gravel mine, formerly called the Rainier, near Angels Camp, is being rushed day and night in the rehabilitation of the promising old property. Regardless of the heavy rains of the last three weeks work of carrying the water from the mine in tank-skips is progressing rapidly. The shaft will be dry in three weeks if present dewatering work continues unchanged. Superintendent Montreville is planning on drifting and breaking out gravel as soon as the underground conditions permit. Hoisting operations are expected to begin by the first of the year.

Grass Valley—A. W. Johnson, principal owner and manager of the South Star mine, in the Deadman's Flat district, reports that a fine ledge has been cut in that property at a depth of about 100 ft. The ledge is stated to be from three to four feet in width and to carry free gold. Johnson believes that it will be possible to place the famous old mine on a record producing basis again. About two years ago several thousand dollars was taken out in shallow diggings, but work was soon afterward discontinued.

Oroville—Purchase of Exploration dredger No. 3, which operated in the Oroville field for a number of years, was made recently by W. H. Hyland, a representative of a Mexican dredging company. The dredge will be sent to Mexico, where it will again be placed in operation. This is the second dredge to be sent to Mexico in the last few months.

Amador City—At a regularly called stockholders' meeting of the Bunker Hill Consolidated Mining Co. the following were chosen directors: N. W. Hyler, O. D. Rohlf, H. A. McQueen, T. G. Negrich and John Eudey. Charles E. Bunker, who has been superintendent of this well-known property for several years, tendered his resignation, and the new directors appointed as his successor Robert Christensen, who filled the position of foreman heretofore.

Jackson—V. S. Garbarini has been appointed general manager of the Argonaut mine at Jackson. He fills the place vacated by N. S. Kelsey, who resigned to accept a position in Colorado. At present all endeavors at the mine are being concentrated on the removal of water from the underground workings.

The Kennedy mine is working steadily in dewatering the old workings. It

is expected that mining will be resumed some time in the spring of 1921.

Happy Camp—Since the Legrange mine, in Trinity County, shut down, the Davis Consolidated mine at Happy Camp is believed to be the largest active hydraulic placer mine in the state. It is operated about nine months of the year with three giants, receiving water through a 32-in. pipe. Over 5,000 miner's inches of water is delivered through two ditches having their sources in Indian and Grider creeks respectively. The mine is now owned and operated by Reeves Davis, of San Francisco, who purchased it in 1908 from the estate of O. H. P. Belmont. The property consists of 1,200 acres of rich placer ground.

COLORADO

**New Freight Rates on Dec. 20—Silver
King Installs New Concentrating
Table—Gold Rock Finds Rare
Minerals**

Idaho Springs—New freight rates on low-grade ore shipped from the Clear Creek district, over the Colorado & Southern Ry., will become effective on Dec. 20, 1920, as follows: On ore up to \$20 gross value, \$1.75 a ton; from \$20 to \$30 gross value, \$2 a ton; from \$30 to \$41 gross value, \$2.50 a ton; from \$41 to \$61 gross value, \$3 a ton; from \$61 to \$100 gross value, \$3.80 a ton. This rate is equivalent to a reduction of 75c. a ton on the first two classes of ore above mentioned, which include the bulk of the ore shipped from this district.

A drift on the 600-ft. level of the Gem mine has opened a pocket of sulphide ore about 5 ft. wide. The drift will be advanced to connect with the Franklin shaft.

The Lord Byron is being developed under the management of Kenneth Matheson. A 300-ton lot of milling ore has been shipped to the Hudson mill.

A new concentrating table, invented by Henry W. Bolthoff, has been installed in the Silver King mill, where tests have been made. The demonstration table is about 7½ ft. long by 30 in. wide. The top of the table is covered with linoleum, which in turn is covered with a layer of 12-gage, 20-mesh wire screen, set about ½ in. above the top of the table. It has both a lateral and a vertical motion. The table is equipped with a 5/5 in. pipe arranged along the side, from which flows a steady spray of water. One-quarter horsepower is required to operate the table. The inventor claims an 80 per cent saving of the values in the ore fed to the apparatus.

The Gold Rock property is being developed by W. P. McLean and associates. Recently a streak of high-grade gold ore has been opened, and small shipments to the sampler assay 3 oz. gold. Milling ore is being shipped to the Hudson mill. A pocket of gold-copper ore was recently opened, and the material is reported to contain 16 per cent uranium oxide. Pitchblend has been identified, and the discovery is

regarded with considerable interest by mining men who are on the alert for rare minerals. The vein is 12 in. wide and was opened at a depth of 450 ft.

Telluride—The Vanadium Corporation of America has shut down all of its works at Vanadium, Fall Creek, and Placerville, west of Telluride. About 350 men have been thrown out of employment.

IDAHO

Wood River—The Golden Glow mine at Boulder Basin has just completed and put in operation a very substantial 50-ton lead-silver concentrating mill, conveniently tied to the lower adit of the property. The property is situated near the summit of the Sawtooth range at an elevation of 9,500 ft. The steam power is developed with coal hauled in at an excessive cost but the company plans to install a hydro-electric plant on Boulder Creek next season, and thereby greatly reduce the operating cost.

Independence mine, owned by Federal Mining & Smelting Co., Wallace, Idaho, is working 75 men, and has been supplying an 80-ton concentrating mill for the last six months. This is an old plant that has been operated, however, at a decided advantage for several seasons with an extremely limited water supply of spring water. The mill was built to treat a very complex zinc ore during the war but has been shut down through lack of market for its product. It is now being overhauled and put in shape for the exclusive treatment of the Independence Mine and has a capacity of 200 tons per day. This property carries one of the cleanest and richest silver-lead ores ever mined in the Wood River district.

Soda Springs—The new phosphate mining and milling enterprise of the Anaconda Copper Co. on the main division of the Oregon Short Line in southeastern Idaho makes excellent progress. The grading for a railway has been completed and the steel is already laid for nine miles, or half the distance from Soda Springs to the mine. Machinery for a 1,100-cu.ft. compressor is on the ground and the concrete foundations are now being laid. A crosscut tunnel 9 x 9 ft. in the clear, to be laid with 60-lb. rails and equipped with 15-ton storage battery motors and 10-ton bottom dump cars, is already in 200 ft. and has already cut one of a series of rich phosphate veins. This tunnel is to have an ultimate length of two miles as a crosscut and will penetrate three separate ore courses of rich rock phosphate 70 per cent or better and each 5 to 8 feet wide that stand at angles varying from 45 to 70 degrees and are traceable at the surface for miles. The big tunnel will give stoping backs to a maximum height of 1,000 feet on the steep dip of the veins. Much of the machinery for the first 1,000-ton unit of a dehydrating mill is on the ground. An electric power transmission line from the main line of the Utah Power and Light Co., near Grace, has been completed to the mine and also an inde-

pendent telephone line. It is expected to have the first unit of the mill, with a daily capacity of 1,000 tons, completed by next August. The plans also involve the plotting of a model mining town on a desirable site in a sheltered cove in the mountains near the portal of the mine for the accommodation of the company's employees. Subsequent mill units are to be installed as the market for the product is created.

Montpelier—The American Phosphate Co. are installing a 500-ton milling plant for the crushing and drying of their phosphate rock, and are already shipping at the rate of 50 tons a day from their contingent mine development, principally to the Pacific Coast market. The Waterloo mine in the same section of Bear Lake County has been shipping 100 tons of rock a day for several months past to San Francisco. The ore is hauled on motor trucks $4\frac{1}{2}$ miles at a cost of \$1.25 per ton. Near Paris, Idaho, the Western Phosphate Co. have a 3-mile spur completed, also a 500-ton mill, and are shipping 200 tons of rock a day. The Bear Lake Mine, a new enterprise in the vicinity, has extended a double-track tunnel on a 5-ft. vein of high-grade rock phosphate 700 ft. This property has recently been equipped with a 500-cu-ft. angle compound air compressor and is making excellent development progress.

