

ENGINEERING AND MINING JOURNAL

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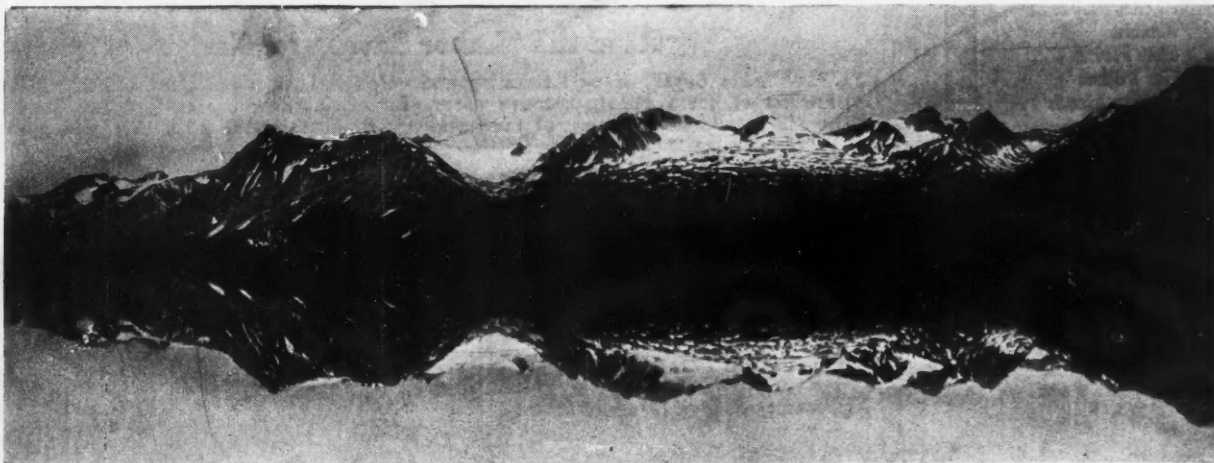
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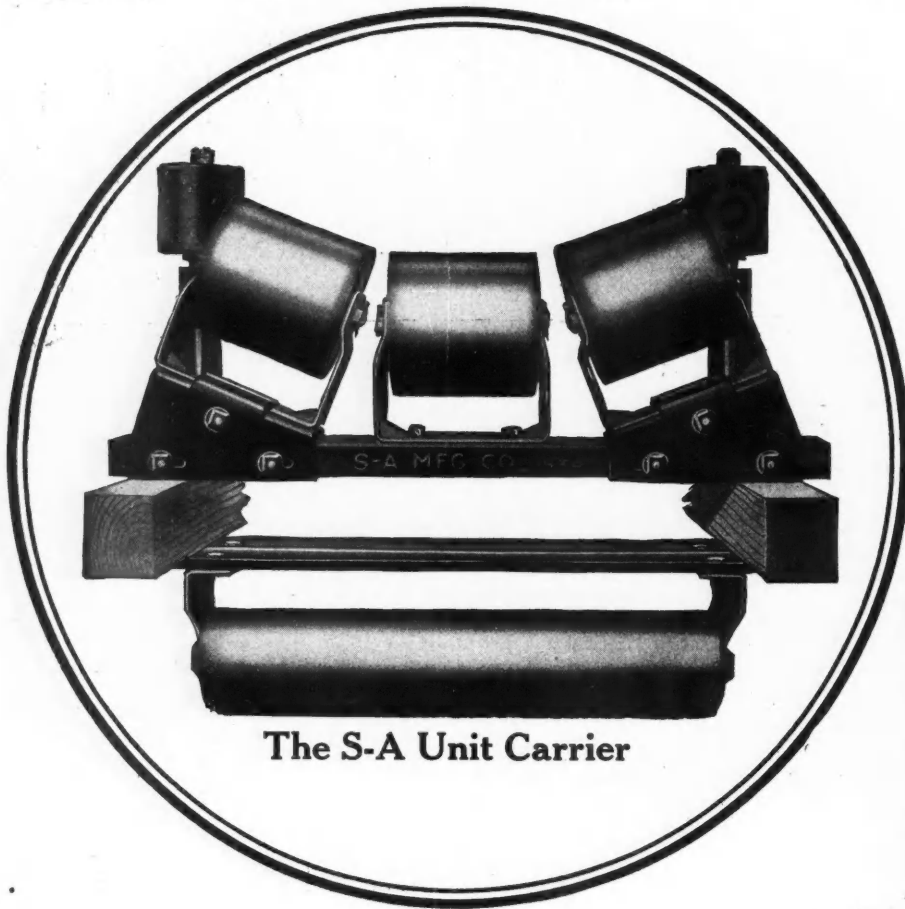
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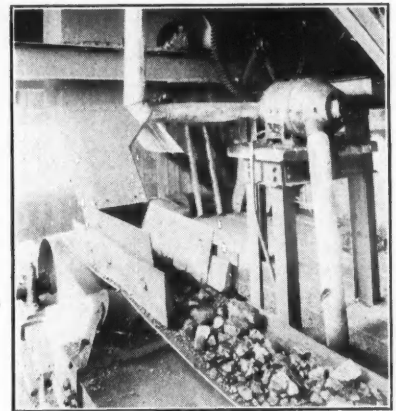
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Cathedral Range, Atlin Lake, British Columbia
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The Fourth Estate

IN MÆDIÆVAL ENGLAND there were three classes, I castes, or estates—the barons, the clergy, and the commons. With the invention of printing, books became a powerful factor in life, and with the development of the newspaper this factor strengthened from a leavening influence into an ever-present dynamic force. Burke, statesman and orator, making a speech in the House of Commons, was suddenly conscious of that power as represented by the reporters in the press gallery. "These gentlemen," he interrupted his speech to say, "represent a distinct class and power in the empire. They constitute a Fourth Estate."

Since that time the power and responsibility of the Fourth Estate has grown so that its influence is probably predominant. Certainly modern life, government, commerce, and industry would be impossible without the press, though it would be conceivable, for example, without the barons or even without the clergy.

The one thing which we all need in common is the newspaper; it is the one medium through which, in the most advanced countries of the world, millions of men and women daily merge their thoughts into common channels. It is the prime essential to intelligent common understanding, the *sine qua non* of democracy, the link that binds great nations and causes together.

Such are the more or less trite and acknowledged functions of the press in general. It is fitting that engineers should apply these definitions to the engineering press. It is especially necessary for the members, committees, and officers of technical societies to keep in mind the necessity and the indispensability of the technical press, and to realize the dignified nature of this medium for the development of a common harmonious thought and understanding. Any Burke of the engineering world must needs pause in his address to engineers and to the nation long enough to recognize the independent status and the power of the Fourth Estate, and the necessity for its support.

It has been said that the technical press could exist without the engineering societies, which is evidently true; and it has been added that the engineering societies could not exist without the technical press. The latter is perhaps only partly true; but, at any rate, it is clear that the technical societies could not have grown to the numbers and power which they have attained except with the support, publicity, and constructive criticism which the press has afforded them.

Those societies which deem themselves self-sufficient, and their officers who are not analytical, will reply: we can have our own journals, our own mediums of publicity—we do not have to recognize the need of an independent press. Think again: has that principle worked as between governments and the press, as between great

industries and the press? The journal of a technical society is an organ, a subsidized publication, bound by the policy of the board of management. It is not the medium for independent editorial comment, a disseminator of general news, or a forum for unbiased public opinion: for sometimes that public opinion and that honest editorial comment would criticize policies of the society; and that, of course, would never do. The administration at Washington during the war issued a daily official organ, under the editorship of one Creel; but Congress tomahawked it at the first opportunity, and there was nowhere in evidence any voice of protest.

In any attitude of the technical societies which does not recognize the necessary function of the independent technical press, and which does not support it, these societies are blind, not only to the advancement of the causes which they represent, but also to their own welfare. Engineers know that the aims and ideals of the societies are as a rule of the highest: they move in any good cause not only from their own earnest conviction but with an ear to the ground for all comment and illuminating criticism. They would like to know as they proceed what the thousands of their own members think of what they are doing. They cannot find that out from their own organizations. Their work is done by committees, and it is a long time between the appointment of committees; and the thousands of the rank and file have only once in a great while an opportunity for the expression of an opinion, and that only on a single categorical question, such as: "Shall the American Society of Civil Engineers join the Federated American Engineering Societies? Answer Yes or No, and be quick about it."

The technical societies cannot find out from their own official organs what the *vox populi* is saying. Therefore, just as Mr. Harding cannot and will not try to run the Government intelligently without the light which the press affords him, just so the technical organizations, especially as they launch out into work of general or public import, cannot keep properly oriented, even as to the opinions and wishes of their members, without the independent technical journals.

The Demagogue

THE House of Representatives is full of all sorts of people, many of them ignorant, many catching at any straw for notoriety. Such a one is Mason, of Illinois, in whose record we recall the episode of his having made a speech during the war at a public meeting in Washington, which apparently was called to expound the beauties of Bolshevism and Pacifism. It is Mr. Mason who recently offered resolutions in Congress calling for recognition of the independent republics of Korea and Ireland.

Quite recently, on the floor of the House, Mr. Mason attacked the copper producers, particularly Mr. John D. Ryan, and also Mr. B. M. Baruch, charging them with having stolen from the Government in copper deals during the war. Mason was promptly rebuked by his own colleagues, who recalled the action of the copper producers in selling the metal early in the war to the Government at 16¢. per pound, when the prevailing price was 26¢. This agreement was made with Mr. Baruch, representing the War Industries Board.

Several members of the Senate also brought out the facts, Senator Thomas narrating that he and Senator Smoot had gone to Mr. Baruch to protest against his buying copper at that figure, because this depression of price, if maintained, would have forced many small companies to the wall. Senator Myers, of Montana, remarking that Mr. Ryan had done his best to keep him out of the Senate, testified to his convictions as to the patriotism of Mr. Ryan and the great value of his services to the country during the war.

The copper producers of America worked during the war at the orders of the Government, and were quick to respond to its desires, even though the last request made, that the producers keep up war production after the armistice was signed, resulted in that surplus of copper stocks which has ever since hung like a pall over the industry. These Government requests were transmitted by Mr. Baruch as chief of the War Industries Board.

There is no question that the Government program left the industry in an unfavorable and crippled condition, when it dropped it with its heavy accumulated stocks. We have heard nowhere, however, any complaint against the Government, or of any claim for damages. It is all in the hazards of the war. Nevertheless, the men who stood behind the Government with all their resources and their untiring personal service should not have to suffer the unnecessary hazard of irresponsible slander.

Why Magnesite Producers Shut Down

WHEN IT WAS ANNOUNCED at the beginning of the year that producers of magnesite in the State of Washington had shut down, the importation of this commodity from Austria was generally accepted as the cause. That is, somebody said this was the reason, and no one denied the statement. Those engaged in mining this mineral have been agitating for a protective tariff, and here, apparently, was ready proof of what Austrian competitors could do to put this war-bred industry, with its great investment and machinery of preparation and distribution, on the rocks.

To what extent the Washington companies will be able to operate in the face of such competition is a debatable point. It is also debatable whether under any circumstances a protective tariff on magnesite be advisable. But it seems unlikely that it is importation of Austrian magnesite that has caused the suspension of operations in Washington. This is pointed out on p. 464 by R. C. Stone, of the U. S. Geological Survey. Imports in 1920 were only about 18 per cent of the magnesite consumed for all purposes, according to Mr. Stone, as compared with 14 per cent in 1919. Also, imports in December last were less than a quarter of those of November, and in neither of these months did any come from Austria. Mr. Stone suggests that the real reason for the shutdown is lack of orders, owing to

conditions in the steel trade, the principal consumer of magnesite. Unless imports increase or Washington producers resume, the steel industry will probably find itself short of refractory material very soon, Mr. Stone believes. We are glad to publish Mr. Stone's convincing conclusions, for at a time when tariff legislation is pending it is proper that the truth be told, as far as it is discernible.

Pittman Act Distortions

APPARENTLY the latest tirade launched against the Pittman Act appears in a recent leading editorial of the *Commercial and Financial Chronicle*. The statements made leave no doubt in anyone's mind as to the attitude of that paper. The operation of the Pittman Act is characterized as "a piece of extravagance and profligacy," a "monstrous wrong to the people of the country," and an "iniquitous law." These caustic remarks would not be so bad were arguments advanced to substantiate them, but absolutely no facts are presented that in any manner prove the *Chronicle's* contentions. One acquainted with the history and operation of the Pittman Act can find much fault and serious criticism with the presentation of the editorial comment noted. Misstatement follows misstatement, so that the reader unfamiliar with this silver legislation may unwittingly be induced to agree with the conclusions reached.

It appears to us that this attempt of the *Chronicle* to discredit the Pittman Act is merely exposing either its own ignorance of the silver situation or its unwillingness to present all the appertaining facts, for the article carefully fails to point out that the Government, and hence the taxpayer, is not losing one cent by the silver purchases under the Pittman Act. The silver was sold to the British government for one dollar an ounce and is being replaced for one dollar an ounce. We reluctantly refer to this point, as it has frequently been stressed in these columns, but it has evidently been overlooked in this patently ignorant attack. It is not the American taxpayer who is feeling the effect of the Pittman Act but his British neighbor, who bought about 207,000,000 ounces of silver in the first place at one dollar an ounce and through the intermediary of the United States Government, which had a large stock on hand and which is now transferring the money it received in the transaction to the American silver producer.

If it had not been for the enormous amount of American silver that was shipped to India in 1918-1919 there is little doubt that the silver market would be in much better condition today. India's large silver repast of that period, judging by the recent selling for Indian account, has evidently not been digested or assimilated. The present unusual spectacle of selling from India would surely have been deferred a bit longer.

The *Chronicle* states that should silver purchases continue, at present market prices, "the loss to the Government and the clear bonus to the silver producers would reach the prodigious sum of \$70,000,000." A prodigious statement. A moment's reflection will show that it would be purely a *paper loss*, and not a loss at all, for, should the Government make its future silver purchases at the market price, it would be making an actual profit of \$70,000,000 at the expense of the silver producers. Is that the purpose of the purchases? If so, why not have the Government withdraw its buying entirely at the present time so as to "bear" the market,

and then to buy gingerly without disturbing the low level of the market? Fortunately such is not the purpose of government, which should function not for its own particular profit but with equal consideration to everyone. The Pittman Act merely gives due and equitable treatment to the silver producers, and the flimsy pretexts, hasty assumptions, and gross distortions of those unfamiliar with its history and its purpose will not change it.

We wonder if it is generally known what a boon the Pittman Act has been of late in keeping the wheels turning in some of our copper and lead mines where silver is recovered as an important and valuable byproduct. Were it not for the support given by dollar silver to the low-priced copper and lead produced, many valuable mining properties would be shut down in Montana and Idaho mining districts and hundreds of miners added to the already swelled list of unemployed in the mining industry. This statement is not introduced as an argument to continue the act, but merely to point out one of its beneficial results through stabilization. The Pittman Act can stand on its own merits and the splendid service it rendered in helping win the war (tribute was recently bestowed upon it by a prominent British official), and needs no extraneous support.

Attacks against the Pittman Act may be expected at any time, particularly as it may appear to the uninformed that the Government, and hence the public, is being mulcted of a large sum of money in making silver repurchases. It would help much, however, if before venting their spleen, critics took care to present all the facts in the case, so that the reader may also draw his own conclusions.

Improved Utilization of Non-Metallic Minerals

IT IS PROVERBIAL that the pork-packing industries utilize everything up to, and some aver even including, the souel. In striking contrast with this are some of the non-metallic mining industries, where the waste is very greatly in excess of the useful products. A paper entitled "Byproduct Expansion in the Non-Metallic Mineral Industries," read at the recent New York meeting of the A. I. M. E., brings this subject into the foreground. It is asserted that in the process of slate quarrying the waste is 80 to 95 per cent of gross production, and in various other non-metallic mining industries the percentage of waste approaches these figures.

Of course it must be remembered that much of this waste is just plain ordinary dirt and barren rock, which are in a sense cheap because the world is made of them, but, on the other hand, it is believed that a considerable part of the discarded material may be fitted into our complex industrial life if its proper niche can be found. It is to find the niches and corners into which non-metallic byproducts will properly fit that the U. S. Bureau of Mines is devoting an important part of its present activities.

Copper bars are all much alike, whether their source was native metal or sulphide, and gold bricks (if genuine) vary little in character, whether derived from placer or quartz vein, but many non-metallics are like people: they have about them a sort of individuality or personality which persists and remains a positive factor throughout their entire lives. Thus, a mica may be stained or transparent, a graphite may

be flake or amorphous, and a slate may be clear or ribboned, soft vein or hard vein, but, whatever their peculiarities, they must for the most part retain these characteristics in the finished products. They are not thrown into furnaces and molded or stamped into series of identical forms, but they are cut, polished, trimmed, or otherwise fashioned, then turned loose in the world, carrying with them all their inherent qualities, and upon such qualities they must stand or fall.

This variation in physical properties, giving rise to types and classes in the same mineral species, opens up a wide field for choice on the part of consumers, and the important point toward which this introductory pathway has been leading is that the overwhelming plurality of choice commonly tends toward the higher and purer grades, with a consequent tendency to "pick the eyes" out of deposits, (a process largely completed in some feldspar mines) and to discard whatever of the lower grades the consumer refuses to use. This is a natural tendency, and for certain purposes, no doubt, the higher grades are essential, but for many uses it may be demonstrated that what are regarded as lower types can be used with advantage. This tendency unduly to limit and hedge in specifications demands correction if several of the non-metallic industries are to remain on a solid footing.

As an illustration, in the Pennsylvania soft vein slate district "clear stock" constitutes only about 10 per cent of what is commonly regarded as the commercial slate, or, say, 1 per cent of the gross tonnage mined. If, therefore, the majority of consumers specify clear stock, such a hardship is laid on producers that the very existence of their industry is threatened. A tendency to accept only the selected stock has been noted on the part of slate blackboard purchasers, and it is quite possible that specifications will be raised to a point where no slate blackboards will be produced. The claim, therefore, that for many uses the banded or "ribboned" slate is of equal quality with "clear stock," except possibly in appearance, is a subject for serious consideration by dealers and consumers.

Another striking example is to be found in the feldspar industry, for the continued and insistent demand for No. 1 spar by ceramists has threatened a shortage of such supplies, and is leading to a condition where the use of lower grades becomes imperative. It is noted that larger proportions of No. 2 spar have lately been used, thus making it possible for the miner to operate more advantageously, to increase his output and profits, and reduce the volume of his waste heap.

Reduced to its basic factors, the question for the consumer is "Shall I insist now and all the time on first-grade material, irrespective of price elevation, the threatened exhaustion of deposits, or the hardship such action may work on producers, with consequent possible reduction in supply, or shall I make a determined effort to use whatever share of lower-grade raw material may be utilized without detriment to my products?" A proper answer to this question is awaited not only with interest but with a certain degree of trepidation by several groups of non-metallic miners, whose operations should reflect such measure of success as accompanies investigation in this field.

WHAT OTHERS THINK

Assisting Deflation

After reading columns of learned mush that appears in almost every issue of almost every periodical, your sane, sensible editorial "Assisting Deflation," which appears in the Feb. 19 issue of the *Engineering and Mining Journal*, on the keynote of the root evil of the times, is most refreshing and reassuring. I begin to feel now that perhaps, in the course of time, others will arrive at your point of view. Then things will begin to happen, and for the better. "Deflation of money-psychology" deserves to become a classic.

You have had the sense and, what is more, the courage to put into words what I have felt for a long time (and I believe that thousands have felt)—the protest against publishing in the *Transactions* the interminable "drools" of men who have nothing to say and an unquenchable desire to say it.

I believe that you are putting the right kind of oil on "crime waves" and other waves that are almost as demoralizing, and I am writing to express the wish that you will keep it up.

FRANK L. NASON.

West Haven, Conn.

A Correction Concerning Engineering Society Publications

Your editorial on "Assisting Deflation" is one that was very much needed. The National Research Council and some other organizations might take it to heart, as well as the two mining engineering societies. But in justice to the two latter, I wish to point out that there is a mistake in the next to the last paragraph.

The Mining and Metallurgical Society of America does not force upon its members any bound volumes. If the members wish them, they pay extra; and if they do not wish them they do not pay.

The American Institute of Mining and Metallurgical Engineers specifically states in a footnote: "If the *Transactions* are wanted in paper covers, deduct \$2 from this bill."

I do not see how the engineer can consistently call on the Government or the industries to cut down their overhead, while his own engineering society and Engineering Foundation expenditures are both soaring, with the moon as the limit.

DONALD M. LIDDELL.

New York City.

Chloridizing Roasting of Copper Ore

I have read with great interest the article in the *Engineering and Mining Journal* of March 5 on chloridizing roasting of pyrite cinders as carried out in Scandinavia. Although an American process, it would appear that the method has been further advanced in Europe. Its consideration in this country depends on locality and the nature of the ores. The process might possibly open a field for selective flotation of pyrite ores impregnated with chalcopyrite. Contrary to the case

of lead and zinc ores, the selective flotation of copper ores has never found practical application.

It is known that chalcopyrite will float before pyrite. If a feed containing, say, 1.5 per cent Cu and 10 per cent S is taken, the highest concentration in regard to copper would probably be around 6.5 per cent, provided a fairly good extraction is obtained. Now, suppose that in a unit of one ton this product can be divided up by selective flotation and tabling the flotation concentrate from the last cells, to contain

1,000 lb. of concentrates of 10 per cent Cu

800 lb. pyrite of 3.5 per cent Cu and 43 per cent S

200 lb. gangue.

If a ready market is at hand for the pyrite and resulting purple ore, it is evident that the method can be worked to great advantage.

The extremely good copper extraction from a flotation concentrate, secured by a chloridizing roast, is interesting. It can find no practical application in this country, however. It will be cheaper to extract the copper by smelting, because the sulphur content will be too low to have any market value. Furthermore, the purple ore will probably contain from 20 to 25 per cent gangue, and this in turn would render this product practically worthless. It is probable that the clogging of the material to be leached in the tanks can be prevented by saturating the roasted ore with dilute solution just before it is put in the leaching vats. This would simplify the leaching. The advantages of this process should not be overlooked, as the cost of extraction is relatively low.

VIGGO CARLSEN.

Brooklyn, N. Y.

The Tainton-Pring Electrolytic Zinc Process

Referring to the article entitled "Electrolytic Zinc" in your issue of Feb. 19, dealing with the discussion of Mr. Laist's paper presented at the recent New York meeting of the A. I. M. E., I should like to add a few words and correct one or two minor inaccuracies.

The new electrolytic zinc process referred to is the invention of Mr. U. C. Tainton and Dr. N. C. Pring. Mr. Tainton has been since 1914 connected with the metallurgical staff of the Rand Mines, Ltd., at Johannesburg, but more directly concerned in the last few years with the development of his invention at a small plant in London, and recently at a plant of commercial size at Martinez, Cal. Dr. Pring is professor of chemistry at the University of Manchester. The patent rights in the Tainton-Pring process are controlled by the Central Mining & Investment Corporation, Ltd., of London, whose interests in this country I am at the present time representing.

The plant at Martinez was erected by, and is the property of, Mr. Charles Butters, but in January, 1920, was taken over on lease by the English owners of the process, who extended and modified it considerably, and placed it under the supervision of Mr. Tainton.

It may be pointed out, in connection with Mr. Smith's interesting testimony, that the success of the process,

commercially and metallurgically, has been definitely established at the Californian plant, and that all the important details as regards construction and design of plant have been practically worked out and standardized.

New York, N. Y.

F. L. BOSQUI.

[We regret the misreporting of Dr. Pring's name, which was caused by our going to press before the close of the meeting, thereby making impossible the verification of all names. Also, Mr. Smith has called to our attention the fact that on page 342, column 2, line 9, "39 per cent ZnO" should read "39 per cent Zn."—EDITOR.]

Postponement of Assessment Work

It so happened that on the very day that I had prepared an effusion on the evils of the law extending the period for the performance of annual labor on mining claims I received the Jan. 15 issue of the *Engineering and Mining Journal* containing the editorial "Postponing Assessment Work." As it covered every point that I had in mind, I submitted to your appropriation of my thunder, but in view of the criticism of your attitude by A. T. Roos, in the issue of Feb. 5, I wish to add my testimony in the case.

Because of the peculiar nature of the work on which I have been engaged for some years, I see far more of the prospector and small claim owner than is possible for the average engineer. I probably see more honest-to-goodness prospectors in one year than most of my colleagues see in ten. For the real prospector I have the greatest respect. For the "claim pegger" I have none. As a class the latter and not the former were the ones who benefited by this law. There may be exceptions to this statement, but they are very much the exception and a long way from being the rule.

Less than a week ago I was in the field with a real prospector. To be sure, every volcanic that we encountered was a "pawfry," and we found several "barium dikes" in our day's work, but he knows ore and where to look for it. He has found and developed a number of good claims at one time or another and makes a good living by selling at a reasonable price when he has something worth while. He is holding about ten claims now. He had the work on all of them done long before the close of 1920, and has already done some of his 1921 work.

We need more of his kind. He, as well as every other real prospector with whom I have discussed the subject, was outspoken in his condemnation of the new law. He summed it up very well about as follows: "Look at ——. He and his brother have nearly two hundred claims within a radius of ten miles of here. They have held them since the first of 1916 without doing a lick of work on them, and now they get six months more. There are some likely looking claims among them, but they won't develop them and they won't set anything like a reasonable price on them. They are simply holding on in the hopes that some of us fellows who are trying to do the right thing will strike it and give them a chance to sell out at a fancy figure." I am acquainted with the men to whom he referred and know that they have so many claims that they can't keep track of them and don't know one from the other.

It is quite true, as Mr. Roos says, that conditions in the mining industry are deplorable, but this very thing has tended to make labor abundant and reasonable, and it would help, in small measure at least, to

alleviate these deplorable conditions to give some of this labor employment on annual assessment work.

Explosives are high, as he says, but bear in mind that the claim owner is not required to spend any more money on his annual labor than he expected and in a sense agreed to spend when he acquired the claim. The difference is that, in return for the same money, he will not get, say, ten feet of work but eight or perhaps only six. These are of the vicissitudes of business, and I am very sure there are few of us but have been obliged, at some time or other, to choose between sacrificing something which we were holding or submitting to financial inconvenience. And the joker is, as you pointed out, that the law was not passed until those who sincerely intended to hold their claims and were deserving of consideration, if anyone was, had performed their work and were beyond its benefits. The beneficiaries were those who did not think enough of their claims to submit to the slight financial inconvenience or those who never had any intention of performing the required labor when they made their locations.

Our mining laws are exceedingly liberal, and, to avoid working a hardship to even a few, they have been liberally—too liberally—applied. Without any special exemption laws a man can, by locating on Jan. 1 of any year, hold a claim two years without doing a thing but post his notice and record it. There was good reason for exemption of assessment work in 1917 and 1918, but there was little in 1919 and none in 1920. The present policy is a serious handicap to development work and is a matter which should be taken up by one of the professional organizations with the purpose of preventing long-time segregation of valuable mineral land by persons who have no intention of developing it. Such are "gamblers in mining claims" of the worst kind, because they expect all of the odds themselves and are not willing to give the other fellow even a respectable run for his money. Their only idea is to get something for nothing, selling at a figure that is out of all proportion to any effort or expense that they may have incurred.

LEROY A. PALMER.

San Francisco.

