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# ENGINEERING AND MINING JOURNAL

A Weekly Journal of the Mining and Mineral Industries

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February 12, 1921

McGraw-Hill Company, Inc.

Vulture Mill  
Maricopa County, Arizona

*In this issue:*

The  
Vulture Mine  
In Arizona

By W. Spencer Hutchinson



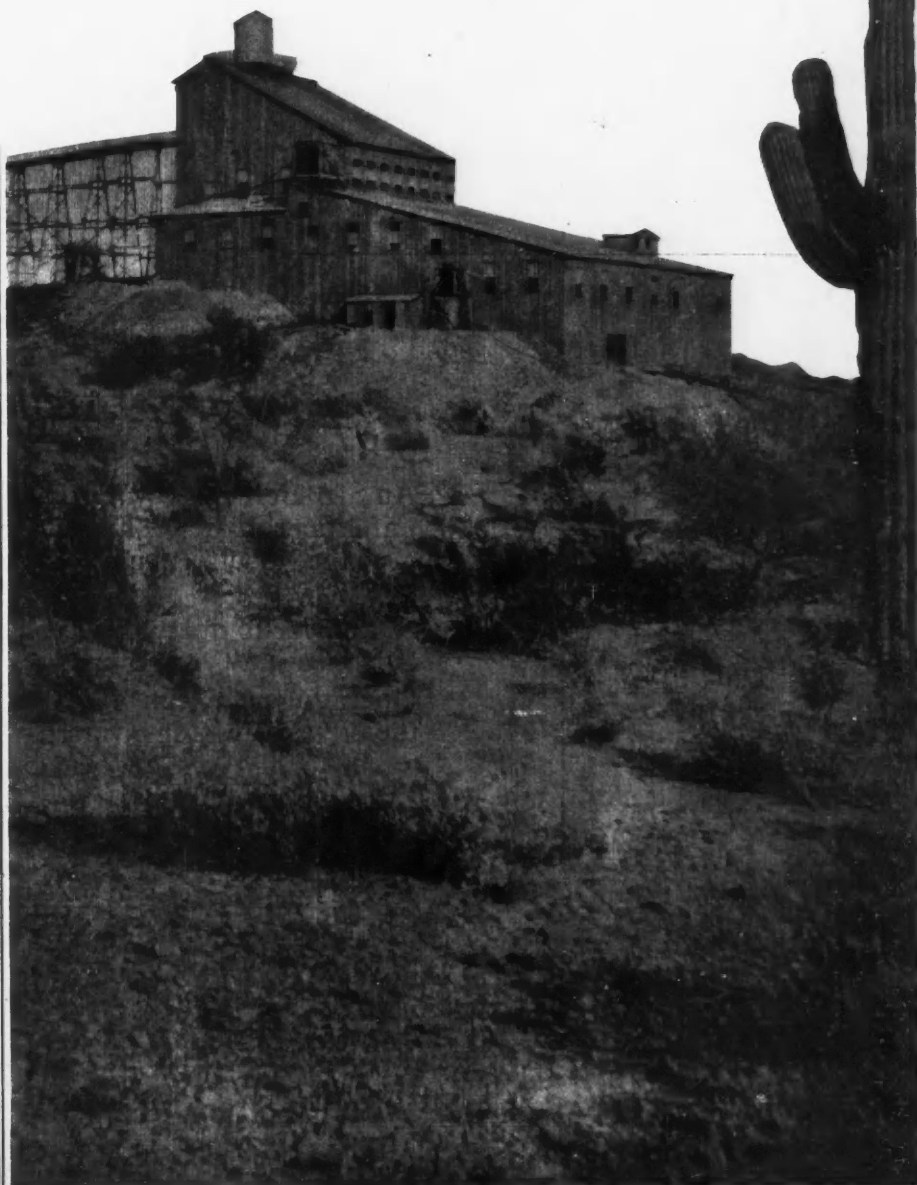
Pyritic Smelting  
of Refractory  
Sulphides

By Edward H. Robie



Chinese Tungsten  
and the  
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By Harwood Koppel





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# Engineering and Mining Journal

*A Weekly Journal of the Mining and Mineral Industries*  
METALS                      NON-METALS                      PETROLEUM

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Volume 111

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Number 7

## Organization Versus Competition

ANYONE who looks over the metal prices for the last few years will be interested and instructed in observing the relative irregularity of the curves—the violence of the periodic fluctuations, for the different metals. These ebbs and flows, of course, reflect corresponding surges in the whole business and industrial world—they represent periods of prosperity exaggerated into periods of overinflation, overexpansion, and speculation, which are presently offset and neutralized by periods of quiet and stagnation, which in their turn are exaggerated into hysterical deflation, forced sales, bankruptcy, and panic.

So the débris is cleared from the stage for a fresh cycle. But in inspecting the behavior of the various metal prices it is significant to note that aluminum, a necessary and widely used metal, has responded only slightly to these abnormal peaks and troughs in general business. The tops of the waves are smoothed out, and the hollows filled in. With nickel, also a fundamental necessity, we observe the same phenomenon. Compare these with copper, with its free movements and wide swings. What is the reason?

The aluminum industry is a monopoly. The Aluminum Company of America controls the business in this country; the British Aluminium Co. that of England; l'Aluminium Française that of France. The nickel industry is closely held, the International Nickel Co. predominating in the world situation. There are economic reasons for this in each instance. The manufacture of aluminum from bauxite requires immense hydro-electric power and the investment of great capital. The ownership of mines is a necessary precaution, and mines, smelters, and marketing organizations are under one direction. In the case of nickel, the vast resources of the Sudbury district in Canada, unparalleled in the world, dominate the situation, and unlimited supply has naturally led to a statistical study and the necessary limitation of output, and more or less centralized control.

These industries do not leap into sudden immense profits during periods of inflation; nor do we ordinarily hear of their mines, smelters, and factories being closed down in dull times. The intermittent employment of labor, with the economic waste involved, the most injurious act against the wage earner, is obviated or diminished. The closing down of mines and mills, with the irremediable injury and loss to invested capital, is likewise minimized.

Compare this condition with the situation in copper mining, for example. There is a very large class of copper mines whose operation is intermittent; which are closed down or even abandoned when copper is low, and are opened up, often by a new enterprise (the early one having foundered), when copper is scaling the heights. What a ruinous speculation for capital is

here involved; what an affront and injury to labor! The copper industry is centralized in relatively few hands, but there is active competition between great mining and smelting organizations (except at present for export trade).

Were there any suspicion in our minds that there existed a secret and efficient "trust," the curve of copper prices would dispel it. Indeed, we suspect, following out this idea, that the degree of organization and effective control in any industry may be decided from a study of the price curves. Note, for example, the gentler curve for zinc, as compared with that for copper. And, on reflection, we remember that the zinc industry is actually far more "controlled" than in the case of copper. Copper, as we pointed out editorially in our issue of Dec. 18, is a sensitive barometer of industrial conditions: as sensitive, apparently, as the stock market; and a more extreme exemplar cannot be given.

We have always been accustomed to believe that competition was "the life of trade," and that control and the elimination of competition were ruinous or iniquitous. But when we inquire into some of our mining industries, like the graphite industry or the barite industry, we often find them almost hopeless because of competition; and it is easy to diagnose that they need scientific and statistical studies, standardizing of product, and central marketing, if they are to find markets and maintain themselves in competition with foreign products.

The tariff is the remedy usually clamored for to offset wastefulness and lack of the best technical methods, but even where such an economically extravagant remedy is obtainable it is often ineffectual. In other industries the remedy of organization has been found necessary. The California Fruit Growers have changed from bankruptcy to prosperity by a centralized control over supply, grade, and marketing. The Eastern farmer sorely needs such centralized and scientific methods of marketing. Labor has found centralized organization better for its welfare than competition. The organization of banks into a Federal Reserve system has recently avoided a panic.

The United States is in itself a combination in restraint of competition—a vast commercial and political combination entered into by many states. Compare the advantages of this plan with free competition and the principle of the survival of the fittest as exemplified in the Balkan States, or, on a smaller scale, in the republics of Central America.

## Standardization of Metallurgical Equipment

STANDARDIZATION is one of the main reasons for the success of many large American manufacturing industries. A certain design of machine or part is found after careful test to be more generally desirable than another, and is thenceforth made exclusively.

Types and models are reduced to the fewest possible number, not only in one plant but in a whole industry, to secure the utmost efficiency in manufacturing. A considerable advance is being made in the standardization of mining methods, too, although by reason of the varying shapes, kinds, and locations of orebodies, as well as the different character of gangue encountered, the problem is a difficult one.

Metallurgists seem more backward, and a vast number of different tools, machines, and processes are used to treat similar ores under similar conditions. This in itself makes for progress if not persisted in too long, but we often find the same variation in the same processes continuing for years. There are several reasons. One is that an engineer who has installed a certain type of machine feels that to admit another to be superior reflects on his judgment. It takes a big man to admit that he has made a mistake. Another reason is that too many engineers dislike to make public the results of their work, being afraid that their methods will be shown in an unfavorable light by the publication of reports of work done at other plants. Particularly, there is to be noted an indisposition to describe experiments which have resulted negatively or unsuccessfully. As a result, one company duplicates the work which another company did years ago, instead of starting off where the former experiments ended.

We were particularly interested in a paper recently prepared by E. A. Wraight for the Institution of Mining and Metallurgy in London. The author attempted to give specifications of steel which would be the most satisfactory for the drills used in mining and for the various grinding media used in crushing and grinding ore. The data on which Mr. Wraight based his conclusions were derived from decidedly scattering published articles, wherein operating results covering two or more varieties of steel used in similar work are given, and are conspicuous by their scarcity. Mr. Wraight emphasizes the necessity for the collection of reliable data and the whole-hearted assistance of steel-makers and mine and mill managers. In this we heartily concur.

Consider balls and ball-mill liners, for example. (We will except, for the time being, a discussion of the various types of ball mills as being too controversial a topic.) Hardly a millman but has tried at least two and usually many more kinds of balls and also various types of liners. He is generally satisfied that certain kinds are either not suitable for the work in hand or are worthless for any purpose. On talking to several millmen recently we were impressed by the almost universal condemnation of a ball of a certain analysis for primary grinding in mills of large diameter; apparently they had all tried it, with unsatisfactory results. Probably others are trying it now. For some kinds of work it may be very suitable. How much of this unnecessary expense could be saved by a little publicity!

As a starter we suggest to our readers who have had experience with various balls and liners that they take a little time to give us their conclusions on the subject, amplified as much as possible by details as to the character and size of ore, size of mill, analyses of steel, cost for power and steel, and other germane details. Such data can, if necessary, be published without the author's name or the name of the mill where the work was done, provided this information is given to the

editor, so that he may have some check on the authenticity of the figures submitted. A compilation of the results from many mills will be highly valuable. Should the response warrant it, we will also be glad to take up other fields where the opportunity for standardization exists.

### How Not To Succeed in Latin America

SOUTH AMERICA, as we have before quoted with approval, is the "New West." There lie our chief opportunities for the expansion of our mining industry, and the trail has already been plainly blazed. In this great field of future opportunity for our sons, they will, however, have to compete on an equal footing with the capital, enterprise, and engineering ability of European nations. At the moment that is possibly not so threatening, what with the far greater financial depression in those countries; but in five years the pressure from Europe will probably be stronger than from America. It will take not only push but tact if we are to fulfill our destiny and carry the blessings of capital and enterprise to Latin America, to their great advantage and ours, rather than have other nations perform that function.

We have had a long experience in Mexico, and have not been successful in dealing with that country, either privately or officially. There are many exceptions to the rule, but we all know the type (not sufficiently rare) of swaggering American in Mexico, who despises and damns the whole country from which he gains his livelihood, and derives a mean kind of enjoyment from lording it over ordinarily docile laborers in a way that he would not dare to do at home. He will not learn Spanish, or is so ignorant that he thinks he knows it with a few words, or is not intelligent enough to acquire it: and holds that the workmen would be able to understand English if they were not so obstinate. We once observed an Irish-American foreman in Mexico bossing a gang of Mexicans. "Hey, you," he said; "bring me that McCarty—McCarty—McCARTY" (macate, a rope). Then, turning in disgust, he confided to us, "The damn fools don't know their own language."

Nor has our governmental contact, as is well known, been more adept or fitting with Mexico, Colombia, or elsewhere. Blundering, bluffing, stupid—all this, and more. We need presidents and diplomats who understand the people with whom they have to deal; and diplomatic and consular agents who inspire respect and esteem by their personalities—a prime requirement which has often been lacking.

We have before us a private letter (not sent to us) which was written by an American engineer in charge of important mine construction work in South America, and he puts one angle of the case so clearly that we quote:

"The United States citizen here, as in every country but his own, is not very popular, and if one looks closely the reason is not hard to find. He is continually flaunting his superiority and making odious comparisons, which are naturally resented. I find these people willing to like us if we will let them; they are a sensitive people, very polite and hospitable, and sometimes our methods are pretty crude, and jar their sensibilities. Their workmen are easily taught and are fairly efficient; many of the craftsmen compare favorably with our own. They are clever and only lack opportunity to develop."

The campaign of which this engineer speaks is simply the campaign for decency. American companies should send to South America only men of innate personal decency, refinement, and tact. We can only despise, fully as much as do our Latin-American friends, the American who is forced to be democratic at home, but expands gladly into a snob and an autocrat when he gets into a foreign country and is charged with a position of some little responsibility and trust. And American mining men should see that our official representatives are also of the type described. If these are unsuited or disreputable, our private American citizens abroad should not hesitate to make a din in Washington about it, at the State Department and through their representatives in Congress. It is their business, more even than it is that of the State Department.

Let all of these remember that the history of the dealings of the United States with our Southern neighbors in the past has not been by any means immaculate, and that there are important passages of which no unprejudiced historian or fair American can approve. The principle of might makes right has shown through too often to now allay the ever-present suspicion. As a nation and as individuals, therefore, we must, in the future, "lean backward" in a fair, generous, and courteous treatment, and what we say we must never forget to make good.

### Could Brass Prices Be Reduced?

**I**NTERESTED as we are in the high retail prices charged for copper products, and why, our eyes are attracted by a statement of the net earnings of the American Brass Co. for the last few years. This company is capitalized at \$15,000,000, and in the year 1920, half of which was an era of general business depression, earned \$3,354,564, a modest 22 per cent. In the last four years, 1917 to 1920, the net earnings have amounted to more than the capitalization. Holding no American brass stock ourselves, we are tempted to inquire if the prices of that company's products could not be lowered a little. The uses of brass might thus be widened. Dividends should not suffer unduly, and copper could be made to go a little faster into consumption.

Possibly, of course, the company is under-capitalized. It is usually the other way, and corporations are often accused of watering stock, but in these days of complex taxes, complexly determined, perhaps an under-capitalization may be more desirable in some circumstances. As a classical example of our idea of an unwatered stock we might cite the Temiskaming & Hudson Bay Mining Co., in the Cobalt district, which, capitalized at \$25,000, of which only \$7,761 was outstanding, paid, during its life, \$1,940,250, or dividends of 25,000 per cent!

We had expected that the earnings of the brass companies might be satisfactory when we were dissuaded, the other day, from buying some brass screws for which our retailer asked at the rate of \$1.35 per lb. Instead we bought some iron screws at 45c. per lb.

As the American Brass Co. is reputed to be the country's largest consumer of copper, we are naturally interested in having its sales as large as possible, and we believe they would be considerably extended by lower prices of those products which must meet active competition with iron. Possibly C. H. Dodge and A. C. James, who are members of the board of directors of both the Phelps Dodge Corporation and the American Brass Co., are the best qualified to fight the battle.

### Fishing for Suckers

**S**ILVERSIDES for snappers and platinum for suckers! Better bait cannot be had by an Izaak Walton in the case of the former or Wallingford himself in the latter. With platinum bringing nearly four times as much as gold, and with the public properly educated to know its uses and value, it is to be expected that once in every moon or so bonanza deposits of it would be discovered even in the most unlikely places. Sulphur Rock, in Independence County, Ark., is the scene of the latest boom, which, according to our most recent information, has not yet collapsed.

As usual, the assay returns secured by the principals, Pat Adams and H. C. Stratton, are said to be generously large. No one-ounce stuff for them, but, rather, ore running \$500 in platinum, with ample amounts of gold and silver. This report does not quite agree with that of an engineer of our acquaintance, whom we know to be reliable. Samples which he privately secured were first analyzed at a laboratory in which he happened to be financially interested. The results were small amounts of gold and silver and no platinum at all. Not content with this, he sent another sample to a well-known firm of assayers and chemists in New York, who reported it to contain none of the metals of the platinum group, and only traces of gold and silver.

The Mr. Stratton referred to claims to be a metallurgist and chemist who has a secret process of discovering and extracting these elusive platinum values. He is manager for what he calls the New American Ore Concentrator Co., and it is by his patent concentrator that he claims to recover the platinum. According to our informant, he set up a small laboratory at the "mine" near Sulphur Rock, and the place has been a Mecca for local citizens ever since, drawing crowds of 1,000 or more people every Sunday. The platinum and gold are in chloride form, says Mr. Stratton, and he even claims that the mine water is charged with platinum chloride. One tale is that he recovered a large amount of the metal by boiling down a couple of gallons of water.

According to our engineer friend, the rock is simply the carbonaceous shale that is prevalent in the district. Development work consists of a 30-ft. tunnel, from which visitors are now barred by gate and lock to prevent them from taking samples. A firm of manufacturing jewelers in Chicago is said to have given Mr. Adams, the promoter, his fancy assays. Fishes are reported to be biting at the proposition. Poor fishes!