MONTANA

Some Developments Under Way—New Mill at the Alta—Western Power & Smelting Completes Matte Smelter

Butte—Though the Anaconda Copper Mining Co. has reduced its working forces somewhat since the closing down of three of its zinc properties about two weeks ago, there has not been further suspension of mining activities on any material scale and Manager John Gillie has announced that for the present the Anaconda would continue without further curtailment. No statement as to the future however was forthcoming.

Further curtailment of output to the extent of one-third by the North Butte company, which had been operating on a 70 per cent basis, emphasizes the depression prevailing in metal-producing circles in the Butte district. North Butte has been putting out about 1,500,000 lb. of copper monthly, and it was officially stated that production will be kept within 500,000 lb. monthly. The company is continuing development work but on a reduced basis.

Tuolumne Copper has started sinking at the Main Range shaft from the 1,200-ft. level with the 2,000 the objective, according to the local office of the company.

Aside from raising out of No. 3 shaft from the 2,300 level, little development work is being done at the Black Rock mine of the Butte & Superior, the suspension of production being necessary in view of the poor condition of the zinc market.

Davis-Daly Copper Co.'s development work is limited to raising an airshaft from the 1,700 level to the surface at its Colorado mine. Production had not been materially lowered below the 70 per cent point, but it may be further lowered unless the copper market improves.

Barnes-King directors decided to pass the dividend for the third quarter, the explanation being that it was desired to conserve the company's resources for the acquirement of new property.

Neihart—At the Moulton the concentrator is handling about 170 tons of ore daily and a number of surface improvements are being made.

Federal Mining & Smelting Co. is reported to have concluded a deal whereby it will take over the development of the Silver Dike property. Silver Dike is a large low-grade proposition embracing ten claims.

Clancy—Jefferson & Teton Mining Co. is installing new machinery and equipment at the Willard mine. Operations will continue throughout the winter.

Sinking is in progress on the Pay Back Mining's Old Timer mine and a good width of high-grade ore is reported.

Corbin—Foundations for a new mill for the old Alta mine are going forward. Old buildings are being torn down and remodeled.

Cooke City—Western Power & Smelting's smelter, with a capacity of 250 tons, was completed this year; it is of the copper matte type.

MINNESOTA

Mesabi Range

Pickands-Mather Co. Makes Safety Awards—New Washing Plant Commences Operation

Hibbing—The Pickands-Mather Co. each year awards prizes to the department officials of the mines in their districts who have the least number of disabilities at the end of the year. The rewards this year were watches, of which four hundred were distributed to the men employed at the Majorca and Albany mines. According to the system of marking, the two mines were so close that only a few points separated the winner. The Elba mine, on the eastern end of the range, won first prize for the least number of injuries. George Martinson has charge of the safety-first and mine rescue work for the company on the Mesabi Range.

The Boeing mine of the Cleveland-Cliffs Iron Co. has reduced its surface labor to a minimum, but an aggressive program has been outlined for all underground development and operation, as all ore shipped next season will be from underground operations.

Gilbert—The new washing plant of the Bowe-Burke Mining Co., at the old Mariska mine, has started to wash its first ore. Although the plant is only a small one, with a capacity of 50 tons per hour, great interest has been

aroused, and its successful operation will be noted by many companies, as it will be the first installation of its kind in the immediate vicinity.

The flow sheet is simple, as the ore is dumped direct into the mill bin from the mine skips. From the mill bin it is carried by a belt conveyor to the trommel, the oversize from the trommel falling directly into a chute, from which it is fed to a conveyor belt below and conveyed to the railroad receiving bin from which the railroad cars are loaded. The undersize from the trommel, which has one-half inch perforations, is fed to a Dorr classifier and the overflow from the classifier is laundered off as the tails; the underflow of the classifier is fed to the belt conveyor going to the railroad receiving bin. The trommel is of such construction that by reducing the diameter of the discharge end, a certain level of water is maintained which allows the trommel to be partly submerged. This arrangement permits a great saving in the consumption of water, as only 150 gal. of water are required per minute.

MICHIGAN

The Copper District

Reductions in Force and Wages Continue—Wolverine Copper Is Removing Shaft Pillars

Houghton—The Quincy Mining Co. has announced a reduction in all departments of 15 per cent on wages and salaries, effective Dec. 1.

The Copper Range group of mines have also announced a cut in wages and salaries to take effect on Dec. 1. This reduction varies for the different classes of labor. In the case of trammers it amounts to about 24 per cent; with company account miners it amounts to 17 per cent. It is also announced that soft coal will be supplied to employees at \$7 per ton instead of the prevailing rate in the district of \$9 to \$9.50 per ton.

The Wolverine Copper Co. is steadily increasing production and within a few weeks will be back to the pre-war normal. No. 4 shaft has been completely idle for several days, due to an accident in the shaft between the 29th and 31st levels. This is about repaired. The Wolverine has started to remove the shaft pillars for about 100 ft. on either side of the shaft. When this work reaches some of the upper levels it should result in materially enriching the yield of Wolverine rock.

The Mohawk Mining Co. is also steadily increasing production. No. 1 shaft is now operating one shift after a year's idleness, and No. 5 shaft is again operating two shifts.

The Seneca Mining Co. is increasing its working force underground, and now has two shifts of miners working in the headings of the third, fourth, and fifth levels north, and the fifth level south and in sinking to the sixth level. They are not accumulating a stockpile at the mine, but are shipping all the rock to the Baltic mill of the Copper Range Co.

The management of the Arcadian Consolidated has decided to continue development work throughout the winter. It expected to cut the plat at the 750-ft. level early in December. A sump has been cut out at the 600-ft. level and will be bailed by means of the skip hoist.

Gogebic Range

Bessemer—The Charcoal Iron Co. of America, operating the Yale mine, has announced a cut in wages of 20 per cent, applying to all classes of labor and taking effect Dec. 1. It is understood that a similar cut has been made at the company's logging camps and at the mill in Marenisco, as well as at its furnaces. The local officials of the other large mines of the range deny knowledge of any wage reductions being planned by their companies. However, at a few of the small properties men have been let off and then rehired at lower rates.

Since the closing down of additional mines in the Copper Country, quite a number of miners have come to the Gogebic Range, and, added to those laid off at the local mines, furnish an adequate supply of labor. A number of the men leaving the mines have found employment in the woods, so there is no great amount of unemployment.

It is expected that the skips will be hoisted through H shaft of the Pabst mine some time this month. The last of the idler stands will soon be up, and the ropes are already being strung. The grading for tracks and stockpiles is about completed.

Marquette Range

Large Stocks Cause Labor Curtailment, Although Wages Are Maintained

Ishpeming—The Cleveland-Cliffs Iron Co. reduced operations on Dec. 1 by releasing several of the single men employed in the company's mines. This was done to make places for the married men and men with dependents who had to be transferred from the Mackinaw-Gardner mine, at Gwinn, which was closed. The working force at the Cliffs Shaft mine, Ishpeming, was reduced by 210. Large stocks of ore at most of the mines was given as the reason for the curtailment. The Cliffs has over 200,000 tons of hard ore in stock, with little demand for hard ores at this time. The Mary Charlotte mine of the Marquette Ore Co. has closed down for an indefinite period, instead of for a week, as announced at first. The high wage scale is being maintained.

Menominee Range

Alpha—Thirty-five miners and laborers were received by Pickands, Mather & Co. this week for work at their Balkan and Amasa mines. This is the first instance since the war that men have been imported for mining work.

Iron River—Although the Tully mine has been idle for three years, the property is kept in good condition. Men are now at work repairing the two shafts, and it is planned to erect a new steel headframe over the No. 1 shaft.

NEVADA

Nevada Silver Horn of Great Promise—Virginia Louise and Others Increase Output—Ely District Still Slowing Down

Pioche—Operations at Jackrabbit on the old Cutts property, owned by the Pioche Bristol Mining Co., have begun. The present two-compartment shaft will be sunk to the 100-ft. level where a drift will run to the fissure mined a few years ago. John Gilmer, who has a lease on the Onondago mine at Jackrabbit, is taking out ore carrying good values in silver and lead from a point about 100 ft. from the collar of the main incline shaft. He has about forty tons of ore now ready for shipment.