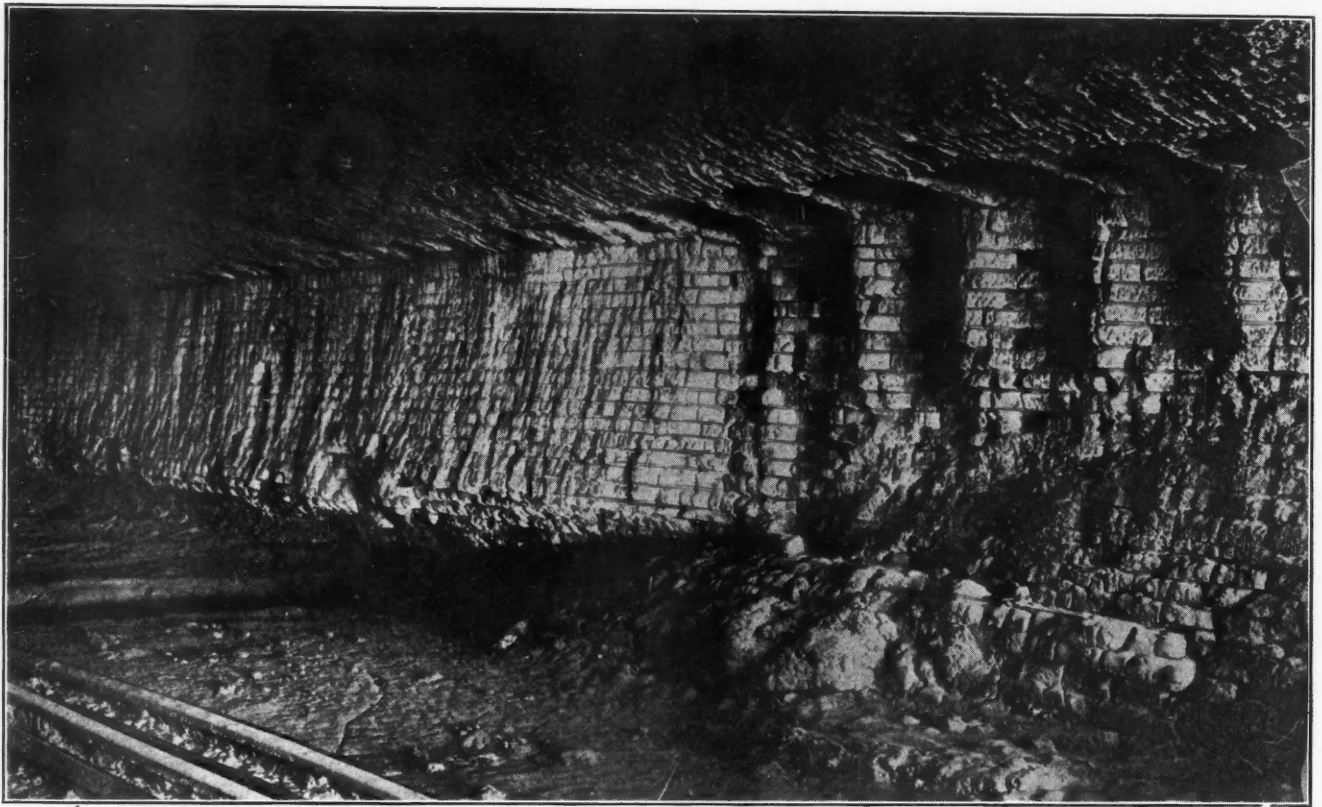
Note by the Editor: The abuse to which Mr. Palmer refers, and concerning which he suggests that the matter be taken up by one of the professional organizations, was part of the mining law problem originally taken up by the Mining and Metallurgical Society of America, whose committee was later merged into a Bureau of Mines committee, consisting of W. R. Ingalls, chairman, with Walter Douglas, J. Parke Channing, J. R. Finlay, John Hays Hammond, L. D. Ricketts, Horace Winchell, and James R. Jones. This committee has nearly ready a draft of the bill which is intended to cover this particular situation and other reforms necessary in the mining law.

Mining in Colorado

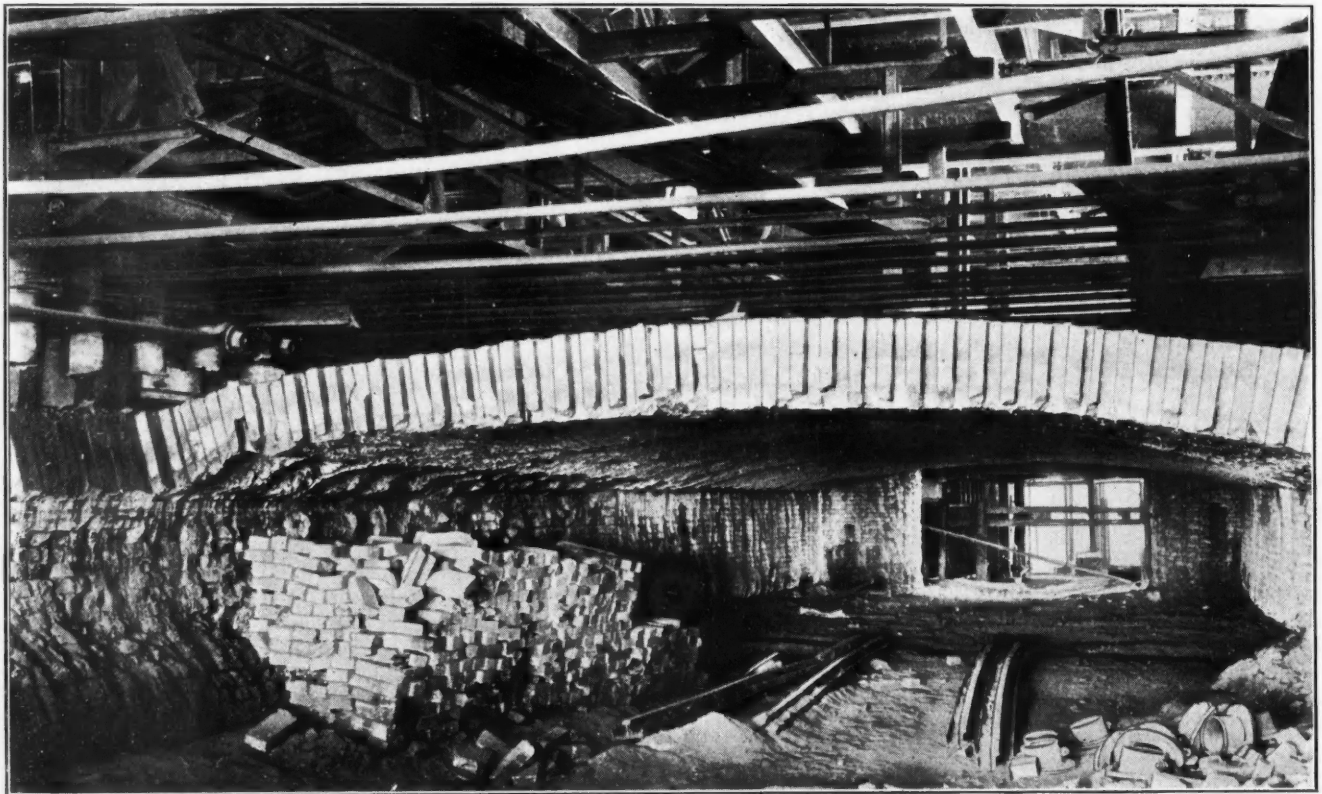
In my article "Colorado" in your Annual Review number (Jan. 22, 1921) I am made to say with reference to the Ouray district (p. 168, line 52) "but there is not at present any important producing mine." This is a typist's error, a line of my draft having been omitted in copying. The sentence should have read "but with the exception of the Atlas and Mountain Top, there is not at present any important producing mine."

Denver, Col.

GEORGE E. COLLINS.



Interior Views of a Reverberatory Furnace in the Copper Queen Smelter, Douglas, Ariz., Shut Down for Repair



The Importance of Foreign Trade in Copper and Other Non-Ferrous Metals*

Gold and Silver Mainly Subservient to Government Regulations—War Volume of Zinc and Lead Exports Not Likely To Be Repeated—Foreign Demand for Copper Only Awaits Financial Readjustment

BY FELIX EDGAR WORMSER

OF THE FIVE domestic metal industries producing copper, lead, zinc, gold, and silver, foreign trade is normally of direct importance to only two—copper and silver. The lead, zinc, and gold industries function quite independently of export stimulus. Foreign commerce undoubtedly plays a most important rôle in the production and marketing of agricultural staples such as wheat and cotton, and foreign trade to the copper and silver industries is scarcely less important. The extent of the effect of this factor on a domestic metal industry may be judged by the serious depression and loss which the post-war dullness in export trade caused the copper industry.

Three chief differences exist between agricultural and mineral commodities that influence their international movements. Farm products are of a perishable nature, whereas the metals are of a permanent nature. Furthermore, food and clothing are of much greater importance to life. Each year there is poured upon the world a supply of new metals which augment existing supplies, enlarging the possibility of using available quantities of scrap metal and transforming it into essential shapes. These facts do not apply to agricultural products, the perishable nature of which precludes use after any but a measurable period. If a nation be faced with the alternative of choosing between the importation of foodstuffs and of metals, the former would undoubtedly be selected. Moreover, though a country may modify its agricultural activities it cannot change its mineral resources, and so must seek its supply of metals from existing deposits, whether domestic or foreign.

Although the statement has been made that foreign trade is important to only two of the five metals under discussion, this should perhaps be qualified through a recognition of the fact that the Great War seriously altered the foreign and domestic demand for the metals and that the present period of economic readjustment has largely distorted the normal movements of some of them. Consequently, statistical records made in the first few post-war years, 1919, 1920, 1921, furnish an unreliable criterion of future developments.

Considering first the importance of exportation of gold upon the gold production of the country, the conclusion may be drawn that gold, being dependent upon financial requirements, moves chiefly in response to the settlement of adverse trade balances with gold-standard countries, and that the use of gold in the arts, or commercially, is not influential in affecting its price. Silver performs a duty similar to that of gold in discharging indebtedness to silver-standard countries or countries on a gold-exchange standard, such as India. The movements of both these precious metals are now mainly sub-

servient to governmental regulations, though normally free and according to banking requirements.

Restrictions on the external movements of gold are more prevalent than for silver, and there is small likelihood of the removal of these gold embargoes in the near future, as nations cling tenaciously to their gold reserves. With the exception of the United States, many countries have prohibited the outward movements of gold, and the export of silver can take place only under government license. The United States permits the free exportation of silver, but through a legislative enactment, the Pittman Act, the Treasury Department is required to purchase up to 207,000,000 oz. of silver mined and refined in the United States at \$1 per ounce, an amount of silver equal to that sold for the same price during the war. This has virtually prevented the export of domestic silver, as the market for foreign silver is much below \$1. All of the domestic production for the next four years will probably be directed into the vaults of the Treasury, unless, of course, an unlikely rise of silver in the world market to over \$1 per ounce should occur.

Thus, present export trade in gold and silver is unimportant to these respective metal-producing industries. Gold always commands \$20.67 per ounce regardless of export trade, and domestic silver will find its way into the vaults of the Treasury for several years to come unless the Pittman Act should be repealed. Normally about 50 per cent of the domestic silver production is exported—mainly to Asiatic countries—and there is hardly an industry more dependent upon export conditions. Silver's phenomenal rise in 1918 and 1919 was due almost wholly to the demand for the metal for the settlement of commercial balances with India and China.

Export trade is of varying importance for the other three metals in the group—lead, zinc, and copper. During the war foreign demand caused extraordinarily high prices and greatly stimulated production. Normally, however, export trade is of much importance to only one of these metallic commodities, copper. The situation in each metal will be considered separately.

Although the United States produces over a third of the world's lead, and about as much as its two chief competitors combined, exports of lead made from domestic ores from the United States for the four years prior to the war were negligible. However, considerable quantities of lead from foreign ore were exported, the production from foreign ore and imports almost balancing. Most of the imported lead comes from Mexico to be refined in this country, and if not entered for consumption may be exported—the familiar principle of the "drawback," or a freedom from duty payment, applying. The following table brings out the pre-war position of the lead industry, its record during the stress

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of war, and the results of two years of readjustment, 1919 and 1920:

LEAD PRODUCTION AND MOVEMENTS
(In Short Tons)

	Production from			Exports	
	Domestic Ores	Foreign Ores and Base Bullion	Imported Lead (Ore, Bullion, Refined)	From Domestic Ores	From Foreign Ores (a)
1910 to 1913, inc.	411,700	82,000	84,800	.....	80,700
1914	534,500	29,300	28,300	58,700	21,550
1915	537,000	43,000	51,400	88,300	38,600
1916	596,200	18,900	35,300	100,500	9,900
1917	579,400	62,300	78,250	53,700	37,700
1918	556,900	100,300	98,600	41,800	59,400
1919	427,800	58,000	71,400	10,000	42,900
1920	471,700	54,000	91,200	3,000	22,500

(a) Excludes lead in manufactures exported with benefit of drawback amounting to 10,500 tons prior to the war, an average of 5,000 tons during the war, and about 2,000 in 1919.

Although exports of lead from domestic ores were negligible prior to the war, the war demand made it profitable to export large tonnages. Thus in 1914, 58,700 and in 1916 a peak of 100,500 tons was exported, but domestic lead movements have since decreased. These figures do not take into consideration the export of manufactures, ammunition, and articles in which the lead content is an appreciable item. However, the domestic trade felt the indirect effect of the lead consumption in other industries during the war.

Little justification exists for hope of a change in the export situation to a pre-war basis. In 1920 importation of cheap pig lead was threatened time and again, and eventually foreign pig lead in large quantities actually did come into the country (27,300 tons in ten months). The difficulty which the United States must overcome in competing in the well-established international lead market, coupled with exchange difficulties, effectually prevents a profitable development of the outward movement of lead. Domestic production and consumption are expected to balance as before the war. The American industry, emphasizing its inability to compete in other markets, is protected under the Underwood tariff by a 25 per cent duty upon the metal in various semi-finished and finished forms and $\frac{1}{2}$ c. per lb. on lead contained in imported ores. This is a greater protection than that enjoyed by the copper and zinc industries; in fact, greater than that accorded any other important metal. Australia, Spain, Germany, and Mexico furnish strong competition for export trade in lead, and have been able to produce the metal at a cost equal to if not lower than that in the United States. Now they, with the exception of Mexico, can also benefit by exchange rates.

The zinc trade of the United States closely parallels that of lead. In pre-war years exports of zinc from domestic ores were small; from 1910 to 1913 inclusive they averaged about 6,300 tons annually, or little over 2 per cent of the domestic production, as the following table illustrates:

ZINC PRODUCTION AND MOVEMENTS
(In Short Tons)

	Production		Imports (a) (Blocks, Pigs and Sheets)	Exports	
	From Domestic Ores	From Foreign Ores		From Domestic Ores	From Foreign Ores (b)
1910 to 1913, inc.	296,300	14,000	4,900	6,300	7,100
1914	343,400	9,600	900	64,800	5,600
1915	458,100	31,400	900	118,600	12,800
1916	564,300	104,000	700	163,100	43,200
1917	584,600	85,000	300	153,800	64,700
1918	492,400	25,500	35	80,200	20,100
1919	452,300	13,500	70	129,500	12,300
1920	449,000	14,000	18	86,000	28,500

(a) There were also imports of zinc in ore, which is sufficiently accounted for under production from foreign ores.

(b) Includes zinc in manufactures exported with benefit of drawback.

The war demands for zinc, however, were so insistent for a large supply of this useful metal that domestic exports increased to 163,100 tons in 1916 and to 153,800 tons in 1917, and although there was a sharp drop to 80,200 tons in 1918, a rise took place the following year to 129,500 tons, chiefly on account of the idleness of one of the world's great zinc producers in Australia. The record for 1920 appears well in the aggregate, 86,000 tons, but when it is considered that during the last five months of 1920 exports had tapered off to a rate of about 500 tons monthly, it is likely that a reversion to a pre-war scale will take place quickly.

As in the lead industry, much zinc material is imported to be manufactured and later exported, the net result of the operation being to avoid the payment of duty. Similarly, the domestic zinc consumption is normally a little below domestic production, and the industry is quite flexible and able to meet sudden demands put upon it. The zinc trade in the United States enjoyed unprecedented prosperity during the war, when remarkably high prices were reached and unusually large exports were made, but it is doubtful if a considerable proportion of this foreign trade can be held, and highly probable that the condition of the industry will revert closely to the pre-war status, not only because of the difficulties that beset export trade in general—chiefly financial considerations—but owing to the lower costs in other zinc-producing countries.

Australia, Germany, and Belgium are rapidly regaining their strength, eager to furnish competition in international markets. The paralysis of the Australian zinc industry, due to prolonged labor troubles, has passed, and already this strong competitor is influencing the international market. Germany, Belgium, Great Britain, France, and Australia have well-established zinc-smelting industries, and they will do everything to facilitate a return to former conditions. The zinc trade in the United States has a slightly better opportunity than the lead trade to expand its exports, judging from past records, but it faces a difficult problem—one that can be solved only as the general solution to the problem of export trade is found and domestic costs are lowered. Competition was at a minimum during the war, and its full force has not been felt by the American industry for many years. The tariff on zinc is 15 per cent on ores, slabs, blocks, and pigs—less protection than the lead industry enjoys and yet not sufficient to prevent the frequent talk of, and actual importation of, zinc for consumption in the United States.

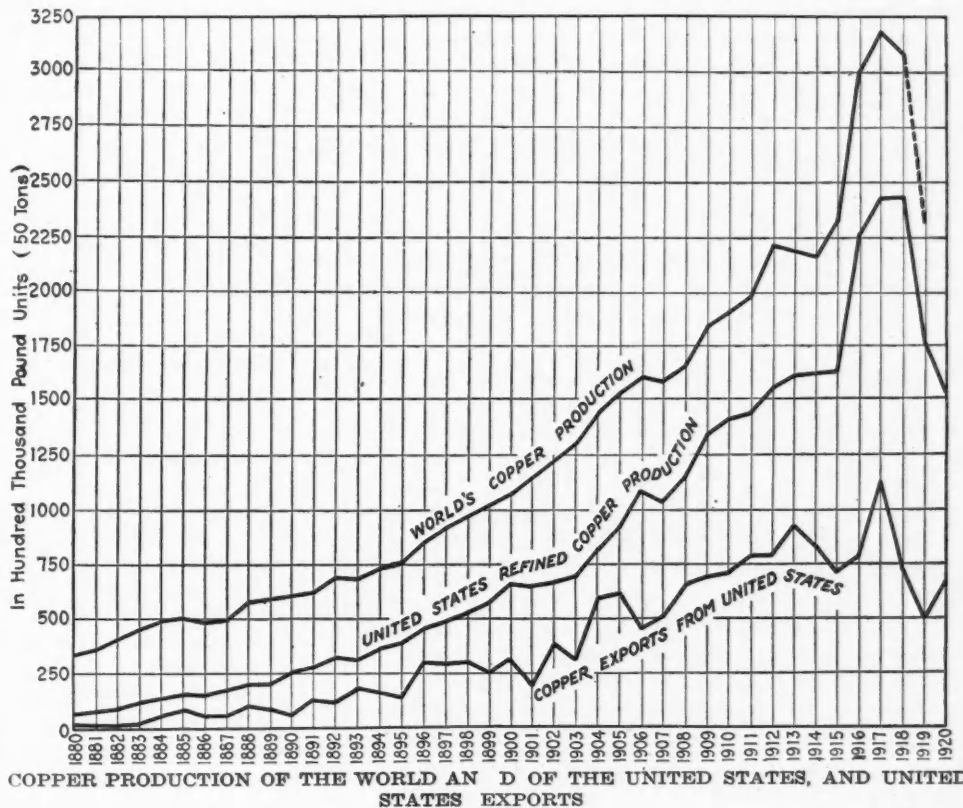
Germany, by the terms of the peace treaty and the probable loss of Silesian deposits and smelting plants, will not be able to hold second place in the zinc industry. The supply of German ore will be cut down two-thirds, and considering that Australian concentrates formerly shipped to Germany are being diverted elsewhere, the most logical source of importation of concentrates is the United States or Mexico. At all events, the best opportunity facing the American zinc export trade lies in supplying the Central Powers, but what measure of success will reward attempts to enter this field—Germany was formerly the second largest consumer of zinc in the world—will depend almost entirely on the attitude that the Germans adopt toward the restoration of their industry and the facilities granted that almost bankrupt country by financial interests.

No concerted attempt is being made by the zinc trade to attack the problem systematically through an export association similar to that of the copper producers, and

the industry is not any too well organized to know how it stands with other countries, particularly in respect to costs and the technology of production. It has been frequently pointed out that there existed for years an unhealthy secretiveness in the industry and an unwillingness to co-operate in lowering costs. Such an attitude will not help the industry in expanding its foreign trade, thereby benefiting itself and the country. Perhaps also because no organized attempt has been made by the American zinc trade to develop foreign markets, export trade in normal years was relatively unimportant. The obstacles to foreign zinc trade loom large, but would doubtless repay study in the endeavor to surmount them.

There remains for discussion one other metal of the group, the most important from the standpoint of production, utility, and export trade of all the non-ferrous metals—copper. Its position has grown stronger and more important with the development of the world's electrical industry, concurrently with the giant strides that have been made in the progress of using more and more electrical power each year. The accompanying curves illustrate graphically the great increase in the world's production of copper during the twentieth century, a production that almost trebled the pre-war rate during the war. The United States has had a remarkably rapid growth in copper production, as the curve indicates, and during the five years before the war accounted for well over 60 per cent of the world's refined-copper production. This, however, includes the imports of crude copper from Canada, Mexico, and South American countries, shipped to this country to be refined. However, the copper production of the United States itself has for many years been the largest in the world, and there is little probability of this leadership being lost. Compared with the relatively stationary production of other countries, the growth of United States copper production has been phenomenal.

As copper is an indispensable metal in modern life, our export trade in that metal has been a natural development of the effort of other countries to procure an adequate supply. With the vast resources available, it has been easy for the American copper industry to respond to any demand put upon it, whether a normal yearly growth in consumption or an acute war appeal. Furthermore, the heavy investment of American capital in South American copper mines, and the concentration of the refining of South American, Canadian and Mexican copper on the Atlantic and Pacific seaboards have helped to bring the world's copper market into the hands of the United States producers, whereas



COPPER PRODUCTION AND MOVEMENTS
(In Short Tons)

1910 to	Smelter Production from Domestic Ores	Imports	Exports
1913, inc	580,500	187,300	399,500
1914	575,000	153,000	420,000
1915	694,000	158,000	341,000
1916	964,000	231,000	392,000
1917	943,000	278,000	563,000
1918	954,500	288,000	372,000
1919	655,500	214,500	258,000
1920	617,500	244,000	305,000

It is striking that the nation's agricultural and mineral wealth in each of four important commodities, corn, cotton, petroleum, and copper, is greater than that of any other country and that in each product foreign trade has developed through the superabundance of our own natural resources and an effectiveness of labor which resulted in trade with other countries willing and anxious to consume this American produce.

during the greater part of the nineteenth century the world's copper market was controlled by Great Britain.

An accompanying set of curves indicates the world's production of refined copper; the production of refined copper in the United States, and the copper exports of the United States. In pre-war years, as the curves show, well over half the refined copper produced in the United States was exported. In 1917, an important war year in which every effort was being made to speed production, the ratio of exports was lower—about 45 per cent; in 1919, 29.1; and in 1920, about 34 per cent. The decline was sufficiently pronounced to disturb the industry seriously, as the domestic consumption was in no condition to take up production on a war scale.

Immediately after the armistice, Nov. 11, 1918, the copper producers were advised by the Government to maintain production at the war rate, on the ground that an armistice did not imply a complete and ultimate cessation of hostilities. Acting upon this advice, production was maintained at 100 per cent of capacity to the end of the year and a short period after the Government had relinquished its interest in the copper industry's activities. It was virtually impossible to curtail output as quickly as might have been desired. A lessening of demand ensued, which, coupled with the reduction of

the excess ore produced at the end of 1918—about four months' work—soon supplied the industry with heavy surplus stocks that have consistently plagued the producers and which await a foreign trade revival to be eliminated.

THE WORK OF THE COPPER EXPORT ASSOCIATION

The pre-war method of exporting copper depended primarily on individual transactions. The largest copper producers usually had representatives in foreign countries whose duty it was to take care of their foreign business. Similarly, agents in this country of foreign consumers looked after their European clients' copper requirements. Competition in foreign trade was keen. The war and Federal legislation have changed all this. Soon after the passage of the Webb-Pomerene Act in 1918, permitting combinations of enterprises to engage collectively in foreign trade, the copper producers of the United States, realizing the advantages accruing to them under this legislation, took steps to organize a Copper Export Association. This corporation has functioned since December, 1918, and has produced the machinery necessary to facilitate export trade in any volume. Practically all the copper producers in the United States are members. Together they account for about 80 to 85 per cent of production. Each member of the Copper Export Association participates in the business of the corporation on a production basis; that is, the larger a member company's production the greater the share of the association's business apportioned to it.

The Copper Export Association has had to confine its operations chiefly to the Allied countries, where financial arrangements could be more readily concluded. Political considerations prevented entering the German field with the credit arrangements possible for France, England, Italy, and Japan. However, the association has sold copper to Germany on a cash basis.

The financial arrangements cover an extension of credit to European consumers, the plan to last two years. Each consumer has a definite credit extended to him, the amount depending on individual circumstances and the financial standing of the purchaser. In addition to the financial and commercial standing of the copper purchaser acting as a warrant for payment, arrangements have been consummated whereby a group of banks of the highest standing guarantees the payment of the drafts at maturity. The Copper Export Association participates actively in the foreign market and makes its prices conform to market conditions.

With its foreign representatives, the association keeps closely in touch with the requirements of European purchasers, and through the medium of copper stocks in warehouses at important seaports such as Liverpool, Rotterdam, Bordeaux, Hamburg, Bremen, Havre, and Antwerp is enabled to fill each order promptly. The association is also enabled to supply each consumer with the particular brand of copper he may desire. Although there is practically no substantial difference between the various brands of electrolytic copper shipped abroad, manufacturers frequently express preference for one particular kind. No attempt is made to increase export sales other than through the personal contact established by foreign representatives. An important feature of the method of handling export trade through an export association is that individual competition of copper producers that are members of

the association, in a foreign market, disappears and only in the home market is competition keen. As with a well-balanced team, the personal welfare of the individual is subordinated to the common good.

Although theoretically one of the compelling arguments in favor of export combinations is the reduction in overhead costs and the elimination of a duplication of effort, the point has not been attained where this result has been fully felt, owing mainly to the decline in the volume of export trade. Maximum efficiency in an export combination is attained only when the volume of exports is on the scale for which the association was organized.

One circumstance which has affected the Copper Export Association's volume of trade has been the decline in the exchanges. After a contract between the European consumer and the association has been made, and payment arranged according to the credit terms outlined, settlement must be made in United States dollars. When exchange is increasing the foreign copper purchaser can advantageously discharge his obligation at a future date, but when exchange declines a larger payment in pounds sterling or francs, as may be, is exacted. The purchaser takes sole responsibility for the fluctuations in exchange, and hence a certain amount of speculation is introduced in purchases.

Some criticism of the Copper Export Association has been made abroad on the ground that it is attempting to control prices arbitrarily, and the conclusion reached that its attempt is doomed to failure. Such a criticism neglects to take into consideration the fact that copper can be obtained in the United States in rather large quantities outside of the association and that European purchasers do not have to avail themselves of the facilities offered by this organization. Criticisms of the sales policy adopted have also been made, but as in such matters a wide divergence of opinion is natural, this criticism is not of material force. Thus, American producers were criticised for holding their copper at 19c. per lb. in 1920 without making sales and then subsequently having to unload large quantities on the market at 13 and 14c. In explanation it may be said that producers were influenced largely by the impression that a decrease in price would not result in pronounced increase in sales. Furthermore the heavy sales of copper made earlier in the year were sufficient in volume to take care of practically the entire year's business, so that there was not as great incentive later on to enter actively into the market only to slash prices. There was also the consideration due purchasers of copper at the higher prices and the protection of their interests which fair trading demanded. As later events indicated, this policy was essentially sound. It is unfortunate that ill-advised criticism should have been directed against the association. To function properly the Copper Export Association requires the good will of foreign consumers, and concessions must be made by both parties if, as in all trading, a mutually satisfactory bargain is to be struck.