The geology of the region is interesting. In a signed article in the *Batesville Guard* Mr. Stratton says:

In the first place these hills are situated within four hundred miles of the Gulf of Mexico and have an elevation of about 200 ft. The Gulf Range is very prominent between the Gulf and these beautiful hills, which lie in a basin of an area of some twenty by fifty miles. A very small portion of this area contains these hills, which resemble a round-bottom kettle turned upside down and each one containing a water flow from the ore shoot. The up shoot comes from volcanic eruptions of which the writer has seen three extinct volcanoes.

The whole would resemble hasty pudding when boiling, could one have seen the action going on under the water at the time of its submergence, which would be characteristic of the China Sea at present.

In addition, some fine diamonds are not an impossibility around these ore shoots as already opened.

We suggest a psychopathic ward at least for Mr. Stratton, or else that he be thrown into the China Sea with one of these diamonds about his neck.

# WHAT OTHERS THINK

## Credit Conditions

The United States Government will not grant further credits to foreign governments. Foreign business men will obtain credit from American business men. These statements seem to be contradictory, though in fact they are not.

A large export and shipping concern and a war baby made many millions of dollars during and shortly after the war. These millions, together with their millions of capital and other millions supplied by their backing bank, have been dissipated as credits granted to business men in Europe, Asia, Africa, and South America. (The fact that these credits were not granted voluntarily is not pertinent.)

Another similar firm, but much larger, older, and more serious, has employed its entire capital, surplus, assets, and line of credit in carrying its foreign buyers; and to such an extent is this true, that only by the most strenuous efforts, and by borrowing on nearly every shipment, cargo, and steamer, has the company been able to continue.

These are two prominent examples. New York has thousands of similar ones. Many if not most of our commercial banking institutions are loaded with acceptances based on shipments to foreign countries, which will *never be liquidated at more than half the invoice value*. Banks which even during the war did not touch export business have been tempted by the apparently easy and good profits.

And so, though our Government will find it a banking impossibility to lend to individual merchants abroad, this lending can and will continue to be done by merchants here, who, in turn, will borrow from the Federal Reserve Bank through their own bankers. This individual lending will be the result of two conditions. First, in consequence of decreased domestic business, manufacturers and producers are attempting to sell abroad. Second, there are so many manufacturers and producers, that if each one of them tries it once, even on a small scale, and fails to collect, sufficient credit to finance Europe will be the result.

This may sound incredible, but we have Cuba, near at hand, which is being financed this way. Exporters, manufacturers, and merchants in America are providing the money for Chile, Peru, Argentina, and many other countries in quantities such that, if collections could be forced, all these countries would be bankrupt. This simply means that, in the same way that the Federal Reserve Bank is carrying the export banks, these carry the exporter, who carries the foreign importer.

It is not a bad method, so long as the exporter uses judgment in his choice of customers. If loans were made by our Government to other governments, these in turn would have to loan to their banks, which would finance the foreign importer. Our Government would have no control over the ultimate beneficiaries of the loan. By the present method, the exporter's success depends upon his judging correctly his customers. It is true that at present few customers in any corner of the

world are "good." It is for this reason that the proposed Credit Bureau of the World will have to go very slow now. Old records are useless. Firms reported at 1,000,000 fr. are refusing shipments and dishonoring drafts calling for the payment of \$100.

Nevertheless, such a bureau is vitally necessary, and the exporter, the merchant, and the manufacturer realize it and are sending their reports as fast as they get new data, particularly when the data are unfavorable.

Although it is true that credit is not being granted at present, many foreign buyers continue to express indignation at offers on cash terms, so probably sooner or later American exporters will again begin to extend foreign credit accommodation—say after the first of the year, when inventories are completed and frozen credits thawed.

In the same way that exporters here are dropping by the wayside, so merchants and importers abroad will surprise their friends. Credit information is now much more important than ever before, and the vast accumulation of data and reports will have to be verified, and even fresh information from bankers and commercial agencies must be verified where more than a week old.

Credits must be granted with extreme caution. It would not be unfair to be almost as careful in granting credits abroad as our banks are in granting credits to their American customers. In this way, though some buyers abroad will be disappointed, fewer exporters will liquidate.

MARK R. LAMB.

New York City.

## Correspondence School Mining Engineer

I have read your editorial "Lenine and Washington B. Vanderlip" in the issue of Dec. 25, and have been quite interested in your reference to Mr. Vanderlip as "a correspondence school 'mining engineer'" and your comment "we are relieved to know that Mr. Vanderlip is *only* a correspondence school mining engineer," from which the natural inference is that you do not consider that one who lays the foundation of his professional knowledge on a correspondence course is a credit to the profession that he seeks to follow.

If we assume as an essential requirement to becoming an engineer that one must stand up in cap and gown before a faculty and receive a sheepskin engrossed in a language that he does not understand, we are in the position of denying that such men as James B. Eads, who conquered the Mississippi River with his jetties and the St. Louis bridge and left many other monuments to his extraordinary ability, and Thomas A. Edison, "the wizard," were not "engineers" until their achievements had become so notable that leading universities were proud to confer honorary degrees upon them.

Similar instances could be multiplied indefinitely. All of us have known men whose standing as engineers is beyond question, but who have never received a degree or had the benefit of a single day of college education. Conversely, all of us have known men with engineering educations as good as money can buy who will never

be worth the traditional tinker's dam as real engineers, no matter how they are placed, and even if they live to be as old as Methuselah and grow whiskers down to their knees.

I know a man who now has a profitable consulting practice. Within a year of his graduation from one of the best mining schools in the country he was unceremoniously fired from a job at day's pay because of his utter ignorance of the most elementary practical principles of the work. When did that man become an engineer? Was it when he received his degree or was it when he acquired such practical experience as to enable him to qualify under Webster's definition of an engineer as "A person skilled in the principles and practice of engineering"?

Engineering is very largely a profession of overcoming obstacles. Does not the man who, having put in his eight hours in the mine or mill, buries himself in his books for another two or three hours while the other fellows are reading the magazines or playing cards exhibit that spirit of the true engineer which wins through in spite of obstacles? Many employers are only too glad to get correspondence school men for that very reason.

And how about those who have secured sufficient credits by correspondence study of a university extension course to entitle them to a degree? Are they "only correspondence school mining engineers," or will you admit them to the elect?

LEROY A. PALMER.

San Francisco, Cal.

### Will the McFadden Bill Make Bandits?

A number of years ago a New York wildcat promoter was operating a small silver property in northern Sonora. To raise more money and to gain the confidence of his directors he considered it most advisable to show a good production for the property. In view of the fact that silver was an extremely scarce article at the mine, and there being little chance that it would produce, he forthwith purchased Mexican pesos on a wholesale scale. The same he melted up and shipped as bullion produced at the mine. Unknown to him, the directors finally learned of these operations and accused him of this practice at their next meeting. Whereupon the wily promoter admitted the fact and told them that every time he had advance information of a bandit raid upon the camp he immediately collected all of the silver coin and melted it into a bar which was too large to be easily carried off, thereby saving the company's money.

Will melted United States gold coin bring a 50 per cent premium?

M. J. ELSING.

Bisbee, Ariz.

### Concerning the Recent Annual Review Number

Congratulations on the Annual Review Number of *Engineering and Mining Journal*, which is a decided improvement over past annual reviews of the same publication. The most valuable feature of the issue is that it devotes a consistent amount of space to each subject, so that the reader who is reasonably busy can absorb the most important facts regarding a metal, substance, or industry in the short space of time that may be at his disposal.

HARRY J. WOLF.

New York City.

### The Artificial Production of Precious Stones

I notice on p. 1131 of the Dec. 11 issue of the *Engineering and Mining Journal*, under the title "Nature Still Supreme in Making Diamonds," one or two misstatements, which, although relatively unimportant, should not have appeared in a journal devoted to the mineral industries. I refer to the statement that reads as follows:

"However, the ruby, topaz, sapphire, amethyst, and emerald, precious stones of the corundum class, are often made by artificial methods. The product is in many cases superior. . . ."

Of course, ruby and sapphire are corundum, but ordinary topaz is either quartz or precious topaz (a silicate of aluminum with fluorine). It is true that yellow corundum is sometimes called Oriental topaz, but it is more frequently termed golden sapphire. It is, it is true, now made artificially. Ordinary amethyst is a variety of quartz, and neither it, quartz topaz, nor precious topaz has ever been made artificially on a commercial scale. Purple corundum, sometimes called Oriental amethyst, has been made artificially, but there is little of the product on the market, as there is not much demand for it.

The principal mistake, and the one to which I wish to take exception, is the statement that emerald is a variety of corundum and has been artificially produced. Not only is ordinary emerald not corundum (it is a variety of beryl, beryllium-aluminum silicate), but emerald-green corundum, sometimes known as Oriental emerald, has never been made artificially. All artificial green corundum is of a rather unattractive yellowish-green shade, and has been sold to some extent under the misnomer of synthetic peridot. Many attempts have been made to manufacture emerald-green corundum, but they have been failures. Equally unsuccessful have been all efforts to make true synthetic emerald on a commercial scale. In spite of the fact that synthetic emeralds are offered for sale by many jewelers, such objects are not true synthetic emerald, but are either nothing other than a green glass, or else are some form of doublet.

G. M. BUTLER.

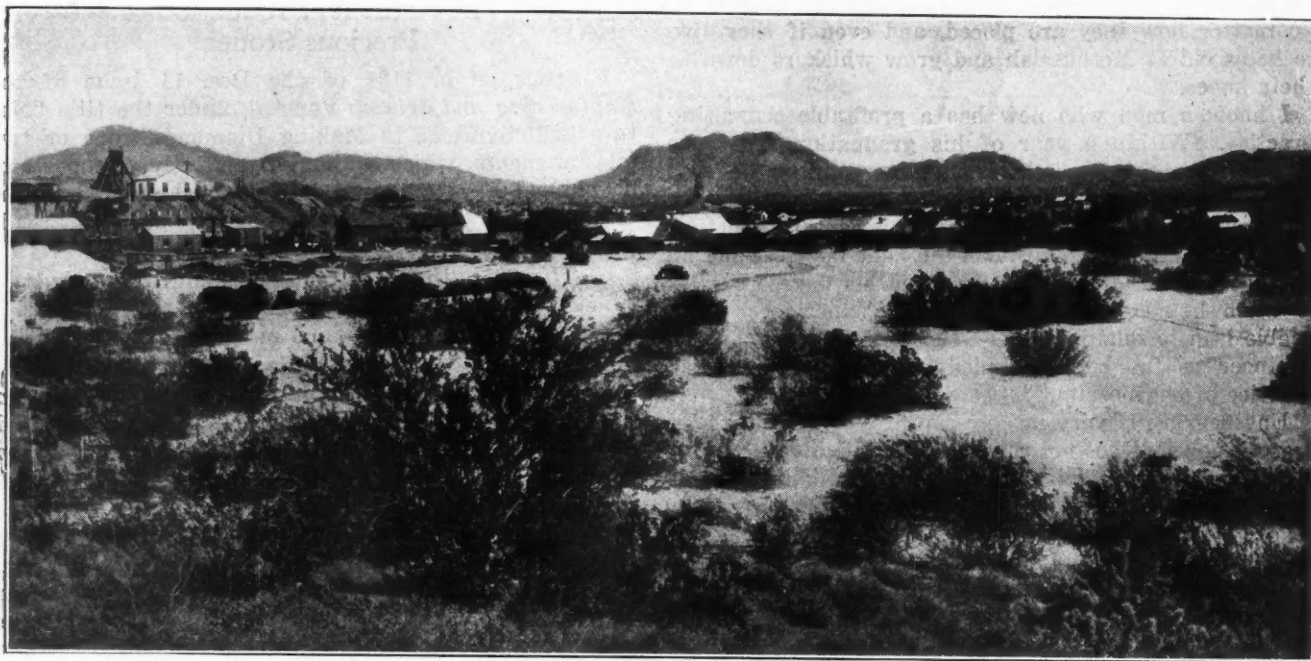
Tucson, Ariz.

[We are glad to publish Dean Butler's intelligent criticism. We should have said Oriental topaz, Oriental amethyst and Oriental emerald. Our statement would then have had the authority of the *Encyclopedia Britannica*, as follows:

"The Oriental emerald has been produced artificially in the same way as the ruby, by adding a larger amount of chromium to the alumina bath and regulating the temperature."

"The Oriental topaz . . . consists of clear crystalline sapphire colored with a small quantity of ferric oxide. It has been produced artificially by adding iron instead of chromium to the matrix from which the white sapphire crystallizes."

"The sapphire . . . is found occasionally of a beautiful violet color; it is then called the Oriental amethyst. . . . If, to the igneous bath of alumina, some coloring matter, such as manganese, is added capable of communicating a violet color to the crystals of alumina, the Oriental amethyst will be the result. Oriental amethyst has been so formed artificially.—EDITOR.]



THE VULTURE MINE AND CAMP, FROM THE MILL, IN 1914

## The Vulture Mine

An Excellent Example of the Effect of Faulting Upon the Development Of a Southwestern Gold Deposit—Discovered in the Sixties, the Property Had a Good Record of Production Until 1917, When It Was Closed Down

BY W. SPENCER HUTCHINSON

Written for *Engineering and Mining Journal*

**T**HE VULTURE, a gigantic tooth of gold-threaded quartz on the rim of the desert, watched century by century the seasonal migration of the Apaches, who crossed the mountains and the forty miles of desert between the waters of the Hassayampa and the Gila. In the sixteenth century it beckoned the adventurous Spaniard from the beaten trail to reveal its gold and to take his brass-poled and steel-edged axe for a token. It was not until 1862 that any attempt was made thoroughly to explore central Arizona; no one had before essayed more than a hurried passage through the country, although all believed it to be rich in minerals. The Territory of Arizona was organized by act of Congress, Feb. 24, 1863, and about the same time Weber, Walker, Wickenburg, and other veteran pioneers came into the district.

Henry Wickenburg, with several companions, was prospecting upon the Hassayampa in October, 1863, and discovered a butte or small isolated mountain of quartz which they recognized as containing gold, but to which they attached no great value at first, so that all but Wickenburg were reluctant to go to even the small trouble of posting notices, claiming the lode. It was, however, taken up, and the Vulture mine by 1867 became the best-known and most profitable property in central Arizona, if not in the entire territory. The main quartz outcrop, a tooth-like butte, was 500 ft. long, 400 ft. wide, and 100 ft. high.

The Vulture mine is in Maricopa County, fourteen miles south of Wickenburg, a station on the Prescott & Phoenix branch of the Santa Fé Ry. about fifty miles northwest of Phoenix. The mine is reached by auto-

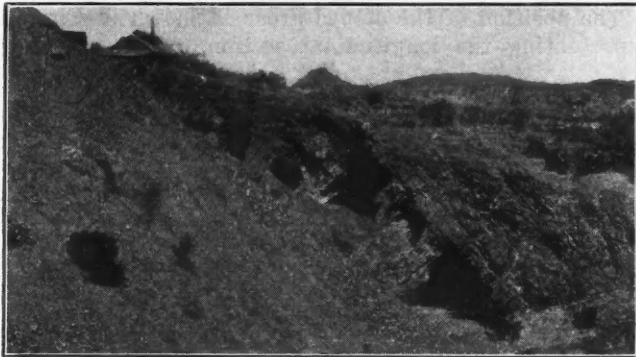
mobile road, which surmounts a pass at an altitude of 2,700 ft., just north of Vulture Peak. The mine itself is at an altitude of 2,000 ft. It was not so accessible in the early days before the railways were built, when Ehrenburg, on the Colorado River, was the nearest supply point and whence all the machinery for the first mill was hauled 168 miles across the desert. In 1880 the railroad reached Phoenix and in 1893 it was extended to Wickenburg. The Hassayampa is a "dry" river the greater part of the year, but its sub-channel stream is unfailing, and at Wickenburg abundant water is found by shallow wells. Of these waters, it is alleged, "He who drinks thereof shall never afterward tell the truth, have a dollar, or leave Arizona."

The first mills for working the Vulture ore were built on the Hassayampa, one a short distance above Wickenburg, and sixteen miles from the mine, the other considerably further down the river and ten miles from the mine. Wells were drilled at the mine in 1909, and a watercourse in gravel was found under the lava at 400 ft. depth. Two wells were equipped with pumps, but the water nearly failed in 1912, and one of the wells was deepened to 1,003 ft., where more water was found. This water rises to 450 ft., whence it is pumped with a standard well rig, and for four years, as long as the well was used, the flow showed no diminution, and there was never any lack of water for the mill at the mine or for other needs.

Wickenburg himself seems to have been possessed of initiative, for within six months of his discovery he had built arrastras on the Hassayampa River, to which he hauled ore yielding \$80 to \$100 in gold per ton, and



in 1865 built a five-stamp mill, which he worked steadily until 1867, when he sold the mine to an English company. The new owners built a new mill of forty stamps about a mile above the town of Wickenburg. Tailings in excess of 200,000 tons accumulated here from the ores hauled from the Vulture mine. The treatment at this early time was, of course, by amalgamation, and although the accounts refer to some concentration by bumping tables, it appears that the concentrates were not shipped away, but were piled up for future treatment. At any rate, after the cyanide process was



THE VULTURE MINE, SHOWING THE VEIN IN THE WEST END OF THE EASTERLY OPEN CUT

developed and in the early 90's, this tailing pile was worked over by cyanidation with great profit.