The Nevada Silver Horn property, situated twenty-three miles west of Pioche, has recently been examined by T. W. France and other mining engineers representing New York capital.

The results of the sampling have demonstrated that large sections of the big cropping carry satisfactory values in silver. The building of a 40-ton pilot cyanide mill will be deferred and an increased amount of development will be started on the property with a view to increasing and substantiating the reserves of milling ore.

Everett Wade and Earl T. Godbe, leasing on the Detroit and Iron mines of the Bristol Silver Mines Co., are now having their initial ore shipment hauled by wagon to the bins at Jackrabbit. The ore is a good lead carbonate. The recent strike of higher-grade ore at the property of the Black Metals Incorporated is holding up well. The high lead content carried by the ore when first struck has dropped to normal, but the silver content is greater. Operations at the Bristol mine have been curtailed on account of a breakdown of the compressor plant. Conditions underground continue satisfactory and an improved grade of ore is being mined. During the last three months seven lessees have ceased operations owing to the increased cost of mining, lower metal prices and increased freight rates. All the larger properties in the Pioche district are putting on men, however, and a brighter future can be clearly foreseen, but unless an equitable freight rate is granted on the higher-grade ores the small operator will perforce stay out of the game.

The Virginia Louise Mining Co. is now shipping an increased output of ore. A new stope in good fluxing ore was opened up this week on the 400-ft. level at the south end of the fourth-level drift.

The Prince Consolidated is shipping its entire product to the American Smelting & Refining Co. smelter at Murray, Utah. It has been arranged to discontinue shipments to the International smelter at Tooele, Utah. The promised restoration of the \$2.20 freight rates on ores of \$6.50 in value will give much needed relief to the future operations of the property.

Ore shipments from the Pioche district for the week ended with Thanksgiving Day showed a total of 2,910 tons, derived as follows: Prince Consolidated, 1,740 tons; Virginia Louise, 535; Black Metals, 310; Combined Metals, 200; Mendha Mine, 40; Bristol Silver, 45; Pioche Assay Office, 40.

Ely—A large number of men have been laid off in all departments of Nevada Consolidated Copper Co., the reason for this being naturally the low price in copper. The reduction in payroll is apparently still continuing.

The properties held by the Consolidated Copper Mines Co. at Ely are practically closed down. Pumping and maintenance work is still being done both in the Morris shaft at Kimberley and at the Giroux shaft over the Kimberley summit. The Giroux shaft is well equipped and the pumping station and machinery constitute one of the most expensive and complete installations in the West. Although little mining is being done it is necessary to re timber continually, as the ground is very heavy.

George H. Ryan, who is working a deposit of zinc ore on the Willard lease from the Consolidated Copper Mines Co., received returns on a car of zinc ore last week. The shipment averaged 47 per cent in zinc content with a small amount of gold and silver in addition. Ryan intends to ship one car a week of this grade of zinc ore, and will increase his tonnage should conditions permit.

Articles of incorporation were filed this week by the Penn Star Mining Co., which owns property in the Cherry Creek mining district near Ely and expects to start development in the near future.

The demolishing of the big trestle at Nevada Con.'s concentrator at McGill is now under way. This structure, which was recently condemned as unsafe, contains about \$175,000 worth of lumber which will be utilized underground in the Ruth mine. The trestle has been replaced by a grade that runs back of the mill, the crushing plant being situated adjacent to this new grade and being connected with the mill proper by large conveyor belts.

Tonopah—The mines of this district are practically all working at capacity; the Tonopah Belmont is mining about 400 tons of ore per day and the Tonopah Mining, West End and Tonopah Extension mining about 150 tons per day each. In addition, regular development is being performed, with no discoveries of importance reported. The Victor shaft of the Tonopah Extension has reached a total depth of 1910 ft., leaving only 20 ft. to sink before starting to crosscut on the 1,885 level, where the station has already been completed. The Tonopah "76" Co. has announced that development work performed by the West End company in "76" ground totaled 107 ft. in October, all work being in West End rhyolite, which rocks at times forms the foot wall of the Ohio and West End veins. It is planned to prospect the rhyolite by

means of raises in the hope of encountering trachyte, and possibly a vein on the contact. West End profits for October were \$48,043.98, derived from 4,897 tons of West End ore, of an average value of \$21.82 per ton, and 552 tons of Jim Butler lease ore. In the Rescue mine the east drift on the new discovery on the 1,100 level shows ore for 30 ft. and in the face. The vein is not so wide as when first encountered but is of good grade.

Divide—On the 800 level of the Tonopah Divide mine the southeast drift shows no change. Crosscutting has been resumed on this level.

Manhattan—In the White Caps mine the west orebody has been cut on the 500 level. The ore so far developed has a width of at least 16 ft. and an average value of about \$20 per ton. This ore is said to be of much less refractory character than the ore in the east orebody, which contains a high percentage of arsenic. The east orebody is being developed below the 800 level by a winze.

ARIZONA

Washing Plant to Treat Sodium Sulphate for Paper Manufacture

Jerome—The Western Chemical Co. has decided to erect a washing plant on the sodium sulphate deposit near Camp Verde, lately leased from the state. The material heretofore has been hauled to San Pedro, Cal., for cleansing before being shipped to Finland, where it is used in the manufacture of coarser grades of paper. The sulphate, after being ground, floated, precipitated and dried, is sawed into regular blocks and shipped by rail to the seaport. The deposit has been developed by a 50-ft. shaft and by open cuts and several tunnels.

Most of the water flowing from the U. V. Extension tunnel is said to come from the surface. At times the flow has amounted to 1,500 in. and now approximates 500 in. Copper is carried in solution, but so diluted that its recovery by precipitation is hardly practicable.

Bisbee—Stoping operations at the property of the Night Hawk Leasing Co. were discontinued Dec. 1. Development work is being continued on the contract system. Results at this property have been encouraging during the last two months, the ore shipments averaging about 9 per cent copper.

Thus far the Copper Queen and the Calumet & Arizona Mining companies have not laid off any of the men working underground. At the mine of the Arizona Bisbee Copper Co. the drift on the 400 level has passed from limestone into leached material. This ground lies under siliceous croppings on the surface, and further developments are being watched with great interest. At the property of the Higgins Development Co. shipments of ore have been discontinued, and work is being confined to prospecting.

Globe—It is stated that a high degree of success has attended experiments

made at the Inspiration mill, at Miami, in handling low-grade carbonate and oxide-copper ores by a new process. It is described as practically a resulphurizing of the crushed ores by means of sulphurous gases, as the charge is passed through chambers. Thereafter, it is told, the ore may be handled successfully by flotation. The necessary sulphuric acid is to be made at Miami, by a plant such as that operated by the Calumet & Arizona Co. at Douglas, primarily for the needs of the New Cornelia leaching works at Ajo.

A new vein, about 10 ft. wide, has been cut in the operations of the White Metal property at Pioneer, in the Pinal Mountains, on the line of the old stage road. Parts of the vein are claimed to sample 100 oz. silver. The ledge, the third cut by the new management, lies parallel to the Pioneer ore shoot and is believed even larger and richer. Pioneer camp has known little activity since about 1882, when it had two silver mills in operation.

The Warrior company, on its property beyond Miami, will drill at least three development holes, exploring the Diamond H group.

Humbolt—The 100-ton concentrating mill of the Big Ledge Copper Co. has had its first test run. As soon as metal market conditions warrant, mining and development operations will be resumed, and the plant put into commercial operation.

NEW MEXICO

Steins Pass—The Steins Copper Co., composed of local capitalists, is developing a promising property three miles south of town adjoining the Johnny Bull. C. G. Perry is in charge.

The D. & H. owners are opening a wide area of mineralized ground on the surface, showing good zinc ore. This property adjoins the McGee ground where the main shaft has been sunk to 300 ft. A crosscut of the orebody here shows a width of about 100 ft.