AN ANALYSIS OF COPPER EXPORTS

In analyzing the normal foreign trade in copper and the more important copper manufactures, Europe is found to be the largest consumer, taking about 95 per cent of export shipments. Germany and The Netherlands were ostensibly the best customers, together accounting for over half the European purchases of American copper. Sales to France, Italy, England,

Austria-Hungary, and Denmark were also important, and although individually not comparable to the volume of Germany's purchases, materially swelled the aggregate amount. The following table is intended to exhibit the heavy European copper purchases from United States producers.

tion to relieve the acute financial embarrassments of European countries. Foreign trade in copper thus depends upon events that must progress together. It is folly to take a disinterested attitude of detachment from the financial affairs of Europe.

The export trade generally in all non-ferrous metals

EXPORTS OF METALLIC COPPER FROM THE UNITED STATES IN POUNDS

(A) Exports in per Cent of United States Production

Year	To England	(A)	To France	(A)	To Germany	(A)	To Netherlands	(A)	To Italy	(A)	Total Exports	(A)
1910	98,000,000	6.8	116,000,000	8.1	176,000,000	12.2	222,000,000	15.5	34,000,000	2.4	708,000,000	49.8
1911	108,000,000	7.5	135,000,000	9.4	190,000,000	13.3	231,000,000	16.0	38,000,000	2.7	787,000,000	55.0
1912	95,000,000	6.1	131,000,000	8.4	252,000,000	16.2	153,000,000	9.7	47,000,000	3.0	775,000,000	49.5
1913	34,000,000	2.1	160,000,000	9.9	307,000,000	19.0	179,000,000	11.1	41,000,000	2.6	926,000,000	52.4
1914	198,000,000	12.9	150,000,000	9.8	177,000,000	11.5	126,000,000	8.2	67,000,000	4.4	840,000,000	54.8
1915	201,000,000	12.3	236,000,000	14.5	.....	.....	4,000,000	0.2	107,000,000	6.6	682,000,000	41.8
1916	173,000,000	7.7	318,000,000	14.1	.....	.....	.....	.....	98,000,000	4.3	784,000,000	34.8
1917	373,000,000	15.3	366,000,000	15.1	.....	.....	.....	.....	153,000,000	6.3	1,126,000,000	46.5
1918	252,000,000	10.4	265,000,000	10.9	.....	.....	.....	.....	122,000,000	5.0	744,000,000	30.7
1919	106,000,000	5.9	89,000,000	5.1	.....	.....	.....	.....	65,000,000	3.7	516,000,000	29.3
1920	101,500,000	6.5	120,000,000	7.6	85,000,000	5.4	34,000,000	2.3	770,000	0.5	610,000,000	37.8

In pre-war years Austria-Hungary imported about 35,000,000 lb. United States copper, and Belgium 7,000,000 lb., annually.

It is now generally conceded that the heavy pre-war purchases of The Netherlands were for German consumption, Dutch companies merely acting as brokers. Denmark's purchases were made with a similar design. Thus, to obtain the true significance of German copper importations, those of The Netherlands, Denmark, Belgium, and possibly Austria-Hungary should be considered. A warrantable estimate of American copper imports into Germany would be 500,000,000 to 550,000,000 lb. per annum; yet in 1920 only about 120,000,000 lb. of copper was purchased by that country. The logical effect of this drop in sales, to a copper industry tuned to the greater rate of purchases, is apparent. A large proportion of German copper consumption was for the munition industry, but the chief reason of the large copper imports was a highly developed electrical industry which combed the world's markets for its export electrical trade and used great amounts of raw copper in electrical manufactures. Germany is at the heart of the copper export situation, and any real stability to the export market is not expected until conditions in that country permit buying copper at approximately the pre-war rate.

The economic influences (particularly fluctuating exchange rates) which depress copper trade with other nations are stressed to a much greater degree in trade with Germany. Political and industrial uncertainties prohibit stabilizing the copper export trade with Germany to the same extent as with other European countries. The fixing of the indemnity, and the proper functioning of German industrial life under definite reparations, will do much to bring Germany back to pre-war importance in the copper trade.

Although the prosperity of the American copper producers is dependent largely upon the foreign demand for the metal, and the industry is bound to be depressed by an absence of such a demand in customary volume, the future outlook for copper is exceptionally bright. The world is living in an electrical age, and expansion in the use of electrical apparatus of all kinds, the utilization of the vast water-power resources in the United States and abroad, and a consequent decrease in dependence upon coal as a fuel will do much to further the demand for this cheap and efficient conductor of electricity. Some competition there will be from aluminum, another excellent conductor, but the general use of aluminum is commercially feasible only when the price of that metal is less than twice the price of copper. Hand in hand with the development of electrical power must proceed the necessary financing of various hydro-electric and electrification projects, to which liberal financial assistance must be given by nations in a posi-

tion to relieve the acute financial embarrassments of European countries. Foreign trade in copper thus depends upon events that must progress together. It is folly to take a disinterested attitude of detachment from the financial affairs of Europe.

produced in America, and in copper particularly, does not depend upon some advantage gained during the war, nor on the financial and industrial helplessness of other nations, but upon the bountiful mineral resources of the United States, the efficient way they are mined and reduced, and the prestige of American leadership in the world's production of most of these metals. Foreign trade has been but a logical outcome of the commercial advantage that our abundant natural resources have given us.

The problem of the copper industry is not one in which the loss of export trade, in part or in whole, is at stake, but, rather, how the present obstacles that hinder foreign trade may be overcome quickly. Exchange difficulties are the root of the trouble.

Some manufacturers have circumvented the disadvantage of present exchange relationships by resorting to direct barter. Trading American-made steam locomotives for Rumanian oil was an example. It is also understood that shipments of copper were made to Germany to be fashioned into exportable manufactures and then turned back into the hands of the shipper financing the operation. Such methods as these are but temporary expedients that will be gradually subordinated to the more convenient arrangements existing prior to the war.

It is to the credit of the copper producers that they have presented an almost unified front to the problem of export trade and have an organization authorized by recent legislation to solve it. The copper producers have been quick to see their predicament and to take the best procedure to remedy it.

The lead and zinc producers have already become timorous and are beginning to clamor for a higher protective tariff. This does not augur well for the ability of either of these industries to enter the international market. Raising the tariff on imports will probably provoke retaliatory measures by Europe and make it more difficult to compete. The gradual awakening of the zinc industry, the internal co-operation of the domestic zinc producers through the medium of their own organization, the American Zinc Institute, in an effort to compare and lower costs, will do much to help the industry in both local and foreign markets. But underneath all efforts to establish export trade stand the economic conditions which hamper its development.

For the non-ferrous metal trade the lack of exports at any time will not be a lasting calamity, for, viewed from the standpoint of conservation of our mineral resources, our irreplaceable deposits of copper, lead, zinc, and other metals will be conserved for posterity. In the meantime domestic wants can be adequately supplied.

Why Washington Magnesite Mines Shut Down

Imports Only 18 Per Cent of Consumption in 1920—
Lack of Orders Probably a Reflection of
Conditions in Steel Trade

By R. W. STONE*

Written for *Engineering and Mining Journal*.

ACCORDING to recent press reports the magnesite industry of Washington is practically at a standstill. On Dec. 31, 1920, the three companies operating near Valley and Chewelah, Stevens County, sixty miles north of Spokane, laid off a force of from 400 to 500 men. It is understood that the mines and plants of the Northwest Magnesite Co. and of the Western Materials Co. are completely closed and that the American Mineral Production Co. has practically stopped mining, but is running a small kiln specially designed for calcining magnesite for the plastic trade. The statement has been published that Austria is now so nearly supplying the demand of the large Eastern consumers that the orders for Washington magnesite are negligible, and that the shut-down will undoubtedly last until a protective tariff is secured.

In view of these statements about large importations of magnesite from Europe killing the market for domestic magnesite, it seems not inappropriate to call attention to figures of the Bureau of Foreign and Domestic Commerce and of the U. S. Geological Survey.

Prior to the world war the annual consumption of crude magnesite in the United States was approximately 300,000 short tons. Magnesite is imported in two forms, crude and calcined. Two tons of crude are required to make one ton of calcined. To have all figures on the same basis the quantity of calcined magnesite imported has been converted to the equivalent in the crude form and from long to short tons in the following table:

CRUDE MAGNESITE CONSUMED IN THE UNITED STATES, 1910-1920,
In Short Tons

	Domestic Production	Imports	Total
1910.....	12,443	322,652	335,095
1911.....	9,375	270,098	279,473
1912.....	10,512	268,309	278,821
1913.....	9,632	347,428	357,060
1914.....	11,293	256,988	268,281
1915.....	30,499	102,913	133,412
1916.....	154,974	93,85	248,859
1917.....	316,838	38,208	355,046
1918.....	231,605	43,530	275,135
1919.....	156,226	25,321	181,547
1920.....	278,000	63,110	341,110

This table shows that the imports in 1920 were only about 18 per cent of the magnesite consumed for all purposes, as compared with 14 per cent in 1919.

Magnesite is produced in only two states in this country, California and Washington. The output in California in 1920 was approximately 70,000 tons, and in Washington 210,000 tons. The principal and most essential use of magnesite is in metallurgy as a refractory material for lining furnaces.

The accompanying diagram illustrates clearly the relation of imports and production for the last ten years and would indicate that the steel industry will be short of refractory material in the next few months unless there is a large increase in importation or the Washington companies resume operations.

The closing of magnesite plants in Washington at the end of December can hardly be ascribed to heavy imports in that month, because the records of the

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Bureau of Foreign and Domestic Commerce show that imports in December were less than one-quarter those of November. There were no importations direct from Austria in November and December. The shipments from Italy may have originated in Czecho-Slovakia. Imports in November and December were as follows:

MAGNESITE IMPORTED IN NOVEMBER AND DECEMBER, 1920

Source	In Short Tons	
	November	December
Germany.....	119	481
Netherlands.....	213	211
Greece.....	4,000	.....
Italy.....	2,954	.....
French Africa.....	745	1,051
England.....	15	.....
Scotland.....	8	.....
Canada.....	298	136
Totals.....	8,352	1,879

Imports of magnesite computed on a crude basis in short tons in 1920 by quarters were as follows: First quarter, 19,294 tons; second quarter, 8,434; third, 18,874; and fourth, 16,508; total, 63,110.

In view of the present freight rate of about \$20 a ton on magnesite from the Pacific to the Atlantic coast, it does not seem likely that the domestic material can long compete with foreign material in the principal market, which is east of Indiana. The question is raised, however, whether there is sufficient importation at present to warrant the action taken by the producers.

I think the cessation of the magnesite mining in Washington can be explained by other reasons than heavy imports. The Western Materials Co. is obliged to haul its product by truck from mine to railroad over several miles of mountain road which may be practically

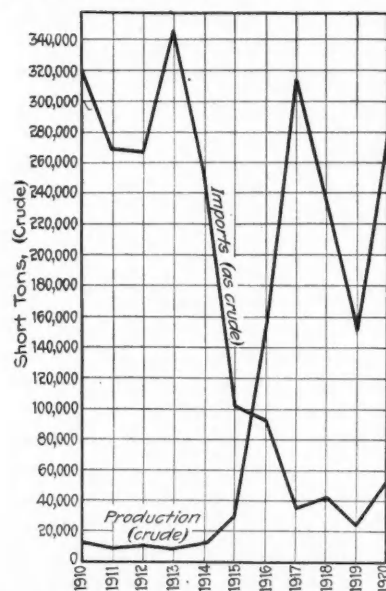


DIAGRAM SHOWING PRODUCTION AND IMPORTS OF
CRUDE MAGNESITE, 1910-1920

impassable on account of snow or mud during several winter months. The American Mineral Production Co. and the Northwest Magnesite Co. have direct rail or aerial tramway connections.

In looking for an explanation of the closing of the Washington magnesite mines, why not assume that the producers of magnesite for refractory purposes have been forced to close for lack of orders? It is well known that many steel plants are idle, and that those which are operating are not running at full blast. It seems much more plausible, therefore, to explain the present idleness of the Washington magnesite mines by the condition of the steel industry.



The Montreal Meeting of the Canadian Institute Of Mining and Metallurgy

Several Papers and Moving Pictures of More Than Ordinary Interest Presented at Twenty-Third Annual Convention—Entertainment Features Maintain Records Of Past Gatherings—Attendance Large and Enthusiastic

BY EDWARD H. ROBIE

Written for *Engineering and Mining Journal*

BUSINESS AND PLEASURE do not usually mix to advantage, but the Canadian Institute of Mining and Metallurgy seems to have solved the problem. The twenty-third annual gathering, which was held last week in Montreal, was notable for the good fellowship and general enjoyment of the social features as well as for the variety and interest of the technical papers presented. The very successful meetings of the Canadian Institute seem to be becoming pretty generally known, for the attendance was a considerably larger proportion of the membership than was the case at the New York meeting of the American Institute, held in February. Of course, Montreal has obvious advantages as a convention city, and there was a tendency toward the smacking of lips rather than the gnashing of teeth when the plans for Ottawa had to be abandoned on short notice owing to the prevalence of smallpox in that city.

FEATURES OF FIRST DAY'S MEETING

The sessions opened on Wednesday morning, March 2, in the "Ladies' Ordinary" room of the Windsor Hotel, with Parlor "A" and Room "4" reserved for committee meetings. The presidential address and reports on the mineral statistics of the various provinces for 1920 occupied the forenoon. The afternoon was devoted to general Institute business, and the evening to a technical session, with motion pictures of the operations of the Mond Nickel Co., in the Sudbury district of Ontario, showing the mining and the smelting of the ore.

Thursday morning brought forth some discussion as to the advisability of allowing company membership in the Institute, and arguments were offered for and against "blue sky" legislation. At 1 o'clock a luncheon was served in the Oak and Blue rooms. In the afternoon, coal and petroleum papers monopolized the program. A separate program of automobile drives,

teas, and theater parties had been provided for the few ladies who had registered.

Thursday evening was the occasion of the annual smoker, which was second only to the banquet among the social features. Some Snappy Syncopaters from McGill University were assisted by cello and vocal soloists in providing the musical fare. The gastronomic features of the occasion were taken care of by item No. 9 of the program — "Beer — Sandwiches — More Beer." The dramatic feature of the evening was a burlesque depicting the granting of government licenses permitting engineers to practice in Ontario. The license board included two long-bearded politicians and an engineering representative who always dissented from the decisions of the other two, but who, of course, was always overruled. In addition, a stenographer was present, Miss _____¹ whose opinions as to who should be granted licenses were always confirmed. Applications were read from some of the leading mining engineers present, and they were called to the stand, but the examination soon separated the sheep from the goats, and it was evident that some did not even understand the principles of calci-mining.

FRIDAY'S SESSIONS

The success of the smoker caused the technical session scheduled for Friday morning to be delayed about an hour. A paper on welfare work was discussed, and the remaining time devoted to iron and steel. In the afternoon various non-metallic minerals were taken up, and the field for manganese steel castings in the mining industry was discussed. Inspection trips were arranged for those of the members who wished to see the plants of the Thomas Davidson Manufacturing Co., Ltd., and the Dominion Engineering Works, Ltd.

The annual dinner on Friday night was held in the

¹Name deleted by the censor.

banquet hall of the Montreal Club, on St. James St. In these days, most banquets are mere slight punctures, but this was a real blow-out and lived up to the best traditions of the old C. M. I. Many distinguished guests were present. C. V. Corless, the president-elect, outlined the aims and activities of the Institute; General Arthur Currie dealt with the reparations question and the problem of taking care of returned soldiers; and J. M. R. Fairbairn, chief engineer of the C. P. R., and O. E. S. Whiteside made short addresses. Several engineers from the United States also spoke: E. Ludlow, the new president of the A. I. M. E.; Colonel A. S. Dwight, who explained the function of the Federated American Engineering Societies; H. F. Bain, the new Director of the U. S. Bureau of Mines; Prof. A. C. Lane, of Tufts College; and E. P. Mathewson. The spirit of the speakers was distinctly Anglo-American and would have confounded the adherents of the disreputable anti-British yellow press. Any reference to the distinguished guests and members present would be woefully incomplete without mention of Neil ("Foghorn") MacDonald, who, as usual, was called upon to sing the C. I. M. M. anthem, "Drill, Ye Tarriers, Drill." "Foghorn" is possibly the most popular member of the Institute, and has been referred to as having the widest personal acquaintanceship in the British Empire. Some time we are going to devote one of our page biographies to mention of his exploits, provided some of his friends will be kind enough to send the necessary information.

PRESIDENT WHITESIDE'S OPENING ADDRESS

In opening the meeting on Wednesday morning, Mr. Whiteside, the retiring president, emphasized that the policy of the Institute must be developed with national rather than selfish interests in view, to achieve the greatest success. He dwelt on the disadvantage of having the Montreal headquarters so far from the mining districts of Nova Scotia and the West, and emphasized the importance, therefore, of expanding branch organizations. These should establish friendly relations with the various provincial governments, but should be careful to act as counselor rather than critic.

Mr. Whiteside then took up the coal problem. The coal resources of Canada are greater than those of any other country except the United States, but it is all in the far East and West, and as a result, central Canada has been importing about twenty million tons annually. The task of molding public opinion on this subject, he said, was worthy of the Institute's highest endeavors. The same subject was touched on by the new president, C. V. Corless, at the banquet. Mr. Corless took advantage of the occasion to compliment F. W. Gray, editor of the *Canadian Mining Journal*, for his fight for the more active development of the Canadian coal resources.

VALUE OF CANADIAN MINERAL PRODUCTION IN 1920 GREATEST IN HISTORY

John McLeish, Chief of the Division of Mineral Resources and Statistics, presented a bulletin giving preliminary production figures for 1920. Owing to high prices and, in many cases, increased production also, the value of the mineral products was the greatest in the history of the country—about \$218,000,000. Of the principal metals, lead and silver decreased both in quantity and value, and of the non-metals, petroleum, natural gas, and pyrites were the only ones to show a decrease in quantity. Quartz was the only non-metal to show a decrease in value of production.

Mr. McLeish's talk was followed by some discussion by Mr. Gray, Dr. Miller, Mr. Denis, and others as to the wisdom of the new government regulation that the collection of mineral statistics be henceforth intrusted to the Dominion Statistical Bureau instead of the work being done, as formerly, by the Department of Mines. The general opinion was that the transfer of this work was a mistake, and that it was a case of carrying centralization too far. Statistics are only of value if comparative, it was pointed out, and the continuity of the work was likely to be interrupted by the change.

T. W. Gibson, Deputy Minister of Mines for Ontario, lauded the work of Mr. McLeish and regretted that his duties had been shifted to other hands. In discussing the Ontario mineral production for the last year, he spoke of the bad condition of the nickel and silver market, and explained the impossibility of predicting the future of silver with the Chinese and Indian demand so little understood. Gold, he said, was the bright spot in the metal-mining industry at present. The value given in his report for 1920, \$11,665,735, should really be augmented by 10 or 12 per cent, as the gold producers market their product in New York and get the benefit of depreciated Canadian exchange rates. Of the non-metallic minerals, Mr. Gibson called special attention to the natural-gas supply, which is undergoing rapid decline.

Mr. Théo. C. Denis, Superintendent of Mines for Quebec, outlined the position of that province as the pre-eminent world producer of asbestos, both as to quantity and quality. About 95 per cent of the product, however, is exported in the raw state, and there is some agitation in favor of having it manufactured within the province.

No reports were available from British Columbia, Nova Scotia, or Alberta. The coal production of Alberta in 1920, however, was stated to be about 6,900,000 tons, an increase of almost 50 per cent over that of the previous year. Coal production in Nova Scotia, according to Mr. Gray, amounted to about 5,600,000 tons. The mining of gold and iron has practically ceased in that province, there now being only one producer of the precious metal. A salt deposit has reached the producing stage, and has some possibilities as a source of some of the more valuable halides.

INSTITUTE'S INTERNAL AFFAIRS DISCUSSED

The business meeting of the Institute was held on Wednesday afternoon. A memorial resolution was first offered for the late Professor Gwillem. Secretary Mackenzie then explained the transference of the place of the annual meeting from Ottawa to Montreal, and the Council meeting of Oct. 26 was ratified and confirmed. The medal given by Colonel R. W. Leonard for the best paper presented before the Institute in 1919 was awarded to E. E. Campbell for his manuscript on the Hidden Creek deposits, and for 1920 to J. C. Nicholls for the description of the International Nickel Co.'s operations.

There was much discussion as to amending the constitution regarding the membership and authority of an Executive Council, and some fear seemed to be felt that a coterie of Montreal men would gain control. The plan to increase the size of the *Bulletin* to that of the A. I. M. E. publication was brought up. The chief reason for the change was that it would be easier to secure advertising. The project was referred to the Committee on Publications, with power to act.

Some interesting charts were then put on the screen by Secretary Mackenzie. The first showed how many of the councilors had been present at the monthly meetings during the year. The average was 5.7 out of 30. The second showed the income and expenses of the Institute for 1920, and the estimated balance sheet for 1921. This should be of interest to A. I. M. E. members, who have recently received requests for a contribution of \$10 to make up a deficit.

The Canadian Institute received \$31,700 in 1920 and showed a surplus of \$4,629 for the year, although it was later said that this did not include certain items for depreciation, and that the actual surplus was only \$12. Without raising the dues, the Institute expects to have a surplus of \$2,000 for 1921. A third chart showed how the members paid their dues, by months. Apparently only about 75 per cent of the dues have been paid in the last three years, and the arrears last year amounted to \$4,400. A fourth chart depicted the comparative growth of the A. I. M. E. and the C. I. M. M., and indicated the same trends in the growth of both societies, with the ratio of the membership of the older society to that of the younger gradually decreasing, as would naturally be the case.

COPPER LEACHING AND PRECIPITATION PRACTICE IN NORTH AND SOUTH AMERICA OUTLINED

The evening session on Wednesday included the reading of two interesting papers, one by Frank E. Lathe, of the British America Nickel Corporation, on the principles of copper leaching and precipitation practice, and the other by W. E. Simpson, embodying suggestions for the better development of the mineral resources of northern Ontario.

Mr. Lathe explained leaching practice as carried on by several representative plants, particulars of which are given in the following table:

PRINCIPAL LEACHING PLANTS IN AMERICA

Company	Tons Daily Capacity	Material Treated	Preliminary Treatment	Solvent	Precipitant
Anaconda	2,000	Sand tailings	Roasting	Sulphuric acid	Scrap iron
Calumet & Hecla	4,000	Tailings	Crushing to 28 mesh and desliming	Ammonium carbonate	Heat
Chile Exploration	15,000	Ore	Crushing to $\frac{1}{2}$ inch	Sulphuric acid	Electrolysis
Kennecott	700	Tailings	Partial desliming	Ammonium hydrate	Heat
New Cornelia	5,000	Ore	Crushing to $\frac{1}{2}$ inch	Sulphuric acid	Electrolysis and scrap iron
Utah Copper	2,000	Ore	Crushing to $\frac{1}{2}$ inch	Sulphuric acid	Scrap iron

Heap leaching is also being practiced by some companies and considerable experimental work is being carried on.

Crushing must be sufficiently fine to set free the copper mineral, and thus make a good extraction; to shorten the leaching time; and to prevent the solution of an unnecessary amount of gangue, thus taking up an unnecessarily long time, and fouling the solution. Too fine crushing will cost too much; will make too much dust; will make leaching difficult without agitation; is liable to cause channeling; and will make the final washing more difficult. Symons disk crushers are generally used for the coarser grinding, supplemented, in some cases, by rolls. No desliming is required before acid leaching if the ore is not crushed finer than one-half inch.

Roasting is sometimes necessary to make all of the copper water-soluble, and is not to be considered an unusually expensive process. The gangue may also be rendered less soluble. In other words, copper sulphides

are almost insoluble in ordinary leaching solutions, whereas those of iron are often fairly soluble. In a general way the opposite is true of the oxides, and roasting therefore brings about two desirable ends and also makes percolation easier by agglomerating the finer particles. Some impurities may be volatilized. Free access of air is necessary in roasting, and careful temperature control by means of pyrometers must be maintained. Salt and other additive agents are sometimes used, as at Anaconda until recently, to dissolve the silver. This addition of salt at Anaconda, however, has been discontinued on account of the expense.

ADVANTAGES AND DISADVANTAGES OF SULPHURIC ACID

As a solvent, sulphuric acid is most popular and is used in about 75 per cent of all plants, because it is cheap; can often be made from waste gases locally; is easily regenerated by electrolysis; makes copper of high purity; and is easily handled. Some objections to its use are that it does not dissolve metallic copper; dissolves only half the copper from cuprite; attacks carbonates in the gangue; and has some action on the oxides and silicates of iron and aluminum, thereby fouling the solutions.

The greater utility of ammonium compounds rests in the fact that they have none of the above-mentioned disadvantages of acid and may be perfectly recovered by distillation. However, they are expensive; cannot be regenerated by electrolysis; are volatile; and do not make a sufficiently pure copper. Therefore the properties of each determine their fields of use. Sulphurous acid has possibilities. Ferric salts are good solvents for metallic or oxidized copper and chalcocite and do not attack the gangue, but reduced ferric salts are hard to oxidize, and precipitation by electrolysis is impossible.

The leaching tanks must be carefully charged where the material is not of uniform size. The rectangular tanks used are usually 10 to 15 ft. deep, and filled by a conveyor belt. Leaching practice varies considerably, and no common leaching cycle can be given. At Chuquicamata, percolation is downward except for the first solution, but at Ajo it is altogether upward. The latter extracts the copper more rapidly and reduces channeling, but results in ten times as much water-soluble copper in the tailings. Downward percolation also lessens the amount of slimes carried over into the solution tanks and requires less power. Continuous percolation is more necessary on high- than on low-grade ore. The percentage of acid-soluble copper which is dissolved should not be under 85.

The leaching tanks are usually made of reinforced concrete, with a lining of either lead or mastic asphalt, sometimes with an inner lining of wood as a protection against wear. Smaller tanks are more often of wood with lead linings.

If precipitation is to be by iron, the acid is not recovered and fouling of solutions only causes trouble by increasing the acid consumption. The acid in the final solution should be low, to prevent an undue consumption of iron.

Consumption of acid depends upon conditions. At Anaconda it is about 60 lb. of 60-deg. Bé. acid per ton of tailings. At Ajo, where the gangue is more soluble, about 90 lb.; at Chuquicamata, combined sulphuric acid is found in the ore, so that only 4 to 5 lb. per ton is needed.

Ferric iron causes more trouble in electrolytic precipitation than any other impurity and is commonly reduced to the ferrous condition. At Ajo, this is done by sulphur dioxide. At Chuquicamata, chlorides also cause difficulty and are precipitated as cuprous chloride by agitating the solution with fine cement copper, which, at the same time, reduces much of the ferric iron present. The impurities cause no end of trouble in the electrolytic deposition of the copper, which is possibly the most difficult part of the whole process. Chlorine up to 0.5 g. per liter has no great effect on the current efficiency, and nitric acid may run up to 15 g. per liter if ferric iron is low and the electrolyte is not too warm. The solutions are not usually heated, and in Chile are artificially cooled.

The anodes used for precipitation have been made of graphite, antimonial lead, ferro-silicon, and fused magnetite. Graphite requires only low voltage, and the amount of acid regenerated is very high, but the liberated oxygen attacks it badly, as do ferric salts. However, it deserves much further experimentation. Lead anodes are not satisfactory where much chlorine or nitric acid is present, but they are a great success at Ajo. Fused magnetite was used in the experimental work in Chile, but the war cut off the supply, and since then, ferro-silicon has been used, which is better in its mechanical and electrical properties and cheaper, but inferior chemically. There, sulphuric, nitric, and hydrochloric acids are in the solution.