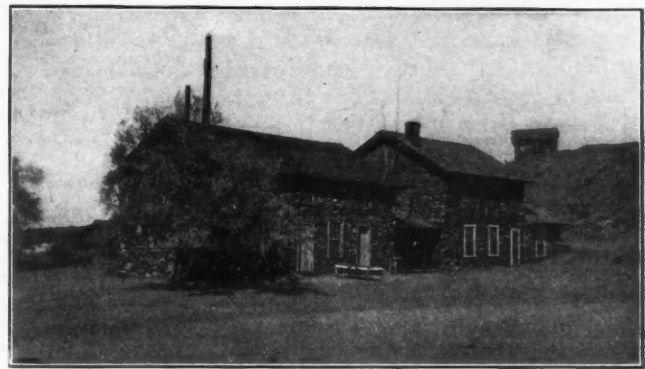
The ownership of the mine was divided, and this fact accounts for another mill of twenty stamps built in 1871 at a point on the river known as Smith's mill, ten miles east of the mine and fifteen miles below Wickenburg. There was a third mill at Seymour some time later, about three miles above Smith's mill and about the same distance from the mine and on the old stage road between Vulture and Phoenix. Frequent mention is made of the excessive cost of operation, due to the long wagon haul from the mine to these mills, which made it necessary to sort the ore at the mine and put into stockpiles for later treatment everything that yielded less than \$20 per ton. The practicability of building a mill at the mine and also of laying a pipe line from the Hassayampa River was considered early in the progress of the work. This plan, however, waited until 1879 for its realization, when the Arizona Central Mining Co. acquired all of the different claims on the deposit. An eighty-stamp mill was then built at the mine and a six-inch pipe line was laid from Seymour, whence water was pumped from wells sunk in the bed of the river. Power was provided by a steam plant burning wood, and during the operation of the mill, which continued for seven or eight years, all of the scanty growth of desert trees was cut off for twelve miles around the mine.

During the twenty years from 1888 to 1908, the mine was worked only in a small way by lessees. In 1908 it was reopened by the Vulture Mines Co. The mine was pumped out and the shaft sunk deeper. Milling began in 1909 from ore mined in the upper levels and milled in twenty stamps of the old mill repaired for that purpose. The ore was amalgamated in the mortars and on plates in approved California style, with very good results and a metallurgical efficiency of 70 to 80 per cent. The tailings were piled for later treatment by cyanide. Water was developed by the deep wells, and a new mill built in 1910. The latter was of twenty heavy stamps,

with supplementary grinding pans, having a capacity of 100 to 120 tons of ore daily, and was driven by a gasoline engine. The mill worked steadily, with the exception of an interruption of a few months, until the end of 1915. All activity ceased in 1917. The mine was allowed to fill with water, and in 1919 the equipment was advertised for sale.

Only the most meager records of the production of the Vulture mine between 1864 and 1908 are to be found, but it is known to be very large. Published reports credit it with as much as \$16,000,000, and some claims are made of even larger production. In *Mineral Resources* for 1869 a record is given of 15,474 tons milled at Wickenburg, which yielded \$399,743, which is at the rate of \$25.83 per ton. Whatever uncertainty there may be regarding early production, there is none concerning that since 1908, which amounted to a total of \$1,839,375, of which about 30 per cent came from concentrates shipped to smelters and the remainder was from bullion derived in nearly equal proportion by amalgamation and cyanidation. Complete records of tonnage are not at hand, but there was milled during the years 1912 to 1914, inclusive, 82,091 tons of ore of an average assay of \$18.94 per ton, which was treated with a metallurgical efficiency of about 82 per cent.

The mine is in the foothills of the Vulture Mountains at the edge of a broad, gently sloping desert valley. The country rocks are schists, probably pre-Cambrian, with dikes and irregular masses of granite, all antedating the mineralization. Vulture Peak, at an altitude of 3,500 ft. and five miles northeast of the mine, is a volcanic neck with radiating dikes whose prominent outcrops form striking topographic features. This neck and the dikes are assumed to have been the



THE OFFICE AND ASSAY LABORATORY AT THE VULTURE MINE

These buildings date back to the very beginning, and are built of mine boulders, some of which show free gold. This picture was taken in 1908. The buildings are still standing.

source of the lavas which filled an old valley and buried the easterly extension of the Vulture mineral zone.

The vein strikes east and west and dips northerly 42 deg. It presents two characters: next to the foot wall, a vein five to six feet thick of rich mineralized quartz but without admixture of schist, and above this, and separated from it by chloritic schist, a big quartz vein thirty to fifty feet thick. In some parts this vein is of clean, white quartz, which is invariably low-grade and cannot be worked at a profit. In other parts, the body of this vein is made up of fragments of schist with quartz between, and is rich. The hanging wall is of chloritic schist, the foot wall being of sericitic schist. The outcrop was 1,000 ft. long, but it has all disappeared

now, the upper parts of the vein having been quarried in two large open pits. The westerly pit is 300 ft. long and the easterly one 500 ft., with low-grade vein matter, which consists mostly of white quartz too poor to mine, remaining between them.

In the oxidized zone the quartz is stained with iron oxide, and some wulfenite in characteristic tabular crystals with razor-sharp edges is found in openings in the quartz. Vanadinite is reported to have been found, but it must be rare, for none was seen during the recent operations. Below the zone of oxidation the vein minerals, other than quartz, are pyrite, galena, blende, and chalcopyrite. The proportion of these is indicated by the ratio of concentration, which was about 30 to

extensive outcroppings of granite are found, occurring as an intrusive mass in the schist. The vein extends into the granite, but pinches out within a short distance after splitting up into several smaller veins, which have, however, yielded some high-grade ore. Granite of identical character was encountered in the westerly end of the 950 level, in the easterly end of the 1,550 level, and in a diamond-drill hole put down from the latter. These points of exposure of granite in the zone of mineralization indicate a probable easterly pitch of the contact and perhaps also an easterly pitch or rake to the ore zone.

The position of the stoped areas is shown in Fig. 1, representing the longitudinal section. Characteristic

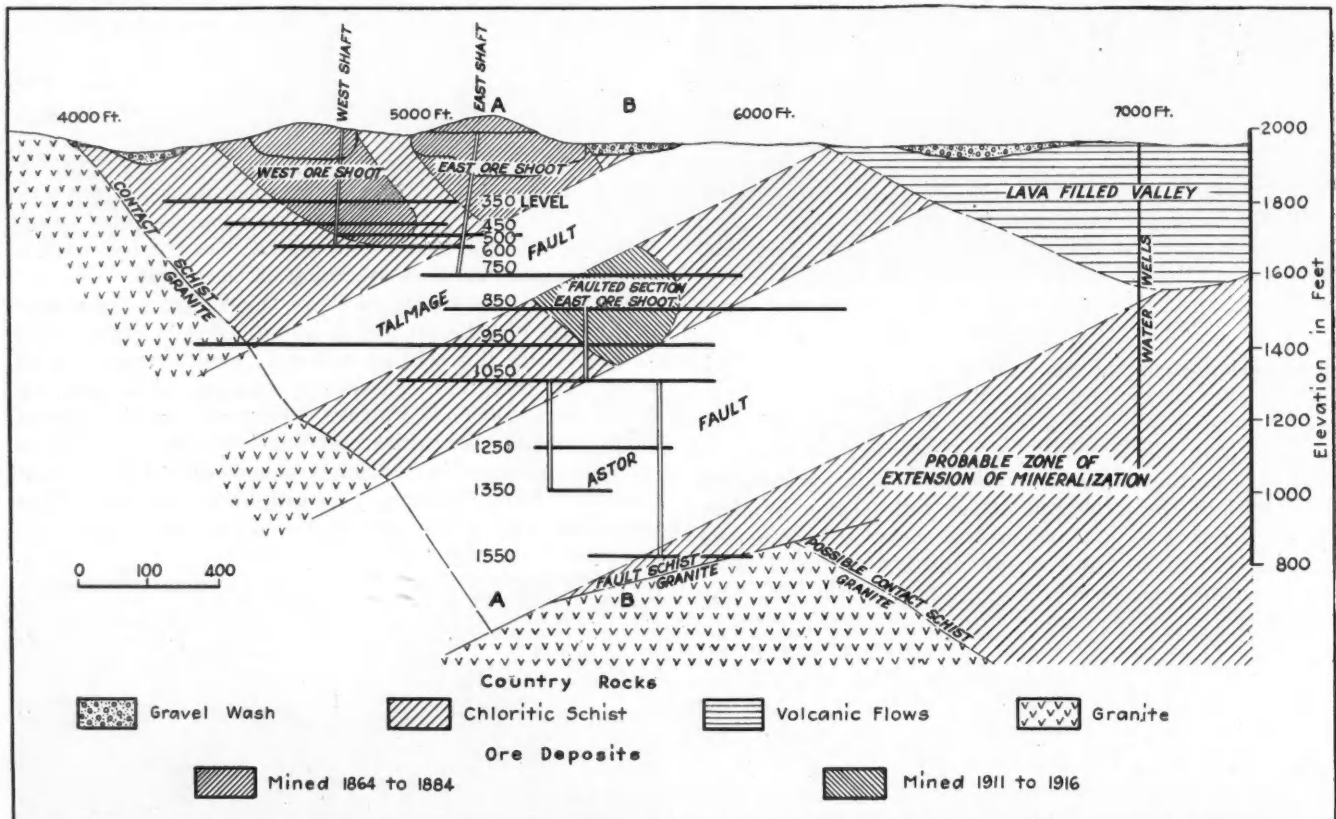


FIG. 1. LONGITUDINAL VERTICAL PROJECTION OF THE VULTURE MINE WORKINGS

1, and the assay of the concentrates, which was 12 to 15 per cent of lead, 8 to 12 per cent of zinc, 1 to 2 per cent copper, and from \$120 to \$200 in gold. Metallic gold was found in all parts of the mine, and even in the deeper workings, where the ore was not oxidized but was made up of characteristic quartz with associated sulphides, coarse gold was present, and thus some pieces weighing half an ounce or more accumulated in the mortars of the stamp batteries. This gold had a fineness of 760 to 780.

The association of gold with galena is an interesting characteristic. The gold thus associated appeared not to be metallic, and proved, upon experiment, to be peculiarly obstinate to cyanidation, but the galena was usually rich, so that when the average mill concentrates assayed \$150 per ton the clean galena concentrate assayed \$600. These characteristics of the ore led to the adoption of a rather unusual metallurgical treatment, a combination of amalgamation, concentration, and cyanidation.

Just beyond the ore shoot on its westerly extension

silicification is found throughout, but mineralization, instead of being uniform, is segregated in two well-defined ore shoots. The easterly orebody, which is the one furthest from the granite, was the larger in every dimension, and the position of the two suggests the conception of a succession of ore shoots *en echelon*. Thus, the next one should be further east and deeper, and the faulting would have carried it to some such position as is indicated on the drawing as "probable zone of extension of mineralization." Evidence of easterly extension of the ore zone would naturally be looked for on the surface, but near-by exposures are lacking, for the reason that the schists are buried by volcanic tuffs and lavas. The schists emerge again 3,000 ft. to the east, where they show characteristic structures and some mineralization.

The geological feature which has been a controlling factor in the history of the Vulture mine is the extraordinary development of faulting. There are a great number of small faults, with displacement, however, of a few feet only. These have been of little conse-

quence and have interfered neither with development nor mining. Besides these, there are two major faults, which are known as the Talmadge and Astor faults. The Talmadge fault cuts the orebody off on the easterly end and on the dip, crossing the vein on its strike at an acute angle. The dip of the fault is 80 deg. to the northeast, which compares with the dip of the vein, 42 deg. to the north. The displacement of the vein is 300 ft. vertically. This fault does not outcrop at the surface, but is buried by gravel wash, a circumstance tending to conceal its true character, which was consequently not recognized until 1911. That this fault was encountered early is shown by the sketch, Fig. 3, and a quotation from a letter<sup>1</sup> written in 1872 by the superintendent of the mine to Rossiter W. Raymond, then U. S. Mining Commissioner:

"At a depth of 232 ft. below the surface of the mesa the fissure is found to change from a dip of 45 deg. north-northeast to an almost vertical position. . . . After sinking 50 ft. behind the foot wall, from the 232-ft. level, the fissure was crosscut and found to be 47 ft. in width, and having on the hanging wall a seam of blue clay some 12 or 15 in. thick. Outside of this was the hanging-wall rock peculiar to the mine above; but the fissure, throughout its width, was found to be filled with a hard black rock full of fine iron pyrites and some galena, and similar in character to the cap or barren filling which is found in many Colorado lodes."

It is interesting to find the correct interpretation of this puzzling geological structure by comparing the sketch, made in 1872, with the cross-section of the orebody as developed in 1918. So far as is known, no work was done deeper than that shown in the old sketch until 1911.

It is not easy to show these faults and their relation to the vein clearly and fully without a series of cross-sections or a model, but the two accompanying sketches, Fig. 2, will give an idea of the disastrous results of the faulting. The fault was encountered during the recent working of the mine on the 500 level near the plane of section A-A, and here it was from five to six feet wide between the walls and was filled with gouge and broken fragments of schist and quartz. For a short distance, in some places fifty or sixty feet, below the point where the vein was cut off, the fault contained so much crushed vein matter that the fault was profitably stoped for a considerable distance. The fault is mineralized discontinuously by calcite, which appears

<sup>1</sup>Mineral Resources West of the Rocky Mountains, 1874.

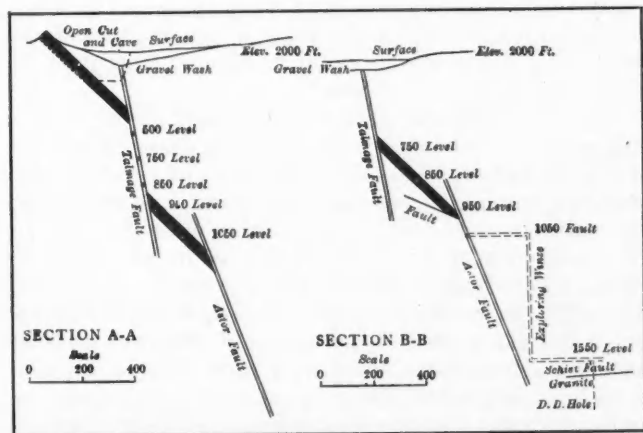


FIG. 2. CROSS-SECTIONS ON A-A AND B-B OF THE VULTURE MINE, SHOWING THE EFFECT OF FAULTING

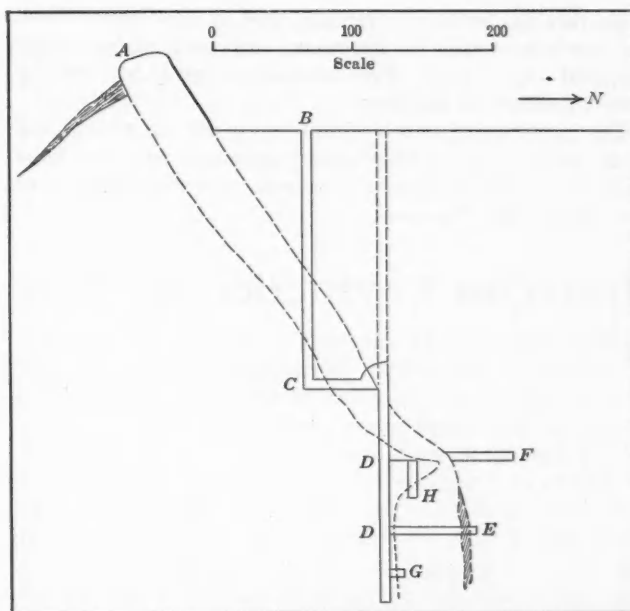


FIG. 3. SECTION OF VULTURE MINE

Drawn by Peter Taylor, superintendent, in 1872, published in report of the U. S. Commissioner of Mining Statistics, 1874, page 348. A, outcrop; B, mouth of main shaft at surface of mesa; C, 182-ft. level; D-D, interior shaft; E, crosscut at 232-ft. level, showing vein 47 ft. thick, with seam of clay on hanging wall; F, north property drift, at 232 ft.; G, crosscut (unfinished) at 312-ft. level; H, small winze.

in lenses a few feet in length, sometimes a foot in thickness, dark colored, and containing here and there crystals of galena. The calcite is comparatively plentiful near the surface and is not found in the deeper parts.

When the position of the fault was determined by the extension of the underground work, its apex was projected and staked on the surface, and it was found that it cut through an area of old dry-placer workings about 700 ft. southeast of the orebody. A working hypothesis was developed based upon the idea that the old placer marked the position of the faulted outcrop of the vein, and exploration was thereafter directed by a drift on the 750 level southeasterly along the fault and by a vertical winze from the same level on the northeasterly side of the fault. This work resulted in cutting the vein on both the 750 and 850 levels exactly where the hypothesis indicated. The orebody, when rediscovered, was 35 ft. thick, and the best part of the ore shoot 200 ft. long.

At this stage it was thought that nothing could interfere with the realization of the most sanguine expectations entertained for the mine, but before many months had gone by the Astor fault was cut on the 1,050 level, at a place where it was expected to find ore. This new fault is parallel, or nearly parallel, to the Talmadge fault, and the displacement is in the same direction—that is, downward on the northeasterly side. The amount of that displacement is not known, for the reason that neither the vein nor any other correlating features have been found beyond it.