Pinos Altos—The work of dismantling the plant of the Cleveland mine of the Empire Zinc Co. is about completed. This machinery has been installed in the Hanover plant of the same company. It is reported that there are ample ores still in the Cleveland, but those coming in are unprofitable with the present mill.

The Calumet-New Mexico mill, which shut down some time ago on account of the dullness of the zinc market, has started up again, handling dump ores from the Manhattan mine. The ores carry gold, silver, copper.

Silver City—A syndicate of local capitalists has organized the American Fluorspar Co. to develop fluorspar property eighteen miles north of Hatch, N. M., where it holds 240 acres having good spar showings. C. A. Farnsworth, Santa Rita, N. M., is president, Judge Porterfield, vice-president, and C. B. Hickman, secretary-treasurer, both of Silver City. Joseph W. Bible is in charge.

Steeple Rock—Black sulphide of silver has been found 200 ft. from the mouth of the tunnel on the Billali property owned by George F. Utter. This mine adjoins the Norman King, which has produced some very high-grade silver ores.

UTAH

International Exchange Rates Upset Lead Exports—Chief Consolidated Finished 1,900-Ft. Shaft—Smelters Lack Usual Surplus

The Salt Lake Valley smelters, as stated by W. A. Howard, manager of smelters for the United States Smelting Co., have not this year received the usual surplus above capacity from production during the summer months. In other years the smelters have been able to stock fairly large tonnages to make up for the shortage in receipts during the winter months. During the war period of high metal prices most of the large mines marketed their developed ore as rapidly as possible, and development work—owing to the heavy expense—was largely allowed to lapse. The mines were therefore left during the year just ending in a condition such that production could not be much increased. For the same reason the prospecting for and development of new mines was neglected. Prospectors and miners have been unwilling to take up the work of opening up new ground, as the risk is twice as great as in normal times, and also it will cost twice as much to do the work, with a resultant loss—if ore is not found, which happens more often than not—twice as great. The recent advance in freight rates—25 per cent from points outside of the state and 33½ per cent on bullion from the smelters to the Eastern market, this latter having had to be charged back to the mining companies at the rate of 1c. for each ounce of silver in their ore and ¼c. for each pound of lead paid for—has aggravated the situation and tended further to decrease shipments. The present rate of exchange has caused an influx of considerable lead ordinarily exported. The recent fall in the price of both this metal and silver is a result of the abnormal exchange rates.

Park City—Shipments for the week ended Nov. 5 were 1,843 tons, as compared to 1,634 tons the week preceding.

The Judge company's new office building and bunk house are expected to be completed by Christmas. The Judge properties—now including the Judge proper, the Daly West, Park-Utah and Daly—are furnishing a large weekly tonnage and doing much development work. Besides the ore produced on company account a considerable number of lessees are working in various blocks of ground.

Bingham Canyon—Ore is reported in a drift on the tunnel level of the Silver Shield, 200 ft. south of the old Miracle stope.

Alta—The Columbus-Rexall is developing its territory and saving ore for shipments, which will be made regularly as soon as the roads are open.

Eureka—Tintic shipments for the week ended Nov. 5 amounted to 166 cars, as compared with 129 cars the week preceding. Those for the week ended Nov. 27 amounted to 173 cars. The increasing output reflects the better labor supply.

The new shaft of the Chief Consolidated has been completed to 1,909 ft. and sinking will be discontinued. Work on the shaft was begun two years ago. It is a double-compartment, concrete-lined shaft. The deepest level from the new shaft will be the 1,880 and drifting will be started soon.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Ontario Smelting Co. Changes Hands—Skelton Lead & Zinc Closes—Lucky Jew Company To Use Gas Engines

Joplin, Mo.—Jesse G. Starr, of Joplin, has purchased controlling interest in Ontario Smelting Co., whose smelter is near Hockerville, Okla. He will succeed O. Longacre, Jr., of Joplin, as president and manager. F. M. Sparks, of Galena, Kan., will continue as plant superintendent and Harry G. Stephens, of Joplin, will continue as ore buyer. The company will establish a new office in the Independent Building, Joplin, Mo. An investigation this week disclosed that 70 mines are still operating, as against 119 six months ago, and few mines are still operating double shift.

Picher, Okla.—The New York Mining Co. has about completed its new concentrator south of the Black Hawk mine and will start it in operation about Jan. 1. The sludge department includes twelve tables.

Douthat, Okla.—The Skelton Lead & Zinc Co. shut down its eight mills on Nov. 27 and will keep them down indefinitely. Most of the miners employed left the district for the Oklahoma coal fields. The Admiralty Zinc Co. is putting down a new shaft. It will erect a derrick and hopper and connect with its No. 3 mine by surface railroad.

Treece, Kan.—Miners of this section are raising a fund to be matched by the Lucky Jew Mining Co., the whole to be offered as a reward for the arrest and conviction of the murderer of Lloyd Cox, a miner at the Lucky Jew property.

Gas engines are being installed at the Lucky Jew property, replacing steam engines. New equipment includes a 200-hp. engine to operate mill, two 150-hp. engines with Ingersoll-Rand compressors to furnish air, and a 65-hp. engine that will be used to run sludge plant.

Miami, Okla.—A suit against J. F. Robinson and the Commerce Mining & Royalty Co. for \$200,000 damages and rescission of deed to a valuable tract of mining land in the Oklahoma field was thrown out of court on a demurrer without hearing the evidence of the defendants by Judge E. F. Laster, sitting as special judge at Miami on Nov. 26.

CANADA

Alberta

Edmonton—The existence of an extensive field of high-grade salt at Port McMurray has been definitely established by drillers operating under the direction of the provincial government of Alberta. The drill has been driven through 30 ft. of pure salt at a depth of 650 ft.

British Columbia

Princess Royal Island—Considerable excitement has been created by recent discoveries on Princess Royal Island. There has been quite a bit of staking. Development on some of these new properties will go forward throughout the winter.

Alice Arm—The Moose Group Mining Co., Ltd., of Vancouver, B. C., has done much work in the opening up of its properties and in the construction of a permanent camp. Development has been pushed forward by means of open cuts and the driving of tunnels. The upper tunnel is in 40 ft., with the face in ore. On Nov. 1 the lower tunnel, 310 ft. lower, was in 21 ft. and the vein is now being crosscut. The mineralization shows gray copper, a little galena, and a considerable amount of manganese.

Howe Sound—The Britannia Mining & Smelting Co., Ltd., will discontinue the shipping of concentrate from its mine at Howe Sound to the Tacoma, Wash., smelter until either the price of copper advances or working conditions so change as to make it possible to produce copper at a reasonable profit.

Nelson—Purchase of the Exchequer and Athabasca groups of gold-bearing mineral claims at Nelson, by the California Mining Co., operators of the California group of mines in the same region, was announced by J. W. E. Cassin, president of the California company. The negotiations for the merger of the properties, forming a solid block of claims on Toad Mountain two and a half miles from Nelson, has been in progress for two years.

With the Athabasca group was purchased a 10-stamp mill, cyanide plant, and compressor operated by water power. Mining and development work will be continued on the California and Exchequer groups, and a geologist will make a preliminary survey of the Athabasca group.

Windermere—Mining continues active in the Windermere district. Australian interests have opened the Isaac mine at Briscoe and the same people have reopened the Nip-and-Tuck. From the latter a considerable tonnage of high-grade ore has been packed down from the mine for shipment. The Paradise mine still is producing. It is the most consistent producer of the district.

Poplar Creek—Ores of the Poplar Creek region are being tested by the Tacoma, Wash., smelter. Returns have gone as high as 624 lb. of arsenic to the ton. Without considering the gold values this makes the material of commercial value.

Ontario

Cobalt—The Nipissing mine has shipped a special car of bullion direct to Shanghai. The car contained 193 bars and aggregated 250,865 oz. of silver.

It is understood that the Crown Reserve has decided to explore its claims in Larder Lake by diamond drilling.