Precipitation may be by electrolysis or on scrap iron, depending upon the relative cost of current and scrap iron. The current efficiency in a new plant is usually low for the first year, owing to inexperienced workmen. With trained men it should be 80 to 85 per cent. The amount of copper deposited per kw.-hr. should be 0.7 to 0.9 lb. At Ajo, where the current density is as low as 7.5 amp. per sq.ft., the voltage is just over two; in Chile, with anodes of greater resistivity and nearly double the current density, it is about 2.8.

Scrap-iron precipitation usually is more adapted to smaller plants. Old tin cans can be used. Sponge iron, reduced from iron ores at a low pressure, offers attractive possibilities. It is ideal for precipitation but difficult to make. Modified tube mills seem to be superior to launders for precipitation purposes. Nearly two pounds of iron per pound of copper is ordinarily required, and the cement copper will average about 30 to 35 per cent impurities.

In ammonia leaching, steel tanks are used. No fouling of solutions occurs. About one pound of ammonia per ton is lost at Lake Linden, and half that at Kennecott, with an elaborate patented system of steam washing. The recovery in the two plants using ammonia is about 80 per cent.

Mr. Lathe summarized the characteristics of an ore suitable for leaching by the methods described, as follows: (1) The copper minerals, except possibly in the

case of heavy sulphides, must be soluble in sulphuric acid or ammonia or capable of being made so by a cheap method. Conversely, the gangue must not. (2) Gold or silver should not be present in appreciable quantities unless made soluble by a chloridizing roast or leach. The most promising extension of leaching in the near future would seem to be in the treatment of large bodies of partially oxidized ores.

In discussing Mr. Lathe's informative paper, E. P. Mathewson spoke of Greenawalt's experiments at a plant at Martinez, Cal., with high current densities, and said that the precipitation tanks might be made about one-fifth of the size now found necessary. Respecting precipitant, Mr. Corless spoke of the practice which obtained at a plant in Russia, of granulating pig iron from open-hearth furnaces for this purpose. The granules formed were up to $\frac{1}{2}$ in. in diameter. Dr. Stansfield mentioned the manufacture of sponge iron for precipitation purposes, this being made by the reduction of iron ores by heating with peat or other fuel. Mr. Mathewson stated that sponge iron made by carbon reduction had proved too expensive at Anaconda.

SUGGESTIONS FOR DEVELOPING NORTHERN ONTARIO MINING COUNTRY

The second paper of the evening was read by W. E. Simpson, general manager of the Miller-Independence mine, at Boston Creek. Mr. Simpson emphasized the importance of doing hard work in the development of properties and criticized the policy of some individuals and companies which were inclined merely to hold their lands while neighboring properties were being developed, thereby profiting without doing anything themselves. In this connection Mr. Simpson pointed out the advantages of the leasehold title system, in which a certain amount of work could be made obligatory under penalty of losing the lease. It was his conviction that something of this kind would be preferable to the present system in northern Ontario, where thousands of acres were lying idle.

The tax levy of 5c. per acre was also criticized as being more of an irritant than a revenue producer, and a tax graduated according to the owner's valuation of his property was suggested instead; this to be refunded where active development had been done.

Mr. Simpson then spoke about the impossibility of the small operator and prospector in remote regions being able to secure a mill run of his ore. He described the practice in West Australia, where small government custom mills had been established in remote sections not served by private mills. There are now twenty-nine such mills, producing well over a million dollars' worth of gold annually, and the plan should also be applicable on a smaller scale, he said, to northern Ontario.

Inefficient transportation is another factor which retards development. Macadamized roads in the northland cost about \$20,000 a mile to build. Transportation over ordinary bush highways will average well over \$1 per ton-mile. As a solution of this difficulty, the construction of a light railroad was described; this was made of 20-lb. rails spiked 4 ft. 8 $\frac{1}{2}$ in. apart to round logs cut to serve as ties from the trees felled in clearing the right-of-way. Such a road, which had been facetiously named the "muskeg express," cost about \$6,000 for a two-mile stretch. The building of roads of this kind might well be encouraged by the govern-

ment, which could secure the right-of-way and arrange the title.

FREEHOLD TENURE DEFENDED BY T. W. GIBSON

In the discussion, T. W. Gibson pointed out that the greatest mining country in the world had been developed on a freehold tenure basis without making development obligatory. Prospectors, he said, claim that even the present terms of obtaining mining lands in Ontario are onerous. He did not attempt to defend all parts of the present Ontario mining law, however, saying, "I did not make the law." The principal value of the 5c. per acre tax, he said, was not in getting revenue but in getting back undeveloped lands for the province so that they could be allotted to others. A 25c. tax he thought would mean the confiscation of almost all undeveloped lands, and the province was getting enough as it was. He doubted the efficacy of a law making a certain amount of work on a claim necessary. Mr. Gibson then described the work of the government in training prospectors in the fundamentals and practical aspects of geology, mineralogy, and mineral spotting. These classes are being held in various mining districts, with skilled teachers in charge, and the attendance has reached as many as eighty.

In subsequent discussion by Messrs. Dresser, Neilly, Cole, and others the tendency of small government custom mills to keep prospectors in one place was emphasized. Usually they wish to skip along to the newest discoveries, and an outlet for their development ore would make them more inclined to stay where they were. Mr. Cole stated that his experience as mining engineer for the government railway had shown him that the demand for such custom mills was widespread. The power question, however, was highly important, and the high cost of power sometimes not realized. A cost of \$400 per horsepower-year for a small steam plant with wood fuel was a conservative figure. Mr. Corless suggested that Mr. Cole would be a valuable man to recommend sites for mills such as had been discussed.

THE PETROLIFEROUS AREA OF NORTHWESTERN CANADA DESCRIBED

What was probably the most important paper presented at the meeting was read by Mr. J. Ness, of the geological department of the Imperial Oil Co., Ltd., on Thursday afternoon, and covered in considerable detail the geology of the possible oil regions of northwestern Canada. Commendation was freely expressed for the liberality of the oil company in releasing information of such value. Mr. Ness first described the Cretaceous area of the plains of Saskatchewan and Alberta; then the Cretaceous area of the foothills; and lastly the Devonian of the Mackenzie River valley. Owing to the character of Mr. Ness's paper, an abstract is hardly possible, but early publication in the *Bulletin* of the C. I. M. M. is assured. The remoteness of the region was emphasized, and the attendant difficulty of transporting supplies to some of the more promising regions discussed. The oil-well recently brought in on the Mackenzie River is 1,470 miles from Edmonton, and the rivers are open only three and one-half months in the year.

A paper read by E. M. Kindle entitled "Salient Features of the Geography and Geology of the Mackenzie River Oil Region" supplemented that of Mr. Ness. The Mackenzie River oil well is forty miles north of the

mouth of Great Bear River, and about 100 miles south of the Arctic Circle. It is about sixty miles further north than the Klondike gold field, which is separated from the oil well by 350 miles of unexplored mountains.

To reach the new well two routes are available. One may leave the railway at Peace River Crossing or at McMurray. The former route involves a change of steamers and a four-mile portage at the Chutes on the Peace River in addition to a sixteen-mile portage on the Slave River. By the latter route a change of steamers is made at Fitzgerald, on the Slave River. Either involves a river trip of 1,500 miles or more. Three steamboat lines are operated by fur companies. The coming year it is planned to institute a hydroplane service, which can be begun about June first, or a month before the ice is out of Great Slave Lake. The flying route will be up the Peace River from Peace River Crossing to the Pine; then up the Pine and down the Nelson and Liard to the Mackenzie at Simpson. Dirigibles are also being considered.

THE NORTHLAND SUMMER

The climate is not really as cold as one might expect, considering that the latitude is that of southern Greenland. Hardy garden vegetables will grow, and raspberries were obtainable by Aug. 7 on Bear Mountain, forty miles from the oil well. The first frost comes about the first of September. The almost continuous sunshine of the summer months causes rapid growing.

The Peace River canyon is said to compare very favorably in scenic beauty with the more famous canyons of the continent. The river has many sharp turns and has cut its valley 700 to 800 ft. through the sandstone and shales. For several miles the walls of the canyon rise almost perpendicularly, but, further down, the valley is broad and nearly level. Heavy spruce timber is found throughout the region.

On the Athabasca River route the cliffs of tar sands may be seen for more than 100 miles rising abruptly from the river banks. These tar sands are impregnated with thick bituminous material to such an extent that they can be molded like clay, and in some instances tar may be squeezed out by the pressure of the hand. Along much of the Mackenzie River the oil product of the Devonian rocks is protected by relatively impervious shales, so that it cannot escape into the sponge-like sandstone. The Devonian rocks include four fairly well-defined types of lithology. These are, starting at the top of the section, sandstones and shales, bluish argillaceous shales, black bituminous shales, and limestones. In view of the vast extent of the Devonian beds along the Mackenzie, and the presence of oil as proved in the one well drilled, there is justification for optimism as to the future oil development of the region.

Four or five reels of motion pictures were shown following Mr. Kindle's paper. They told "The Story of Petroleum," and were prepared by the U. S. Bureau of Mines, co-operating with the Sinclair Consolidated Oil Corporation. The story covered all phases of the subject, from prospecting to refining, and the films were of absorbing interest. The photography was excellent, and the mysteries of the animated cartoon were employed to show how a well is "shot," how the pipe lines are kept clean with the "go-devil," and how fractional distillation is performed.

Some of the other interesting papers which were presented at the meeting will be reviewed in a later issue.

BY THE WAY

On the Stage

In "The Bad Man," at the Comedy Theater, which (though this is no dramatic column and we paid good money for our seats) is one of the most thoroughly entertaining plays we have seen in a long time, the villain seeks to prove the existence of oil lands by scraping up a sample of the country soil and carrying it back to Wall Street in his bag. We doubt if such evidence would convince even the lambiest lamb. Doubtless in the present case the sample was carefully gathered from the spot where the flivver customarily stood, but even so he should certainly have obtained a few samples of "structure" too.

In another show, the name of which we have forgotten, the hero finally has reached the point where, on bended knee he asks the lady for her hand. "But you are a millionaire," she says. "Ah! No, dearest, I am but recently graduated as a mining engineer and am on my way now to begin my career in a position paying only \$6,000 a year. If you can endure my poverty let us begin life together."

Making Hooch From Coal

G. A. E. Martin, the sage of Adona, Ark., is devilish deep at times, in this way resembling the Pacific Ocean. Those not on the inside may not at once fathom the meaning of all that is in the following letter that we have received from Mr. Martin, but they have no one to blame but themselves. The letter follows:

By a delicate simple process I have discovered a method to eliminate the gasses and alkalies from coal when a pure blueish white crystalized metal, H about 3.50, S.G.6.428, is left, proving that pure carbon is in its elementary state such metal; that has the property of, in the presence of sufficient oxygen, hydrogen and alkalies with heat, when smothered as when well covered with earth and shale, of making what we know as natural coal-beds. Hence in nature we have stone-coal. Said metal in such molecular solution on cooling crystalizes in the form of the so called coal-plant, hence the erroneous supposition that our coal beds are necessarily a naturally transformed vegetable growth. That such metal properly in solution with alkalies (it has an acid reaction) has a greater attraction for oxygen at ordinary temperature than any other product, and is the substance of vegetable and animal growth. It, when heated very slightly as in vegetable growth, has the property of rising to obtain oxygen and makes a cork-screw-to-the-right course. Hence the course of vines and the commonness of right-handed people; a continued supply of such solution to the blood of animals, as is effected by normal assimilation of the normal foods carboniferous, is necessary to enable such animals to extract oxygen from their breath while breathing. Hence when animals are sick and cannot so supply their blood with oxygen, they have abnormal blood-pressure and heart-failure.

I have learned to make such a solution suitable to animal blood, which is a beautiful bright purple fluid. This should be given in any depletion of the digestive system, and is readily absorbed by the blood, a very great and innocent germicide, and will insure sufficient oxygen by the natural process of breathing. It is indirectly a great stimulant and it is practical to give it with any of the many fevers in them it does away with the necessity of the common heart stimulants and is more efficient and keeps fevers from running so high, it may, and should be given with any other needed medicine the action of which it aids. This medicine can be made at a cost of 10c. a gallon and should sell at \$4.00 per gallon. To make the discoveries explained above,

I have been very busy much of my time for the last 30 years that I have kept myself financially very poor and for this reason I am alone unable to promote this enterprise (which should be one of the most successful). Hence I write you to ask if you would care to furnish the capital necessary to patent same in every civilized country in the world and control this medical and plant fertilizer discovery on reasonable partner-shares?

These Central Arkansas mountains and ridges are almost wholly composed of this carbon-alkali combination, much of it crystalized as the famous Arkansas crystals, in such proportions, that when ground to promote solution it is nothing less than that the necessary elements to compose the richest of soil for vegetable growth—hence in its self the very best fertilizer for vegetable growth. All this I can verify to any chemist, if he, by his own experience will test samples of such material by my method, which though very delicate, is very simple. And I would be only too glad to explain minutely details only to those competently interested for business reasons.

If you are not interested but are acquainted with one that is, will you kindly pass this proposition to him?

Yours, very truly,

G. A. E. MARTIN,
Adona, Arkansas.

P. S. I have a piece of this metal practicly pure in its virgin state, was found near here where nature placed it in black perpendicular shale that will weigh almost 180 gr. It has such magical and varied chemical reactions it should be worth \$100 per grain for research work alone.

Every time we read this we get a new meaning out of it. Mr. Martin is a physician and druggist, and those desiring that he prescribe for them can get him at Adona.

Tha Mine Smell

BY D. E. A. CHARLTON

There's tha salt o' tha sea to tha sailor,
To tha woodsman tha smell o' tha pine,
But to miners like we there's nothin' can be
As gran' as tha smell from tha mine.
If thee's askin' for me to describe it,
Then thee's asked for a 'ard thing to do,
For I naws it so well that I 'ardly can tell
O' w'ot she's made up o' to you.

W'en thee stan's at tha bloody shaf' collar,
An' tha h'upcast is suckin' tha h'air
From h'each manway an' drif', an' h'all o' tha shif'
Is workin' an' sweatin' daown there,
Then thee'll naw w'y it's 'ard to describe un,
An' thee'll naw w'ot that smell means to me.
For I tell ee, m'son, there's no h'other one
No matter w'ere h'else I may be.

Firs' o' h'all there's tha h'odor o' h'earth clods,
Freshly turned as a plot on tha farm.
An' I naws bloody well they's givin' 'er 'ell
Daown there, an' thee's naught to fear 'arm.
Then there's steam with it's fizin' an' fussin',
An' a wee sniff o' h'oil burnin' slow
On tha 'eads o' tha pump, an' then from tha sump
Comes a smell o' tha water below.

Mixin' in with these 'ere many h'odors,
There's tha powder-gas commin' h'up strong
From tha drif's on tha sub (a breath from tha pub
Thee may say that it's like, but thee's wrong).
Then there's cannels, an' carbide, an' Peerless,
All o' they smells tha same at tha top.
It's 'ard to define jus' tha smell o' tha mine
It's mixin', tha h'odors thee's got.

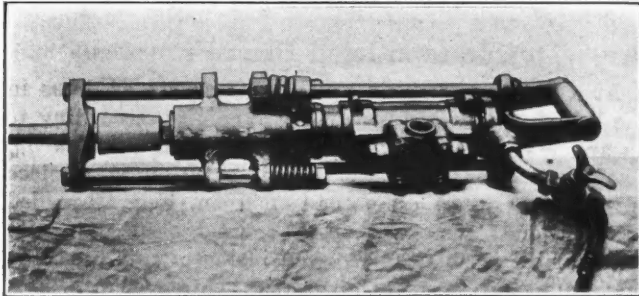
Although, dam-me, m'son, there's no diff'rence,
An' it matters not w'ere thee may be,
(I naws I am soun') any 'ole in tha groun'—
A mine—smells tha same, jus' thee see.
So, tha salt o' tha sea to tha sailor,
To tha woodsman tha smell o' tha pine,
But to miners like we there's nothin' can be
As gran' as tha smell from tha mine.

HANDY KNOWLEDGE

Shanks for Hammer Drill Steel

The technical advisers of the Chamber of Mines in Johannesburg, South Africa, have for some time been seeking to standardize and improve rock-drill practice at the Witwatersrand mines, and committees have been appointed for that purpose. The advisers also investigate all new local applications for patents.

Much loss and inefficiency have been caused by bad design and the neglect of proper maintenance of rock-drill steel shanks, more particularly those for use in hammer drills. Research along this line has been undertaken by the advisers. If the top of the shank is not kept smooth and true, the hammer or tappet of the drill does not strike the steel a true blow, and breakage of both shank and piston results. If, again, the area of the top of the steel is too small to withstand the stresses set up by the blow, as may be caused by excessive chamfer or too large a water hole, breakage is caused.



DEVICE WITH SPRING ATTACHMENT TO FACILITATE USE OF DETACHABLE SHANK

Bad tempering due to faulty work in the mine drill shops is a most frequent cause of breakage. Again, a bad fit or excessive wear on the sides of the shank also causes excessive wear on the chuck lining.

Evidently the remedy for these evils lies in providing exactly the right conditions for tempering by means of exact control of heating and quenching temperatures, and, second, by improving and standardizing design to give adequate wearing and stress-resisting surfaces. Such control is best obtained at some central works equipped with pyrometers and having the services of experts, but the great bulk of drill steel to be handled renders this impossible. It seemed that the best solution lay in the direction of making the shank detachable. In the jackhammer shown in the accompanying illustration the shank of the drill steel is tapered at such an angle that the steel seizes in the shank while at work sufficiently to hold firmly, but not so firmly that it cannot be detached by a blow. The most suitable taper is approximately 6 per cent.

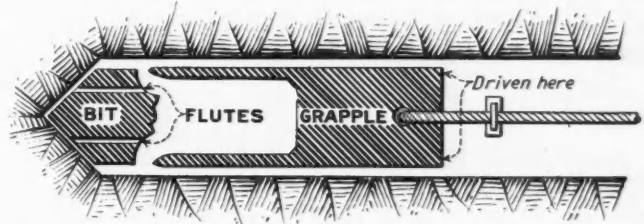
In the photo it will be noted that a sort of forehead is used, with a spring attachment to minimize jar. When it is necessary to change steel, the front of the shank is driven against this by turning on air when the steel is not against the rock. The steel then flies off from the shank, which is always retained in its place in the front head of the machine. A new taper drill is

then inserted, and drilling is resumed. It will be noted that the square shank head is of large and ample section. The adoption of this device is due largely to the efforts of F. A. Roberts, technical adviser of the Chamber of Mines.

Recovering a Broken Drill Bit

BY R. FRANKLIN MUNDORFF
Written for *Engineering and Mining Journal*

When a rope-drill bit breaks in a 5½-in. hole 70 ft. deep in granite, its recovery is a difficult problem. This, however, recently occurred in a quarry at Columbia, S. C., and after several attempts at retrieving the



DEVICE USED FOR RECOVERING BROKEN ROPE-DRILL BIT

broken bit, which was a piece of steel about five inches long, had failed, a device to recover it was forged from malleable iron. It consisted of a flat plate with two long



ROPE DRILL BIT RECOVERED BY SPECIAL RIG

prongs, as shown in the illustration. The arrangement was lowered by a rope and pressure used to force it down. The two prongs were bent around the broken bit, and drawing it to the surface was an easy matter.

"Hypoing" Silver Ores

BY LEROY A. PALMER

Written for *Engineering and Mining Journal*

The following qualitative test, locally known as "hypoing," is in vogue among the silver miners of the Calico mining district, in San Bernardino County, Cal.: A calcium sulphide solution is used, which is made up by mixing quicklime and flowers of sulphur in the proportion of one pound of sulphur to two of lime and boiling for four to five hours in half a gallon of water. To make the test, a test tube is filled a quarter full of pulverized ore and well filled with a saturated solution of hyposulphite of soda. After shaking well, the solution is allowed to stand until clear, when a drop of the calcium solution is added and the silver thrown down as a brownish-black precipitate of silver sulphide. The test is useful with free-milling ores, chlorides, bromides and native silver, if the latter is in fine grains.

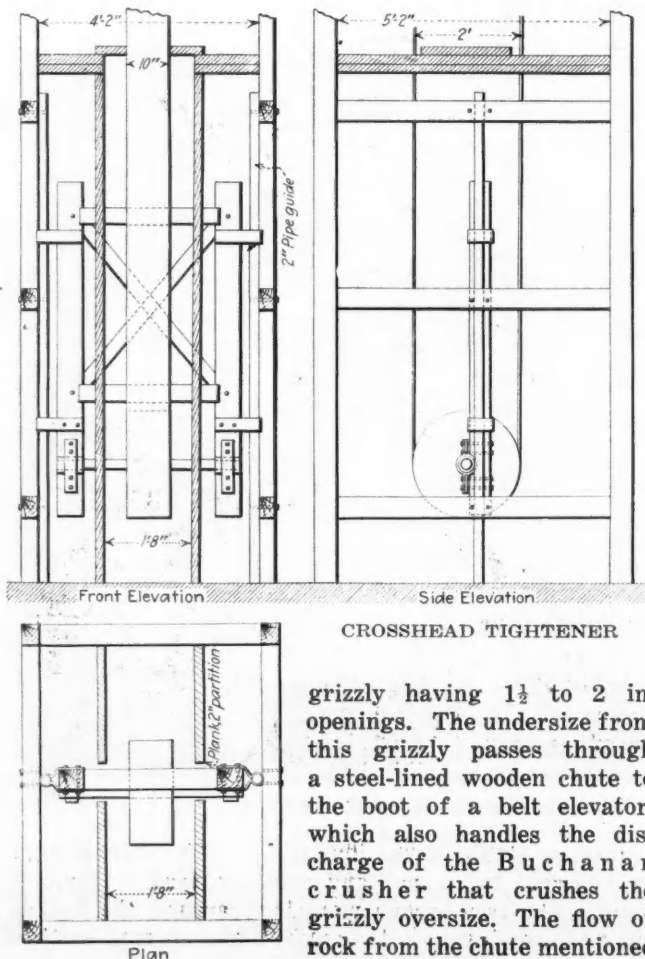
The miners at Calico have become very expert in applying this test. On an ore of not more than 100 oz. per ton they can estimate the silver content within 10 per cent by the color of the precipitate. Above 100 oz. an accurate quantitative estimate is not possible.

Crosshead Tightener for Dry Elevator

BY HUGH B. LEE

Written for *Engineering and Mining Journal*

At the plant of the Porcupine-Crown Mines Ltd., Timmins, Ont., the ore is hoisted in 14 cu.ft. cars and trammed from the shafthouse to the mill, about fifty yards distant, where the cars are dumped upon a bar



grizzly having 1½ to 2 in. openings. The undersize from this grizzly passes through a steel-lined wooden chute to the boot of a belt elevator, which also handles the discharge of the Buchanan crusher that crushes the grizzly oversize. The flow of rock from the chute mentioned

is controlled by means of a gate operated by the crusher man. Forgetfulness on his part would at times permit this chute to fill up, when, in releasing the accumulated ore, he frequently overtaxed the capacity of the elevator. This sometimes resulted in blocking the elevator and tearing or breaking the belt. Considerable time was lost, and the life of the belt was shortened.

To overcome this condition the crosshead shown in the figure was installed. The tightener posts, which carry the bearings of the boot pulley shaft, are 6 by 6 in. with 4 by 6 in. crosspieces and 3 by 6 in. braces. The weight of the tightener is supported by the elevator belt, and the tightener is held in place by the two vertical pipe guides at either side of the housing. The 2-in. plank partitions, which inclose the pulley and belt, prevent accumulation of rock beneath the posts of the tightener and also protect the bearings. The elevator belt is 10 in. in width, and carries 9 by 9 in. buckets. It travels at a speed of 225 ft. per min.

In operation, the tightener rides freely, and is very responsive to changed conditions in the boot. Whenever there is an excess of feed, it rises, and then gradually lowers as the accumulation is removed. The installation of the tightener has not only done away with the annoyance and delays formerly experienced, but the device has practically doubled the life of the elevator belt.

Dynamite in Lead Blast Furnaces

At a Colorado smelting plant, the crusts of dross in the lead furnaces are broken by dynamite, according to an article in a recent issue of *Mining and Metallurgy*. The bomb used in the blasting operation is a piece of pipe, 1½ in. in diameter and 7 in. long, threaded at each end. One-half of a cartridge of dynamite (measuring ¾ x 4 in.) is placed inside of this pipe and the remaining space is filled with powdered asbestos. The caps are then screwed on and white lead is applied to make an air-tight joint. By means of a long rod of ¾-in. iron attached to one of these caps, the bomb is thrust through the lead well into the crucible and up near the crust of dross, and the workmen leave the vicinity.

After 1½ to 5 minutes the dynamite is detonated by the temperature of the lead bath in which it has been placed. As a rule one detonation will completely break up the crust. Occasionally, a second shot is necessary. If the first shot does not break up the crust, some of the bullion is thrown out on to the furnace floor through the lead well. This is easily recovered after cooling.

Cleaning Muck Out of Mine Cars

BY ROY H. POSTON

Written for *Engineering and Mining Journal*

In a mine in the southeast Missouri lead district a man whose duty it is to clean the packed muck out of mine cars had the blacksmith put a wedge-shaped point on a discarded starter drill. He then borrowed a jackhammer from the drill repair man. To cut loose the packed material from the mine car bottom with this machine is the work of but a few seconds, instead of minutes as by use of pick or hammer and moil.

The car-cleaning station is close to the drill repair shop, and the air connection is therefore convenient. By using a jackhammer "in for repairs" no machine is taken out of regular service.

Fluorspar Production and Imports Increased in 1920*

Many Domestic Consumers Have Large Stocks on Hand—Producers Seeking Tariff Protection From Foreign Competition

THE PRODUCTION OF FLUORSPAR in 1920, compared with that for 1919, is shown in the following table prepared by the U. S. Bureau of Mines and the U. S. Geological Survey:

State	1919 (Actual)			1920 (Estimate)		
	Quantity (Short Tons)	Value	Average Value per Ton	Quantity (Short Tons)	Value	Average Value per Ton
Colorado.....	9,687	\$150,739	\$15.56	14,000	\$279,000	\$19.93
New Mexico.....	2,346	37,643	16.05	7,700	136,000	17.66
Illinois.....	92,729	2,430,361	26.21	121,000	2,970,000	24.55
Kentucky.....	32,386	883,171	27.27	42,000	1,134,000	27.00
Nevada, New Hampshire, Utah, Arizona.....	1,142	23,660	20.72	1,300	25,000	19.23
Total.....	138,290	\$3,525,574	\$25.49	186,000	\$4,544,000	\$24.43

The imports of fluorspar into the United States during 1920 amounted to 24,610 short tons, valued at \$265,624; in 1919 they were 6,943 short tons, valued at \$107,631. The value at the foreign ports of shipment assigned to the imports for 1920 averaged \$10.79 a ton; for 1919 it was \$15.50 a ton. The imports for 1920 were greater than in any year since 1913, when they were 22,682 short tons.

Small quantities of fluorspar have been imported into the United States from Canada prior to 1919, the largest being in 1918, when 913 tons was reported, practically all of which was obtained from Ontario. During 1920 the imports increased to 7,068 tons, a considerable portion of which were fluorspar concentrates from the Rock Candy mill in the Similkameen district, British Columbia, which were shipped to steel plants at Gary, Ind. Small quantities of fluorspar were received from Germany, British South Africa, and Australia during 1920.

The increase in the imports of fluorspar in 1920 can probably be attributed to the difficulty in securing supplies from American mines, due to the insufficient car supply and labor troubles, and to the easing up of the ocean freight situation. Most of the English spar is consumed at steel works in the Lehigh and Susquehanna valleys of Pennsylvania, at which points the foreign material can be delivered at a slight advantage in price on account of a saving in railway freight charges.