The physical condition of the fault-filling does not suggest displacement greater than that of the Talmadge fault, but the winze 500 ft. vertically below the 1,050 level did not find the vein, although it did find stringers of quartz which yielded good assays, a condition which is characteristic of mineralization in the schists beyond the ends of the ore shoots. It is believed that the drifts might wisely have been carried further east before the work was stopped, but, in any case, if the vein should

some day be found in the east end, a new shaft from the surface would be necessary for economical working, and any further explorations had probably best be done by diamond drilling.

The purpose of this account is to put on record the facts concerning a remarkable gold mine, with the hope that it may be of service to others who may harken to the call of the Vulture.

## Iron-Ore Production in 1920

THE iron ore mined in the United States in 1920, exclusive of that which contained more than 5.5 per cent of manganese, is estimated by the U. S. Geological Survey at 67,773,000 gross tons, an increase of 12 per cent as compared with the output in 1919. The shipments of ore from the mines in 1920 are estimated at 69,558,000 gross tons, an increase of nearly 24 per cent as compared with shipments in 1919. The stocks of iron ore at the mines, mainly in Michigan and Minnesota, apparently decreased from 12,986,000 gross tons in 1919 to 11,145,000 tons in 1920, or 14 per cent.

The production of iron ore in 1920 was less than 2,000,000 tons below that of 1918 and is exceeded only by that of the war years 1916, 1917, and 1918. In 1920 shipments exceeded production by approximately 1,785,000 gross tons, but in 1919 production exceeded shipments by about 4,147,000 tons.

### LAKE SUPERIOR DISTRICT

About 86 per cent of the iron ore mined and shipped in 1920 came from the Lake Superior district, in which 58,173,000 gross tons was mined and 60,056,000 tons was shipped, increases of about 12 and 24 per cent, respectively, as compared with the quantities mined and shipped in 1919. These totals include the ore mined and shipped from the Mayville and Baraboo mines, in Wisconsin, and ore shipped by rail as well as water from all mines, but exclude manganiferous ores that contained more than 5.5 per cent manganese. The ore is chiefly hematite. The stocks of iron ore in this district apparently decreased from about 11,887,000 gross tons in 1919 to about 10,000,000 tons in 1920, or 16 per cent.

The shipments of iron ore by water from the Lake Superior district in 1920 (including manganiferous iron ore), according to figures compiled by the Lake Superior Iron Ore Association, amounted to 58,527,226 gross tons, an increase of 24 per cent as compared with these shipments in 1919. A total of about 1,529,000 tons is thus indicated to have been shipped by rail.

The mines in Minnesota furnished 67 per cent of the total iron ore shipped from the Lake Superior district in 1920 and 58 per cent of the total of the United States. The mines in Michigan furnished 31 per cent of the Lake shipments and 27 per cent of the grand total.

### SOUTHEASTERN STATES

The southeastern states, which constitute the second largest iron-ore producing area, including the Birmingham and Chattanooga districts, mined 6,663,000 gross tons of iron ore in 1920, an increase of 16 per cent as compared with 1919. The shipments of ore from these states to blast furnaces in 1920 amounted to 6,575,000 gross tons, an increase of 18 per cent as compared with shipments in the previous year. The ore contains about 78 per cent of hematite, 21 per cent of brown ore, and 1 per cent of magnetite. The production of ore in these

states in 1920 apparently slightly exceeded the shipments, so that the moderate stocks at mines and furnace yards were increased.

### NORTHEASTERN STATES

The northeastern states, which include New Jersey, New York, and Pennsylvania, in 1920 mined 2,027,000 gross tons of iron ore and shipped 2,070,000 gross tons, an increase of 12 per cent over the quantity mined and of 36 per cent over the quantity shipped in 1919. A slight decrease in ore stocks is thus indicated. Most of this ore is magnetite, and is subjected to concentrative treatment before shipment.

### WESTERN STATES

Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Washington and Wyoming, the iron-ore producing states in the West, are estimated to have mined and shipped 734,000 gross tons of iron ore in 1920, an increase of 8 per cent as compared with the quantity mined and shipped in 1919. No large stocks of iron ore are maintained at western mines. Hematite predominates in the western states, but considerable brown ore and magnetite are mined.

### OTHER STATES

Other states, including Connecticut, Maryland, Massachusetts, Missouri and Texas, in which there are small iron mines that produce chiefly hematite and brown ore, mined about 176,000 gross tons in 1920, an increase of 63 per cent as compared with the quantity mined in 1919. The shipments from mines in these states in 1920 are estimated at 123,000 gross tons, an increase of 16 per cent over the shipments that were made during the year 1919.

## Prehistoric Monsters Overran Nebraska And Wyoming

What geologists term the Oligocene formations contain the fossil bones of a great variety of strange extinct animals. These strata are among the most widespread and most regularly distributed of the Tertiary sedimentary rock formations of the Great Plains, and cover a vast area in Nebraska and Wyoming.

The lower Oligocene beds, which are believed to be over a million years old, are often called *Titanotherium* beds, because they contain great quantities of the bones of extinct mammals of that name. They were clumsy brutes of elephantine size, according to the U. S. Geological Survey, having on the front of the skull a pair of great bony protuberances, which, although hornlike in form, were probably not sheathed in horn.

The animals of Oligocene time were apparently abundant as well as varied in kind. Among those characteristic of this epoch were primitive forms of rhinoceroses, peccaries, ruminants, camels, insectivores, and opossums. The saber-toothed tiger, one of the most formidable enemies of primitive man, first appeared in the Oligocene epoch. The horses whose history began with the diminutive four-toed *Eohippus* continued in the Oligocene. Hoglike animals were rather numerous. One of these was a formidable beast with curious protuberances on its head, the use of which is not known. Rhinoceroses similar to those now found in Africa and India lived in western America, and other rhinoceros-like animals were abundant.

## Consumption of Reagents Used in Flotation

IN APRIL, 1919, according to Thomas Varley, of the U. S. Bureau of Mines,<sup>1</sup> the Bureau sent to ore-dressing plants a questionnaire asking for data on their operations in 1919. Replies have been obtained from practically all plants, and the figures are representative and complete enough for all practical purposes. Presumably they cover plants in all parts of the United States.

The reports showed that 26,545,564 tons of ore was treated by flotation, from which 3,105,343 tons of concentrates was produced. The total of 113,510,234 lb. of oil, acid, and other reagents used was equivalent to 4.2384 lb. per ton of ore treated, by far the greater part of which was copper ore.

Not many reports were received from companies treating ores of gold and silver. In the plants making reply, 75,081 tons of ore was treated, yielding 8,698 tons of concentrates, a concentration of 8.63 into 1. Oils used were petroleum fuel oil, 42,054 lb.; pine-tar oil, 24,720 lb.; and turpentine, 36,320 lb.

The number of tons of graphite ore treated was 55,980, yielding 906 tons of concentrate, a concentration of 6.18 into 1. Oils and reagents used were pine oils, soda ash, and lime, aggregating 250,700 lb.

Of miscellaneous and complex ores, 73,690 tons was treated, yielding 5,840 tons of concentrates. Oils and reagents used were sodium sulphide, 73,360 lb.; soda ash, 133,770 lb.; sodium silicate, 111,136 lb.; and pine oils, 22,786 lb.

In tabulating the returns for copper ores, all plants that were treating ores solely by gravitation methods have been excluded. Many companies, however, use a combination of gravity concentration and flotation. Of 38,255,707 tons of ore milled, 23,265,832 tons, or 60.8 per cent, was treated by flotation. This would indicate that 39.2 per cent was discarded as tailings low enough in metal content not to warrant regrinding for further treatment, although a certain small proportion would represent concentrates removed by concentration machinery.

In the following table the total amount of each reagent used is calculated into average number of pounds consumed per ton of ore. This figure of course does not represent the average consumption in any one flotation plant, for some plants use large quantities of one reagent, whereas others use none. The total amount of copper ore treated by flotation was 23,265,832 tons, producing 2,837,660 tons of concentrates, a concentration ratio of 8.23 into 1.

REAGENTS USED ON COPPER ORES

	Pounds	Equivalent in Lb. per Ton of Ore Treated
Coal tars.....	20,488,275	0.8787
Coal-tar creosotes.....	1,399,170	0.0601
Hardwood creosotes.....	1,772,722	0.0767
Pine oils.....	2,142,065	0.0920
Pine tars.....	1,064,199	0.0498
Fuel oil.....	212,985	0.0099
Sulphuric acid.....	70,290,505	3.0254
Caustic (kind not stated).....	1,570,200	0.0675
Kerosene acid sludge.....	7,935,200	0.3402
X cake.....	228,740	0.0099
Xylidine.....	188,472	0.0088
Turpentine.....	23,310	0.0009
Other oils.....	375,000	0.0161

Total average number of pounds of oils and other reagents used per ton of ore treated..... 4.6360

<sup>1</sup>Reports of Investigations, No. 2,203.

The comparative tonnage of lead and lead-silver ores treated by flotation is considerably less than that of copper ores. The total quantity of these types of ores treated by combined gravity and flotation methods was 6,742,815 tons. Only 1,671,740 tons, or 24.78 per cent of the total tonnage reported, was treated by flotation. This 1,671,740 tons, re-treated by flotation, produced 147,552 tons of concentrates, a concentration ratio of 11.33 into 1.

REAGENTS USED ON LEAD AND LEAD-SILVER ORES

	Pounds	Equivalent in Lb. per Ton of Ore Treated
Coal tars.....	324,861	0.1943
Coal-tar creosotes.....	71,860	0.0430
Hardwood creosotes.....	642,051	0.3840
Pine oils.....	221,416	0.1324
Pine tars.....	22,904	0.0135
Wood tars.....	86,926	0.0520
Crude petroleum.....	318,544	0.1905
Sodium sulphide.....	151,212	0.0904
Cresylic acid.....	12,069	0.0072
Sulphuric acid.....	98,027	0.0586
Kerosene.....	9,707	0.0057
Gasoline.....	2,934	0.0017
Soda ash.....	95,210	0.0570
Sodium silicate.....	144,371	0.0863
Niter coke.....	161,270	0.0964
Other reagents.....	86,720	0.0517

Total average quantity of oils and reagents used per ton of ore treated by flotation..... 1.4647

The reports show that 2,917,443 tons of zinc ore was treated by combined gravity concentration and flotation, whereas 1,563,482 tons, or 53.59 per cent of the total tonnage, was treated by flotation alone. This yielded 211,302 tons of concentrates, a concentration ratio of 7.39 tons into 1.

REAGENTS USED ON ZINC ORES

	Pounds	Equivalent in Lb. per Ton of Ore Treated
Coal-tar creosotes.....	21,110	0.0013
Hardwood creosotes.....	31,742	0.0020
Copper sulphate.....	81,145	0.0518
Pine oils.....	1,741,674	1.1136
Crude oils.....	11,238	0.0007
Other oils and reagents.....	63,300	0.0041

Average quantity of oils and reagents used per ton of ore treated..... 2.5578

The most generally used flotative agents for copper ores are sulphuric acid, kerosene acid sludge, and the coal tars. For lead and lead-silver ores hardwood creosote is used most generally, followed by coal tars, crude petroleum, and pine oils. Most important for zinc ores are the pine oils, with copper sulphate and hardwood creosote next in importance.

## Talc Production in Canada

The talc production of Canada has increased steadily during the last ten years, and as a large part of the Canadian talc is exported to the United States, the increase can be followed approximately from the imports into this country, according to the U. S. Bureau of Mines. Practically all of the talc produced in Canada comes from near Madoc, Hastings County, Ont. The three companies, George H. Gillespie & Co., Ltd., Madoc, Ont.; Anglo-American Talc Co., Ltd., Madoc, and the Eldorado Mining & Milling Co., Ltd., Eldorado, are producing ground talc. Of these companies the George H. Gillespie company is probably the largest and ships the highest grade of talc. The mine and mill are efficiently operated and had a prosperous year in 1920. It is reported that the erection of a new mill of larger capacity is under consideration. According to reports of the Ontario Department of Mines, the Eldorado company does not produce a real talc but an altered siliceous magnesian limestone.

## Pyritic Smelting of Refractory Sulphides in a Knudsen Furnace

Experiments on Copper-Nickel Ores of the Sudbury District Prove That the Necessary Fuel Can Be Reduced From the Normal Figure of 11 per Cent on the Charge to 4 per Cent

BY EDWARD H. ROBIE

Written for *Engineering and Mining Journal*

TO COMBINE the functions of the copper blast furnace and converter in one vessel, or at least to make the flow of molten material between the two continuous, has been the subject of much thought and the object of many experiments. It is a variation of the problem of pyritic smelting, the solution of which has also been formidable. Normally, the blast furnace may be said to be essentially a melting furnace, the object being to transform the ore to a molten condition, so that the mineral matter may be separated from the

practiced at Mount Lyell, at Copperhill, at Anyox, and at Clarkdale, is a partial solution of the problem. Those who have been successful with this method of smelting know that the charge must be of a definite character, and the process is a delicate one which is of only limited application.

### THE KNUDSEN FURNACE

At each of the plants mentioned, blast furnaces of conventional design, or at least with only minor modifications, are employed. In Norway, however, at Sulitjelma, an entirely different type of smelting furnace has for several years been used, known as the Knudsen furnace. The design is more like that of a converter than a blast furnace. The operation is briefly as follows: The tuyères, which are near the bottom of the interior space, are covered with a small quantity of solid fuel, low-pressure air then being turned on to start combustion. Sulphide ore is then charged, which is melted by the heat from the burning fuel, and a bath of low-grade matte forms gradually over the tuyères. The air pressure is gradually raised as the bath of matte and slag becomes deeper. When the charge is completely fused and the matte blown to the desired grade, the furnace is tilted down and the contents are poured through the throat into some form of settler where the slag and matte may be separated, the matte later to be blown to blister by conventional methods. The product of the Knudsen furnace, therefore, is not unlike that of the pyritic blast furnace, although the operation is quite different. The action is not continuous, but a saving of fuel is made.

Seven years ago the officials of the International Nickel Co., after a long series of unsuccessful attempts to apply the principles of pyritic smelting to the copper-nickel sulphide ores of the Sudbury district, in Ontario, decided that the problem offered little hope of solution unless radical changes were made in the design of the equipment used. The successful operation of the Knudsen process in Norway being known, it was decided to send 200 tons of the Sudbury ores to the Sulitjelma plant for experimental treatment. David H. Browne, who had been conversant with the pyritic experiments formerly conducted by the Nickel company at Copper Cliff, went to Norway to observe the work. The results were so promising, even with small furnaces and unsatisfactory means of disposing of the product, that it was decided to spend a large sum on experimental equipment at Copper Cliff. To be practicable, larger units would be required than were used in Norway, so a furnace which would hold fifty tons was designed, following the same principles as were embodied in the Norwegian twenty-ton furnaces. A small oil-fired reverberatory was also provided for settling the Knudsen product. Fig. 1 is a photograph taken during construction.

The shell was of the cross-section shown in Fig. 2,

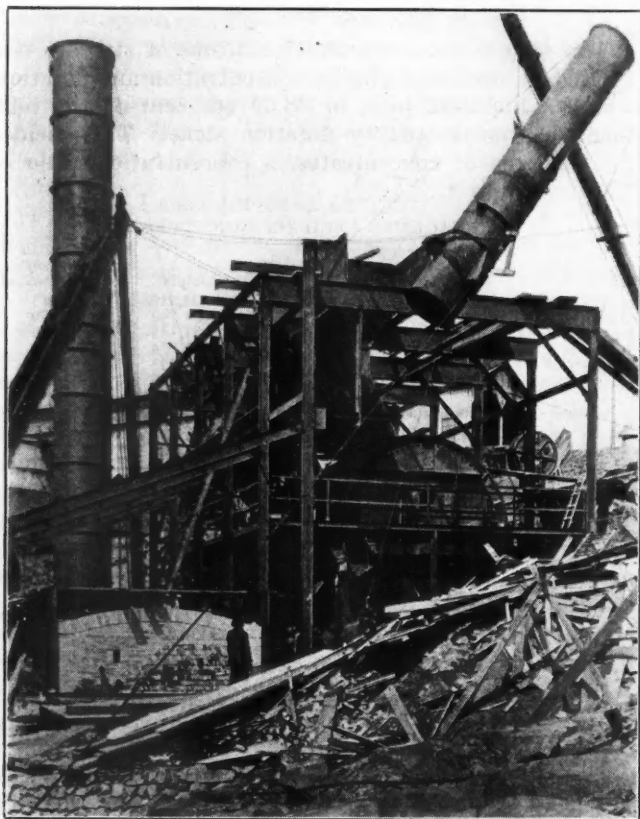


FIG. 1. KNUDSEN FURNACE AND SETTLER UNDER CONSTRUCTION

rock, this being commonly done in an external settler or forehearth, where advantage may be taken of the relative specific gravity of the matte and slag.