The Beaver mine has again resumed operations at full capacity, following a short shutdown, during which the mill was overhauled.

Kerr Lake is sending dump ore to the Dominion Reduction mill at the rate of 3,500 tons a month. The ore averages about 8 oz. to the ton and, at the present rate of treatment, the dump will last two years. One of the veins recently discovered on the surface has been cut at the 90-ft. level, but the values are not encouraging.

The Lake Shore mine, at Kirkland Lake, is still maintaining an average tonnage.

The Ontario Kirkland has opened up some new ore at the 250-ft. level, and general conditions throughout the property are stated to be very satisfactory.

It is understood that plans are under way for the reorganization of the Teck-Hughes. This company had a considerable amount of bonds outstanding, which expired last October, and on which the interest had not been paid for some time. Fears were expressed by some of the shareholders that they would be squeezed out, but it is understood that the plans proposed will protect everybody. The mill is handling about 70 tons of \$10 ore per day. This could be increased were it not for the curtailment of power.

Gowganda—The Sanderson Mines Syndicate, the head office of which is in Montreal, has taken over a group of ten claims in the Townships of Lawson, Nicol, Chown and Haultain. A company will be organized with a capital of \$3,000,000.

Boston Creek—A. G. Burrows and P. E. Hopkins, of the Provincial Bureau of Mines, have been making an examination of the formation exposed by extensive development at the Miller Independence mine. Considerable attention was given to a study of the "faulting" to be seen at the 500-ft. level, which is probably the continuation of the fracture as found in the "D" or Telluride shaft, where rich showings of gold tellurides were opened.

Manitoba

Rice Lake—At the Gold Seal the shaft is down 182 ft. The vein, which came into the shaft at a depth of 160 ft. is 2 ft. wide. Lateral work will be done when the 210-ft. level is reached.

The survey for the railway to the Flin Flon copper mine, in northern Manitoba, has been begun, with Major Wilcox in charge. The route lies from Mile 7 on the Hudson Bay Ry., to Lake Athapapuskow, a distance of 53 miles, thence on the north side of the lake for 32 miles to the Flin Flon. Four miles of the railway are already built as a spur line of the Hudson Bay Ry.

THE MARKET REPORT

Daily Prices of Metals

Dec.	Copper, N. Y. net refinery*	Tin		Lead		Zinc
		99 Per Cent	Straits	N. Y.	St. L.	St. L.
2	13.25@13.50	32.00	33.75@34.00	5.00	4.85@5.00	5.60
3	13.35@13.50	33.00	35.00@35.25	5.00	4.85@5.00	5.85
4	13.50	33.00	34.50@34.75	4.90@5.00	4.85@5.00	6.10@6.15
6	13.50@13.75	32.00	34.00@34.25	4.90@5.00	4.75@5.00	6.20
7	13.75	32.50	35.00@35.50	4.90@5.00	4.75@5.00	6.20@6.25
8	13.75	33.25	35.75@36.25	4.90@5.00	4.75@5.00	6.25

*These prices correspond to the following quotations for copper, "delivered": 13.50 @13.75, 13.60@13.75, 13.75, 13.75@14, 14, and 14c.

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

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

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

to take less than 14½c. for delivery in the first quarter. Outsiders have no copper to offer except small lots of spot, and are not cutting prices. Rather, are they anxious to buy at current prices, but producers of course prefer to sell direct into the hands of consumers, so that they are having some difficulty in picking up as much as they would like. Bids of 14½c., f.o.b. refinery for February shipment, have been made in these quarters and turned down by producers.

Our prices represent metal for delivery during this and next month. For later deliveries a premium of ½ to ¾c. would be asked.

Lead

On Friday, Dec. 3, the A. S. & R. official price was reduced from 5.50 to 5c., this being the fifth reduction in less than a month, from 7.25c. On receipt of the news, the outside market did not make the customary recession under the Smelting company's price.

Consumers have come into the market in a very satisfactory manner during the last week, and considerable business has been done. They feel the price to be a satisfactory one, even though they may not be getting in absolutely at the bottom. Electrical and cable companies are among those that have shown the most interest in providing for their requirements. There is little demand for forward metal, and the price is little if any different from that of spot. Supplies for immediate delivery are not large, but appear to be adequate for the present demand.

In St. Louis the market is reported as dull, and Granby and similar brands are offered slightly below the New York price, although from 5 to 5½c. is asked for chemical lead.

Zinc

The price of zinc has suddenly bounded upward, and demand has been comparatively active at sharply advancing prices. Importation is again being thought of, and Belgian zinc could now be delivered here at 6c. or slightly under. However, it contains too much lead to satisfy most American consumers, and would have to be sold at a discount. Galvanizers are now the principal consumers on the open market. The brass business continues very depressed.

American production of zinc is probably now at the rate of about 250,000 to 275,000 lb. per year, which is somewhat less than the pre-war figure. Belgian production is gaining gradually, but in November was only about 9,000 tons, so the market should not be glutted by over-production even with the Australian metal coming on soon.

London

Dec.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
2	78½	78½	88	214	219	28½	29½	30½	32½
3	79½	80	88½	221	224½	27½	28	31½	33½
4									
6	79½	79½	89½	218½	222½	26½	27½	30½	32½
7	80½	80	90	223½	227½	26	26½	31½	33
8	81½	81½	91	225½	229½	26½	27	32½	33½

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

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver			Dec.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
2	348	99½	69½	44½	6	346	99½	68	43½
3	347½	99½	70	44½	7	342½	99½	65½	43½
4	346½	99½	69	44½	8	344	99½	65½	43

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. 8, 1920

A much better feeling exists in the metal market. There seems to be no definite reason other than a desire to discount better business conditions, which are expected by the end of next summer at the latest. Sales of metal have not in general been large, but have been satisfactory as compared with recent business, and prices have tended firmer. There has been considerable speculative demand for copper, lead, and zinc, which would indicate that those who follow the market closely do not expect further marked declines and believe the present strengthening to be not merely a flash in the pan. There is one governing factor, however, which must be kept in mind: European deflation has not pro-

gressed to the extent that it has in this country, and should metal prices go much lower in London they would act as a brake on any advancing market here. Zinc, for example, is already not far from the point where it would pay to make importations. London prices have been a little stronger recently, but that this strength will continue is by no means certain. It has also been offset partly by lower sterling quotations.

Copper

An occasional sale of 500 or 1,000 tons has been made recently, but most of the business has been confined to small orders. The total volume has not been great. Producing interests today are holding firmly at 14c. delivered for spot copper, and they are not willing

Tin

The situation in this metal is practically unchanged locally, though the action of the government of the Federated Malay States in contracting to buy all of the production of those states at not less than \$110 per picul (equivalent to about £225, New York or London) is expected to have a stabilizing influence, for about one-third of the world's production will thereby be taken off the market should the price go lower than the present figure.

Straits tin for future delivery: Dec. 2d, 34.75@35c.; 3d, 36@36.50c.; 4th, 35.50@36c.; 6th, 35@35.75c.; 7th, 36@36.75c.; 8th, 37@37.50c.

Arrivals of tin in long tons: Total for November, 3,170. Dec. 1st, China, 10; 4th, London, 10; 6th, Straits, 700; 7th, Straits, 775.

Silver

The trade balance of India, which has been seriously adverse since June of the current year, continues to affect the exchange rate of the rupee, which was quoted today at a new low of 1s. 5½d. China exchanges are also weak, with the result that demand from that quarter continues apathetic. Silver in New York fell to a new low today at 65½c.

Mexican Dollars—Dec. 2d, 53½c.; 3d, 53½c.; 4th, 53½c.; 6th, 52c.; 7th, 50c.; 8th, 50c.

Gold

Gold in London: Dec. 2d, 117s. 4d.; 3d, 117s. 6d.; 6th, 118s. 2d.; 7th, 118s. 9d.; 8th, 118s. 7d.