According to a consumer in the Lehigh Valley who uses a large quantity of fluorspar imported from England, the foreign spar purchased in 1919 averaged 75 per cent calcium fluoride and 4 per cent silica, and the cost, delivered at its works, was about \$7 a ton less than the cost, delivered, of the domestic spar, which averaged 85 per cent calcium fluoride and 6 per cent silica. This consumer states that the better grades of domestic fluorspar are more efficient than the imported material and that on a fairly even price basis the better grades of domestic spar are preferred.

At the close of 1920 little new business was being booked, although some of the larger producers were still running to capacity on old contracts. For most of the smaller mines the market was stagnant. Though in general an optimistic view is held, especially in the West, there are several disturbing features. One is that the imports for 1920 were large and increasing

toward the end of the year. Though Canadian competition has been small, it will probably increase. To equalize the price of imported and domestic spar, the principal fluorspar producers recently presented a petition to the Ways and Means Committee of the House of Representatives to increase the import tariff from the present rate of \$1.50 to \$5 per long ton.

Another factor of some importance in the early part of 1921 will be the fact that many steel producers have accumulated large stocks of fluorspar which will be used up slowly until the present industrial depression ends. It is also possible that many consumers will withhold contracts with the expectation of lower prices. However, no tendency toward price reductions on gravel spar have been noted.

There seems to be a tendency, particularly among Western producers, to specialize on high-grade fluorspar such as used in the acid, glass, and enamel-ware industries. This is due, no doubt, to the apparent scarcity of spar of these grades during 1920 and to the fact that the item of freight cost is relatively lower on material of high grade. It should be remembered that the consumption of fluorspar of these grades is small in comparison with that of gravel spar, and any considerable increase in the production of these grades would result in an oversupply, with a consequent reduction in price.

Fluorspar Industry Active in Germany

The largest fluorspar fields in Germany are situated in the Hartz, Upper Palatinate, Thuringian Forest, and Black Forest. The best quality is produced in the Upper Palatinate. The fluorspar found in the Upper Palatinate contains generally from 95 to 98 per cent of fluoride of calcium and relatively little silicic acid in the marketable product.

Most of the fluorspar in Germany is consumed at present by the iron industry, according to *Commerce Reports*. In this kind of utilization broken materials suffice. Other consumers are the glass industry and the chemical and enamel industries. These utilize fluorspar in a milled form, and together they use much less than the iron industry alone. According to a rough estimate made before the war, it is calculated that the quantities supplied, respectively, to the individual industries are approximately as follows: Iron and metal smelting industry, 79 to 84 per cent; glass industry, 10 to 15 per cent; chemical industry, 5 per cent; enamel industry, 5 per cent, and the optical industry, about 5 per cent.

Today the cheapness of extraction and milling, due to the condition of German exchange, constitutes a great encouragement for the export trade. Under these circumstances the Germans are in a position to export with profit, despite the enormous wages, freights and cost of packing. Germany is able to offer cheaper prices than any other country.

The utilization of fluorspar in the iron industry has made steady progress in consequence of the shortage of coal since the armistice, as fluorspar increases the fluidity of the fusible material and thus effects an economy of fuel, although at the cost of the quality of the resulting product. Consequently, it is probable that post-war statistics will show an increase of the consumption of fluorspar by the iron industry at the expense of that of the glass and possibly other consuming industries.

*U. S. Bureau of Mines, *Reports of Investigations*.

THE PETROLEUM INDUSTRY

Relation of Topography to the Oil Fields Of the Texas Gulf Coastal Region

BY ALBERT G. WOLF

Written for *Engineering and Mining Journal*

IT HAS BEEN freely predicted that the present known oil resources of the United States will be exhausted in twenty years if our rate of production continues to increase as it has during the last decade. Even though this estimate may be over-conservative, we must grant that ultimate exhaustion of our known resources is inevitable, and, therefore, any work that will surely lead to the discovery of new oil fields should be undertaken without delay. Various ways of prolonging the life of the oil industry have been suggested, the most obvious being the discovery of more oil fields. One such work, so large that only the United States Government can successfully undertake it, is a complete topographic survey of the Texas and Louisiana Gulf Coastal plain.

GULF COASTAL OIL PRODUCTION ALL FROM SALT DOMES

Practically all of the oil, sulphur, and salt produced in the Gulf Coast region of Texas and Louisiana are found in salt domes. Not all the salt domes so far discovered have proved to be commercially productive in even one of these minerals, but the majority of them have. Though all of the salt domes do not appear on the surface as topographic domes, the greater number of them, whether productive or not, do appear as such.

The importance of salt-dome oil fields is shown by the fact that between 6 per cent and 6.5 per cent of the petroleum production of the United States in 1920 came from them, the total Gulf Coastal production being about 27,000,000 bbl. out of a total production by the United States of 443,400,000 bbl. (figures based upon statistics obtainable at the time of writing). In 1919 the coastal fields produced 20,500,000 bbl., the United States 377,719,000 bbl. and the world 558,692,519 bbl. (*Mineral Industry*, Vol. 28, 1919). Expressed in percentages, the coastal production during 1919 was 5.43 per cent of the United States' production and 3.67 per cent of the world's. It is self-evident, then, that any work that will lead to the discovery of more surface domes will result in the discovery of more salt domes, and will be an important preliminary step in adding to our known oil resources.

Though the oil production is of paramount importance in this discussion, it is not out of place to point out that the coastal domes play an extremely important part in the world's sulphur production and also produce a small amount of salt. During 1917 the world produced 1,553,232 metric tons of sulphur, the United States 1,138,416 metric tons, and of this United States' production the coastal fields produced more than 99 per cent. In 1918 the production of the United States was 1,287,103 metric tons (1,353,525 long tons, according to

the U. S. Geological Survey), of which the coastal domes contributed more than 99 per cent. (*Mineral Industry*, Vol. 28). Further statistics are not available.

To show more clearly the percentage of producing to non-producing domes, and the percentage of salt domes that appear as topographic domes, the following table of known salt domes lying within seventy-five miles of the Gulf coast and between the Sabine River and the Colorado River (of Texas) has been prepared. One of the domes in this list, Markham, lies just west of the Colorado River, outside of the area specified, but is included because it is a proved salt-dome oil field. The salt core at another, Goose Creek, has never been found, but as all other oil in the Texas coastal region has been found on or immediately around salt domes, and as thin strata of salt have been found, which may be outlying portions of or redeposits from the main core, it appears fair to treat this area as a salt-dome field. There is no surface dome here, and if a salt dome exists, it is either very deep, even deeper than that at Markham, or out under San Jacinto Bay.

At Big Hill, Jefferson County, a prominent surface dome, drilling on the dome has not been done to sufficient depth to prove or disprove the existence of a salt core, at least the results have not been made public if so, but as limestone and gypsum in quantity, together with anhydrite in some cases, invariably form the "cap rock" of the dome salt-cores, it appears fair to include this in the list of salt domes. Furthermore, as this area has never proved productive, to leave it out would increase the percentage of productive salt domes; hence it must be included to be fair in the final deductions.

Near Orange a little oil is being produced (30 bbl. a day at the present time, according to *The Oil Weekly*), but as I am not sure that the salt core has been struck here I will not include it as a producing salt-dome structure.

KNOWN SALT DOMES

Name	County	Surface Configuration and Elevation Above Surrounding Area	Barrels Oil Production, 1920, and Total to Oct. 1, 1920
Barbers Hill	Chambers	Distinct dome, 45 ft.	136,367
			287,487
Batson	Hardin	Flat	484,036
			30,207,855
Big Hill	Jefferson	Distinct dome, 30 ft.	Nil
Big Hill	Matagorda	Distinct dome, 36 ft.	Nil
			200,000 (est.)
Blue Ridge	Fort Bend	Distinct dome, 30 or 40 ft.	173,087
			No data
Bryan Heights (Freeport)	Brazoria	Distinct dome, about 20 ft.	Nil
Damon Mound	Brazoria	Distinct dome 83 ft.	1,259,375
			1,598,742
Davis Hill	Liberty	Dome, partly eroded	Nil
Dayton (North)	Liberty	Dome	100,000 (st.)
Dayton (South)	Liberty	Dome	526,921
Goose Creek	Harris	Flat, part submerged	5,666,384
			28,978,122
High Island	Galveston	Distinct dome	Nil
Hockley	Harris	Monocline or portion of eroded dome	Nil (traces found)

Name	County	Surface Configuration and Elevation Above Surrounding Area	Barrels Oil Production, 1920, and Total to Oct. 1, 1920
Hoskins Mound.	Brazoria...	Distinct dome, 30 ft.....	Nil (?) 100,000
Hull.....	Liberty....	Low dome, 15 ft.....	4,468,612
Humble.....	Harris....	Slight dome of considerable extent.....	4,565,278
Markham.....	Matagorda.	Flat.....	3,692,108
Pierce Junction.	Harris....	Slight dome, 10 ft.....	83,574,361
Saratoga.....	Hardin....	Two slight elevations.....	75,774
Sour Lake.....	Hardin....	Flat.....	2,500,000
Spindle Top....	Jefferson...	Dome, 10 ft.....	Nil (traces found)
Stratton Ridge..	Brazoria...	Dome, 10 to 15 ft.....	913,728
West Columbia.	Brazoria...	Dome, partly eroded.....	20,169,721
			2,073,483
			58,372,681
			323,995
			46,975,144
			Nil (traces found)
			10,563,748
			15,077,619

From the above list the following tabulation is derived:

		Per Cent
Known salt domes.....	23	
Oil producers in quantity.....	14	60.87
Producers of appreciable quantities of oil in the past.....	2	8.70
	16	69.57
Non-oil producers to date.....	7	30.43

Of 16 oil producers 12, or 75 per cent, are surface domes, and 4, or 25 per cent, are flat.

Salt domes productive and visible on the surface, $69.57 \times .75 = 52$ per cent.

In at least three of the non-productive dome structures small quantities of oil have been found, and these cannot be classified as barren. On three others, sufficient prospecting has not been done to prove them so.

Regarding the salt domes classified here as surface domes, a word of explanation is necessary to those unacquainted with the Gulf Coast region. The highest of these domes, Damon Mound, is about 83 ft. above the level of the surrounding country, and the lesser ones are only eight or ten feet in height, not sufficient to be visible to the untrained eye but sufficiently high to make them quite prominent on a contour map of one-foot contour interval.

The high percentage of productive salt domes, together with the high percentage of salt domes that appear as surface domes, and the difficulty, in many cases, of seeing these slight elevations with the unaided eye, make it evident that the first requisite in the search for new fields in the Texas coastal region is a good topographic map. Such a map does not exist at present. No topographic survey of this region has been made by the State of Texas, and the U. S. Geological Survey has completed only a few quadrangles, most of Harris County, to be specific, and as yet has not published all of these quadrangles. A few other small areas have been surveyed by operating oil companies, almost all of these areas, however, covering productive domes.

This topographic survey is a big and a hard undertaking, not alone because of the extent of the region involved, but because of the nature of the country. Much of the surface is covered with dense timber, in many places forming veritable jungles, or with swamps, or a combination of both. However, a survey first of the accessible areas would show all the surface domes in a considerable part of the coastal plain. This could be followed by meanderings of all the stream banks, roads, trails, and railroad right-of-ways, which would aid greatly in detailed examinations of specific tracts now too densely overgrown to permit stadia work. Undoubtedly such a survey would lead to the discovery of many more salt-dome oil fields in this portion of the state.

It is probably too much to expect that 50 per cent of

all newly discovered surface domes will prove to be productive oil fields, but I do believe that 25 per cent of all the distinct surface domes within the area already delimited will prove, upon drilling, to be salt domes, and at least 50 per cent of the salt domes so discovered will develop into oil fields; or, in other words, I consider one productive oil field out of eight distinct (upon survey) surface domes to be a conservative estimate. In making this estimate I am assuming that the selection of the apparent domes will be made by one who is familiar with the country, and who will not mistake residual cut-off deposits by meandering streams, or ancient wave ridges, for surface domes likely to have been formed by a salt-core "intrusion." I place the word "intrusion" here in quotation marks, as it is not within the limits of this article to discuss the theories of salt-dome origin.

Assuming that the above figures are correct, how much better it would be for wildcat oil companies to confine their drilling in the coastal region to the centers of distinct surface domes where the chance of finding a salt dome is probably one in four, rather than engage in promiscuous drilling that is often induced by nothing more reasonable than the possession by some "oily" promoter of leases on a block of 1,000 or 5,000 acres in "rice" or "cotton" country. Confine the drilling to the tops of the distinct surface domes; then the salt core will be found if one exists, and oil too if it occur in either the cap rock or the shallow strata above it. A salt dome once proved will be eagerly purchased by the larger oil companies, whether oil has been found or not. No organization except a big, experienced oil company with great financial resources should attempt to be the first to find oil in the deeper abutting strata of a salt dome, for fifty wells may be required finally to "tap" the oil "pool."

It is hoped these notes will elicit discussion and further information. Possibly there are either errors or omissions in the list of salt domes presented, and some slight changes may be necessary, but the main facts will remain unchanged; that is, the majority of salt-dome structures are oil producing and the majority of these producing domes appear on the surface as topographic domes. Likewise, all the oil produced in this region is from salt-dome structures. Hence the prime requisite in the search for more oil fields here is a good topographic map.

Canadian Oil Regulations Amended

SPECIAL CORRESPONDENCE

The Canadian government has issued an Order-in-Council making some important amendments to the new oil regulations governing the Mackenzie district. The regulations provided that companies acquiring permits or leases must be incorporated under Part 1 of the Companies Act, which provides that shares or capital stock must be without a nominal or par value. After this regulation was approved it was discovered that companies had been incorporated and had issued stock with a nominal value under prior regulations.

One clause of the order enacts that "Citizens of another country, the laws, customs or regulations of which deny similar or like privileges to citizens or incorporations of the British Empire shall not by stock ownership, stock holding or stock control own any interest in any permit or lease acquired under the provisions of these regulations."

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Immigrants and Immigration Are Discussed at A. I. M. E. Local Monthly Meeting

The monthly meeting of the New York section of the A. I. M. E. was held on March 2 at 50 Church St., with Vice-chairman Robert Linton presiding. The subject of the evening was "Immigration and Immigrants as Affecting the United States," and four speakers took part in the discussion. The chairman introduced the first speaker, Frederick A. Wallis, U. S. Commissioner of Immigration at Ellis Island, with the statement that Americans often forget how many of our people are immigrants or but one generation removed, and said that even the older lines are all descended from immigrants.

Mr. Wallis spoke at some length on the conditions he found at Ellis Island and on the immigrant-bringing ships, declaring that they are worse, if that be possible, on the ships today than they ever were at the station. Mr. Wallis finds that the immigrant is indispensable to this country, and that the actual problem is to insure his high quality. This can be done by careful, rigorous, medical selection abroad, the only humane and businesslike method. We need expect at the most not over one and one-quarter million newcomers annually, and we shall not net that many. If these are selected, distributed intelligently and treated humanely from the time they arrive onward they will prove no burden but will be a help and strength. Our real danger lies in superficial medical inspection, hordes of criminal stowaways, deserting seamen and the like, but not the declared immigrant. The "literacy" test he holds to be worthless as a protection.

Dr. Albert Shiels, managing director of Interracial Council, discussed errors we constantly make in the personal treatment of the immigrant. Too often he is reproached because he cannot speak English and is not an Anglo-Saxon. Freedom, said the speaker, appeals to others besides the Anglo-Saxon, and usually our ignorance of other languages prevents us from explaining all the subtleties of the "American Idea" to those who long to become intelligent citizens. We should speak to them in their own language, put basic business truths into simple plain English for their benefit, leave to them their own regulatory ideals, and, above all, extend personal help to them in every way.

Prof. S. McC. Lindsay, of Columbia University, discussed very briefly the existing and contemplated immigration legislation. He finds many good laws on the statute books, but they are

poorly enforced. The pending bill was also a step in the right direction, but the "literacy" test he condemned unsparingly.

Sidney Rolle, of the U. S. Metals Refining Co., Chrome, N. J., had but little time available. He stated that his company had tried to prefer the native-born workers, but experience showed that they were not as efficient in some of the major operations as were the immigrants from Hungary and southwestern Europe. Mr. Rolle maintained that the latter were essential to the country's industrial life, and thought the best guide in dealing with them is the Golden Rule. Pending legislation is aimed directly at these classes we so need.

Connecticut Legislature Will Consider Registration of Engineers

The bill recently introduced in the Connecticut Legislature by Representative Ford, the object of which is to compel the registration of professional engineers in all branches of engineering work, has attracted the interest of the professional engineers of Connecticut. Its provisions include civil, mining, mechanical, and electrical engineers; also land surveyors and other persons exercising an engineer's functions.

The bill is similar to laws already enacted in many states, and most recently in New York. A bill embodying the same regulations is now before the Massachusetts Assembly. Connecticut professional engineers are prohibited from practicing in states that now register engineers unless they are registered in those states. If the pending bill is enacted at Hartford, Connecticut engineers may, through reciprocity clauses, practice in other states.

The Connecticut bill is in accord with the suggestions for uniform laws in the registration of professional engineers, as drawn up by Engineering Council.

Aid From the O. C. Marsh Fund Available

A fund established in 1898 by the late Prof. O. C. Marsh has now grown to \$20,000, and an income of \$1,500 is available this year to the National Academy of Sciences for grants in accordance with the original purpose of the bequest. The Academy has approved the recommendations of its Committee on the Marsh Fund ". . . that grants in the first instance should be used for the support of paleontological and geological research. . . ." Applications should be forwarded to the National Academy of Sciences, Washington, D. C., before April 5.

Conference Urges Publicity for Engineers

Problem of Educating the Public in Technical Matters Discussed at A. A. E. Meeting

Engineers, technical journal publishers and editors, college professors, magazine writers and daily newspaper men met on the common ground of educating the public, at the publicity conference of the American Association of Engineers held in Chicago on Feb. 25. The conference emphasized three main points: (1) Co-relation of the various avenues of publicity; (2) possible co-operation of the various agencies, and (3) details of how to go about the task.

Dr. F. H. Newell, after stating the wrongs inflicted on the engineer in public service because of a lack of appreciation of his work, indicated that the engineer mostly deserved the attacks because he had not told the people what he is doing in terms that they can understand.

R. W. Krum, engineer of materials and tests, Iowa State Highway Commission, spoke of the success of the Iowa plan whereby the small-town newspaper editor was cultivated by the local engineer, the latter being furnished news from a central bureau. W. W. De Berard, Western editor, *Engineering News-Record*, emphasized the same idea of local contact in his plan for a national bureau of publicity.

A description of a course of engineering journalism at Iowa State College by H. E. Pride, led several editors to say they would work for similar courses elsewhere.

Harvey V. Deuell, city editor, *Chicago Tribune*, emphasized the fact that real news cannot be kept out of the newspapers. Too often, however, an engineer's writing is heavy because he wants the bones of his structure to show, whereas the public is only interested in the outline, general appearance and interpretation.

F. M. Feiker, vice-president McGraw-Hill Co., Inc., pledged the help of the technical press.

The Committee on Elimination of Waste in Industry, established by American Engineering Council and organized last January, has its work well under way. First reports in each industry were made on Feb. 21; preliminary reports were made to the planning board on March 1, and it is expected that the fuel industries work will be completed by April 1, according to vice-chairman L. W. Wallace. Other industries now under study, and from which field reports have been received, are transportation, clothing, shoes, printing, textiles, and the metal trades.

MEN YOU SHOULD KNOW ABOUT

Arthur W. Jenks, consulting mining engineer, of Berkeley, Cal., is making examinations in Idaho.

J. Morgan Clements, mining engineer, has gone to Hinan, near Canton, China, on professional business.

E. Percy Smith, mining engineer, of Allendale, N. J., has moved his office to 35 Wall St., New York City.

George H. Garrey, mining geologist, of Philadelphia, Pa., is in British Columbia doing geologic work.

Jerome R. Buchanan, manager of the Homestead-Iron Dyke Mines Co., Inc., Homestead, Ore., is at Pasadena, Cal., on a brief vacation.

C. Minot Weld, consulting mining engineer, of New York City, is in West Virginia on professional business for two weeks.

Ming-Yi Chang, metallurgical engineer, of 414 West 118th St., New York City, has returned from a recent professional trip.

Donald M. Liddell, metallurgist, of the firm of Weld, Liddell & Lazenby, was in Washington on professional business the last week.

W. R. Van Slyke, of Eveleth, Minn., superintendent of fee interests on the Mesabi Range, was in New York City the early part of the week.

Andrew W. Newberry will return to New York City about March 28 from the west coast of Nicaragua, after an absence of nearly four months.

E. O. Daue has returned to Easton, Pa., from a recent trip to Nicaragua and Central America, where he spent several months in examination work for New York interests.

Lloyd D. Cooper and **J. H. Stovel**, of the E. J. Longyear Co., Minneapolis, Minn., were in New York City recently.

William W. Odell, superintendent of the U. S. Bureau of Mines experiment station at Urbana, Ill., is now in charge of lignite investigations being made by the Bureau.

R. H. Sargent, of the U. S. Geological Survey, who has been doing commercial work in Bolivia, has again taken up his duties with the Alaska division of the Survey.

Edward Thornton, recently with the American Smelting & Refining Co., at Tucson, has been appointed general manager for the Arizona United Mining Co., at Johnson, Ariz.

Earl J. Weimer, mining engineer, recently with the Federal Lead Co., at Flat River, Mo., has accepted a position as mining engineer at the Union Colliery Co.'s Kathleen mine, Dowell, Ill.

H. R. Robbins, mill superintendent, has returned to Fierro, N. M., from Minneapolis, Minn., where he has been

for several weeks supervising ore tests for the Hanover Bessemer Iron & Copper Co.

Herbert N. Witt, geologist, of Carson, Nev., has been appointed geologist to the North End group of mines on the Comstock lode, Virginia City, Nev., operated by the Consolidated Virginia Mining Co.

G. B. Richardson, geologist in charge of petroleum statistics for the U. S. Geological Survey, is paying a personal visit to the principal producing companies in Louisiana, Texas, Oklahoma, and Kansas.

J. C. Dick, chief of the subdivision on natural resources of the office of the U. S. Commissioner of Internal Revenue, retires on March 31 to resume his profession of consulting mining engineer at Salt Lake City, Utah.

J. B. Mertie, Jr., sailed from Valparaiso, Chile, Feb. 28, for the United States. Mr. Mertie, who is on the staff of the U. S. Geological Survey, has been engaged in commercial work in South America for the last nine months.

Fidel A. Reyes, trade commissioner of the Philippine government, and **V. Manabo**, superintendent of navigation and lighthouses of the Philippines, visited the Mesabi iron range recently to inspect the iron mines in anticipation of the development of the Philippine iron ore resources.

W. Armstrong Price has resigned his position with the West Virginia Geological Survey and is now geologist on the staff of the Transcontinental Petroleum Co. **Lloyd C. Gibson**, geologist, formerly with the Seneca Hill Oil Co. of West Virginia, is with Mr. Price, whose headquarters are at Tampico.

Frederick G. Clapp, petroleum geologist, of New York City, is giving twelve lectures on oil geology before the Geological Department of Harvard College, Cambridge, Mass., beginning March 8. Mr. Clapp is chief geologist of the Petroleum Corporation of America and president of the Pan-American Exploration Co.

Philip Wiseman, president of United Eastern Mining Co., of Oatman, Ariz., was recently elected a vice-president of the California Chamber of Mines and Oil. Mr. Wiseman has given much time to mining affairs, having started in with the Colorado Smelting & Mining Co., Butte, Mont. Subsequently he was general manager of the Shannon Copper Co. and also of the Ray Copper Co.

W. A. Carlyle sailed for London on the "Imperator" on March 12. Mr. Carlyle was managing director of the British America Nickel Corporation, with headquarters at Ottawa, until that property was closed down on Feb. 26. It is reported that he will resume consulting practice at 62 London Wall, London, E. C. 2, and that the British America Nickel interests in Canada will be in charge of **D. Vogt** in his absence. Mr. Vogt has been connected with refining interests in Norway.

Mining engineers and geologists recently visiting New York City included **R. P. Howell**, Devon, Pa.; **A. P. Grossman**, Melrose, Mass.; **A. A. Holland**, Ottawa, Canada; **W. W. Bennett**, Ottawa, W. Va.; **T. Poole Maynard**, Atlanta, Ga.; **Paul F. Pape**, Chino Copper Co., Hurley, N. M.

SOCIETY MEETINGS ANNOUNCED

The American Electrochemical Society meets at Atlantic City on April 21 to 23.

The National Society of Industrial Engineers meets at Milwaukee, Wis., on April 27 to 29.

The Iron and Steel Institute, London, will hold its annual meeting May 5 and 6 at the house of the Institution of Civil Engineers, Great George St., London, S.W. 1. Dr. J. E. Stead, president, will preside.

The Geological Society of America will hold its next annual meeting Dec. 28-30, 1921, at Amherst, Mass., by invitation of the authorities and the geologists of Amherst College. The affiliated societies are the Mineralogical Society of America, the Society of Economic Geologists, and the Paleontological Society.

American Society of Mechanical Engineers holds meetings locally in the near future as follows: On April 11 the Hartford, Conn., Section, meeting at the City Club there, will discuss "The Corrosion of Metal Surfaces" at a joint meeting with the Connecticut Valley Section of the American Chemical Society; on April 15 the Meriden, Conn., Section will be addressed (illustrations) by H. A. Winne, of the General Electric Co., on "Electric Furnaces"; on April 22 the Birmingham, Ala., Section meets with the Atlanta, Ga., and New Orleans, La., sections, at Battle House, Mobile, Ala.; on April 28 and 29 the Mid-Continent Section meets with the chemical engineering societies at Tulsa, Okla.

The International Mining Convention's third annual session will be held at Portland, Ore., April 5 to 9, inclusive, in the Municipal Auditorium. The program includes a discussion of gold and silver mining, led by **W. J. Loring**; a symposium on the future of copper; and forecasts of the market conditions for lead and zinc. The mineral tariffs also will be discussed. Coal, coal distillation, and phosphate also will receive attention. Among the special features will be British Columbia Day and Alaska Day, a competition in mineral determinations by inspection, and U. S. Bureau of Mines cinema exhibitions. A mines and mining exposition will be in charge of **John E. Miller**, 417 Oregon Building, Portland, Ore. **Henry M. Parks**, director of the Oregon Bureau of Mines, is chairman of the executive committee of the convention.

THE MINING NEWS

LEADING EVENTS

WEEKLY RÉSUMÉ

Two conventions marked the last week: that of the Canadian Institute of Mining & Metallurgy, at Montreal, and the Northwest Mining Convention, held at Spokane. Both were well attended. In Utah the State Supreme Court has upheld the ruling of the Public Utilities Commission that all consumers taking power from the Utah Power & Light Co. must pay the regular rate regardless of special contract arrangement. C. K. Quinn of Duluth, is reported to have bought the large Atikokan iron property, 130 miles west of Port Arthur, Ontario. The Minnesota Legislature has passed a bill providing for a tax on iron-ore royalties. In the Lordsburg district, New Mexico, the Calumet & Arizona Mining Co. has organized a co-operative mercantile store at its Eighty-five mine.

In Washington the Timberlake sub-committee voted to report the McFadden Gold Bonus bill favorably to the full committee; final action was not taken, however, owing to the congestion marking the end of the session. The Interstate Commerce Commission's bill to regulate the transportation of explosives was passed. The Senate appropriation for a mining experiment station at Butte was lost.