The function of the converter is to oxidize iron and sulphur; that is, after the mineral has been separated from the rock in the blast furnace, the converter separates the commercially important metal or metals in the matte from those which it is found advisable to throw away. Any method of treatment, therefore, which seeks to perform both of these operations at once, or within the walls of one furnace, must be the result of careful thought, with a full knowledge of the reactions involved in each operation. Pyritic, or semi-pyritic smelting, as

having somewhat the characteristics of a horizontal converter of the Peirce-Smith type, with the exception of a narrow crucible along the bottom instead of the ordinary circular cross-section. The inside length was 30 ft., the width 6½ ft. and the height 9½ ft. Magnesite brick, 18 in. long, formed the lining, except in the roof, where 12-in. magnesite brick was used. Air was admitted through seventy-six 1-in. tuyères. A special turbo blower was installed to furnish air at the variable pressures and volumes required by the furnace. The oil-fired settler was 38 ft. long and 12 ft. wide, with walls of 24-in. magnesite brick, a magnesite floor and a 12-in. silica-brick roof. Slag and matte were tapped from this

stead of running the low-grade matte and slag into a settler, it was run continuously into this forehearth and blown, with the addition of flux. Owing to rapid corrosion of the magnesite forehearth lining and insufficient improvement in the grade of matte, the experiments seemed to offer little encouragement as a solution of the problem. With a purely copper ore the pyritic process was workable, but nickel for some reason appeared to add some devilish impediment; it seemed, as some one has said, to put the Old Nick into the charge, the two words having the same meaning and derivation.

The practice in 1914 remained as it had been, and as it still is, with minor modifications—roasting in open

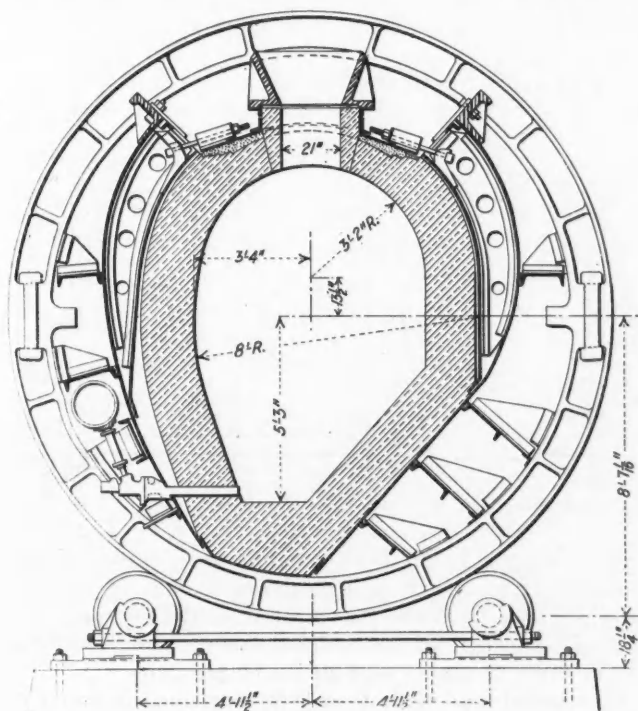


FIG. 2. SECTION THROUGH CHARGE HOLES. FIRST DESIGN

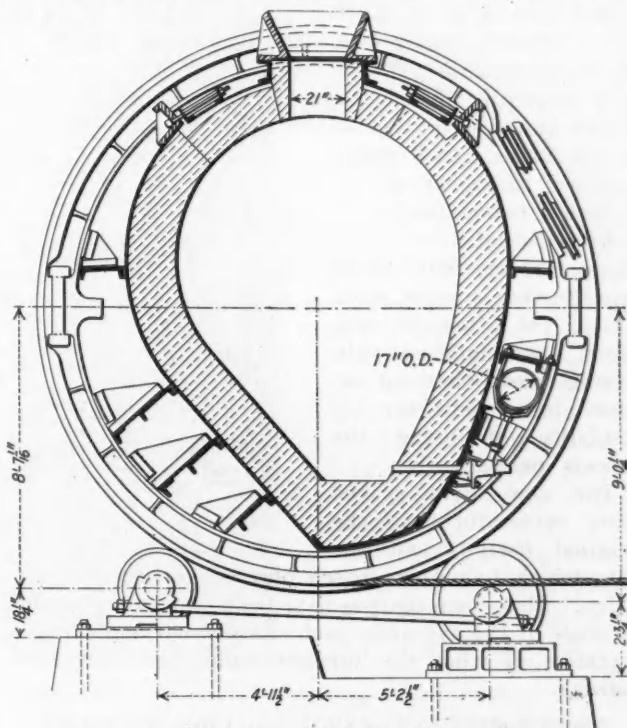


FIG. 3. REVISED DESIGN SECTION THROUGH CHARGE HOLES

settler intermittently into pots standing on a standard-gage track.

Before describing just what happened in this furnace, brief mention may be made of the character of ore customarily smelted and of the previous attempts to smelt it pyritically. The ore from the Creighton mine which was used in the Knudsen test was not unlike that ordinarily smelted by the company. It averaged about 1.50 per cent Cu, in the form of chalcopyrite; 4.10 per cent Ni, in the form of pentlandite or nickeliferous pyrrhotite; 42 per cent Fe; and 23 per cent S, the iron sulphide being wholly pyrrhotite. The gangue was largely norite from the hanging wall and granitoid gneiss from the foot wall. The SiO<sub>2</sub> content of the ore smelted was between 18 and 19 per cent. Theoretically, such an ore should be capable of a high degree of pyritic treatment, but all such efforts had failed.

In 1905, G. F. Beardsley unsuccessfully attempted to apply experience gained at Mount Lyell. Later, in 1909, D. H. Browne and J. L. Agnew carried out extensive experiments, in which almost every conceivable idea was thoroughly tested. In 1912, G. A. Guess, with experience at the Tennessee Copper Co., failed to solve the problem. In 1913, a basic-lined tilting forehearth, similar to a Peirce-Smith converter, was installed alongside of an ordinary blast furnace, smelting green ore. In-

stead of running the low-grade matte and slag into a settler, it was run continuously into this forehearth and blown, with the addition of flux. Owing to rapid corrosion of the magnesite forehearth lining and insufficient improvement in the grade of matte, the experiments seemed to offer little encouragement as a solution of the problem. With a purely copper ore the pyritic process was workable, but nickel for some reason appeared to add some devilish impediment; it seemed, as some one has said, to put the Old Nick into the charge, the two words having the same meaning and derivation.

#### OPERATING DIFFICULTIES

The method of smelting in the Knudsen furnace has already been given briefly in the third paragraph of this article. The first few runs proved that the Knudsen process was actually able to smelt this troublesome ore with less than 5 per cent of fuel. This was the first time this feat had been accomplished, and the solution of the local problem of pyritic smelting seemed to be at hand. To be sure, the operators experienced a liberal amount of what metallurgists so aptly term "grief," but that was to be expected. At first, of course, the lining leaked, tuyère hose was burned up and tuyères frozen, the blower was inclined to be balky, with obvious effects on the charge; too little fuel was sometimes used in an effort to be economical, or ore of too low sulphur content was charged. Great crusts would form across the molten bath, which had to be barred out or smelted

out, and sometimes, for some of the reasons already given, the entire charge froze up. The intense fumes of  $\text{SO}_2$  added to the excitement.

After eighty-eight charges had been treated, it had been proved that the bath was not of sufficient depth for the proper blowing of the matte. Had the interior of the furnace remained clean, the dimensions might have been adequate, but occasional blocks and crusts cut down available capacity and prevented the molten material from being evenly distributed along the tuyères. Decision was, therefore, made to decrease the inside length from 30 to 21 ft., to increase the width from 6 ft. 6 in. to 8 ft. 7 in. and to increase the height from 9 ft. 6 in. to 11 ft. The bottom was also hopped in for 2 ft. from each end. The new design, shown in Fig. 3, gave a deeper bath over the tuyères from the same amount of charge, particularly in the early stages of the blow, when it was most needed. The shorter length necessitated fewer tuyères, forty,  $1\frac{1}{2}$  in. in diameter, being used.

After remodeling and re-lining, ninety-four more charges were smelted, after which the furnace was closed down, sufficient data having been obtained on which to calculate the advisability of using the process permanently.

The new form proved more successful than the original design, and the data which follow are based only on the second campaign. Also, some charges have been omitted in making up some of the averages, such charges not being representative of what the furnace could do, for various reasons.

#### ABOUT 4 PER CENT OF COAL AND COKE NECESSARY

The first thing charged to the furnace is the fuel. Various kinds and qualities were tried, but for satisfactory work it was found that about 3,000 lb. of bituminous coal mixed with 1,000 lb. of coke was necessary. This was distributed as well as possible along the bottom of the incandescent lining, and it immediately ignited. The blower was then started and set to deliver about 2,000 cu.ft. of air per minute at a pressure of from 8 oz. to 1 lb. per sq.in. In a few minutes the air was shut off and the ore charged into the throat through a chute. It was found that starting the smelting on the average ore containing about 23 per cent of S furnished hardly sufficient heat properly to smelt the upper portions of the charge. Hand picking of clean sulphides was then resorted to, about 10 per cent of the charge being so picked and added first. This picked ore contained possibly 30 to 35 per cent of S. This hand picking was a disadvantage which had weight in finally determining the commercial applicability of the process.

About fifty tons of ore and four tons of quartz flux was customarily charged, and with a clean interior this amount could be slightly exceeded. After fusion was well under way, the furnace was blown with maximum pressure and volume of air, up to 14,000 cu.ft. per minute at 15 lb. per sq.in., until the charge was in complete fusion and the matte was of the desired grade. This could be determined from experience, from an inspection of the interior, from the appearance of the flame,

from the ease of punching and from the sound. The average blowing time under normal conditions was four and a half hours, although various factors caused a variation of from three to eight hours. To empty the furnace, clean accretions from the throat and recharge, required, when all was going well, close to two hours, but this time could probably be reduced to one hour with conditions more favorable, so that the twenty-four-hour capacity would be between 225 and 250 tons of charge, or a less amount of ore if reverts were added.

An effort was made to smelt a lower grade of ore from the company's No. 3 mine, containing about 3 per cent of Cu plus Ni, 11 per cent of S, and 27 per cent of  $\text{SiO}_2$ . Several tons of this was added toward the end of some of the charges, but its refractory qualities usually caused trouble.

The grade of the matte produced was, of course, dependent on the length of the blow. A matte containing

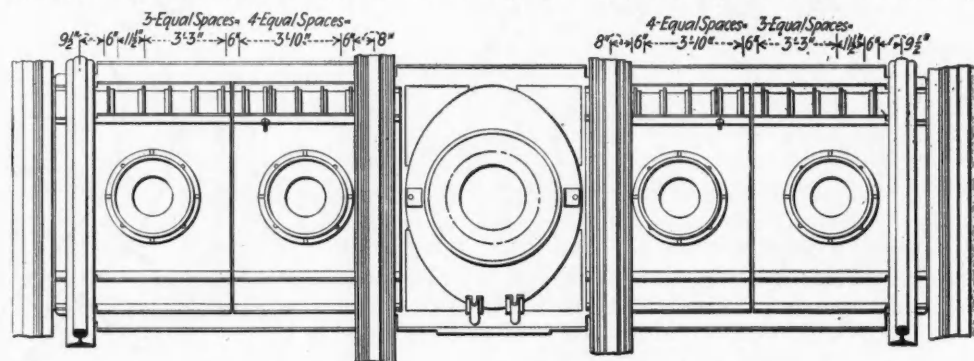


FIG. 4. PLAN OF TOP OF FURNACE AS RE DESIGNED

40 per cent of Cu and Ni was the aim, for a richer matte than this meant an unwarranted slag loss. With low-grade ore from the No. 3 mine on the charge, long blowing was required for complete fusion, and the matte was in some instances as high as 60 per cent.

No attempt was made to recover any flue dust, and it is unlikely that any great amount would be formed unless fine ore were used on the charge. Most of the "dust" which was visibly liberated seemed to be in the form of small prills of matte and slag such as are customarily found in converter flues. In Norway, it is understood, fine ore and flue dust have been successfully smelted by the Knudsen process, but the work at Copper Cliff was almost exclusively done on the oversize from a 1-in. trommel. Some scrap will also have to be taken care of; in fact an unconscionable lot was made during the tests. With normal operation, however, it is unlikely that the total reverts would exceed 15 per cent of the ore charged, and possibly the figure might be considerably under this.

The magnesite lining stood up better than was expected, and the wear was comparable to that of an ordinary basic converter working on similar material. During the second campaign over 4,400 tons of ore was smelted, and the bricks were still in such good condition that they were used, after the furnace was dismantled, in making repairs to the ordinary converters, for which they came in handy when magnesite was expensive and scarce in the early months of the war.

Careful records were kept of the power requirements, and it was found that 27 hp. was theoretically required for blast per ton of charge smelted. Figuring the over-all efficiency of the blast equipment at 55 per cent, 49 hp. would actually be required per ton of charge. The power consumption, of course, rapidly increased



toward the end of the blow, when both volume and pressure are the greatest.

Separating the matte and slag was found to be a big problem in itself, and several delays were caused by trouble with the reverberatory settler. Large quantities of magnetite formed in the Knudsen, which not only was conducive to a mushy condition in the settler, but also, according to the researches of Maier and Van Arsdale, no doubt accounted for the suspension of much valuable metal in the slag. The average slag loss was well over 1 per cent of Cu plus Ni, although a tempera-

ture for erecting a commercial plant. The intermittent smelting operation and the high slag loss went far to offset the advantage of low fuel costs. Also, should the grade of smelting ore materially drop, and the sulphur content fall below 20 per cent, a great deal of difficulty might be had in smelting, as was indicated by work on the lower-grade No. 3 ore.

Considering the difficulties which have always been experienced in smelting the Sudbury ores pyritically, the Knudsen process certainly achieved a metallurgical triumph, and had it had the benefit of some of the long years of development which the older process has enjoyed, might also have proved well worth trying from the commercial standpoint. It should work much better on straight copper ores; that is, it should be able to treat ore containing considerably less than 25 per cent of S satisfactorily. Whether the results would show an advantage over pyritic smelting in blast furnaces, with low fuel ratios, and converting in ordinary basic converters, is a question about which, so far as I know, no accurate comparative data have ever been obtained.

My thanks are due to John L. Agnew, vice-president of the International Nickel Co. of Canada, and general manager of the Mining and Smelting Division, for permission to publish this article.

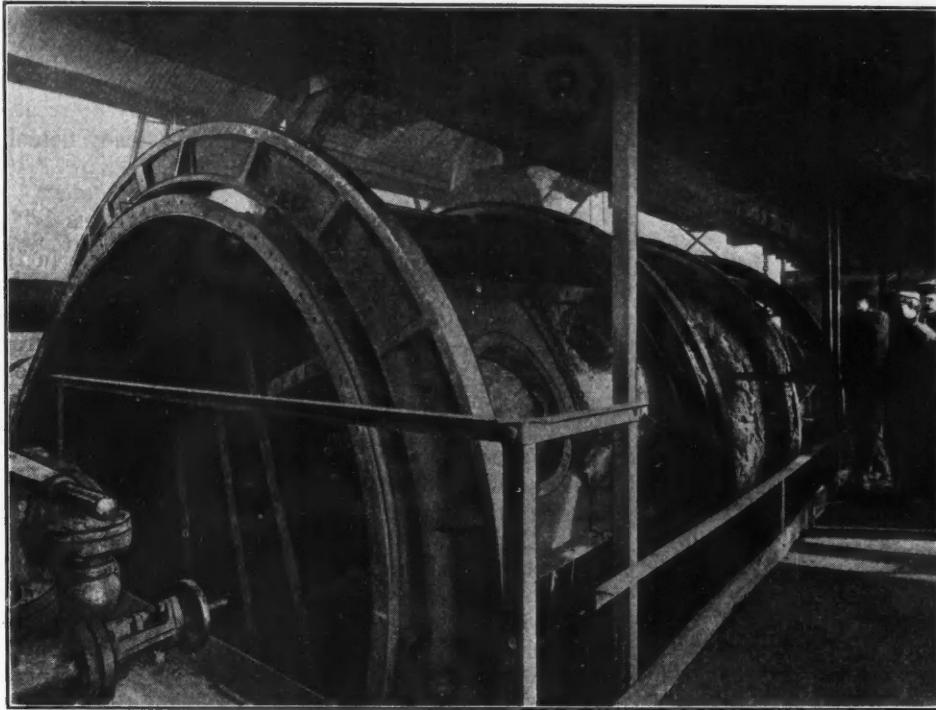


FIG. 5. CHIPPING THE THROAT OF THE FURNACE IN ITS LATER FORM

ture of 1,350 deg. C. was maintained in the settler by the liberal use of oil burners. Such a loss is, of course, out of the question. It was believed that a loss as low as 0.8 per cent might be obtained with a 40 per cent matte in regular practice, but even this would seriously affect the commercial applicability of the process. Nickel, it may be said, replaces part of the copper and is not an additive loss.

The ordinary blast-furnace losses in nickel plus copper are no higher than the copper loss alone would be with ore of similar character. The slags are heavy, for the ore contains only about 2 per cent of lime, and iron oxide has to be almost wholly relied on for the basic constituents. The addition of about 8 per cent of quartz to the ore charge in the Knudsen proved efficacious to a large extent in preventing the formation of magnetite, and reduced the slag loss. The high temperature maintained, along with a seemingly very corrosive basic slag, played havoc with the walls of the settler, and fettling was necessary, that they might be preserved.

The relative cost of the Knudsen process and ordinary smelting at Copper Cliff was gone into as thoroughly as conditions would permit. The figures will not be given here, for space forbids a detailed analysis, and they would otherwise be meaningless or misleading, as unexplicated cost figures so often are. Suffice to say, although the experiments were a metallurgical success, it was not felt that the time or conditions were oppor-

cle. Some of the data are from memory of the work, but I believe the information is accurate.

### Mine Rescue Telephones in England

A new mine rescue telephone has been introduced in England to fulfill requirements of the British mining acts, writes the *National Safety News*. The British mining laws prescribe that rescue telephones must be part of the equipment of a rescue outfit and that they must be metal cased.