Foreign Exchange

A tendency toward a general decrease in the value of foreign money was evident during the last week, although the market was narrow. On Tuesday, Dec. 7, francs were 5.88c.; lire, 3.52c.; and marks 1.31c. New York funds in Montreal advanced to 15½ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33c.; 98@99 per cent, 32c. Outside sales reported at as low as 22c.

Antimony—Chinese and Japanese brands, 5½@5¾c.; market very quiet; W.C.C. brand, 6½@6¾c. per lb. Cookson's "C" grade, 11@12½c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony¹ (200 mesh), 7½c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb₂O₃, wholesale lots, 8c.

Bismuth—\$2.40 per lb., 500-lb. lots, and \$2.42 per lb., 100-lb. lots.

Cadmium—Nominal, \$1.40 per lb. Market steady.

Cobalt—Metal, \$6 per lb.; black oxide, \$4.10 per lb.; sulphate, \$1.60.

Iridium—Nominal, \$350@400 per oz.

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

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

Nickel—Ingot, 43c.; shot, 43c.; elec-

trolytic, 45c., f.o.b. Bayonne, N. J. Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne. Osmium—Open market, \$70@80 per troy oz.

¹Palladium—\$85 per oz.

Platinum—Firm at \$85 per oz.; nominal.

Quicksilver—Market quiet; \$48@49 per 75-lb. flask. San Francisco wires \$52@55. Barely steady.

¹Rhodium—\$200@225 per troy oz.

¹Ruthenium—\$175@200 per troy oz.

¹Selenium—Black powdered, amorphous, 99.5 per cent pure, \$2@2.25 per lb.

¹Thallium Metal—Ingot, 99 per cent pure, \$20 per lb.

¹Tungsten Metal—\$35@60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr₂O₃ foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. California concentrates, 50 per cent Cr₂O₃ and upward, 60@65c.

¹Manganese Ore—45@50c. per unit, seaport; chemical ore (MnO₂) \$65@70 per gross ton, lump; \$75@80 per net ton, powdered.

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

¹Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 45c. per lb. in ton lots.

¹Titanium Ores—Ilmenite, 52 per cent TiO₂, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO₂, 15c. per lb. for ore, with concessions on large lots or running contracts.

¹Tungsten Ore—Scheelite, 60 per cent WO₃ and over, per unit of WO₃, \$4@4.50, f.o.b. mines; wolframite, 60 per cent WO₃ and over, per unit of WO₃, \$4@4.25, in New York.

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

Vanadium Ore—\$1.50 per lb. of V₂O₅ (guaranteed minimum of 18 per cent V₂O₅), New York.

¹Zircon—Washed, iron free, 5c. per lb.

¹Zirkite—According to conditions, \$80@90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at \$1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 4—Zinc blende, per ton, high, \$35.25; basis 60 per cent zinc, premium, \$32; Prime Western, \$30@31; fines and slimes, \$30@27.50; calamine, basis, 40 per cent zinc, \$35@30. Average settling prices: Blende, \$36.73; calamine, \$30; all zinc ores, \$36.52.

Lead, high, \$69.60; basis 80 per cent lead, \$75@47.50; average settling price, \$69.27 per ton.

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

Shipments for the week: Blende, 6,154; calamine, 197; lead, 1,677 tons. Value, all ores the week, \$349,150.

Lead dropped from offerings of \$55 last week to \$47.50 this week. The \$75 basis noted was paid in some settlements. Blende dropped to \$30 basis, with considerable ore sold, advancing to \$31 basis yesterday under pressure of largely increased demand. Purchases were 2,100 tons larger than last week. Approximately 30 per cent of production is suspended owing to the lowest price since December, 1907.

Platteville, Wis., Dec. 4—No ore sales in open market were made this week. The National plant again made the only shipment of high-grade blende, four cars going to the Illinois Zinc Co. and two cars of Prime Western on contract schedule. The National has started its acid department again after three weeks' shutdown. Shipments for the week: Blende, 308; lead, 50 tons. Shipments for the year: Blende, 59,281; calamine, 2,534; lead, 4,523; sulphur ore, 1,342 tons. Shipped during week to separating plants 2,228 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, \$2,000@3,500; No. 2, \$1,400@2,000; spinning fibres, \$400@1,000; magnesia and compressed sheet fibres, \$325@500; shingle stock, \$110@150; paper stock, \$60@75; cement stock, \$17.50@30; floats, \$8.50@15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, \$10@12 per net ton; ground (white) \$24@30 in bags, carload lots; (off-color) \$22@26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, \$23; ground (white), \$45; ground (off color) \$30@32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, \$10 per ton, f.o.b. cars, Missouri; floated, \$28 per ton in bbls.; \$26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

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

Feldspar—Crude, \$8@14 per gross ton, f.o.b. Maryland and North Carolina points; \$7.50@10, f.o.b. Maine; ground, \$27@30, car lots, f.o.b. Baltimore; ground, \$17@21, f.o.b. North Carolina points; \$17@21 per ton, No. 1 ground, f.o.b. New York State; \$21@23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$25 per ton, f.o.b. Illinois mines, and \$25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

ical or enameling purposes, \$60; lump, \$17, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for \$20 per ton f.o.b. Madoc; output limited. Canadian price generally \$18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—\$18 per ton carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade, 7@9c.

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

Kaolin—See China Clay.

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

Magnesite, Calcined—High-grade caustic calcined, lump form, \$35@\$40 per ton, carload lots, f.o.b. California points. In Chicago district, \$57.70; Atlantic seaboard, \$61@\$63.

Dead-Burned—\$38 per net ton, Chewelah, Wash.; \$58@\$64, Chester, Pa. Austrian grade, \$55@\$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, \$1.20 @\$1.40; No. 4, \$2@\$3; No. 3, \$4.25@\$5; No. 2, \$5.50@\$7; No. 1, \$8. Clear block; No. 6, 55c.; No. 5, \$1.75; No. 4, \$3.25; No. 3, \$5; No. 2, \$6.50; No. 1, \$8; A1, \$10; extra large, \$25; all f.o.b. New York; ground, \$150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, \$45 @\$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., \$1.15; 2 x 3 in., \$1.65; 3 x 3 in., \$2.10; 3 x 4 in., \$2.50; 3 x 5 in., \$2.75; 3 x 6 in., \$3.75; ground 165 mesh, \$150 @\$170 per ton; ground roofing mica, \$60; mica washers, 75c. @ \$2 per lb.; 1½-in. disks, No. 1, \$1.40 per lb.; No. 2, \$1.25. The foregoing domestic prices obtain also in the Chicago district.

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

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$13; 75 per cent, \$11.50; 75@74 per cent, \$11; 70 per cent, \$8.35; 68 per cent, \$7.85; 68@66 per cent, \$7.60. Finely ground Tennessee rock sells for \$8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, \$9; both prices being f.o.b. Centerville, Tenn.

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

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

Quartz—(Acid tower) fist to head, \$10; 1½ to 2 in., \$14; rice, \$17; all net ton, f.o.b. Baltimore; lump, carload lots,

\$5@\$7.50 net ton, f.o.b. North Carolina mines. Even lower quotations are heard.

Sand (Glass)—Dry glass sand, \$4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is \$3 per ton; \$2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is \$2.50 on contract; some outside sales have been made at \$4. St. Louis, open market, at \$3.50; contract price on large quantities, \$2.50; on small quantities, \$3.

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

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

Mineral Products

Arsenic—White arsenic, 12@12½c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

Sodium Nitrate—\$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, \$22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, \$225 @\$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

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

Ferrocobalt—Per lb., \$12@\$15.

Ferrocobalt—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 16@17c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, \$150, freight allowed; \$145, f.o.b. seaboard bases; English, \$135@\$140, c.i.f. Atlantic seaports. Spiegel-eisen, 18@20 per cent, \$60@\$65, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, \$2.25@\$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, \$60@\$65; 50 per cent, \$80@\$85; 75 per cent, \$160.

Ferrotungsten—Domestic, 70 to 80 per cent W, 65@75c. per lb. of contained tungsten, f.o.b. works. Foreign, 65c.