New Stopping Record Claimed on the Rand

At the Geduld Proprietary Mines, on the Rand, South Africa, a miner, L. H. Ellitson, established what is claimed to be a new world's stopping record when in the month of November, 1920, he broke 215 fathoms of rock, the previous world's record having been 190 fathoms. Three No. 18 Ingersoll-Leyner drills were used, the fathoms per machine shift being 2.56, and 40 tons being broken per machine shift. The stopping width was 63 in. In the three months preceding November the same miner broke 185, 185½ and 190 fathoms, respectively, with the same machine. According to the Union Corporation, Ltd., which operates the Geduld mine in which the record was made, the Leyner stopping in this mine averaged 1.7 fathoms per machine shift for 1920 for thirty-eight machines running.

Iron Ore Royalty Tax Bill Passed

A bill taxing royalties on iron ore in Minnesota was passed by a vote of 103 to 14 in the House of Representatives. This bill is practically the same as a bill that was introduced in the house last year. The word "royalty" as used in the bill is defined as meaning any fees received by owners of land for the right to explore or mine ore.

Mining Men of Pacific Northwest Meet in Convention at Spokane

Oregon, Idaho, Montana, Washington and British Columbia Represented—Need for United Front To Secure Relief for Mining Industry Impressed Upon Delegates

BY HILLIARD W. POWER

Written for *Engineering and Mining Journal*

The annual meeting of the Northwest Mining Association was formally opened Monday, Feb. 28, at the Spokane Hotel, in Spokane, Wash., with an initial attendance of about one hundred delegates from surrounding districts. By the second day the attendance had more than doubled. The interest shown in the convention was especially gratifying to the officials of the Northwest Mining Association, who realized at the outset the difficulties to be met in getting together a representative gathering of mining men from a widely scattered area at a time when discouragement was general all along the line. However, it seemed to be generally realized that a united front was necessary in order to secure improvement in some directions, and that there were many matters which could be profitably discussed and upon which action could be taken to voice the opinions of the Northwest mining industry. The neighboring province of British Columbia, as well as the states of Oregon, Idaho, Montana and Washington, was represented in the gathering.

Exhibits of minerals were large and well placed and included displays from such districts as Ferry County and Chewelah and Colville, Washington; Pend Oreille, Bonners's Ferry, Coeur d'Alenes, in Idaho; East and West Kootenay, British Columbia. In addition there were numerous exhibits from individual properties, most of which are in the prospect stage as yet. H. M. Lancaster, of the St. Lawrence mine, Saltse, Mont., had one of the largest individual displays, and the Bunker Hill & Sullivan Mining & Concentrating Co. was represented by a splendid exhibit, showing the Bunker Hill product in its various stages between crude ore and lead in various manufactured articles. Washington bricks, pottery and other articles manufactured from clay were in evidence, as well as exhibits of machinery and mining supplies.

L. K. Armstrong, chairman of committee of control, presided at the opening session on Monday. Addresses of welcome were made by Charles A. Fleming, mayor of Spokane; Frank A. Ross, on behalf of the Northwest Mining Association and by G. A. Phillips, president of the Spokane Chamber of Commerce. Replies were made by

James F. McCarthy, president of the Hecla Mining Co., on behalf of Idaho; W. B. Dennis for Oregon; C. S. Muffly, president of the Montana Metal Mining Association, for Montana, and Colonel Pollen, of Cranbrook, for British Columbia. An informal reception was held in the evening in the parlors of the Spokane hotel, a large number of ladies being present.

A resolutions committee was appointed Tuesday morning, the following being named: Sidney Norman, chairman; N. Thompson and F. A. Starkey, British Columbia; J. F. McCarthy and William Brown, Idaho; F. M. Smith and C. A. Gray, Washington; and R. M. Betts and W. B. Dennis, Oregon.

G. B. DENNIS MADE FIRST HONORARY LIFE PRESIDENT

Tuesday's proceedings were opened with a very interesting ceremony, this being the presentation to Graham B. Dennis, of Spokane, of the first honorary life presidency of the Northwest Mining Association, in recognition of the work Mr. Dennis has accomplished on behalf of the organization since it was formed in 1894. Mr. Dennis, who has been directly or indirectly connected with the mining industry of Washington since 1885, was visibly touched by the appreciation shown and paid a tribute to L. K. Armstrong, Sidney Norman and President Oscar Cain for the lively interest they had shown and the efforts they had put forth at all times to further the interests of the organization.

By Tuesday afternoon, when the session was presided over by F. A. Starkey, Nelson, B. C., the convention was in full swing, the topic being "Safeguarding Investments." Discussion was participated in by Dean Howard, of the State College, Pullman, Wash.; W. B. Dennis, and Prof. H. M. Parks, of the Oregon Bureau of Mines; Ravenel MacBeth, secretary of the Idaho Mining Association; Sidney Norman, of Spokane; Dr. Clapp, Montana Bureau of Mines; Dean Landes, of Washington University; Nicol Thompson, chairman of Vancouver (B. C.) Chamber of Mines, and Francis A. Thomson, dean of the Idaho State College of Mines, Moscow. "Blue Sky Legislation" received its share of attention in the discussion, Federal vs. state legislation in that respect being touched upon.

Wednesday morning's session was presided over by Senator C. S. Muffly, of Montana, and was largely taken up with an address by H. S. Stoolfire, attorney, of Spokane, who went exhaustively into the distribution of the domestic silver output, and strongly urged united action by producers of the United States, Canada and Mexico with a view to controlling the market themselves, instead of leaving it to London.

NUMEROUS RESOLUTIONS PASSED—MCFADDEN GOLD BONUS BILL ENDORSED

The following is a synopsis of resolutions passed, after being presented to and considered by the resolutions committee:

States Senate to take immediate action upon the measure, already concurred in by the House of Representatives, providing for an adequate protective tariff upon Austrian and other foreign magnesite, "to the end that a domestic industry of magnitude and great value be maintained in prosperity to protect other domestic industries in times of both peace and war."

4. Urging Congress to adopt such changes in the present duties upon lead in ores, lead in mattes, drosses and reguluses, lead in bullion or base bullion, lead in pigs or bars, lead in any other form or combination, as to levy a tariff of 2c. per lb., and that an increase in the tariff on zinc and lead

their "efforts to remove what constitutes a serious menace to the mining industry."

9. Accepting invitation to the Portland convention.

10. Commending and thanking the Idaho Mining Association for intelligent work at Washington in impressing upon Congress the necessity for an increase in the present protective tariffs upon lead and zinc; commending work of Jerome J. Day and Ravenel MacBeth, president and secretary, respectively, and offering co-operation.

11. Favoring protection of the investing public, but pointing out the variegated "blue sky" legislation covering over thirty states and urging na-



FALLS IN SPOKANE RIVER AT SPOKANE, WASH.

Photo by Brown Brothers, New York

1. Petitioning Congress to amend the present law to provide that annual work on mining claims be performed on or before Sept. 1 of each year so that prospectors may perform such work within the period of the best climatic conditions.

2. Pointing out detrimental effect upon the mining industry of the enlarged homestead grazing act, through opening the way for unscrupulous individuals to make entries and thus burden legitimate mining, and urging upon Congress the immediate repeal of the act.

3. Pointing out the hardship worked upon the Northwestern magnesite industry through dumping of cheaply produced magnesite upon the local markets in competition with a domestic product manufactured under high labor costs and with large capital outlay made at a time when such material was essential to the successful carrying on of the war, and urging the United

ores be provided in conformity with the recommendations made by the American Zinc Institute.

5. Endorsing the McFadden Gold Bonus Bill.

6. Pointing out that rail rate advances since June, 1918, resulted in an undue burden upon metal mining, smelting and refining and urging immediate steps by carriers and ore producers to secure such readjustment of the present ore rates as will permit of the continued operation of metal mines, and at the same time give to the carrier a just and reasonable compensation for the services that are rendered by it.

8. Endorsing and commending the proceedings of the Federal Trade Commission against Minerals Separation, North American Corporation; endorsing and approving the action of American Mining Congress in supporting the Commission's proceeding, and pledging assistance to officers of the Congress in

tional standardization along lines that would remove all restrictions on the raising of capital and permit men engaged in legitimate constructive effort to seek capital in any state of the Union untrammelled by destructive and repressive laws retarding development of the mineral resources of the West; condemning "blue sky" measures, including the Kenyon bill that is now before Congress.

12. Asking Washington State Legislature to pass certain "blue sky" legislation, adopted by the State Senate with a certain amendment favorable to the state mining interests.

Burma Corporation's Production in January

The Bawdwin mines of the Burma Corporation produced 8,339,520 lb. lead in January. The output of refined lead was 5,707,520 lb. and refined silver approximately 234,487 oz.

Dual Control of Minerals on Vancouver Island To Be Abolished

Canadian Pacific To Survey E. & N. Belt First, Before Releasing Underground Resources

A thorough mineral survey of the Esquimalt & Nanaimo Ry. belt, on Vancouver Island, B. C., an area of over 2,000,000 acres, is to be undertaken immediately by the Canadian Pacific Ry., through its subsidiary corporation, the Consolidated Mining & Smelting Co. of Canada. Engineers will be engaged to inspect all prospects that have not passed out of the hands of the company and geologists will make reconnaissance of the mineralized zones of the district. The intention is to obtain as complete information as possible preliminary to entering into an agreement with the provincial government for eliminating the dual control of minerals within the E. & N. belt.

William Sloan, Minister of Mines, has been working on the problem of bringing the minerals of the belt within the sole jurisdiction of the province since 1918. The progress made has not been as satisfactory as he could have wished because of the reluctance of the company to release underground resources without a more exact knowledge of their economic potentialities. The company, it is said, has been brought to realize that the present situation requiring that title to mineral lands within the area must come both from the province and the company cannot continue. It is assumed that if, as a result of the survey that is to be made, deposits of value to the Consolidated company are found, that concern will undertake their development. The minerals of the entire section then would be turned over for administration solely by and under the laws of the province.

Engineer Mine, Atlin, B. C., Claimed by Goodwin and Associates

Title to the Engineer mine in the Atlin district of British Columbia is again the subject of litigation. Action has been brought by Walter L. Goodwin and associates against the beneficiaries under the will of Captain Alexander, who owned the property and had it under development at the time of his death. The plaintiffs allege that they located the property at the time that surveys were being made for the White Pass & Yukon Ry. and it was because the majority of the locators were engineers that the present mine was named the Engineer. It is alleged that documents relating to early assessment work and surveys for the crown granting of the property were mislaid in the Gold Commissioner's office at Atlin and were not recorded. Subsequently Captain Alexander located and the property has since fallen to relatives of the late Allen Smith, of Philadelphia. Custody of the property has been entrusted to J. A. Fraser, Gold Commissioner, of Atlin, B. C.

Shippers Win Rate Decision in Utah

Need Not Pay 25 Per Cent Increase on Coal and Ore Within State, Commerce Commission Rules

Shippers of ore and coal in the state of Utah will not have to pay the 25 per cent increase in intrastate freight rates asked by the carriers to correspond with the blanket increase granted by the Interstate Commerce Commission that became effective Aug. 26 last. A ruling to this effect was handed down by the Interstate Commission on Feb. 23. It is estimated that this will mean a saving of \$1,500,000 annually to the mining companies. The commission found that present interstate rates on coal and ores are not unreasonably preferential, unduly prejudicial or unjustly discriminatory against interstate commerce.

The proposed increase in rates was fought by Utah shippers through the State Public Utilities Commission. The Traffic Service Bureau of Utah, the Commercial Club and the Utah Chapter of the American Mining Congress, together with the aid of many individual operators.

Jesse Knight Retiring as Head of Investment Company

Jesse Knight, whose name is so closely associated with the development of the Tintic mining district in Utah, and especially with the Iron Blossom and Colorado mines, is retiring from his position as head of the Knight Investment Co., being succeeded as president and general manager by his son, O. Raymond Knight. Another son, J. William Knight, is vice-president of the company, and R. E. Allen is treasurer. The companies comprising the Knight Investment Company are: The American-Colombian Corporation, Empire Mines (Utah), Bonneville Mining Co., Colorado Consolidated, Dragon Consolidated, Eureka Hill Railroad, Iron Blossom Consolidated Mining Co., Knight Woolen Mills, Union Grain & Elevator Co., Springville-Mapleton Sugar Co., Rico-Wellington Mining Co., Spring Canon Coal Co., Tintic Milling Co., Utah Ore Sampling Co., Tintic Drain Tunnel, Miller Hill and Big Hill mining companies.

Trojan Mining Co. Buys Holdings of Ofer Company

A deal has been closed whereby the Trojan Mining Co., the second largest gold producer in South Dakota, becomes the owner of all mining ground formerly owned by the Ofer Mining Co. in the Bald Mountain district. Although the purchase price paid by the Trojan company has not been stated it is large, inasmuch as the Ofer company's holdings were extensive and among the most valuable in that section. The Trojan company now owns nearly all the valuable ground from the head of Nevada Gulch to the foot of Annie Creek.

The Copper Position in Sweden

"Svenska Dagbladet" Comments on Recent Article in "Engineering and Mining Journal"

A recent article in the *Engineering and Mining Journal* on the copper position in the United States has been reproduced in *Svenska Dagbladet* (Stockholm), with the following comment: "The abnormal conditions, above referred to, also fully prevail in our own country. As with us, since the crisis years, there remains a tendency to resort to substitutes, which, at present prices, are in the long run dearer than copper and its alloys. The chief reason for this, probably, is that the eyes of the public have not been opened to the fact that copper is no longer an expensive metal, since it can be sold from Swedish copper works at 1.30 kroner per kilogramme."

All Utah Power Consumers Must Pay Regular Rate

The ruling of the public utilities commission of Utah ordering that holders of special contracts with the Utah Power & Light Co. pay the regular rate for power has been upheld by the state supreme court in a decision just handed down, Judge Frick presiding and the other justices concurring.

Soviet Russia's Iron Ore Output Small Last Year

From official Russian sources it appears that the mines of Kriwoi-Rog, which before the war contributed about three quarters of the whole Russian iron production, have in the last year produced nothing. The production of the copper mines has dwindled down to insignificance. The production of lead is 10 to 25 per cent that of the pre-war output.

The total of iron-ore production in 1920 was one-tenth of the quantity expected. In the Ural districts only 9,000 workmen instead of 27,000 as before the war are employed.

Differential Flotation Success on Cœur d'Alene Ores

Dorsey A. Lyon, chief metallurgist and superintendent of experimental stations of the U. S. Bureau of Mines, in discussing the work of the station at Moscow, Idaho, in charge of A. W. Fahrenwald, recently said:

"Mr. Fahrenwald assures me that by the end of the fiscal year next July the station will have done all in its power to improve the efficiency of the Cœur d'Alene milling processes. These are now excellent and commercially efficient, and it is our aim to make them metallurgically efficient. In differential flotation experimental work to effect a clean separation of lead and zinc, Mr. Fahrenwald has been successful. We feel that when our work is completed this coming summer we will have been able to point the way to get higher recoveries in Cœur d'Alene ore treatment."

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

McFadden Gold Bill Favored by Subcommittee Voted To Report Measure to Full Committee—Final Action Delayed by Legislative Jam

By a vote of 3 to 1 the Timberlake subcommittee of the Committee on Ways and Means voted just before Congress adjourned to report favorably to the full committee the McFadden Gold Bonus Bill. Owing to the congestion incident to the closing of Congress, no opportunity was afforded for the subcommittee to make its report to the full committee, but the favorable report will be conveyed to the committee immediately on the assembling of Congress in extra session. In connection with the action of the committee, which constitutes another step in the progress of this legislation, the American Mining Congress, which is working to secure its enactment, issued the following statement:

"This bill was introduced by Congressman Louis T. McFadden, chairman of the Banking and Currency Committee of the House in the last session of Congress, to prevent a further decline in the nation's gold production and the continued wastage of developed gold ore resources by caving, flooding, and the rotting of timbers when the mines are shut down. The gold production of the nation declined from \$101,000,000 in 1915 to \$49,500,000 in 1920, which indicates to what extent the mines have already closed down. At the time of the Civil War our gold fields, both quartz and placer, although largely unworked, were fairly well known to constitute resources adequate to the country's need for gold. Since then, these fields have yielded over three billion dollars, and the best deposits are ex-

hausted. There is less chance now for the discovery of new gold mines, and prospecting has virtually ceased because gold mining is no longer attractive to capital.

"Our present limited resources are principally low-grade ores, developed at great cost and requiring large-scale operations. The mines that are still working are mostly restricting production to their best ores, gutting the mine. This is a fatal policy, involving not only permanent loss of developed ore reserves, which cannot be replaced, but the non-use and scrapping of expensive plants which the mines will not again justify building.

"The Director of the Mint reports that the gold supplied for the manufacture of jewelry and other industrial uses in 1919 amounted to \$75,500,000, in excess of the production for that year of \$15,000,000. The price of gold being fixed by the Government has rendered gold production unprofitable during this period of rising costs, while for the same reason the jewelers and other consumers of gold being supplied with their metal at the pre-war price, are in effect subsidized. Mr. McFadden, in an interview, stated that the bill which he has introduced merely corrects the cost and price equation between the producer of new gold and the industrial consumer of gold without in any way interfering with the monetary unit. On account of the emergency now confronting the gold mining industry Mr. McFadden urges that Congress expedite the enactment of this bill."

Government's Silver Purchases

Purchases of silver under the Pittman Act at the close of business March 5, totaled 41,065,391 fine ounces.

No Money for Butte Station This Year

The appropriation added by the Senate to the Sundry Civil Bill, with the idea of providing funds for the establishment of a mining experiment station at Butte, was lost when the House conferees declined to accept the amendment. After considerable wrangling in conference over the matter, the Senate conferees receded.

Bill To Control Transportation of Explosives Passed

One of the last acts of the 66th Congress was to pass the bill regulating transportation of explosives. The bill, as passed, is the one recommended by the Interstate Commerce Commission. The commission is authorized to promulgate regulations to govern the transportation and packing of explosives.

War Mineral Awards

Awards totaling \$51,704.53 were recommended by the War Minerals Relief Commission during the week ended Feb. 26. The largest award was in the claim of Holbrook & McGuire. In that case an additional award of \$21,482.31 was recommended. When the claim was considered first, an award of \$20,548.22 was allowed. In the tungsten claim of Edward Wagner, an award of \$17,056.14 was recommended. An award of \$564.17 was recommended in the manganese claim of William C. Hull.

In the light of additional evidence, further awards were made in several cases, as follows: Philipsburg-Chicago Manganese Syndicate, \$3,453.65; Edward A. Silverstein, \$3,323.40; Nelson & Merser, \$303.75; Ladd & Ladd, \$421.50; W. G. Marqua, Engineering Co. \$5,099.61.

NEWS BY MINING DISTRICTS

Special London Letter

Labor Indifferent to Capital's Problems
—F. M. S. To Hold Tin Stocks for Profit — Germans Seeking To Renew Zinc Convention

BY W. A. DOMAN

London, Feb. 22. — Labor apparently pays no attention to the serious economic problems that confront capital. First there was the strike at Broken Hill which kept the mines closed for about seventeen months; now the Australian shipping strike is holding them up again, and in addition, the broken

Hill Proprietary has closed down its last blast furnace at the Newcastle, N. S. W., steel works, and has discharged the bulk of its employees.

The miners on the Rand who struck frivolously and against the advice of the union leaders have now caved in. Having been discharged, it was necessary for them to apply for reinstatement. This has been granted in the majority of cases, but on very different conditions from those obtaining previously. To put it plainly, the men have only injured themselves. Had they not returned many of the mines would have

remained closed, as with the decline in the gold premium the difference between the falling price of the metal and the cost of producing it has almost vanished.

A report has just come to hand that the men at the Shamva Mines in Rhodesia have ceased work; no explanation is given. The Shamva is a very low-grade property, something under 4½ dwt. per ton, and consequently cannot afford to make any substantial concessions in regard to wages.

The Falcon Mines, a copper producer which sells its output in the United

States, makes a poor return for last month. From 15,301 tons of ore treated it obtained 241,742 short tons of blister copper, containing 2,803 oz. of gold and 5,722 oz. of silver, of an estimated value of £28,881. The low grade is explained by falls of ground in the stopes. The company gives an alternative valuation; taking copper at £65 p.t., gold at 100-per oz. and silver at 2/6 per oz. the figure is £30,151. Working expenses and profits are not stated. Today's price of copper is £72/7/6.

The decline in silver to 33d. per oz. is severely hitting the mining companies. Santa Gertrudis £1 shares, for instance, are no better than 7/9. Burma Corporation shares are only 7/6. Presumably the company feels the virtual cessation of the demand in the Far East, where its production is customarily sold.

The Modder Deep did remarkably well last year in the way of opening up new ore. In December, 1919, the reserves were 3,775,000 tons, of an average value at normal price of gold of 38/8 per ton; in 1920 there were milled 507,700 tons and at the end of the year the reserves were estimated at 4,100,000 tons of an average value at normal price of 39/11 per ton.

The Exploration Company, whose principal investments are in North and South America, took advantage of the appreciation in the United States dollars last year to dispose of the majority of its American holdings at a profit. The profit earned was only £74,560, as against £107,020 in 1919, the latter being a record for the reconstructed company. A dividend of 10 per cent is declared, comparing with 15 per cent in 1919 and 7½ per cent in 1918.

The Federated Malay States have stated their policy in regard to tin. Last year the government purchased the metal at the equivalent of £237 per ton, and it now announces that it will not sell its accumulated stocks until a profit can be realized. Apparently this does not carry the mining companies very far, for it is not clear whether current production is being purchased. Quite recently the price was reduced from 115s. to 100s. per picul, and a term to purchasers had been suggested.

The mining market is absolutely dead, and prices are slipping away, mainly on account of the fall in the price of the metals. It is reported that the Germans are endeavoring to renew the zinc convention; but so far they have met with no success.

AUSTRALIA

Queensland

Government Asked To Take Over Properties of Thermo Company

Brisbane—The Thermo Company, an English concern, was formed to acquire and work properties in the Cairns hinterland containing wolfram, molybdenite and scheelite. Since January, 1917, it has spent £357,000. From May, 1918, to March, 1920, the company exported metal to the value of £214,000.

The company, however, was engaged for a long time in installing machinery, and had recovered only £61,000 worth of metal from its own mines up to March, 1920, at which date, when it had just reached the real producing stage, work was stopped owing to a reduction of the price of the metals and the company went into liquidation. Recently the Cairns Chamber of Commerce took steps to urge upon the Commonwealth Government that it take over the properties of the Thermo Company, which are valued at £100,000, the principal argument in favor of this course being that every ounce of wolfram and molybdenite should be conserved for the use of the Empire, and that even if the properties were not worked until another war occurred they would be an insurance asset for the Commonwealth. So far it has not been stated whether or not the Federal Government is inclined to look upon the matter in the same light.

FINLAND

Finnish Copper Company Bankrupt

From Our Berlin Correspondent

The copper deposits near Outukumpu in Northern Finland rank as to quality and quantity amongst the best of Europe. Soon after discovery mining operations were begun. In 1917 the mines were leased by the Outukumpu Company. This contract was revised in 1919 and the company agreed to start at once to erect adequate works. Since then the company has fallen into disagreement with the owners, who are of the opinion that the mines are not properly equipped and managed, and that the agreement has been violated by neglect. As the company cannot find the necessary capital it has lately gone into bankruptcy.

The largest shareholder is the Nikkelraffineringsverk at Kristiansand in Norway. Mining operations are carried on with financial assistance of the state.

COLOMBIA

The South American Gold & Platinum Co.'s No. 2 dredge has now reached dredging ground and an increase in production is anticipated. A third dredge will probably be put in operation this year.

CANADA

British Columbia

Coast Range Steel, Ltd., Offered Bounty on Pig Iron

Victoria—The British Columbia Government has entered into an agreement with the Coast Range Steel, Ltd., a new provincial incorporation, under the terms of which the government undertakes to pay bounties on pig iron manufactured in the province from local ore to an amount not exceeding \$3 per long ton and on pig iron manufactured in the province from foreign ore to an amount not exceeding \$1.50 per long ton. It is set out that British capitalists are ready to invest the necessary money in the establishment of the in-

dustry upon the execution of the agreement and upon receipt of the report of engineers, now engaged in the province investigating the iron ore resources, that conditions are suitable. These particulars were laid before the provincial legislature recently and it was further stated that the incorporation fee had been reduced to \$50 in order to encourage the enterprise.

Provision is being made by the British Columbia Government for the distribution of powder to prospectors at a considerably cheaper figure than it now is available to them. This privilege, however, will be open only to "the bona fide mineral prospector." It will not be open to those engaged in general mining operations. The concession is being made as a result of strong representations, backed by forcible arguments, from the B. C. Prospectors' Protective Association.

Trail—Ore shipments received at the Consolidated smelter during the week ended Feb. 28 totaled 8,031 tons, coming only from company mines.

Ontario

Board of Arbitration Favored To Consider Wage Question—Taxation Increase Opposed—Easier Assessment Work Requirements Proposed

Cobalt—In connection with the wage reduction of 75c. per shift throughout the Cobalt district, which came into effect on Feb. 15, the workmen have decided to ask for a board of arbitration. A vote taken showed a very large majority in favor of such a board, but no strike vote was taken, nor, in view of all conditions, is there any possibility of a strike taking place. The mine managers agreed to appoint a man to this board, and it is expected that hearings will start within the next two weeks, unless the Minister of Labor decides that the board is not necessary. The final decision on this point rests with the Minister of Labor, but it is very seldom that a board is refused, particularly when applied for by the men.

Recently strong opposition has developed throughout Northern Ontario to the proposed new increase in taxes. At present all mining companies except the nickel mines pay provincial taxes amounting to 3 per cent on profits over \$10,000 a year and up to \$1,000,000, and 5 per cent on such profits over \$1,000,000. It is now proposed to increase this to 4 per cent up to \$1,000,000 and 7 per cent over \$1,000,000. This, of course, does not include the Dominion income tax, which amounts to approximately 5½ per cent. The companies consider this a most inopportune time to make an increase, particularly when the mining industry seems to be the only one on which an increased tax is proposed. The gold mining industry is just now getting on its feet again. In the nickel field the companies are only doing sufficient work to maintain their organizations. In Cobalt, owing to high costs and the

low price of silver, only a few mines are operating, and less than 900 men are employed, as compared with over 2,000 ordinarily. The amount it is expected to raise by the new tax is not much, but it is felt that any further increase in the burden which the mining industry has to bear will retard new development.

The proposed amendment to the Mining Act provides for a change in the requirements for assessment work. At present 240 days' work must be done within three and one-quarter years, and it is proposed to change this to 200 days, spreading it over five years. It is also proposed to increase the number of free assays by those holding a miner's license from two to twelve. Last year prospectors took advantage of the free assays on account of the small number granted.

Porcupine—The McIntyre mines in Porcupine has secured a lease on the Sturgeons Falls, on the Mattagami River, about thirty miles below the Sandy Falls plant of the Northern Canada Power Co. It is understood that these falls have a capacity of about 9,000 hp., which the McIntyre can develop, if it so desires. Any action they may take, however, will depend upon the assurance they can obtain from the power company as to a future supply of power. During the past winter there has been a shortage of power, and the McIntyre has been forced to curtail operations to a considerable extent.

The annual report of the Hollinger Consolidated for the past year has just been issued.

At the annual meeting of the Goldfields, Ltd., held in Toronto, the shareholders approved the sale of the company's property to the Canadian Associated Goldfields, Ltd., a \$30,000,000 company which has been formed to take over the various holdings of the former company.

During January the Lake Shore mine in Kirkland treated 1,674 tons, and recovered \$37,375, or an average of \$22.34 a ton. The broken ore reserves amount to 18,702 of an average value of \$23.37 per ton.

The Wright-Hargraves mill is practically ready to start, but on account of the uncertain power situation it has been decided not to begin operations until spring, when it is expected that the freshets will provide a surplus of power.