The new telephone outfit is constructed of cast aluminum, and is of the magneto type, made easily portable and compact, and is fitted with induction coil, two dry cells, powerful magneto generator and buzzer. It has a combination transmitter and receiver of a short pattern, which clips into a cast aluminum hinged cover on top of the case, which fastens with a strong spring. The cover also protects the generator handle. The hand combination is connected by a metallic flexible cable, which coils in the cover when not in use, and the case is provided with a strong leather carrying strap. The line cable is connected by means of a twin connecting plug. Cable of especially strong construction is unreel from a cable reel on a special stand at the top of the mine, and is so connected that the conversation with the person in the mine can be carried on even when the person below is moving and unreeling more cable.

## Chinese Tungsten and the American Market

Asiatic Supplies Abundant and Labor Cheap—Expensive Plants and Equipment Not Essential—System of Village Control—Despite Handicap of High and Abnormal Exchange Conditions, the Chinese Product Appears Able Successfully To Meet American or Other Competition

BY HARWOOD KOPPEL

Written for *Engineering and Mining Journal*

THE normal demand for tungsten ore in the United States in the pre-war period was about 2,000 tons per annum, and during the war this demand increased to about 7,500 tons, which is the estimated production in South China in 1918. The pre-war demand was supplied almost wholly by American mines, and after the war demand for tungsten began to be felt it was possible, by extending workings, to increase the American supply to about 5,300 tons. The high price which resulted from the shortage of the American supply caused increased developments in China, where it was found that tungsten ores were much more accessible than in America, and that they could be landed in American ports, even with excessive freight charges, at prices with which American ores could not compete. The low wage scale in the Chinese mines was an important factor in this situation, although how far the comparative ease with which the ore is mined in China affects the factor of higher efficiency attending the higher wages paid in American mines, operated under more difficult conditions, is manifestly hard to judge accurately.

### THE COMPETITION OF CHINESE TUNGSTEN

The natural result of this condition was a remarkable exploitation of the tungsten mining areas of South China; but with the armistice came a temporary lull in the American market for Chinese tungsten. The abnormally high prices which prevailed during the war were followed by a decided decline, which was immediately reflected in the lessened avidity with which the small Chinese miners sought the ores. It is now generally conceded, however, that Chinese ore can be marketed in America in normal times at good profits in competition with domestic ore; and the Chinese industry is, therefore, gradually assuming permanent proportions.

Though no separate statistics for tungsten exports are available in the Chinese customs, the exports of "ores, unclassified," show an increase from 275,031 piculs (36,670,800 lb.), valued at 1,152,744 haikwan taels (average exchange value for year, \$1.03) in 1917, to 687,146 piculs (91,619,465 lb.), valued at 7,826,734 haikwan taels (average exchange value, \$1.26) in 1918. It is reasonable to assume that all of this increase was accounted for by tungsten ore. Hongkong consulate figures show a total 1918 shipment of 5,163 short tons of tungsten ore to the United States, valued at \$4,808,358, gold. American import statistics report an increase in tungsten ores from "other countries," including China, from 726 tons, valued at \$558,848, in 1917, to 5,897 tons, valued at \$6,262,043, in 1918, and practically all of this increase came from the tungsten-mining areas of China.

An interesting feature disclosed by the American Government statistics is that, with a war demand estimated at 7,500 tons, the United States imported in 1918 a total of 10,362 tons, valued at \$11,409,237. This

is undoubtedly accounted for by the fact that many users of tungsten were encouraged to stock up heavily with ore when there was some uncertainty as to the time when the European conflict would end. To tide over the effect of this overstocking, plans are on foot to erect smelters in China where the ore may be treated and offered in markets which furnish a steady demand for the finished product.

### ECONOMIC AND POLITICAL CONSIDERATIONS

The growth of China as a predominant figure in the tungsten market of the world is based on sound economic laws of abundant and cheap supply, and it should be to the greatest advantage of American manufacturers whose products are affected by the price of high-speed steel to continue to draw from the Chinese market. This will not only give their products a lower price in world competition, but will encourage export trade with China by furnishing return cargo.

On the other hand, it is argued, with a good deal of justice, that by not discouraging the importation of Chinese tungsten the mining interests and the people of the United States are practically scrapping an American mining industry which should prove a desirable source of supply for a very essential raw material in case of war, and that it is more desirable to maintain present American sources of supply, albeit they tend to increase cost of production in the steel industry, than to abandon these and become dependent upon far-distant mines. The wisdom of any course of action in this situation depends wholly on whether America's future economic policy is to be guided by a fear of war or by a confidence that, through a just application of economic principles, economic and other warfare will eventually cease.

### TRADE PRACTICES

Tungsten ore is usually bought in the United States according to the tungstic-acid content. Ore containing 1 per cent of tungstic acid is taken as a unit, and the price is generally fixed on a guaranty that the ore contains from 60 to 65 per cent tungsten. The American consumer usually buys the ore from the Chinese exporter on a cash payment of approximately 50 per cent, the balance being paid when the ore arrives, is assayed, and the actual tungstic-acid content determined. The ore is packed in double bags, 100 lb. to the package, and the whole wrapped with matting and bound with rattan. Local Chinese capitalists in South China employ individual native miners to collect the ore from pockets, and sell it to native traveling middlemen, who in turn sell it to the foreign exporter in the port.

The results of heavy overstocking, as evidenced by 1918 statistics of imports into the United States, were a fall in the American market and the temporary collapse of the industry in China in the closing months of 1918, affecting most heavily the exporters and middlemen.

A report from the American Consul General at Hongkong points out that the volume of shipments of the ore to date is in no fair way a measure of the potential production of the ore from year to year. Under the stimulus of war conditions, production was rapidly developed at points near the seaboard, and often in pockets or deposits which were more expensive to work than normal conditions might have justified. On the other hand, the great mass of China's tungsten resources is as yet untouched, and the best fields or deposits were just coming into working when the collapse of the war trade came. One field discovered in July, 1918, was producing, at the height of the demand, 1,200 tons of ore per month, and the possibilities of its development on an economical, scientific, and normal basis are indicated by the fact that the shipments of ore out of South China were made profitably at about one-third the price realized from the later shipments.

The new field centers around Sai Wah Shan, in the vicinity of Nannanfu, in Kwangsi Province, not far from the Kwantung Province boundary line. Practically all of this ore is taken from public or semi-public lands—i.e., lands owned in common by the people of neighboring villages—and the work is done either by the villagers or by Chinese capitalists working under an arrangement with the people of the villages. Therefore, though the recent collapse affected all the people concerned in the trade who had ore on hand at the time, it involved no expensive plant and little permanent investment.

#### CHINESE PRODUCTION COSTS

It is almost impossible to establish a fair value for the ore in South China. The actual cost of production in most of the deposits for good ore is generally placed at about \$20 local currency per picul of 133½ lb. (at recent exchange about \$16 gold per picul, or \$240 gold per short ton). The same ore at the same price at normal pre-war exchange would cost, say, \$130 gold per short ton. Of course the coolie transport, the small boat transport, and so many transshipments render the cost of getting the ore to the coast very high, to which must be added *likin* charges. When prices of the ore were high, all these drains could be paid, and there still remained a large margin of profit, but with the prices low all such items must, so far as it is possible, be eliminated from the expense account. One of the difficulties of the present situation is that of indicating to the Chinese concerned what they can reasonably ask for their part of the proceeds of ore sold—the price villages may fairly ask for ore rights, the taxes officials may fairly impose, and the division of the various charges generally.

The Eastern situation is further complicated by the fluctuating exchange value of silver, the effect of which is to vary greatly the gold price of the Chinese ore as compared with smaller fluctuations four or five years ago. Ultimate costs in American currency of producing ore for the American or European market therefore are at present largely a matter of exchange. The difference is illustrated by the fact that the short ton of tungsten ore that was bought in the United States for \$330 gold, at an exchange of 82c. gold to the Hongkong dollar, would have cost only \$166 gold four years ago, at exchange of 40c. gold to the Hongkong dollar. It seems probable, from the course of the tungsten market generally, and as a result of the adaptability of the Chinese producers to the demands of the

moment, that the ore can be mined profitably and exported, even at present exchange, in competition with ore produced in any other field in the world; and with normal exchange China is unquestionably the cheapest producing market. Even under present conditions of production any steady demand from the United States for the ore at a fair to good price will result in an immense increase in its production and a steady supply.

#### Tin and Tungsten Production in Burma In 1919

The increased price of tin stimulated activity in the tin-mining industry in Burma during 1919, and production of tin and tin ore showed an improvement of 48 per cent over the figures of the previous year, according to *The Ironmonger*. The cessation of the government demand for tungsten after the armistice caused many of the wolfram mines to be closed and miners to turn their attention to tin. The figures for tin production are based on the royalty paid, but they do not represent the exact amount of the metal exported, as much tin is included in concentrates as wolfram.

With the exception of 462½ tons from the Southern Shan States, the whole of the 1,250 tons of tin ore exported from Burma in 1919 comes from Tavoy and Mergui and two other districts of the Tenasserim division. The industry employed a daily average of 2,738 persons during 1919, as compared with 1,524 persons in the previous year. Despite the collapse brought about by the cessation of the war, the production of tungsten ore in 1919 was maintained at a higher average rate than in any year prior to 1916.

In the Mergui district a good deal of the mining, both for tin and wolfram, is done by Chinese contractors on the tribute system. Many large European firms have taken up the work in Tavoy, investing capital in the newest machinery, so that prospects of larger supplies in the future seem to be warranted. The government also is opening up roads and communications and making fresh surveys. A railway in the direction of Tavoy from Moulmein is in course of construction.

#### Unprofitable Malay States Tungsten Mining in 1919

Tungsten mining was unprofitable in the Malay States in 1919, according to Consul H. J. Dickinson in *Commerce Reports*. With the withdrawal of government support in the spring, the open market for the metal fell to a nominal figure, but the price is regarded as too low for miners to exploit their deposits, in view of increased costs of labor and materials. Exports from the Federated Malay States in 1919 amounted to 7,323 piculs (1 picul = 133½ lb.) as compared with 5,971 piculs in 1918.

#### Few Persons Have Ever Seen Radium

Radium is a metal that is described as having a white metallic luster. It has been isolated only once or twice, and few persons have seen it. It is ordinarily obtained from its ores in the form of sulphate, chloride, or bromide, according to the U. S. Geological Survey, and it is in the form of these salts that it is usually sold and used. These are all white or nearly white substances.

## BY THE WAY

### Mathematically Speaking

"Ere's a story, m'son," said Cap'n Dick, "that h'only gaws to show that a chap be sometimes deceived by tryin' to figger h'out somethin' 'e nawns nothin' baout. H'appears h'up in Painesdale, Michigan, tha members o' tha h'Odd Fellows' Lodge put h'up a large buildin' for to 'old meetin's in. An' then they 'ad a h'openin', an' tha 'ol town turned h'out. In tha front they 'ad one o' these 'ere 'uge signs with tha letters h'I. h'O. h'O. F. T., h'all made o' h'electric lights, so tha bloody thing could be seen for miles. Tha firs' night they lit 'er h'up, Jan Trengrove an' Billy 'All wuz comin' h'off shift'. 'Dahme,' sez Jan, 'some beauty, isn't un?' 'She surely be,' sez Billy, 'an' I wonner w'ot's for they letters stan,' readin' tha h'I. h'O. h'O. F. T. 'W'y, you bloody fool,' sez Jan, 'that stan's for a 'undred feet tall!' W'ot's think o' that naow?"

### The Missing Link

"Crawford, I am firmly convinced that I have located the oil stream which connects the Tampico and Texas fields. I am not yet prepared to announce my discovery, but I am going to go there and drill a well. It is a very long way from the railroad, probably ninety miles, but I am going to drill a well there and I am confident that I will strike oil and plenty of it."—Thus spake S. E. J. Cox, of Houston, Tex., recently. Domes be hanged! Drill deep where the oil floweth and tap the mother stream—we can hardly say lode. If Mr. Cox is right, then the solution of the Mexican petroleum problem is in his hands. All he has to do is to connect with this deep-lying pipe line, let the gushers gush and the pumps pump, and sooner or later the Tampico field will be drier than we are, and there will be no oil left to scrap about.

### Columbus Astray

The Bank of Miami, Ariz., recently received its share of the "300,000 Columbian half dollars, issued by an act of Congress to commemorate the landing of the Pilgrims in 1620," according to a Miami newspaper. The sale of these souvenir coins by the banks at \$1 is authorized by the Government, and it is intended that the proceeds from the sale will be used to build the Pilgrim monument at Plymouth. A small portion of the fund might fittingly be spent in putting a breakwater around Columbus' footprints on Plymouth Rock.

### Religion and Mining

In certain circles the mixing of mining and high finance is not uncommon. Religion and mining, on the other hand, are usually felt to be as oil and water in their relationships, one being of a spiritual and the other of a materialistic nature. It has remained for Charles F. Caldwell, general overseer of the Christian Catholic Apostolic Church, to demonstate in no uncertain way that religion and mining are capable of fusion. Mr. Caldwell has been identified with various mining enterprises in the West for the last thirty years, his operations including the Cœur d'Alenes, Rossland, and Slocan camps. Recently he accepted the overseership of what is known as the Christian Catholic Appos-

tolic Church, a religious sect founded by the late John Alexander Dowie, and having its community headquarters at Zion City, just north of Chicago. Upon returning to the scene of his former activities on a business trip early in January, Overseer Caldwell decided that a little religious instruction would do no harm to the natives, and in Kaslo, B. C., he advertised as follows:

Religious Service  
Eagles' Hall

Commencing at 2:30. Subject: "Greater Prosperity of Kaslo and Slocan Depends upon Righteous Living and Righteous Laws," by

C. F. Caldwell,

General Overseer Christian Catholic Apostolic Church, founded by John Alexander Dowie; Caldwell is also president of the Independent Mine Owners' Association; president of the Utica Mines; president of the New Alaska Mines, believed to be one of the largest mines in Alaska; director of the Forty-nine mine, undeveloped bodies estimated at three millions; president of the Portland Canal Railroad & Terminal Co., which taps the largest and richest gold and silver mines in the world; come and hear about them; president of the Alaska-British Columbia Financial Agents, head office, Fifth Avenue, New York.

### Dangers of Carrying It on the Hip

A news dispatch says that Frank Pelone, a stable boss of Uniontown, Pa., on finding a stick of dynamite, put it in his hip pocket. Later while working in the stable, he was kicked by a mule. The dynamite exploded, blowing Pelone to atoms and destroying the stable. What happened to the mule remains unrecorded. We cannot guarantee the reliability of this tale. We got it from another. It does, however, forcibly point out the danger of carrying stuff with a kick in it on the hip.

### The Librarian Speaks

Who e'er you are  
That put the gin in Engineering  
And make our daily grind more cheering,  
We thank you;  
For

When indexing seems cold and gray  
And technical accounts infernal  
We grab the Eng. and Mining Journal  
At  
"By the Way,"

Where comments by that jolly bloke  
Old Cap'n Dick help make us merry,  
(We'll e'en peruse the dictionary  
To get  
The joke);

And gleefully we watch you close  
The boxite scrap, while to the cellar  
You pack the statements of the feller  
Who said 'twas  
"Boze."

Subconscious psychic stunts and such  
We scan . . . oh that we could a' seed yuh  
When you interrogated Ouija  
And learned  
Too  
Much!

The solid stuff that you purvey  
We read to earn our bread and butter  
And socks—so we'd not have you flutter  
From mining dope to F. P. A.  
Nath'less warm thanks to you we utter  
Whene'er you're  
Gay.

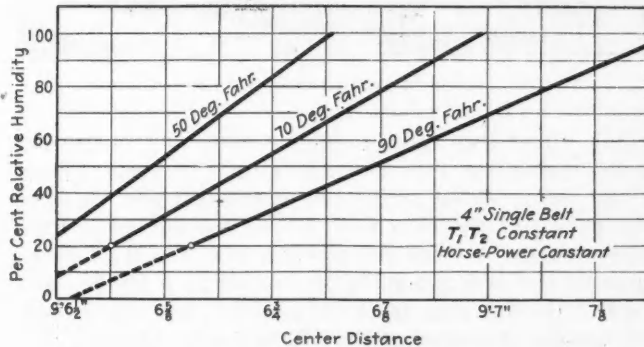
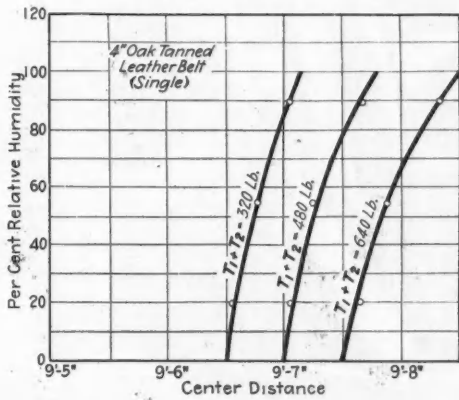
A. S.

# HANDY KNOWLEDGE

## Effect of Humidity Upon Leather Belting

The effect of relative humidity upon leather belting was recently investigated by F. W. Roys, of the Worcester Polytechnic Institute, and the results of his experiments are presented in a paper read before the National Association of Leather Belting Manufacturers, on Nov. 17, 1920. The experiments were restricted to the study of a single four-inch belt under various conditions of humidity.