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

Ferrovanadium—Basis 30 to 40 per cent, \$6.50@\$7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets—Current New York

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

price, 23½c. per lb.; wire, 18c. Even lower quotations are heard.

Lead Sheets—Full lead sheets, 9½c.; cut lead sheets, 9½c. in quantity, mill lots.

Nickel Silver—Unchanged at 35½c. per lb. for 18 per cent nickel.

Yellow Metal—Dimension sheets, 22½c.; sheathing, 22½c.; rods, ½ to 3 in., 19½c.

Zinc Sheets—\$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10½c. per lb.

Refractories

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

Chrome Cement—40@45 per cent Cr₂O₃, \$55@\$60 per net ton, and \$65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, \$55@\$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, \$45@\$50.

Magnesite Brick—9-in. straights, \$110 per net ton; 9-in. arches, wedges and keys, \$120; soaps and splits, \$130.

Silica Brick—9-in., per 1,000: Chicago district, \$65@\$70; Birmingham, Ala., \$56@\$61; Mount Union, Pa., \$55 @\$60.

Iron Trade Review

Pittsburgh, Dec. 7, 1920

Wire products and sheets have followed tin plate, bars, shapes, and plates in the decline of the independent market to the Steel Corporation or Industrial Board level. The independent market on pipe remains at \$7 a ton above the Steel Corporation level. The reductions have brought the independents little additional business, nor was it expected that they would.

The Steel Corporation continues to operate substantially as well as formerly, at 85 to 90 per cent of capacity. Independent operations hardly average over 50 per cent, and are declining. There will probably be extensive closings the last week or two of the year, to allow orders to accumulate.

Last Thursday the American Sheet & Tin Plate Co. (Steel Corporation) opened order books for the first half of 1921, at regular prices, \$7 for tin plate, 3.55c. for blue annealed sheets, 4.35c. for black sheets and 5.70c. for galvanized sheets, but on account of about three months of work carried over, the new contracts will really be for approximately the second quarter.

Pig Iron—There are offerings of bessemer at \$35, Valley, or \$2.50 decline, and of basic at \$33, or \$2 decline. Foundry remains nominally \$37.

Semi-finished Steel—The independent market is nominal at about \$50 for billets or sheet bars.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 5½c. per lb., in 250-lb. bbls. Barrel charge is 35c. additional.

Connellsville—Furnace, \$10@\$12; foundry, \$8@\$10.

Curtailment in the Copper Industry

Relatively Small Decrease in Output So Far—Tendency of Most Producers To Lower Costs Rather Than Production—Surplus Stocks Still Huge and Export Trade Poor

THE extremely low prices of copper are having their inevitable consequences. Operations are being curtailed by some of the country's largest producers, and there is a growing determination in the trade drastically to readjust the industry in an effort to meet the causes of the present depression in the market. This was to be expected, in view of the great forces that have been bearing down upon the price of copper and the impossibility of meeting today's prices by immediately lowering costs.

Ten years ago it was conservatively estimated¹ that no copper can be produced in North America at a profit for less than 10c. per lb. Copper today can be had at 14c. per lb. delivered, so that it is not difficult to realize the situation in which practically every copper company in the country finds itself. It was further estimated ten years ago that 11c. copper meant only half the production for the period; 12c. copper an interchange of a "new dollar for an old one," and at 15c. "the business is profitable and prosperous only to an entirely legitimate degree." Although this estimate should possibly have been slightly modified in 1913 and 1914 by the records of some of our great low-grade porphyry coppers and the results of improvements in the metallurgy of copper during the last ten years, the modification up to the beginning of hostilities would probably not have been large, but at this time an upward revision of perhaps 50 to 75 per cent is evidently necessary. Present costs, based, as they are, on a labor payment compatible with a war price for copper, are very much higher than ten years ago.

To meet the acuteness of the situation producers have taken a logical step. They have begun to curtail their output and to lower their costs through a readjustment of the elements that enter into the cost of production—chiefly labor. Greene Cananea has announced it will suspend operations indefinitely on Dec. 15; North Butte has dropped production two-thirds, or from 1,500,000 to 500,000 lb. monthly, and other announcements are momentarily expected. The desire has been more to decrease wages than to lessen production in meeting the situation. The Copper Range Mining Co. in Michigan has reduced wages about 17 per cent, but the reduction is slightly compensated by concessions in the price of fuel to employees. The American Smelting & Refining Co. has reduced wages 50c. per day at its Tacoma plant, and is considering similar action at the East Helena smelter. Quincy Mining Co., Michigan, has also made a reduction of 15 per cent in wages. Calumet & Hecla has already made a wage cut. The Lake Superior copper mines have no compensating silver production which would help to lower production costs, as in the Butte district, and are relatively high-cost producers. It was but natural that they should first feel the pinch of low copper prices.

Although labor is one of the items that is amenable to a reduction, transportation charges, which have been greatly increased during the last year, admit of only an indirect decrease. Not only have the increased freight rates added to the marketing cost of copper, but to a considerable extent to other items of production cost, as the prices of mine supplies also reflect the increased rail rates. A successful attempt has been made by western companies to ship their product by rail to Pacific Coast ports and then by boat via the Panama Canal to Eastern points.

Operating companies are naturally reluctant to abandon operations entirely, and it is largely a question of what entails the greater cost—a complete shutdown, partly curtailed operations, or production at a rate which produces copper at the cheapest figure but which nevertheless necessitates marketing copper at a certain loss per pound. It is no easy matter to decide exactly what procedure is best

sued for the individual mine, particularly as the future price of copper is uncertain. Judging from the announcements of many important companies and partly referred to above, the copper producers in general prefer to decrease their costs by reductions in wages and other items rather than by drastic curtailment. This is not all to be desired, as neither domestic nor export business is upon a scale which bodes well for the industry; whereas production is still above the pre-war rate. In fact, an estimate of October production shows a rate slightly higher than that of September.

MONTHLY SMELTER PRODUCTION OF COPPER IN 1920
In Pounds

	Average New York Price		Average New York Price		
Jan.	121,900,000	18.92	July	109,730,000	18.58
Feb.	117,450,000	18.57	Aug.	116,430,000	18.35
Mar.	120,310,000	18.33	Sept.	104,920,000	18.14
Apr.	116,100,000	18.66	Oct.	105,100,000	15.93
May	115,000,000	18.48	Nov.	.....	14.26
June	116,100,000	18.07			

AVERAGE MONTHLY COPPER PRODUCTION

Year	Average Monthly Production	Average New York Yearly Price	Year	Average Monthly Production	Average New York Yearly Price
1910	90,500,000	12.74	1916	162,000,000	27.20
1911	90,500,000	12.38	1917	160,300,000	27.18
1912	103,400,000	16.34	1918	161,500,000	24.63
1913	102,400,000	15.27	1919	100,800,000	18.69
1914	91,000,000	13.60	1920 (a)	114,300,000	.....
1915	118,600,000	17.28			

(a) Estimated.

A glance at the figures will show how slightly copper production has declined in the current year and that it is still above the pre-war rate.

It is well known that stocks of both refined and crude copper are still very large, and that despite the dent that was made in the copper surplus earlier in the year the stocks are still formidable—in fact, the key to the situation. Estimates vary widely as to their amount, but it is safe to say that there is enough copper in crude and refined form to be equivalent to three-quarters of the normal annual production in this country. Such large stocks carry an interest charge that serves to aggravate the effect of the supply. Consumers are fully aware of the existence of this surplus and the improbability of decreasing it in a short space of time.

It is hoped that foreign trade in raw copper will help to diminish the heavy copper surplus, but from the record made so far this year no hopeful impression is gained. Although earlier in the year exports of copper considerably exceeded imports, of late the trend has changed, and for the last two months reported more copper has been imported than has been exported. During the first ten months of the current year approximately 543,150,000 lb. of copper in various forms was exported. At the same time about 406,440,000 lb. was imported, which leaves a favorable net balance of about one and a half month's production that has been exported—not a very encouraging rate for the period.