Port Arthur—The Atikokan iron mine, 130 miles west of Port Arthur, Ont., has been purchased by Clement K. Quinn, of Duluth, from the National Trust Co., trustee for the bondholders, for \$1,500,000. The City Council of Port Arthur, which had invested \$200,000 to assist the establishment of a blast furnace in the city to be supplied with ore from the mine, has ratified the deal, consent of the other bondholders having previously been obtained. The city receives the amount of \$150,000 invested in the mine and it is reported that it also retains an interest in the blast furnace.

Quebec

New Black Lake Asbestos & Chrome Co. Board Elected

Black Lake—The fight for control of the Black Lake Asbestos & Chrome Co., Ltd., was decided at the annual meeting held in Toronto March 2 by the election of a board of directors nominated by J. A. Jacobs, of Montreal, including the following: Jacob A. Jacobs, Montreal; Maurice Amado and Leon Schinasi, New York; and W. G. Ross and John W. Cook, Montreal. The annual report for 1920 showed a profit from operations of \$161,097, as against \$155,129 for the preceding year, and after payments for interest and allowance for depreciation there was a surplus of \$1,510 as compared with a deficit of \$4,975. Notice was received of an application by bondholders for the winding up of the company.

CALIFORNIA

Carson Hill Gold Finds Excellent Ore in Morgan Mine—Placer and Drift Mining More Active

San Francisco—Gold dredge castings have dropped a cent per pound, a recession of approximately 5 per cent. Other mining supplies are dropping in price somewhat but when price drops are reduced to a per ton basis there is but little decrease in the per ton cost, which still remains high. There is a noticeable increase in placer and drift mining activities. This is due to a more abundant water supply in the case of hydraulic and placer properties, and in the case of drift mining to a keener realization of opportunities in this kind of mining.

Jackson—Continued progress is being made in unwatering the Argonaut and Kennedy mines. Central Eureka at Sutter Creek is operating steadily. Fremont Consolidated, near Drytown, is reported to have almost completed mill repairs. The Elephant hydraulic mine near Volcano is in operation.

Johnsville—The Plumas Eureka is reported to be about to resume operations on an extensive scale.

Plymouth—The main shaft of the Plymouth Consolidated has reached a depth of 3,235 ft., at which point a station is being cut. The orebody on this level will be ready for stoping by the time the station and pocket are completed. A winze was sunk from the 3,050 level on the orebody to the 3,235 level, from which point development both north and south is in progress in a vein which, as far as it has been exposed, is over 13.5 ft. wide and carries excellent ore. The shaft will be carried down to 3,400 ft. as rapidly as possible. Shaft sinking will be continued without interruption for the entire year. The output for January was \$56,000, but owing to excessive costs and the large amount of development work very little profit is shown.

Melones—Recent development on the 1,750 level in the Morgan mine of the Carson Hill Gold Mines group has disclosed ore of commercial grade, which

if it continues will mark one of the most important developments in the history of the mine. The two new ore shoots recently developed on the 1,600 level are of great importance to the company's future. The north shoot is several hundred feet north of anything yet discovered. Other development openings continue satisfactory. In the mill the additional ten stamps have been completed. At present twenty-five stamps are in operation and five are held in reserve. On Feb. 24 the tonnage crushed by 25 stamps totaled 502 tons, or better than 20 tons per stamp per day.

Red Mountain—The W. K. Minerals Co. is developing a magnesite deposit at Red Mountain in Stanislaus County. The present plans of the company, which is headed by G. C. Williams, with M. W. Kirk as manager, include marketing high-grade magnesite. The deposit is in vein form and the mineral amorphous magnesite of high purity. There is an active demand for magnesite of this grade from electrical and chemical companies. Operation is expected to start early in April. The magnesite will be hauled by automobiles twenty-five miles to Patterson, on the Southern Pacific.

NEVADA

Brougner Divide Levies 2-Cent Assessment To Finance Deeper Development—Elkora Making Notable Gold Production

Reno—Reports from the Peavine district, near Reno, state that the ledge recently encountered on the 300 level of the Standard Metals has widened to 10 ft., and the entire width is shipping grade.

Jarbridge—The Elkora mine, at Jarbridge, operated by the Guggenheim interests, is said to be producing at the rate of \$175,000 per month in gold. This mine was the second largest producer of gold in Nevada in 1920, the Nevada Consolidated Copper Co. at Ely being first.

Virginia City—On the Comstock the Con. Virginia shipped 444 tons of \$21 ore last week. Mine conditions are stated to be excellent. In the Ophir values in the Hardy vein on the 2,000 level are improving, and the face of the drifts shows 6 ft. of \$45 ore with no walls in sight.

Tonopah—In the Tonopah district bullion shipments, representing the first two weeks' operations in February, are as follows: Tonopah Belmont, \$105,000; West End, \$52,000; Tonopah Extension, \$50,000; and Tonopah Mining, \$42,000. The Tonopah Extension has declared a 5-cent dividend payable April 1. Daily ore shipments of this mine have been increased 25 tons to 300 tons per day. West End profits for January are announced as \$54,419.65, coming from 5,716 tons of West End ore and 405 tons of Jim Butler lease ore.

Divide—No favorable news concerning conditions on the 800 and 1,000 levels of the Tonopah Divide has been reported. A raise is being driven from

the 1,000 to the 800 level for ventilation, the heat at present being a deterrent factor.

In spite of unfavorable results as a whole in the Divide district during the last year many companies are operating and chances for the discovery of new orebodies in 1921 are better than in 1920. Surface work and shaft sinking have been completed and future work will be crosscutting and drifting. The Brougner Divide has levied an assessment of 2c. per share to finance deeper development to the elevation of the 1,000 level of the Tonopah Divide. At 718 ft. depth a narrow width of good ore has been encountered on which drifting is being done.

The northerly and southerly crosscuts on the 900 level of the Kernick Divide are making good progress. This is important work for the entire western portion of the district.

Manhattan—The Mammoth shaft, now 100 ft. deep, and originally sunk at a point where high-grade ore showed on the surface, is to be sunk an additional 50 ft. and a drift run northerly to intersect projections of important surface showings.

Eureka—In the Eureka district the Eureka Nevada is driving a tunnel into Prospect Mountain to open up orebodies at depth and facilitate ore handling. The tunnel is now in 1,000 ft. and several promising shoots of ore have been found. The Eureka Holly has 4 ft. of good ore on the 400 level. The crushing plant of this company's new mill is being given a preliminary tryout.

Goldfield—At Goldfield 18 in. of high-grade ore has been discovered in a raise below the 266 level of the Great Bend, 2½ in. assaying \$11,000 per ton. Eight lease blocks are being worked in the Florence with fair results. High-grade ore has been opened up on the 500 level of the Cracker Jack in what may prove to be a spur vein from the hanging wall side of the Little Florence vein. Many lessees are working profitably in the mines of the Goldfield Consolidated.

The shaft of the Goldfield Deep Mines Co. has reached a depth of 180 ft. More rapid progress will be made after March 1, when two shifts instead of one will be employed. The present objective is 2,400 ft., or 650 ft. deeper than the Merger shaft, which is the deepest shaft in the Goldfield district.

Johnnie—Drifting and stoping is well under way at the Eureka Johnnie. The hoisting plant has been enlarged and the two-stamp mill is now running on custom and Eureka-Johnnie ore. The treatment is plain amalgamation, as the gold is very free and coarse. Charles Labbe is in charge. A road is to be built to Death Valley Junction before the hot weather sets in. This will bring the district 20 miles closer to the T. & T. R.R.

The Congress claims have been leased to A. N. Coe, who is taking out ore averaging \$20. This is about 2 ft. wide in an open cut off the main vein. Wede-

kind is pushing ahead development work on his group of claims and is taking out ore for an extensive mill test.

Mina—The accompanying cut shows the flow sheet of the new mill of the Simon Silver-Lead Mines Co. Construction work is 60 per cent completed and 90 per cent of all machinery and materials is on the ground.

UTAH

Ophir Silver Mines Tunnel Reported to Have Cut Buckhorn Fissure

Milford—At the Leonora considerable mineralization is reported in a drift on the 325 level following an east-west fissure. Mineralization shows over three feet, and of this, although as yet no assays have been taken, one foot is thought to be shipping ore. The drift is only a short distance from its objective, the intersection with a north-south fissure.

Eureka—Ore shipments from the Tintic district for the week ended Feb. 26 amounted to 178 cars as compared with 155 cars the week preceding. Shippers were: Tintic Standard, 57 cars; Chief Consolidated, 41; Dragon, 19; Iron King, 17; Eagle & Blue Bell, 14; Iron Blossom, 11; Victoria, 8; Centennial - Eureka, 3; Gemini, 3; Grand Central, 3; Eureka Hill, 1; and Mammoth, 1.

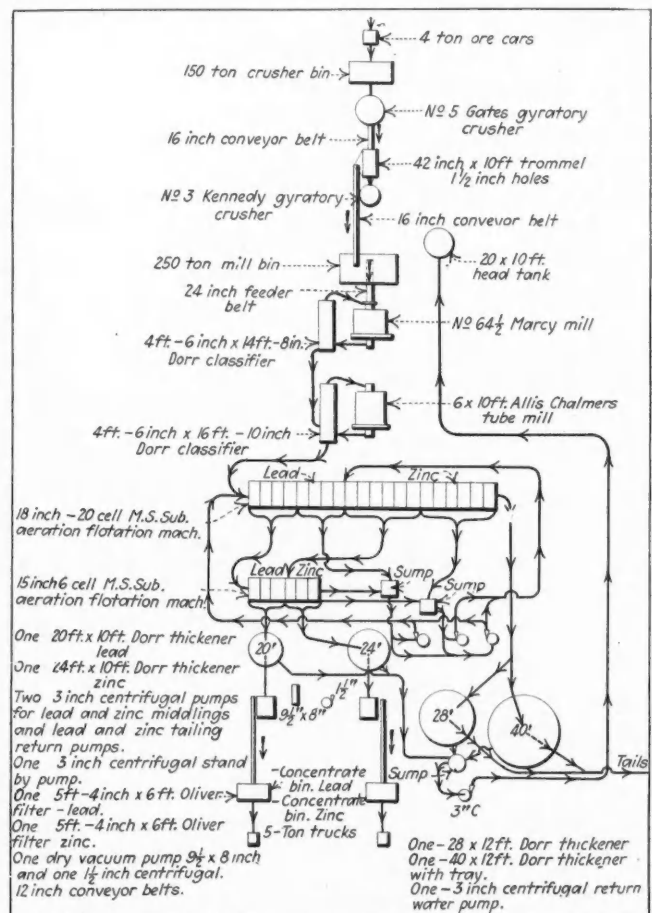
Ophir—It is reported that the tunnel at the Ophir Silver Mines has cut the Buckhorn fissure, which at the point cut is several feet thick, with heavily mineralized streaks in the limestone.

Park City—Shipments for the week ended Feb. 26 amounted to 1,818 tons of ore and concentrates. Ontario shipped 360 tons; Judge allied companies, 938; Silver King Coalition, 460; and Maildriver, 60.

Leeds (near St. George)—The renewed activity at the old camp of Silver Reef continues. Large tonnages of tailings were left by earlier operators, and these are to be made available with modern methods. Mills are to be built to treat this ore, and a good profit is expected. Only the richer ore was milled or marketed years ago. Some development is also being done. The Silver Reef Consolidated has good

showings of ore. The Honest, a new mine, is being opened, and is reported to have good ore. The Thompson mine is being unwatered. Ore of good grade is reported to have been opened in the old Leeds mine. The ore at this camp occurs in relatively flat dipping sandstone beds, sometimes in the vicinity of porphyry dikes, but extending some distances from them.

Perry—Suit has been brought by the field service of the U. S. Land Office against J. M. White, J. M. Dalton, Ephraim White, Brigham Mebeker and C. N. Butler to cancel the patent on 80 acres of land three miles east of Perry, Utah, the question at issue being whether the land was known to be mineral bearing or not at the time of



FLOW SHEET OF NEW MILL OF SIMON SILVER-LEAD MINES CO., IN MINA DISTRICT, NEVADA

entry. The government charges that the defendants made application for the land under the homestead act, claiming that to their knowledge the land contained no mineral deposits. The further charge is made that Butler in 1898 filed a mineral claim on the land, protesting the homestead right of the other three men, and a record of agreement between Butler and them to withdraw his protest upon promise of a half interest in the tract is cited by the government as proof that Dalton, Nebeker, and White knew the land to contain mineral. It is contended that the land now has a working mine, which is producing \$40 gold ore.

COLORADO

Kokomo Company and Colorado Silver Mines Co. Plan Small Mills

Aspen—Development in the Park tunnel has opened a 4-ft. vein of good silver ore, the important mineral being polybasite. Selected streaks assay above 200 oz. silver a ton. The Park tunnel has a total length of 2,900 ft. and is being advanced to cut the Last Dollar vein. A raise will be driven to connect with workings above the tunnel level, and tributary to the Jenny Lind tunnel.

Plans have been made to continue development at the Hurricane during the spring. Operations were suspended in the shaft workings on account of water, but the lower tunnel will be advanced to drain the upper workings to permit further development.

Kokomo—The Kokomo Mining Co. is developing the Pearl Consolidated property through the Pearl tunnel. A raise 18 ft. above the tunnel level has cut a 9-ft. vein of ore which has been opened by a drift for about 25 ft. Average samples assay \$2 gold, 15 oz. silver and 3 per cent lead. Selected streaks assay over 60 oz. silver per ton. Erection of a mill is being considered.

Romley—The Colorado Silver Mines Co. is developing its property on Shavano Mountain, and trial shipments have been made to the Ohio & Colorado smelter at Salida. Sorted ore averages about 50 oz. silver a ton, plus small values in gold, silver, copper and lead. Milling ore averages 15 oz. a ton. Erection of a small concentrator is under consideration.

Central City—The Cornucopia Leasing, Mining & Milling Co. is connecting its workings with the Reform shaft. Considerable milling ore has been opened and the company plans the erection of a concentrator in the near future. John Havens is president.

Victor—The Edna Forrest Mining & Milling Co. is developing the properties of the Dante Gold Mining Co. and the Gold Sovereign Mining & Tunnel Co. under lease below the tenth level. The new crosscut on the twelfth level of the Gold Sovereign has been advanced 100 ft. and will be continued to connect with the main shaft of the Dante.

Idaho Springs—The Gem Mines Co. will remodel the recently acquired mill at the Newhouse tunnel, at a cost of about 150,000. The new plant will have a capacity of 200 tons per day. The company proposes also to expend about \$75,000 in development work. In order to stimulate activity in the tunnel, the transportation charges have been reduced 50 per cent. As a result of this reduction, development has been resumed in the Kansas and Concrete properties. The Mazda vein has been opened on the 1,600-ft. level in the face of the east drift.

The Amherst Mining Co. plans to sink its shaft on the Hampton property an additional 200 ft. A new pump will be installed.

Cripple Creek—The output of the Cripple Creek district during January is estimated as follows: 15,000 tons to Golden Cycle mill, 17,556 tons to Portland mill, and 2,000 tons to smelters; total, 34,556 tons. The average assay value per ton was \$12.25, and the total assay value was \$422,610.

NEW MEXICO

C. & A. Organizes Co-operative Mercantile Store at 85 Mine

Lordsburg—The 85 Co-operative Mercantile Co. has been organized at the 85 Mine branch of the Calumet & Arizona Mining Co. The authorized capital is \$50,000 divided into 500 shares of a par value of \$100 each. The board of directors for the first three months will be as follows: Karl I. Mohler, general manager of the 85 Mine, statutory agent; J. C. B. Amos, John B. Rawlings, B. H. Cross, mine foreman, and J. H. Clark, master mechanic. The store will be operated on the same plan as the co-operative store of the same company at Ajo, Ariz., which has paid regular annual dividends of 15 per cent to the employees who participated.

Messrs. Ves Chase and Robert Reynolds have bought the half interest held by Frank Weldon in the Nelly Gray mine which joins the Bonney mine on the north. This gives Chase and Reynolds a five-sixth interest in the property. Negotiations are now under way for a lease on the mine which has produced high-grade copper-silver ores. The Co-operative company has shipped a car of high-grade lead-silver ore to the El Paso smelter. A 50-hp. gas engine has been purchased from the Monte Rico Mining Co.

The Co-operative Mining Co. has opened a strong vein of lead-silver ore on the 300 level. Ore is being hauled to the loading platform for shipment to the El Paso smelter. E. H. Walters is general manager.

Silver City—Arrangements have been made whereby the Silver City waterworks will pump water for domestic purposes from the main shaft of the Silver Spot mine on Boston Hill. Drought caused a serious shortage of water last year. An electric pump of 200 gal. per minute capacity will be installed. Development will be continued in shaft No. 2.

Columbus—Development at the Homestake has reached a depth of 150 ft., with ore showing on all sides which is said to average 20 per cent lead, 14 oz. silver and 18 per cent zinc.

Sulphide ore has been struck at 70 ft. in the Edwards shaft, and at 35 ft. in the Lackland shaft. Work upon the Romaho Mining Co.'s property will be continued.

Santa Fe—The U. S. District Court dismissed the entire proceedings brought by West Virginia stockholders against Lawrence Boyd, president, and the Monte Rico Mining Co., of Lordsburg, N. M. This was a suit to wrest the control of the company from Mr. Boyd, owner of the controlling interest, and was instituted four years ago.

ARIZONA

Delta Mine in Hassayampa District Under Development

Skull Valley—Development work continues at the J. & J. mine. A carload of machinery has been received recently.

Venezia—The lessees at the Mc-Masters mine have produced two cars of ore assaying over 130 oz. silver to the ton. As weather permits, shipments will be increased. A large quantity of ore is ready for shipment. At the Bodie mine preparations are being made to resume shaft sinking. Some shipments of ore are being made. The Turkey Silver Mining Co., which recently purchased the Cutter mine on Turkey Creek, has begun operations, according to Edward Weaver and H. J. Peterson.

Wickenburg—After long idleness the Eva Consolidated Mining & Leasing Co.'s properties are to be reopened. The Magwood Copper Mines Co. has taken over the property and will develop it under the direction of Kirby Thomas, of New York. The company is being financed through the Standard Securities Co., of New York. The Consolidated Vanadium Co. is overhauling its milling equipment.

Prescott—The Delta mine, formerly the Atkin, near the Big Pine property in the Hassayampa district, is being developed by C. E. Anderson and A. O. Egbert, of California. The property at one time produced high-grade silver ore when operated by John Schaffer, postmaster at Groom Creek. Then the ore was shipped via Ash Fork to Pueblo, Col. The new operators are deepening the shaft and are drifting on the 100 level. The Dos Oris company is drifting on the 160 level from the Buzzard shaft. The orebody is over 7 ft. wide at this point, of which 18 in. is high-grade, carrying 275 oz. of silver and \$14 in gold. Shipments are being made to Hayden. The company plans to develop the orebody to the 210 level and to install a mill.

At the Ruby Silver mine a contract has been let for an additional 150 ft. in the upper tunnel. The raise from the lower to the upper tunnel will be carried to the surface and used as a working shaft.

Yuma—A large body of tungsten ore has been located in the Fortune Range about three miles from Blaisdell by Herbert Connor and G. A. Rodenbaugh.

Winkelman—The outlook seems favorable for considerable activity in the old Saddle Mountain district which was abandoned during the rush to the Christmas field when that part of the reservation was opened some years ago. After many delays the Little Treasure negotiations are completed and active work has been begun. Mr. Chittenden, a pioneer in the district and the leading figure in the efforts to open the reservation to mining around the Christmas mine, has taken over the old Saddle Mountain Mining Co.'s properties under bond and lease and is shipping high-grade silver ores.

IDAHO

Cœur d'Alene District

Hypothek Crosscut Cuts Vein on 500 Level—West Sunset Develops Important Ore

Wallace—The crosscut on the Hypothek has intersected the vein west of the shaft at a depth of 500 ft. and corresponding to a depth of 400 ft. below the collar. The company has developed the property by shaft to a depth of 1,100 ft. Much commercial ore was found on various levels down to the 900, but on the lowest level little ore was found. Two parallel veins north and south are in evidence on the surface and diamond drilling from the shaft shows both to carry lead-silver ore. The course of these veins indicates that they unite about 1,500 ft. west of the shaft.

The West Sunset Mining Co., which has extended the drift on the 1,000 level of the Sunset mine into its property joining on the west, has about 4 ft. of high-grade lead-silver ore in the face. When the drift was started there was only about 10 in. of ore. The drift is now well within the West Sunset ground, formerly known as the Portland. The Sunset mine is owned by Senator W. A. Clark, of Butte, and the success of the West Sunset in developing an important orebody may induce him to resume operations of the Sunset. He suspended work some three years ago, after having sunk 1,000 ft. and opened levels every 200 ft. without satisfactory results.

Murray—The Bear Creek Mining Co. is planning to install electric power and make other important improvements with the view to placing the property on a profit-earning basis. A stockholders' meeting will be held on March 22 to act upon the proposition to increase the capital stock of the company from 1,000,000 to 1,500,000 shares, the additional stock to be sold to provide funds to carry out the improvement plan. Electric power will be obtained from the Washington Water Power Co. and necessitate construction of a 4-mile transmission line.

MONTANA

Taxation Bill Passes Lower House at Helena

Helena—An administrative measure providing for an additional tax of 1½ per cent of the net proceeds of metal mines of Montana has passed the lower house of the Legislature at Helena, but its passage in the Senate is considered doubtful. A bill proposing an additional tax on hydro-electric plants in the state was defeated.

ILLINOIS

Fluorspar Mines Close Owing to Poor Business

Elizabethtown—The Fairview Fluorspar & Lead Co., operating the fluorspar and lead mines at Fairview, Ill., closed all mines on Feb. 14, laying off upwards of 150 men. W. C. Bohn,

general manager, stated that the steel industry had slackened in production and that there was no market for fluorspar. He also said that the mines would be reopened when business justified it.

The Rosiclare Mines discharged part of its force over a week ago, retaining some on repair work.

The Pell Mining Co. has also closed down.

Cave-in-Rock—The Cave-in-Rock Fluorspar Co., has closed its mine at Cave-in-Rock, because of lack of market. One man was hurt recently at the company's Baldwin mine by stepping under a bucket that was being lowered in the shaft.

SOUTH DAKOTA

Golden Crest Consolidated Mining Co. Incorporated

Deadwood—Articles of incorporation have been filed with the Secretary of State at Pierre for the Golden Crest Consolidated Mining Co., of Deadwood, with a capital of \$1,000,000. This property, which is situated about six miles southeast from Deadwood, was purchased late last fall by James D. Hardin and associates.

MICHIGAN

Marquette Range

Cleveland-Cliffs To Close Salisbury Mine at Ishpeming

Ishpeming—The Cleveland-Cliffs Iron Co. has announced that it will close its Salisbury mine, in this city, and that its Holmes mine and North Lake mines will be operated five days a week until further notice, the order to go into effect immediately. The closing of the Salisbury will let out 125 men, among the best miners in this district, all being old employees of the company. The large investment in ores now in stock and unsold, and the uncertainty of the market are reasons for the curtailment.

The mines of the Oliver company, the mining subsidiary of the Steel Corporation, are working their usual forces at the old rate of wages. No reductions have as yet been announced.

The Beaverboard company has closed down its rock-crushing plant, presumably from lack of orders. The company is seeking to place \$20,000,000 bonds to finance its operations in the various fields in which it is busy. About seventy men have been let go.

MINNESOTA

Mesabi Range

Shenango Furnace Co. Closes Webb Mine Down

Hibbing—The Utica mine of the Pickands Mather Co. has been placed on a basis of four days a week. A temporary curtailment of production because of a decreased demand for ore at the lower ports was given as the cause.

The Webb mine, a property of the Shenango Furnace Co., closed down last week indefinitely. About 150 men were thrown out of employment.

TEXAS

Freeport Sulphur Co. Operating at One-Third Capacity

Freeport—The Freeport Sulphur Co. has shut down units A, B and C of its plant at the sulphur mine, and is operating unit D only, or at the rate of about one-third of total capacity. It is stated that the company will start at once to build a plant for the extracting of asphalt from Mexican crude oil. This company produces its own supply of fuel oil in Mexico, and has for some time successfully operated a topping plant at Freeport for the extraction of gasoline from this oil.

Chronology of Mining

February, 1921

Feb. 1—Further cuts in wages became effective in numerous camps throughout the country—Northern Pacific, Great Northern, and Oregon-Washington roads lowered freight rates on low-grade Cœur d'Alene ores to Northport, Wash.—Anaconda Copper Mining Co. suspended zinc operations.

Feb. 9—British Columbia section, Canadian Institute of Mining and Metallurgy, opened annual meeting at Vancouver, B. C.

Feb. 11—Idaho Mining Association met at Boise, Idaho.—Public legislative hearing held at Helena, Mont., on 1½ per cent tax on mining companies.

Feb. 12—Torreon smelter, at Coahuila, Mex., resumed operations after several months' idleness.—Republic Iron & Steel Co. ceased operations on Mesabi Range.

Feb. 14—U. S. District Court at Phoenix, Ariz., remanded to Superior Court suit of Iron Cap Mining against Arizona Commercial concerning titles in Globe district.

Feb. 15—Wages cut \$1 per day at Oatman, Ariz., and 75c. at Cobalt, Ont.—Colorado Industrial Commission at Denver held hearing on question of wage reduction announced by mining companies.

Feb. 19—U. S. Mint at Philadelphia resumed coinage of silver dollars, the first put into circulation since 1905.

Feb. 21—Minerals Separation, Ltd.'s supplemental bill to bring Mineral Separation North American Corporation into suit against Miami Copper, argued at Wilmington, Del., district court.

Feb. 24—Anvil-Palms and Newport mines of Steel & Tube Co. of America, at Ironwood, Mich., cut to four days per week.

Feb. 26—British America Nickel Corporation closed mine and smelter in Sudbury district, Ontario.

Feb. 27—Anaconda Copper Mining Co. shut down electrolytic zinc plant at Great Falls, Mont.

Feb. 28—Northwest Mining Convention opened at Spokane, Wash.—U. S. Supreme Court reversed Utah Circuit Court of Appeals award of \$570,000 damages to Conkling Mining Co. from Silver King Coalition Mines Co.

THE MARKET REPORT

Daily Prices of Metals

March	Copper, N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
3	12.10	27.00	29.00	4.00	3.85@4.00	4.75
4	12.10	26.50	28.75	4.00@4.10	3.85@4.00	4.75
5	12.10	26.50	28.75	4.00@4.10	3.85@4.00	4.80
7	12.00	26.50	28.50	4.00@4.10	3.90@4.00	4.80
8	11.85@12.00	26.25	28.00	4.00@4.20	3.90@4.00	4.85
9	11.75@12.00	25.75	27.00	4.00@4.20	3.95@4.00	4.85

*These prices correspond to the following quotations for copper, "delivered": 12.35, 12.35, 12.35, 12.25, 12.10@12.25, and 12@12.25c.

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.

some cash business has been done in England. The differential between standard and electrolytic in London has grown very small.

It is evident that even with the present curtailed copper production, stocks are accumulating. One estimate we heard places production at 110,000,000 lb. per month, and consumption at 70,000,000, thus leaving 40,000,000 lb. monthly surplus.

Lead

The A. S. & R. official price continues at 4c., New York and St. Louis.

The firmer tendency for lead prices, which we reported last week, caused a scurrying by consumers to buy before the price advanced further. In general, the lots sold were not large, but the aggregate was very satisfactory. Most of the lead sold was for March delivery, sellers not being disposed to offer much metal for later shipment. The business was well distributed, but cable manufacturers seemed a little more active than usual. We are unable to confirm the high prices (up to 4.40c.) quoted in the metal trade papers, and if such prices can be obtained, they no doubt represent small speculative spot lots. Lead has been freely offered for prompt delivery to reputable customers by one of the largest interests for 4c. throughout the week. A premium is being asked for chemical lead, however, and on this brand we quote 4.25@4.45c. St. Louis throughout the week. This lead, of course, costs more to make, inasmuch as no silver is obtained in its reduction. Some important curtailments in the Missouri and near-by lead districts are rumored to be impending.