In the first series of tests the sum of the tensions (tight and loose sides of the belt) was varied, the horsepower being constant. The center distances between the driving and driven pulleys varied with a change in



### HUMIDITY EFFECTS ON LEATHER BELTING

The upper figure shows the relation between relative humidity in per cent and distances between pulley centers for three sets of constant power. The lower figure denotes the relation between pulley centers and relative humidity at three different temperatures.

humidity for a given sum of tensions, increasing as the humidity increased. In other words, the moister the air the greater the stretch of the belt for all other conditions fixed. As an example, at a tension of 450 lb., the distance between pulley distances was increased from 9 ft. 7 in. at 20 per cent relative humidity to 9 ft. 7 1/2 in. at 90 per cent relative humidity. At a constant humidity and horsepower, an increase of temperature increased the length of the belt. The illustration depicts the conditions for both variation in humidity and temperature.

Mr. Roys states in summary of the practical bearing of his experimental work that "in a general way it may be stated that the effect of a change in the relative

humidity is greater at high humidities than at low; that the effect is shown more rapidly in single than in double belts; that increasing the humidity shows practically immediate results, while a decrease in the humidity takes a longer time to be effective."

## Steam Shovel Repairs

BY H. H. HUNNER

Written for *Engineering and Mining Journal*

Quick repairs can be made to a steam shovel dipper boom by means of a yoke. As an example, the shovel crew on a 100-ton shovel allowed the four large bolts securing the dipper castings to the lower end of the dipper boom to work loose. The shovel was operating under exceptionally heavy duty, and, as a consequence, the two bottom straps on the dipper boom sheared off,



DIPPER BOOM REPAIRED BY MEANS OF YOKE

the direct result of the loosening of the bolts mentioned. After the 1 x 6-in. straps had been sheared, the rear bolts could no longer hold against a hard pull. A yoke was made consisting of top and bottom 2 x 5-in. straps and 2-in. bolts on the sides. The straps were given a twist of about 20 deg. near the end, thus securing a flat bearing for bolt washers. The upper plate or strap, as shown in the illustration, rests on the upper straps and the bottom plate supports the dipper hinge. The repair yoke has been in service for six months without repairs.

## Dredge Repairs and the Electric Furnace

In the second annual report of the Canadian Klondyke Mining Co., Ltd., and the Canadian Klondyke Power Co., Ltd., the prohibitive cost of steel wearing parts used in dredge operation caused careful consideration to be given to the advantages that would result from the installation and operation of an electric furnace for remelting and manufacture of scrap steel into bucket lips, bushings, and other parts. Excessively high cost, unsatisfactory delivery, and heavy investment charges militated against direct purchase of such parts. To obtain the necessary dredge supply parts to complete the dredging season of 1919 and to begin operations for the season of 1920, the minimum cost of repairs which it was considered absolutely necessary to insure such operations was estimated at \$140,000. The companies being in the hands of a receiver, it was impossible at the time to finance this sum, and a three-ton electric furnace was purchased. The Canadian Klondyke Mining Co., Ltd., had at the time 2,000 tons of steel scrap and 400 tons of scrap iron. Other supplies of scrap were available at reasonable cost. The scrap was estimated to have a value of 8c. per lb. for remelting purposes. To operate the three dredges of the company efficiently a minimum of 350 tons of dredge wearing parts are required annually, distributed as shown in the following table:

	Tons		Tons
350 bucket lips.....	350	Dump box and chute plates.....	30
Six sets upper and lower tumbler plates.....	22	Miscellaneous iron and steel castings.....	59
225 bucket pins.....	54		
900 bucket bushings.....	25	Total.....	350
Screen plates and bars.....	30		

It was estimated that from 33 to 40 per cent of this tonnage would be reclaimable as scrap to be worked up in the electric furnace.

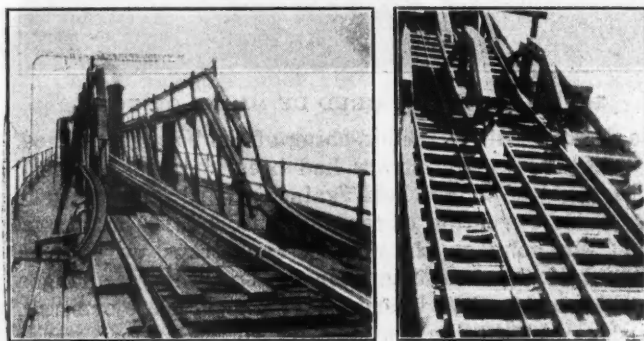
The "landed cost" of the repair parts for the operation of three large dredges and one 7-cu.ft. dredge was estimated at \$225,000 and the extra spare parts to insure continuous operation at \$250,000. The 2,000 tons of scrap in sight was estimated to be sufficient to keep the reclaiming plant in operation for five or six years.

## Skip Dumping at Different Levels In Inclined Shafts

BY GEORGE J. YOUNG

Written for *Engineering and Mining Journal*

Three methods for skip dumping at two points are shown in the accompanying illustration. Fig. 1 shows the device in use at the Raimund mine, in the Birmingham district, Alabama. A single skipway is used. The



FIGS. 1 AND 2. DEVICES FOR DUMPING SKIPS AT TWO POINTS

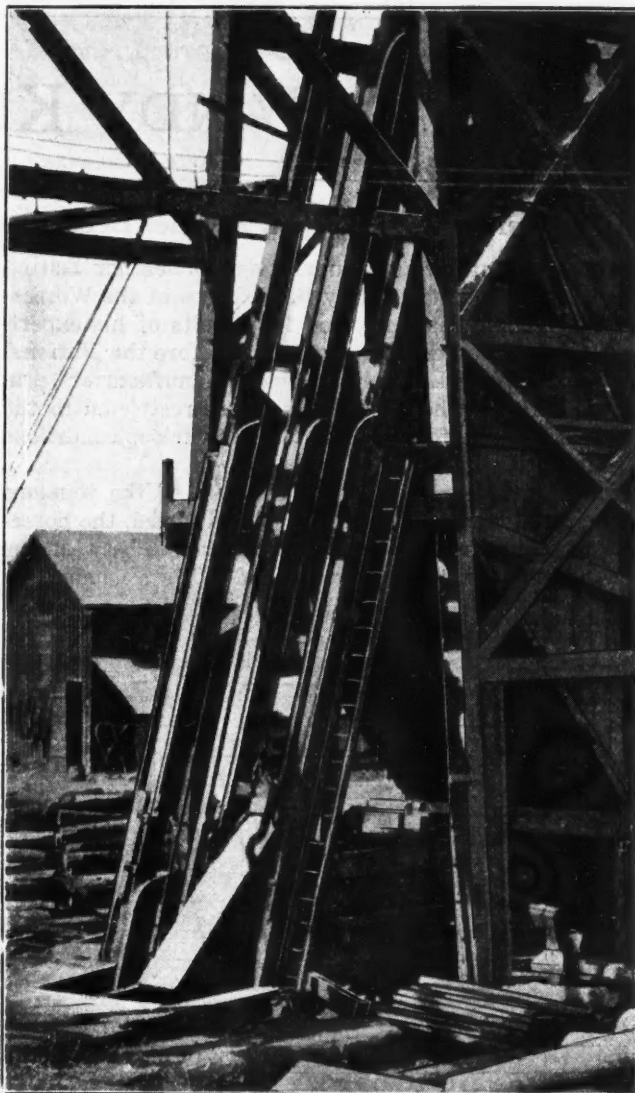


FIG. 3. SKIP DUMPING AT THREE POINTS

skip is tilted into the dumping position by projecting treads concentric with and a part of the lower wheels of the skip. These strike the dumping track, and the bottom end of the skip is lifted up the curved portion of the track. A track run parallel with the skip tracks succeeds the lifting portion of the dumping track. The gage of the dumping tracks is greater than that of the skip tracks. A section of the lifting track is hinged, and by means of levers both parallel sections can be lifted from their position, permitting the dumping treads to pass on to the next dumping track in the headframe. The last pair of dumping tracks is made without the hinged sections.

A guard rail is placed directly above the lifting rail and prevents overturning of the skip. The arrangement is not satisfactory for a double-track skipway, as there is insufficient room between the two skip tracks. A simple arrangement for a double-track skipway is shown in Fig. 2. In this arrangement hinged plates are used to cover the gap through which the dumping treads pass when it is desired to use the upper dump in the headframe. The plates are moved by hand. Instead of being hinged in the manner shown they are sometimes hinged on an axis parallel with the track, and lifted up like the cover of a box, as shown in the illustration in Fig. 3.

## The Mining and Preparation of Rhodesian Mica

THE mica in the deposits at Lomagundi, Rhodesia, is wholly muscovite, chemically a hydrated silicate of aluminum and potassium, according to the Rhodesia Geological Survey. It is usually either of a ruby or of a bottle-green color, though some clouded silvery mica has been found. The native name for the mica is "datsi." The books of mica occur in a band or in a series of lenticles on each wall of a pegmatite dike, the books lying at all angles, but often touching one another and even being closely packed. The band or lenticle is in places close to the wall of mica schist country rock, in others separated from it by a few inches of pegmatite. Here and there a dike is seen with only one band, but this is unusual.

Inclusions or horses of mica schist country rock are common in the dikes, and it is usual to find a zone of mica books completely surrounding the horse, which is thus a structure not unwelcome to the mica miner. The books vary in size from 4 to 5 in. in length to as many feet, the majority probably being between 6 and 18 in. They are seldom more than 6 in. thick, and frequently half that. Much of the mica is stained—near the surface deeply stained—but mining seems to show that staining diminishes 10 to 15 ft. down, and the mica becomes slightly stained, spotted, or clear.

All work is open-cut, not below a depth of about 35 ft. Much of it is done by pick and shovel, the feldspar of the pegmatite being decomposed to a clay and therefore easy to work. When blasting has to be resorted to, either 30 per cent or farmer's dynamite is used for loosening the rock without shattering the books. The pegmatite dikes are on some claims so closely placed that it is economical to take out together the foot-wall band of mica, the intervening strip of mica-schist country rock, and the hanging-wall band of mica in the next dike. In other occurrences the two bands belonging to the one dike are worked together, or each band is separately worked.

The books commonly split up on being taken out into slabs about  $\frac{1}{2}$  in. thick. These slabs are taken to the dressing ground, and first split up with the aid of a knife into sheets about  $\frac{1}{4}$  in. thick. They are next trimmed by shears into irregular polygonal shapes, all cracks, flaws, and striations being rigorously cut away, and the faces of the sheets peeled until a smooth even surface is obtained. Bent or buckled mica should not be split at all, but rejected.

The trimmed sheets are taken to the grading sheds, where this most important operation is carried out. The groups depending on transparency recognized recently by the Ministry of Munitions are: Clear, part stained, second quality clear, second quality part stained, fair stained, ordinary (rust and clay stained), densely stained, black spotted, and soft white. Generally, however, only four groups are recognized, namely: Clear, slightly stained, stained, and densely stained. In each group there are ten sizes, depending upon the largest rectangle which a sheet can give. The largest size is 72 in. square or over.

It is estimated that  $1\frac{1}{2}$  lb. of trimmed mica is a good average yield from each hundredweight of mica won. The waste is therefore enormous. Much of this waste is of marketable quality, and could be converted into splittings for the manufacture of mica board, mica

cloth, or mica paper, and other parts could be pulverized to form ground mica.

The quality and quantity of the mica over a large area in Lomagundi are sufficient for the establishment of a regular mica-mining industry, and the mica is more regular in its distribution in the dikes than is usual in pegmatites. The deposits are seldom pockets, but are generally sufficiently continuous to be called "reefs," as this term is understood in South Africa. The mode of occurrence of the mica, and the ease with which a marketable product can be obtained without much capital, make the work suitable for the "small man," and in view of the large number of reefs scattered over a wide area it may be confidently anticipated that continual efforts will be made to work the mineral.

### The Domestic Talc Situation

The year 1920 was a very busy one for the talc industry in general, according to R. B. Ladoo, of the U. S. Bureau of Mines. With little additional plant capacity, a record production was made. The demand was strong up until about November, when the general business depression was strongly felt. At the close of the year, new orders were scarce, production had started to decline, and stocks of finished talc in the hands of producers were large and increasing, owing to the catching up on unfilled orders, and lack of new business. Some producers reported orders booked for over 50 per cent of capacity for 1921, and others no orders booked; but a general attitude of optimism for the new year was evident.

No general decline in quotations for talc in 1921 is looked for, as the prices of talc have not increased materially since 1914. The average value of talc in 1920 was only about 13.5 per cent greater than that of 1914. Labor supply was adequate but not plentiful, with wages remaining about the same. Car shortage hampered shipments for over half the year, resulting in the maintenance of many unfilled orders on the books. Numerous inquiries for spot shipments sent to several producers simultaneously made a further apparent increase in demand. Most of the producers, however, met the demand by increased efficiency and capacity output. A few expansions in capacity were noted, but on the whole they were unimportant.

Toward the close of 1920 new plant capacity, building or under consideration, amounted to nearly 300 tons per day, or 90,000 tons per year. The country probably cannot absorb this additional capacity for several years at a normal rate of increase, but new uses which would consume it might be developed through research and publicity. However, it is not likely that much more than a third of this projected plant capacity will actually be built and placed in operation.

Little progress was made in 1920 in the development of new uses which would absorb large quantities of talc, most of the production going into the paper, roofing, paint, rubber, and textile industries. A previously known use, however, as one of the principal ingredients in fire-retardant paints, received an impetus, due to the publication of favorable results of tests on these paints and the licensing of paint companies to manufacture them. This use should create a market for an increasing quantity of talc in the future. The opening of no new talc deposits has been reported, but a few old deposits were reopened.

# THE PETROLEUM INDUSTRY

## Total Petroleum Production and Imports During 1920 Show Increase—Consumption Reaches Unprecedented Figures

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

being a loss of 342,000 bbl. in stocks of California grade.

Preliminary figures for the year 1920, including a number of revisions of reports of previous months, show a total production of 443,402,000 bbl., a gain of 17 per cent as compared with 1919 and 78 per cent as compared with 1913. These figures, representing the quantity of petroleum removed from producing properties, will be increased when the amount of oil consumed on the leases is known and after allowance is made for net changes in stocks held by producers on the leases. Imports of petroleum during 1920 amounted to 106,175,000 bbl., more than double the imports of 1919 and almost five times greater than the imports in 1913. These impressive figures emphasize the growing dependence of the United States on foreign supplies.

Consumption of domestic and imported petroleum

PETROLEUM PRODUCED IN THE UNITED STATES IN OCTOBER, NOVEMBER AND DECEMBER, 1920

(Barrels of 42 U. S. gallons)

State	—October, 1920 (a)—		—November, 1920 (a)—		—December, 1920—	
	Total	Daily Average	Total	Daily Average	Total	Daily Average
California.....	9,459,000	305,129	9,340,000	311,333	10,038,000	323,806
Central and Northern Texas.....	6,659,000	214,806	6,711,000	223,700	6,749,000	217,710
Coastal Texas.....	2,619,000	84,484	2,762,000	92,067	2,517,000	81,193
Oklahoma.....	9,437,000	304,419	9,028,000	300,933	8,742,000	282,000
Kansas.....	3,269,000	105,452	3,215,000	107,167	3,044,000	98,194
Northern Louisiana.....	2,511,000	81,000	2,462,000	82,067	2,434,000	78,516
Coastal Louisiana.....	150,000	4,839	153,000	5,100	164,000	5,290
Wyoming.....	1,676,000	54,065	1,340,000	44,667	1,424,000	45,936
Illinois.....	872,000	28,129	847,000	28,233	840,000	27,097
West Virginia.....	759,700	24,506	723,000	24,100	740,000	23,871
Kentucky.....	446,000	14,387	437,000	14,567	466,000	15,032
Central and Eastern Ohio.....	182,000	5,871	165,000	5,500	172,000	5,548
Northwestern Ohio.....	646,000	20,839	603,000	20,100	624,400	20,142
Pennsylvania.....	56,000	1,807	92,000	3,066	86,000	2,774
Montana.....	85,000	2,742	81,000	2,700	84,000	2,710
Indiana.....	82,000	2,645	75,000	2,500	79,000	2,549
New York.....	9,000	290	8,000	267	9,000	290
Colorado.....	1,300	42	1,000	33	600	19
Tennessee.....						
Totals.....	39,592,000	1,277,162	38,699,000	1,289,967	38,961,000	1,256,806

(a) Revised.

A halt to the long-sustained increase in the production of petroleum in the United States, which has been reported monthly throughout the year except for similar checks in May and September, is recorded for December. The daily average production during December amounted to 1,256,806 bbl., a decrease of a little more than 33,000 bbl. a day compared with revised figures for November, but more than 200,000 bbl. greater than the daily average production for December, 1919. Imports during December, amounting to 12,845,482 bbl., a daily average of 414,370 bbl., decreased almost a million barrels over the imports during November, but increased more than 8½ million barrels as compared with December a year ago. Consumption of domestic and imported petroleum during December, estimated to have been 47,909,000 bbl., decreased almost a million barrels as compared with revised figures for November, and stocks increased more than three million barrels. A gain of 2½ million barrels was made in stocks of Oklahoma-Kansas-Central and North Texas grade and of more than ¼ million barrels of Gulf Coast grade. Smaller gains are recorded for stocks of other domestic grades except California and North Louisiana, there

during 1920 reached the unprecedented total of 531,186,000 bbl., yet it did not keep pace with the increase in available petroleum, and at the end of the year there was recorded a net increase of stocks of more than ten million barrels, of which pipe-line and tank-farm stocks of domestic petroleum amounted to 5,823,000 bbl. and stocks of Mexican petroleum held in the United States by importers amounted to 4,523,000 bbl. Although for the entire country there was this total increase of stocks for the year, conditions in California were reverse, there being recorded for that state a net decrease in stocks of 8,212,000 bbl.