How the present policy of the copper industry will meet the situation it is difficult to say. Economic forces have caused the industry to contract its production and will likely cause further contraction, no matter how distasteful the process. There has been a relatively small effort on the part of the country's largest producers to conserve their output by decreasing production, and further curtailment is not only logical but inevitable should present low prices prevail. Until the heavy surplus stocks of copper are lessened, or the foreign exchange situation rights itself, there is no need of producing on a basis which implies satisfying the wants of a world which is not prepared to purchase.

¹J. R. Finlay's survey in "Cost of Mining."

COMPANY REPORTS

Chino Copper Co. Shows Deficit

Copper: New Mexico

A statement of the operations of Chino Copper Co. for the third quarter of the calendar and fiscal year 1920 shows that the gross production of copper contained in the concentrates from milling operations for this and preceding quarters of the year 1920 was 12,354,752 lb., 11,980,615 lb. and 10,621,276 lb. respectively.

In addition to the copper derived from the concentrating ores, there was a total of 221,462 gross pounds of copper in crude ore shipped direct to the smelter, making the total gross production for the quarter 12,576,214 lb., as compared with 11,989,451 lb. for the second quarter and 10,621,276 lb. for the first quarter. The net production of copper after smelter deductions for the quarter was 12,023,444 lb. as compared with 11,411,178 lb. and 10,159,566 lb. respectively, for the second and first quarters.

The total amount of ore treated for the three months was 498,376 tons, which is an average of 5,417 tons per day. This average daily tonnage is 257 tons per day less than for the second quarter of 1920. The average copper content of the ore treated by the mill for the third quarter was 1.82 per cent copper, as compared with 1.67 per cent copper for the previous quarter.

The recovery per ton of ore milled for the third quarter was 24.79 lb. gross, compared with 23.204 lb. gross for the second quarter. There was produced a total of 36,861 dry tons of concentrates averaging 16.76 per cent copper.

The cost per pound of net copper produced from all sources in the third quarter was 15.01c., compared with 15.90c. for the second quarter. This cost includes plant depreciation and all other items excepting charges for Federal taxes. Income from precious metals and miscellaneous sources amounted to \$57,703.13, equivalent to 0.48c. per lb. of net copper produced, which being credited to the cost of producing copper reduces the net cost for the quarter to 14.53c. per lb.

The financial results of the company's operations for the quarter under consideration compared with the second and first quarters of 1920 are shown in the following table:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Net income from copper production only.....	\$51,079.70	\$260,031.67	\$737,605.40
Miscellaneous income, including payments for precious metals.....	57,703.13	70,120.39	72,121.75
Total.....	\$108,782.83	\$330,152.06	\$809,727.15
Distribution to stockholders.....	326,242.50	326,242.50	326,242.50
Net surplus.....		\$3,909.56	\$483,484.65
Net deficit.....	\$217,459.67		

The earnings for the third quarter of 1920 are based on a price for copper of 15.43c. per lb., compared with 18.175c. per lb. for the second quarter of the year. The total net income for the nine months amounted to \$1,248,662.04, or \$1.435 per share. A distribution to stockholders, amounting to 37½c. per share, was made at the end of the third quarter.

During the quarter there was removed by steam shovels at the Santa Rita mine a total of 1,026,570 cu.yd. of material, equivalent to an average of 342,190 cu.yd. per month, compared with a total of 1,018,784 cu.yd. of material, or an average of 339,595 cu.yd. per month, for the second quarter. Of the total material removed, 688,580 cu.yd. were stripping, the remainder being equivalent to 662,609 tons of ore of an average grade of 1.68 per cent copper, according to mine sampling and assaying. The difference between the tonnage mined and the tonnage milled or shipped direct to the smelter during this quarter is due to oxidized and partly oxidized ore which it was necessary to remove in connection with stripping and mining operations and which was sent to ore stockpiles.

Ray Consolidated Copper Co.

Copper: Arizona

The thirty-seventh quarterly report of Ray Consolidated Copper Co. covering the third quarter of the year 1920 indicates that the gross production of copper contained in concentrates for the third quarter, as compared with the previous quarters of 1920, was 13,029,427 lb., compared with 12,880,605 lb. in the second quarter and 11,547,103 lb. in the first quarter.

The net production of marketable copper derived from this gross output for the quarter, after allowing for smelter deductions, was 12,631,222 lb., as compared with a net production of 12,553,623 lb. for the quarter ended June 30, and of 11,259,534 lb. net for the quarter ended March 31, 1920. During the quarter 443,100 dry tons was milled.

The cost per pound of all net copper produced was 15.47c., including the customary charges to cover depreciation of plant and equipment, all administrative and general expense, and also a fixed charge of 15c. per ton of ore treated for the retirement of mine development expense, and after crediting miscellaneous income (including gold and silver values) amounting to .486c. per lb.

The financial results of operations for the quarter, compared with the previous quarters of 1920, are as follows:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Operating profit or loss.....(a)	\$113,518.89	\$343,650.73	\$587,165.50
Miscellaneous income.....	61,369.96	43,604.72	50,134.39
Total.....(a)	\$ 52,148.93	\$387,255.45	\$637,299.89
Disbursement to stockholders.....	394,294.75	394,294.75	394,294.75
Net surplus for quarter.....			\$243,005.14
Net deficit for quarter.....	\$446,443.68	\$7,039.30	
(a) Loss.			

The average carrying price of copper for the quarter was 15.057c., as compared with 18.426c. for the previous quarter. All costs as shown and the financial results as stated are exclusive of any charge for or reserves set up to cover Federal income and profits taxes. A quarterly distribution to stockholders of 25c. per share was made Sept. 30, 1920.

Mining Dividends for November, 1920

The following is a partial list of dividends paid by mining companies during November, 1920.

Mining and Metallurgical Companies of U. S.		Location	Per Share	Totals
American Zinc, Lead & Smelting pfd.	U. S.		\$1.50Q	\$120,810.00
Anaconda Copper Mining.....	Mont.		1.00Q	2,331,250.00
Chief Consolidated Mining, c.....	Utah		.10Q	88,422.30
International Nickel, pfd.....	U. S.-Can.		1.50Q	133,689.00
Miami Copper.....	Ariz.		.50Q	373,557.00
Mohawk Mining, c.....	Mich.		1.00Q	100,000.00
New Jersey Zinc.....	U. S.		4.00Q	1,680,000.00
United Verde Exten., c.....	Ariz.		.50Q	525,000.00
Utah-Apex Mining, c.....	Utah		.25K	132,050.00
Mining and Metallurgical Companies of Canada and Mexico				
Amparo Mining, g.s.....	Mexico		.05QX	100,000.00
Coniagas Mines, Ltd., s.....	Ontario		.12½Q	100,000.00
El Oro Mining & Ry., g.s.....	Mexico		1 sh. A	£57,375.00
Greene-Canaan Copper.....	Mexico		.50Q	\$250,000.00
Hollinger Consol. Gold.....	Ontario		.05X	246,000.00

A, Annually. Q, Quarterly. X, Extra. K, Irregular

American Zinc, Lead & Smelting Co. failed to declare a dividend on its common stock at this time, and the condition of the copper market has caused Calumet & Hecla to withhold a dividend declaration usually made, and Mohawk Mining to drop to \$1, from the \$1.50 paid in August. On the other hand, Utah-Apex Mining resumes after an interval of two years, and Amparo Mining maintains its extra of 2c. El Oro is still able to pay its annual shilling (tax free), and Hollinger Consolidated Gold Mines, Ltd., of Canada, is able to bring out 5c. extra, in addition to the regular bi-monthly payment made in October. Arizona Copper Co., Ltd., voted on Nov. 17 not to pay an interim dividend.

MINING STOCKS

Week Ended December 4, 1920

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

Table listing mining stocks with columns: Stock, Exch., High, Low, Last, Last Div. Includes sub-sections for GOLD, SILVER, SILVER-LEAD, NICKEL-COPPER, QUICKSILVER, TUNGSTEN, VANADIUM, and ASBESTOS.

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