Zinc

Due entirely to the better sentiment in the London market and a rise of over £3 in the London spot quotation, the market in St. Louis has risen steadily during the week from 4.75c. to 4.85c. today. Domestic buying has been no better, which accounts for the relatively small reflection of the London jump in price. With the German supply of zinc temporarily removed or reduced, the gradual decline in zinc that has been taking place for weeks is arrested. Producers are at a loss to ascertain whence an improvement in the market is to come. Present economic conditions have been unusually severe to zinc, and the methods used so far in meeting the situation, such as curtailing domestic production, have had little effect on prices. It is estimated the zinc production in March will be unusually low, not over 15,000 to 20,000 tons, or less than half the rate of production in 1920.

High-grade zinc was sold during the week for 7c. per lb.

London

March	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
3	67 $\frac{3}{4}$	67 $\frac{3}{4}$	73	154 $\frac{3}{4}$	158	18 $\frac{3}{4}$	19 $\frac{3}{4}$	23 $\frac{3}{4}$	24 $\frac{3}{4}$
4	66 $\frac{3}{4}$	67 $\frac{1}{4}$	72	153	156 $\frac{3}{4}$	18 $\frac{3}{4}$	19 $\frac{1}{4}$	23 $\frac{3}{4}$	25 $\frac{3}{4}$
5	...	...	71	...	...	...	...	...	...
7	66	66 $\frac{1}{2}$	71	153	156 $\frac{3}{4}$	18 $\frac{3}{4}$	18 $\frac{3}{4}$	24 $\frac{1}{2}$	25 $\frac{3}{4}$
8	66	66 $\frac{1}{4}$	71	150 $\frac{3}{4}$	154 $\frac{3}{4}$	18	18 $\frac{3}{4}$	26 $\frac{1}{2}$	26 $\frac{3}{4}$
9	65 $\frac{3}{4}$	66	70	148	151	18 $\frac{1}{2}$	18 $\frac{3}{4}$	26 $\frac{3}{4}$	26 $\frac{3}{4}$

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

Silver and Sterling Exchange

Mar.	Sterling Exchange	Silver			Mar.	Sterling Exchange	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
3	389	99 $\frac{1}{2}$	54 $\frac{7}{8}$	31 $\frac{7}{8}$	7	390	99 $\frac{1}{2}$	54 $\frac{3}{8}$	31 $\frac{1}{2}$
4	389 $\frac{1}{2}$	99 $\frac{1}{2}$	53 $\frac{3}{4}$	31 $\frac{1}{2}$	8	388 $\frac{1}{2}$	99 $\frac{1}{2}$	53 $\frac{3}{8}$	31 $\frac{1}{2}$
5	388 $\frac{1}{2}$	99 $\frac{1}{2}$	52 $\frac{3}{4}$	30 $\frac{3}{4}$	9	387	99 $\frac{1}{2}$	54 $\frac{3}{8}$	31 $\frac{1}{2}$

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

Metal Markets

New York, March 9, 1921

Lead and tin have been more active than usual during the last week, but copper and zinc have yet to find in evidence any consuming demand. The post-war troubles in Europe have affected marketing conditions abroad somewhat, and international business has been even less than usual. So far no sign of a resumption of activity by metal-manufacturing interests has appeared. Also, such metal consumers continue indisposed to speculate by laying in stocks of raw materials at current low prices, most of the buying being for early use. Generally, the reason is lack of money rather than expectation that prices will go lower.

Copper

A buyer's market is very much in evidence, and inquiries are few and far between. The large producers are holding aloof from the market, at 13c. delivered, although at least one would sell for prompt delivery at 12.75c. The metal offered by certain custom and trading interests seems sufficient to more than fill all orders, so that price cutting is resorted to for the purpose of securing such business as may be had. Some tempting inquiries for large lots from certain electrical and steel corporations have strengthened this tendency. One large interest is freely offering prompt copper today for 12c. delivered.

Foreign demand is very poor, but

Tin

With current prices the lowest in twelve years, the temptation to buy has proved great, and a good business was done for both prompt and forward delivery, although it is unlikely that much of the tin will go directly into consumption. Electrolytic has been in good demand at, or about $\frac{1}{2}$ c. less than, the price of Straits. The differential between "99 per cent" and Straits is diminishing rapidly, and is now only about $\frac{1}{2}$ c. in London.

Spot tin in London on March 1 was $\pounds 158$, instead of $\pounds 152$ as given last week.

Straits tin for future delivery: March 3d, $29.50@30.00$ c.; 4th, $29.50@30.00$ c.; 5th, $29.50@30.00$ c.; 7th, $28.25@28.75$ c.; 8th, $28.25@28.50$ c.; 9th, $27.50@28.00$ c.

Arrivals of tin, in long tons: March 1st, Straits, 5; 7th, Buenos Aires, 25; Straits, 15; China, 3.

Silver

Owing to continued selling by China and consequent weakness in the Indian bazaars, the price of silver was forced down to $30\frac{1}{2}$ d. in London on March 5. On buying by Indian bazaars the market reacted sharply to $31\frac{1}{2}$ d. on the 7th; but, the demand being satisfied, the price has since held fairly firm and closes quiet at $31\frac{1}{2}$ d., on Indian bazaars buying. Our local market has followed London, as there has been no active buying by the China banks. Eastern exchanges continue bearish, with large stocks of silver on hand. Indian rupee exchange closes at 1 s. $3\frac{1}{2}$ d. The news from Mexico continues to confirm the statement that production is being curtailed by the low price of silver.

Mexican Dollars—March 3d, $42\frac{1}{2}$; 4th, 41 ; 5th, $40\frac{1}{2}$; 7th, $41\frac{1}{2}$; 8th, 41 ; 9th, $41\frac{1}{2}$.

Gold

Gold in London: March 3d, 105 s. 7 d.; 4th, 105 s. 3 d.; 7th, 105 s. 3 d.; 8th, 105 s. 6 d.; 9th, 105 s. 11 d.

Foreign Exchange

The commotion in Europe has, of course, influenced exchange rates to a certain degree, the tendency being weaker, with heavy liquidation in the last day or two. On Tuesday, March 8th, francs were 7.03 c.; lire, 3.65 c.; and marks, 1.525 c. New York funds in Montreal, $14\frac{1}{2}$ per cent premium.

Other Metals

Aluminum—List prices of $28@28.5$ c. are nominal. Outside market, $24@25$ c. per lb. Market quiet.

Antimony—Chinese and Japanese brands, $5\frac{1}{2}@5\frac{1}{4}$ c.; market quiet. W.C.C. brand, $5\frac{1}{2}@6$ c. per lb. Cookson's "C" grade, spot, $9\frac{1}{2}$ c. Chinese needle antimony, lump, nominal at $4\frac{1}{2}$ c. per lb. Standard powdered needle antimony (200 mesh), $6\frac{1}{2}@6\frac{1}{4}$ c. per lb. Demand light, with heavy supplies available.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3 , wholesale lots, 7 c.

Bismuth— $\$1.50@\1.65 per lb., 500-lb. lots. London price reduced Feb. 12 from 12 s. 6 d. to 7 s. 6 d., accompanied by a decline here.

Cadmium—Nominal, $\$1.40$ per lb., in 1,000-lb. lots.

Cobalt—Metal, $\$4.50$ per lb.; black oxide, $\$3@\3.10 per lb. in bbls.; sulphate, $\$1.35$ per lb. in bbls.

Iridium—Nominal, $\$275@\300 per oz. Some dealers feel iridium is in a strong position.

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

Nickel—Standard market, ingot, 41 c.; shot, 41 c.; electrolytic, 44 c. Small tonnage, spot, $38@40$ c.

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

Osmium—Open market, $\$70@\80 per troy oz.

Palladium— $\$65$ per oz. Unchanged.

Platinum— $\$70$ per oz. Steady.

Quicksilver—Nominally, $\$47@\48 per 75-lb. flask. San Francisco wires $\$46.75$. Market dull.

Rhodium— $\$200@\225 per troy oz.

Ruthenium— $\$175@\200 per troy oz.

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

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

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

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 , foreign ore with a maximum of 6 per cent silica, $50@55$ c. per long ton unit, f.o.b. Atlantic ports.

Manganese Ore— $35@40$ c. per unit, seaport; chemical ore (MnO_2) $\$60$ per gross ton, lump; $\$70@\75 per net ton, powdered. Market dull.

Molybdenum Ore—85 per cent MoS_2 , $55@60$ c. per lb. of contained sulphide, New York.

Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 40 c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO_2 , $1\frac{1}{2}@2$ c. per lb. for ore. Rutile, 95 per cent TiO_2 , 12 c. per lb. for ore, with concessions on large lots or contracts.

Tungsten Ore—Scheelite or wolframite, 60 per cent WO_3 and over, per unit of WO_3 , $\$3@\3.25 , f.o.b. Atlantic ports.

Uranium Ore (Carnotite)—Ore containing $1\frac{1}{2}$ per cent U_3O_8 and 5 per cent V_2O_5 sells for $\$1.50$ per lb. of U_3O_8 and 75 c. per lb. of V_2O_5 ; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $\$2.25$ and 75 c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore— $\$1.50$ per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York.

Zircon—Washed, iron free, 3 c. per lb.

Furnished by Foote Mineral Co., Philadelphia, Pa.

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

Zinc and Lead Ore Markets

Joplin, Mo., March 5—Zinc blende, per ton, high, $\$24.75$; basis 60 per cent zinc, premium, $\$21$; Prime Western, $\$21@\20 ; fines and slimes, $\$17.50@\15 ; calamine offered $\$8$, no sales. Average settling price, all grades of blende, $\$23.03$.

Lead, high, $\$44.50$; basis 80 per cent lead, settling $\$45@\40 ; offerings $\$35$; average settling price, all grades of lead, $\$40.73$ per ton.

Shipments for the week: Blende, $4,544$; lead, 850 tons. Value, all ores the week, $\$139,380$.

The zinc blende output of this district is close to 60 per cent of the peak of highest production, and retorts in operation are reported at 25 per cent of full capacity. Ore stocks have increased approximately 20,000 tons since the first of the year, indicating a weekly output in excess of the demand of nearly 2,000. Output figures are estimated around 7,000 tons per week; the pre-war demand was around 5,000 tons. Yet producers wonder why prices continue to sag. Prices are practically on a par with the panic prices of 1896. Offerings of $\$32$ for lead last week found few sellers. This week offering of $\$35$ is getting a fair tonnage.

Platteville, Wis., March 5—No market for zinc and lead ore. Shipments for the week: Blende, 722 tons. Shipments for the year: Blende, $7,193$; lead ore, 510 tons. Shipped during week to separating plants, 323 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $\$2,000@\$3,000$; 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 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), $\$35$; ground (off color), $\$25@\30 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, $5@5\frac{1}{2}$ c. Domestic light, $4\frac{1}{2}@5$ c.; heavy, $4@4\frac{1}{2}$ c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $\$8@\10 ; washed, $\$10@\12 ; powdered, $\$15@\20 ; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, $\$15@\20 , f.o.b. Virginia points. Domestic lump, $\$10@\20 ; powdered, $\$25@\30 ;

imported lump, \$15@25, f.o.b. American ports; powdered, \$35@45, 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.

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, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, \$60; lump, \$17.50, f.o.b. Heathden, 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. Demand very slack, with ample stocks on hand.

Fuller's Earth—\$16 per ton, carload lots, f.o.b. mines.

Graphite—Ceylon lump, first quality, 8@9c. per lb.; chip, 7c.; dust, 5½c. No. 1 flake, 7c.; high-grade amorphous crude, 3c.

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, \$60.

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

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

Phosphate Rock—Domestic demand weak; movements of stocks into consuming channels reported slow. Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$12; 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.

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, 16c., c.i.f. Atlantic seaport; furnace size,

16½c.; Spanish lump, 14@15c.; 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.

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

Talc—Paper making, \$11@20 per ton; roofing grades, \$8.50@13; rubber grades, \$11@18; all f.o.b. Vermont. California talc, \$18@40, talcum powder grade. Southern talc, powdered, carload lots, \$10@14 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, \$35@40; Canadian, \$20@40 per ton.

Mineral Products

Arsenic—White arsenic, 9@10c. per lb. in carload lots. Usual spring demand is not being felt for insecticides. Supplies are plentiful and market is dull.

Sodium Nitrate—\$2.85@3 per cwt. ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, \$20 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract; \$30 per ton, New York.

Potassium Sulphate—Domestic, \$220@230 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

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

Ferrocerium—Per lb., \$12@15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 15c. per lb. of chromium contained; 4 to 6 per cent carbon, 14½c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, \$90@95, f.o.b. furnaces; resale, \$90, delivered; English, \$90@95, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, \$35@40, f.o.b. furnace.

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

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, \$55@60; 50 per cent, \$85@90; 75 per cent, \$145@150.

Ferrotungsten—Domestic, 70 to 80 per cent W, 50@55c. per lb. of contained tungsten, f.o.b. works. Foreign, 60c.

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

Ferrovandium—Basis 30 to 40 per cent, \$5 per lb. of V contained, plus 75c.@2 differentials and according to silicon content, f.o.b. works.

Metal Products

Copper Sheets—Current New York list price, 20½@20¾c. per lb.; wire, 15@15½c.

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

Lead Sheets—Full lead sheets, 8c.; cut lead sheets, 8½c. in quantity, mill lots.

Nickel Silver—33½c. per lb. for 18 per cent nickel.

Yellow Metal—Dimension sheets, 18½c.; sheathing, 17½c.; rods, ½ to 3 in., 15½c.

Zinc Sheets—\$11 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10c. per lb.

Refractories

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

Chrome Cement—40@45 per cent Cr₂O₃, \$45@50 per net ton, and \$55 in sacks, carload lots, f.o.b. eastern shipping points.

Chrome Brick—Straights, \$80 per net ton, shipping point; arches, keys, wedges, \$85; splits, soaps, \$100.

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, \$90@100 per net ton; 9-in. arches, wedges and keys, \$105; soaps and splits, \$120.

Silica Brick—9-in., per 1,000: \$45@55 in carload lots, f.o.b. shipping points.

The Iron Trade

Pittsburgh, March 8, 1921

There have been some cross-currents in steel prices in the last week. Some extreme prices on bars, shapes, and plates appear to have disappeared, presumably because there proved to be no prospect of their bringing out orders large enough to make extreme prices worth while. On the other hand, sheets can be had on orders of ordinary size at \$2 a ton below the previous market, and at least one large producer has begun openly to quote nails at \$3, this comparing with a special price of \$3.10 quoted by some producers on the first break and afterward withdrawn, at least as an open quotation.

The situation is puzzling, as it is plain the price decline is not taking the usual course, and there is even a thought in some quarters that the breach may be repaired.

A slight improvement in demand in general, particularly for sheets, is now observed, and further improvement is expected for spring.

Pig Iron—Foundry pig iron has been quoted freely at \$26.50, Valley, or 50c. decline. Bessemer remains nominally \$27, Valley. At least one small lot of basic has sold at \$23, but \$25 is still regarded as nominally the market. About one-fourth the merchant furnaces in this general district are operating, and they are piling a large part of their make.

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, \$4.50@5; foundry, \$5@5.50.

Four-Cent Lead and Its Significance

Dollar Price of Domestic Silver Is Causing Rocky Mountain Producer To Increase Lead Production—Missouri Operators Curtailing Because of Unusually Low Lead Prices Prevailing

THE record of lead in the beginning of 1921 is disappointing. Lead below 4c. per lb. New York can only be visualized in company with unusual times, such as the beginning of the war, the panic of 1907, and similar periods. During only one year in the last fifteen years has lead dipped for any length of time below 4c., and that was in 1914.

AVERAGE YEARLY PRICE OF LEAD, NEW YORK

In Cents Per Pound	
1905.....	4.707
1906.....	5.657
1907.....	5.325
1908.....	4.200
1909.....	4.273
1910.....	4.446
1911.....	4.420
1912.....	4.471
1913.....	4.370
1914.....	3.862
1915.....	4.673
1916.....	6.858
1917.....	8.787
1918.....	7.413
1919.....	5.759
1920.....	7.957

What is happening today to lead is identical with what has already occurred to other metals, such as copper, zinc, and tin, with the important difference that the decline in lead follows an extended period of trading and production at abnormally high prices, so that the depression in lead has not been of the same duration as that in the other metals. Lead producers must now solve some of the problems faced by the copper companies. Fortunately for them, they have no unwieldy surplus stocks comparable to those of the copper producers, and have already taken steps to cut production heavily. In fact, one of the largest lead producers in the country has taken the bull by the horns and decided, as present prices are below his cost of production, to purchase lead in the open market, it being far cheaper to follow this procedure than to mine and market lead at a loss, besides depleting a valuable asset.

The controlling factor in the lead situation is the almost continual importation of foreign lead into the United States at prices below the market level at New York. Ever since lead first began to drop last summer domestic producers have tried to prevent importations by lowering the domestic prices, but the attempts have been practically ineffectual. Until the quantities that are available in Europe, and elsewhere, are consumed in the United States or by European manufacturers, this market depressant will continue.

Position of Leading States Under Present Conditions

The most important lead-producing states are, in order, Missouri, Idaho, Utah, Colorado, and Montana. Each of these states has a different problem to face in producing lead with a 4c. market. This is because of the varying quality of ore (the common association of lead with other metals, particularly with silver), and the stipulations of the Pittman Act. These conditions have imposed certain restrictions upon different operating companies in meeting the present market that are bound to have considerable effect. Thus Missouri, the leading lead producing state, recovers an insignificant amount of silver from local lead

VALUE OF SILVER RECOVERED PER POUND OF LEAD PRODUCED

	Probable Average Range	Approximate per Cent
		of Total United States Lead Production
Missouri (a).....	Negligible	49.0
Idaho.....	\$0.025 to \$0.035	25.4
Utah.....	.055 to .060	14.2
Colorado.....	.045 to .060	4.8
Montana.....	.070 to .110	3.4

(a) Includes Missouri, Kansas, Oklahoma and Wisconsin lead mining districts.

ores. Idaho, Utah, Colorado, and Montana, on the contrary, produce large amounts of silver from local lead mines. Although in order of importance as lead-producing states they rank as indicated, the ratio of silver to lead production from lead ores is greatest in the reverse order. The table is based on calculations which are too detailed to reproduce here, covering the results of an investigation as to the

average value of silver recovered per pound of lead produced in the states mentioned. The value of silver is taken as that established by the Pittman Act, \$1 per troy ounce.

This table cannot be considered as giving a hard and fast range of silver recoveries, but it does present the relations between the various states in point of silver credits. Most of the lead-silver mines can exercise appreciable latitude in the selection of lead ores rich or low in silver, a privilege which may alter the ratios shown. Nevertheless, it is striking that the majority of the Rocky Mountain lead producers on the average have a sufficiently large silver credit to balance, partly or completely, the present price of lead. The lead companies in Southeastern Missouri and in fact of the entire Middle West are in a different position and have no valuable byproduct compensatory recovery. If the price of silver received by the domestic producer were as low as that prevailing in the foreign market—around 54c. per oz.—the value of these silver credits would be cut almost in half.

Byproduct Lead Rather Than Byproduct Silver

Glancing at these figures, it is not difficult to see why domestic lead can sell at the present low prices—it is notable that most of it being sold is either imported or of Far Western origin—and why the attitude of various producers toward cutting down production is bound to be different. The Rocky Mountain producer is moved by the consideration of taking maximum advantage of the Pittman Act, which is of measurable duration; in other words, of obtaining the largest share possible of the premium the Government is giving the domestic silver producer. Instead of producing silver as a byproduct in the Rocky Mountain belt, lead is now being produced as a byproduct of silver. It is no exaggeration to say that in some cases the disposal of lead is entirely secondary to that of silver, and that the greatest silver output possible is the ruling factor at the present time.

Such companies as the Federal Lead Co. and the St. Joseph Lead Co. operate their own mines in Missouri, and, although they have low costs of production, they are unable to realize the advantages possessed by their fellow producers in the West. Hence, even though they may desire under present market conditions to cut production drastically, the tendency in the West would appear to be counterbalancing. One advantage in Missouri production is that the lead output does not have to stand the heavy freight charges imposed upon the Western product in transporting it to the market.

An interesting feature of the transportation element is the comparison between the rail charges from Idaho points to St. Louis and New York which enable Western lead to compete in either market. The rate from Idaho to New York is about \$22 and from Idaho to St. Louis \$20. The Missouri producer pays about \$10 per ton in moving lead from St. Louis to New York consuming points, and although this is much less than the cost from Rocky Mountain points, it is apparent that but a small differential between the St. Louis and New York markets exists as far as the Idaho producer is concerned. "Milling in transit" rates, or special freight charges covering shipments of lead to a refinery, where it may be treated, and thence to its ultimate destination, also aid the producer furthest from a market.

Silver Purchases Under the Pittman Act

	Ounces
Silver to be purchased under the Pittman Act.....	207,000,000
Silver purchased to March 1, 1921 (a).....	39,200,391
Silver purchases remaining.....	167,799,609
Average monthly purchases.....	4,126,300

(a) Government purchases of silver at \$1 per ounce, 1,000 fine, began May 13, 1920.

COMPANY REPORTS

Utah Copper Co. Deficit Increases

A statement of the results of the operations of the Utah Copper Co. for the fourth quarter of the calendar and fiscal year 1920 states that the copper contained in concentrates for this quarter, 23,921,581 plus a total of 1,157,562 lb. of copper contained in precipitates from the leaching plant, gave a total gross production for the quarter of 25,079,143 lb. The net production of marketable copper derived from this gross output, after allowing for smelter deductions, was 23,943,816 lb., as compared with a net production of 24,103,161 lb. for the third quarter, 27,793,114 lb. for the second quarter, and 26,057,667 lb. for the first quarter.

The average cost per pound of net copper produced from concentrates and leaching plant precipitates was 17.309c., as compared with 17.156c. for the third quarter. These costs include plant depreciation and all fixed and general charges, but exclude Federal taxes. No credits are made to costs in either case for the gold and silver or miscellaneous income. The value of the gold and silver in concentrates totaled \$185,680.05, and the miscellaneous income for the quarter amounted to \$328,778.38. These items combined are equal to 2.149c. per net lb. of copper produced, which, being deducted from the operating cost above stated, results in a net cost of 15.16c. per lb.

Financial results of operations for the four quarters:

	Fourth Quarter	Third Quarter	Second Quarter	First Quarter
Net profit from copper production only.....	\$668,703 a	\$329,021	\$1,254,033	\$2,291,013
Miscellaneous income, including payment for precious metals.....	514,458	581,850	736,312	329,452
Income from Nevada Cons. Copper Co. dividends.....		250,125	250,125	250,125
Income from Gasfield Chemical & Mfg. Corporation dividends.....	100,000			
Total income.....	\$54,245	\$502,954	\$2,240,470	\$2,870,590
Net loss on marketable securities, etc.....	535,270			
Total net income.....	\$589,515	\$502,954	\$2,240,470	\$2,870,590
Disbursements to stockholders.....	2,436,735	2,436,735	2,436,735	2,436,735
Net surplus.....				\$433,855
Net deficit.....	\$3,026,250	\$1,933,781	\$196,265	

(a) Deficit.

The earnings for the fourth quarter are computed on the basis of 14.516c. per lb. for copper, as against 15.791c. for the third quarter, 18.209c. for the second quarter, and 21.994c. for the first quarter. The comparatively low carrying price of copper for the fourth quarter is due to the sales having been considerably less than the production. The deduction from the total income for the quarter is due almost entirely to loss from the sale of Liberty bonds. The regular quarterly disbursement of \$1.50 per share was paid.

Chino Passes Fourth-Quarter Distribution

A statement of the operations of the Chino Copper Co. for the fourth quarter of the calendar year 1920 states that the net production of copper for the quarter after smelter deductions was 10,457,661 lb., as compared with 12,023,444 lb., 11,411,178 lb., and 10,159,566 lb., respectively, for the preceding quarters of the year. The total amount of ore treated for the three months was 409,564 tons.

The cost per pound of net copper produced from milling operations and crude ore shipped to the smelter was 15.09c., compared to 15.01c. for the third quarter. This cost includes plant depreciation and all other items excepting charges for Federal taxes. Income from precious metals and miscellaneous sources amounted to \$137,753, equivalent to 1.32c. per lb. of net copper produced, which, being credited to the cost of producing copper, reduces the net cost for the quarter to 13.77c., as against 14.53c. per net lb. of copper for the third quarter computed on the same basis.

The financial results of the company's operations for the four quarters follow:

	Fourth Quarter	Third Quarter	Second Quarter	First Quarter
Net income from copper production only.....	\$66,826 ()	\$51,080	\$260,032	\$757,605
Miscellaneous income, including payment for precious metals.....	137,753	57,703	70,120	72,122
Total.....	\$70,927	\$108,783	\$330,152	\$809,727
Distributions to stockholders.....		326,243	326,243	326,243
Net surplus.....	\$70,927		\$3,910	\$483,485
Net deficit.....		\$217,460		

(a) Loss.

The operating loss for the fourth quarter is based on a price for copper of 14.45c. per lb., as compared with 15.43c. for the third quarter, 18.175c. for the second quarter, and 21.88c. for the first quarter.

No distribution was made to stockholders during the fourth quarter, the directors having deemed it to the best interest of the company and its stockholders not to weaken the company's cash position during the then and still existing depression and unsettled state of the copper metal market by further borrowings on copper for the purpose of continuing disbursements to stockholders. Though the operations for the year 1920 showed a surplus after payment of three distributions to stockholders, and the quick assets Dec. 31 were approximately \$4,500,000 in excess of current liabilities, most of this surplus and the excess quick assets were represented by copper and supplies on hand. The financial results for the year are as follows:

	Total	Per Share
Total net income.....	\$1,319,588.90	\$1.517
Disbursements to stockholders.....	978,727.50	1.125
Net surplus for the year.....	\$340,861.49	\$0.392

Ray Consolidated Earnings Decrease

A report of the Ray Consolidated Copper Co. covering the fourth quarter of the year 1920 states that the total net production for the quarter, after allowing for smelter deductions, was 10,617,651 lb., as compared with 12,631,222 lb. for the previous quarter, 12,553,623 lb. for the second quarter, and 11,259,534 lb. for the first quarter of the year. During the quarter there was milled 375,228 tons.

The average cost per pound of all net copper produced for the quarter was 16.27c. This figure does not take into account any credit for the value of gold and silver or for miscellaneous income, and compares with a cost of 15.96c. for the previous quarter. These costs include a charge of 15c. per ton for the retirement of mine development expense, but are exclusive of estimate of Federal income and profits taxes. Miscellaneous income for the quarter, including net income from gold and silver produced, amounted to 1.105c. per lb., resulting in a net cost of 15.16c. per lb., as compared with a net cost, computed in the same way, of 15.47c. for the preceding quarter.

The financial results of operations for the four quarters follow:

	Fourth Quarter	Third Quarter	Second Quarter	First Quarter
Operating profit or loss.....	\$178,082(a)	\$113,519	\$343,651	\$587,166
Miscellaneous income.....	117,350	61,370	43,605	50,134
Total.....	\$60,731	\$52,149	\$387,255	\$637,300
Disbursement to stockholders.....	394,295	394,295	394,295	394,295
Net surplus for quarter.....				\$243,005
Net deficit for quarter.....	\$455,026	\$446,444	\$7,039	

(a) Loss.

The average carrying price of copper for the quarter was 14.590c. as compared with 15.057c. per lb., 18.426c. and 21.96c., respectively, for the third, second, and first quarterly periods. A quarterly distribution to stockholders of 25c. per share, which was paid Dec. 31, 1920, amounted to \$394,294.75.

MINING STOCKS

Week Ended March 5, 1921

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

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

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