### To Seek Oil in Leicestershire, England

The British Ministry of Munitions is reported by the *Chemical Trades Journal and Chemical Engineer*, to have granted a license to Reginald Gilbey, of Nottingham, to bore for petroleum at Weston, Leicestershire. Boring must begin within six months from Oct. 9, 1920, and payments by way of royalties, commissions, profits, or otherwise for the petroleum obtained are specifically forbidden.



## Oil Development in British Columbia

BY ROBERT DUNN

Written for *Engineering and Mining Journal*

A NUMBER of parties have been organized to make the winter trip into the Fort Norman oil district of northwestern Canada, so that they may be on the ground when the spring opens and proceed with their prospecting without delay. The geographical branch of the Provincial Lands Department has been asked for information concerning the best route.

Careful investigation shows that there are three practical overland winter routes into the Mackenzie River country via British Columbia. The best route is by way of Fort Selkirk, Yukon Territory. In reaching Selkirk no great difficulties are to be encountered, there being boat and railway transportation as far as White Horse and a trail thence into Dawson. Though the trail is not as generally used this year as heretofore, the White Pass & Yukon Ry. Co. having withdrawn its elaborate system of stage transportation, it is quite passable to dog teams; in fact, the mail is carried to Dawson by that means at regular intervals.

From Selkirk east across the Yukon and across the Rockies into the Mackenzie River basin is the part of the trip that will test the experience and the endurance of those who have determined to reach Fort Norman before the breaking of the ice. The distance is roughly 385 miles, the country for the most part is open, and there is a good pass through the mountains. But it is no task for a *chechako*. Those who hit the trail will have to travel light and be prepared to meet and overcome all the hardships and dangers of the Canadian Northland in the grip of winter.

The two other routes that have been considered are by way of Atlin and of Dawson. The former, on the information available to geographers, is the least practical. It is true that there is easy transportation from Victoria or Vancouver to the town of Atlin, but an expedition leaving from that point would have to travel overland approximately 460 miles in reaching Fort Norman, and, for a considerable part of the distance, the going would be comparatively rough. As for the selection of Dawson as a starting point, it would be a good place to outfit, and the journey, a distance of about 460 miles, is quite as feasible as is the Selkirk route.

However, there is no doubt that although exceptionally enthusiastic prospectors will take the winter trail, the majority will defer the trip into the new oil fields until the ice breaks and the great waterway from Athabasca Landing is open. This will occur sometime in the latter part of June or early in July. This trip presents all the attractiveness of a Pullman car as against a cattle car in comparison with the snow routes that have been described. From the city of Edmonton, the capital of the Province of Alberta, to Athabasca Landing, there is the Edmonton, Dunvegan & British Columbia Ry. From the landing it is a matter of taking a boat down the Athabasca River to Athabasca Lake, thence down the Slave River to Great Slave Lake, and from there down the Mackenzie River to Fort Norman. The distance is approximately 1,400 miles.

No doubt, with the opening of these waterways, transportation will be provided, as the news of the finding of oil by representatives of the Imperial Oil Co., and the well-authenticated reports that there is a vast extent of

promising territory yet to be prospected, will draw hundreds to the Fort Norman region. There already are reports that a number of gas boats will be pressed into the service, oil tanks being constructed at proper intervals along the route to provide the necessary fuel. Under such conditions the journey should not take longer than twelve days from Edmonton.

Navigation for light-draught craft is simple. The rivers are large bodies of water, and the only dangers of note are sand bars and banks.

In discussing the prospects of marked activity in country adjacent to Fort Norman this year it is interesting to note that there is talk of the organization by a syndicate of Vancouver business men of a seaplane expedition as soon as weather conditions improve. The proposal is that the planes shall set out from Edmonton and go by way of Fort McMurray. The plans, according to reports, have been well advanced, and it is intended that the seaplanes shall be used not only in reaching the immediate objective of Fort Norman but in transporting experts from one point to another in the northern territory for prospecting purposes. The Imperial Oil Co. too, it is commonly reported, is taking steps to provide for a similar method of reconnaissance. Certainly these air-boats should be well adapted to such work in the Fort Norman country, as it abounds in rivers, lakes, and streams.

The investigations of this year in the Canadian Northwest, however, are not to be confined to the Mackenzie River basin. The government of the Province of British Columbia is to carry on its explorations of the Peace River section of the Provincial Northeast. The field work of the last two years, carried out under personal supervision of geologists, has established that oil may be expected and that systematic drilling is likely to develop the presence of petroleum in commercial quantities.

The Pouce Coupe district, situated in the Peace River country, is particularly promising from an oil standpoint. The Imperial Oil Co. has leased about 40,000 acres along the Pouce Coupe River, at a point about ten miles north of the village of Rollo and running in a southeasterly direction into the Province of Alberta. Within this area there are a number of known seepages. A peculiar occurrence was described a few days ago to me by a resident of the district. He said that along a rugged canyon on the river there is a natural cup in the shale formation, from which there gushes at intervals of about ten minutes, with the regularity of a heartbeat, a small quantity of petroleum. There are many other stories of indications, such as the discovery by settlers that their well water is tainted by petroleum. The Imperial Oil Co. is planning to begin drilling as soon as equipment can be brought from Spirit River, the nearest railway point.

It may be stated in conclusion that several companies are engaged in drilling at different places on the lower mainland of British Columbia and that these investigations are said to be promising. The Graham Island Oil Development Co. also is preparing to begin drilling operations in the spring at the north end of Graham Island, one of the Queen Charlotte group.

## Technical Papers

**Steel for Mining and Milling**—The January number of the *Bulletin of the Institution of Mining and Metallurgy* contains an eighteen-page paper descriptive of the kinds of steel found best adapted for drills, stamp shoes and dies, cam shafts, cams and tappets, battery stems, mortar boxes, mortar-box linings, battery screens and frames, crushing rolls, balls, rock-breaker jaws, tube-mill liners, dredges, and other appliances. The author, E. A. Wraight, gives many analyses, and points out that much of the data is of a conflicting nature. A copy of the paper may be had for 1s. 6d. by applying to the offices of the Institution, 1 Finsbury Circus, London, E. C. 2, England.

**Idaho Clays**—A pamphlet of seventy-four pages devoted to the clays of Idaho has just been issued as Bulletin No. 2 by the Bureau of Mines and Geology, Moscow, Idaho. It may be had without charge. Several pages of general information on clay are given, followed by a description of methods of testing and the results of a large number of tests. The clay resources of Idaho are large, but are only beginning to be developed.

**Corundum**—Memoir No. 15 of the Geological Survey of South Africa (Pretoria) is entitled "Corundum in the Northern and Eastern Transvaal." It contains 223 pages and is sold for 7s. 6d. The corundum fields in the Transvaal are the largest known. This book describes the geological features in detail and also has chapters on the classification and character of corundum, and its industrial and economic aspects.

**Ontario Mining**—A report on the mining industry along the T. & N. O. Ry. has just been issued by the Temiskaming and Northern Ontario Railway Commission, Toronto (fifty-three pages, free). The report is devoted largely to statistics concerning Cobalt and Porcupine producers.

**Bureau of Mines**—The tenth annual report of the Director of the Bureau of Mines is available at 15c. from the Superintendent of Documents, Washington, D. C. It is a 150-page book covering the activities of the Bureau for the year ended June 30, 1920.

**Etching Reagents**—A recent bulletin of the U. S. Bureau of Standards discusses the etching of copper in metallography, and the reagents used. It may be obtained on application to the Bureau at Washington, for Bulletin No. 399.

**South African Geology**—The Geological Survey, Pretoria, South Africa, has issued a forty-eight-page pamphlet on the geology of Pondoland and portions of Alfred and lower Umzimkulu counties, Natal. The book also contains a list of all the survey publications. Price, 2s. 6d.

**Mineral Fuels**—Part II of Bulletin 711 of the U. S. Geological Survey, "Contributions to Economic Geology," is a 171-page book devoted to mineral fuels. It is a compilation of previously published separate papers on petroliferous occurrences in various parts of the country. Obtainable on request to the Survey at Washington, D. C.

**Wyoming Oil**—U. S. Geological Survey Bulletin 716—E (thirty-two pages, free from the Survey at Washington) is descriptive of the Lance Creek oil and gas field, in Niobrara County, Wyo. The field now has about a dozen producing wells.

**Black Sand**—U. S. Bureau of Mines Reports of Investigations No. 2,192 describes briefly test methods of recovering gold from Alaskan black sand. Obtainable on request to the Bureau at Washington.

## Book Reviews

**Latin-American Year Book for 1920.** Cloth; 6 x 9; pp. 647. Published by the Criterion Publishing Syndicate, Inc., New York. Price, \$4.50.

This is the third of a series of annual handbooks descriptive of Mexico and the Central and South American countries from the investors and merchants' standpoints. Considerable space is devoted to political conditions, natural resources, foreign trade, financial conditions and customs tariffs. Names of important dealers in each country are also given.

**The Centenary Volume of Charles Griffin & Co., London.** Cloth; 6 x 9; pp. 290; illus.

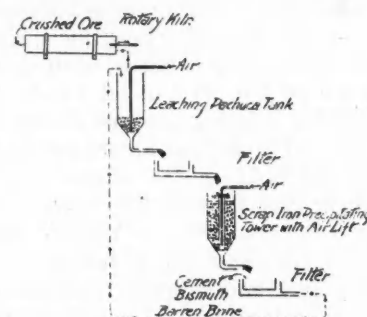
This artistic book has been prepared to review a hundred years of progress by the technical publishing house of Griffin. The achievements of this firm in the dissemination of scientific knowledge have made their name familiar throughout the world. The volume is most happily conceived, and gives a brief history of the development of mining, metallurgical and chemical technology throughout the last hundred years, as well as other subjects which have been covered so authoritatively by the Griffin publications.

**Annual Report of the Director of the Mint for the Fiscal Year Ended June 30, 1920.** Cloth; 6 x 9½; pp. 309. Government Printing Office, Washington, D. C. Free from the Treasury Department.

This is a report of the operations of the Mint during the fiscal year 1920, with the production and consumption of gold and silver in the United States during the calendar year 1919. The book contains highly valuable statistical tables covering foreign and world monetary matters, as well as many descriptive reprints of articles discussing developments in currency during the last year.

## Recent Patents

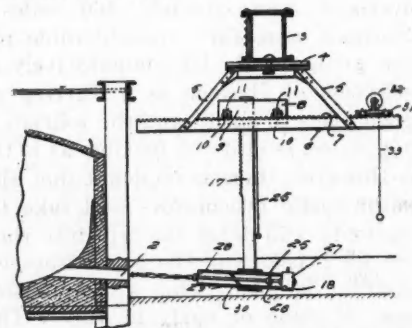
**Extraction of Bismuth**—No. 1,360,271. J. F. Cullen, Midvale, Utah, and M. J. Udy, Salt Lake City, Utah, assignors to U. S. Smelting, Refining &



Mining Co. A method of extracting bismuth which consists in leaching the ore with brine containing an acid to form a solution of the bismuth salt of that acid, and precipitating the bismuth from solution.

**Flotation Reagents**—Nos. 1,364,304-8 inc., C. L. Perkins, Pittsburgh, Pa., assignor to Metals Recovery Co., New York. These patents in order cover the use of a non-oleaginous mineral-collecting agent; an organic nitrogen compound containing two nitrogen atoms joined to each other; a hydrazine compound; an organic nitrogen-sulphur compound, and a thio-urea substance or compound. Mr. Perkins' patents Nos. 1,364,858 and 1,364,859 cover similar flotation processes.

**Furnace Tapping Machine**—No. 1,361,103. T. T. Scott, Youngstown, Ohio. A mechanical arrangement to facilitate the tapping of furnaces as shown in the accompanying cut.



**Amalgamator**—No. 1,361,723. Ralph Hanssen and P. B. Haug, Great Falls, Mont., and M. E. Darby, Tacoma, Wash. A form of amalgamator comprising an inner and outer cylinder, with rifles and ribs on the outer cylinder to hold the mercury.

**Concentrating Table**—No. 1,360,764. Irving Klindt, Round Mountain, Nev. A new concentrating table of box form.

**Roller Mill**—No. 1,361,601. F. E. Marcy, Salt Lake City, Utah. A new type of mill, having the discharge end normally open, and carried on roller bearings.

# COURT DECISIONS IN MINING CASES

By Wellington Gustin

## Oral Agreement Void in Transfer of Real Property

**Cerro Gordo Mines Co. and Others Win New Trial Over Chris Crohn Springs in California**

The Inyo Cerro Gordo Mining & Power Co., the Cerro Gordo Mines Co. and Louis D. Gordon, defendants in the action brought against them by S. C. Simons, have been granted a new trial by a decision of the Supreme Court of California, reversing the judgment obtained against them.

The lower court had adjudged Simons to be the owner of the "Chris Crohn Springs," situated about four miles northeasterly from Cerro Gordo, in Inyo County, Cal. It further decreed that Simons had the right to divert all the waters for domestic, mining and milling purposes; that Simons is the owner of all the pipes, flumes, tanks, pumps and other apparatus used to divert and conduct the waters; and that plaintiff recover damages of defendants.

Simons claims title to the springs as successor in interest of Chris Crohn, an old miner and prospector, who conveyed water in kegs on muleback from one of the three springs to the mining camp at Cerro Gordo and there sold it by the gallon. This business was continued until 1882. In 1878 a pipe was laid to the Augusta mine located by Crohn.

Defendant Cerro Gordo Mines Co. claims through the Union company, which purchased the Cerro Gordo mine in 1889 and purchased from others rights to the springs, such rights being claimed by reason of certain appropriation notices posted by it at or near the springs. Immediately after purchasing these claims the Union company built and installed the diversion system of pipe lines, pumps, tanks, and complementary distributing apparatus. From its installation in 1889 to the date of the trial the system was used by the Union company and by its successor the Cerro Gordo Mines Co.

There was evidence to the effect that in 1890 the general manager of the Union company told Chris Crohn that the company would pay Crohn 1½c. per gallon for all water it might take from the springs through its diversion system, and that if it did not pay such rent and the company should quit working, Crohn could have the pipe lines, pumps, tanks, and other means of storage and distribution.

The court held the system to be real property, title to which under an agreement with the general manager of a mining company must be supported by evidence that he had authority to dispose of same. Further, it was pointed out that, the right of way and pipe lines being realty, the property could not be

conveyed by an oral agreement. The sale must be evidenced in writing.

But it was said that the Cerro Gordo Mines Co. and its predecessor the Union company were trespassers, and therefore had no rights to the system. In answering that the court said, even if the Union company never acquired any water right, and even if, as against the Federal Government, the laying of the system through upon the vacant public lands was a trespass, still as between the disputants herein, the plaintiff Simons would not be entitled to the system. But as a matter of fact, the court said, neither the Union company nor the Cerro Gordo Mines company was a trespasser, either at the springs or in the vacant government lands wherein its diversion system was installed.

## Oklahoma Court Defines Operators' Liability

A judgment for \$9,650 for personal injuries has been affirmed in the Supreme Court of Oklahoma against the Quapaw Mining Co., and in favor of Charles Cogburn. The latter was employed in the company's lead and zinc mine, and was severely injured by falling rock from the roof or side of the drift in which he was working. He alleged that the company was negligent in failing to provide timbers to prevent the falling of the rock and in failing to inspect the mine. The company made denial, and defended on the grounds of contributory negligence and assumption of risk of the employee, and further alleged a settlement with the employee before trial. These things were in turn denied by the employee, and though the settlement was admitted it was charged same was procured by fraud.

These facts were presented to a jury, which rendered the above detailed judgment against the company. The injuries consisted of wounds upon the head, back, breast, and arm, the back wound resulting in permanent paralysis from the waist downward. Settlement had been made for \$2,000, which was alleged to have been obtained by fraud, consisting of false and misleading statements made to the employee concerning his condition by the claim agent and physicians, that he was not badly injured.

The court said that where a release for personal injuries has been obtained fraudulently for a grossly inadequate sum, an action for damage may be brought without first obtaining a decree to cancel or rescind the release. Further, the statute prescribing certain duties of mine operators toward employees, including the duty of daily inspection, applies to the operator of lead and zinc as well as coal mines.

## Leases of Blue Stem Oil Cancelled Kansas Supreme Court Holds Them Terminated Notwithstanding Unavoidable Obstacles

The difficulties of well drilling and a lack of foresight in the lease contracts are shown in the decision of the Supreme Court of Kansas terminating the leases of the Blue Stem Oil Co. on the Baldwin lands in Greenwood County.

The leases provided that they should remain in force for three years, and that they should terminate in one year if no well was completed within that year. They also provided for an extension of the leases from year to year by the payment of rental named therein; but the leases terminated absolutely at the end of three years from their dates, unless a well was drilled producing oil or gas.

The oil company contended that the leases should not be forfeited by reason of the failure to complete a well before the end of the three year period. Forty days previous to this date drilling was begun. The delay in drilling was due to lack of adequate water supply, as it was alleged that from 1916 to Nov. 7, 1918, rain did not fall in a quantity sufficient to supply water for drilling, and that after the latter date drilling operations were begun, but on account of excessive rainfall the roads became muddy so that fuel for the engine and casing for the well could not be transported. Then a blizzard intervened, and the employees became sick—too sick to drill. Furthermore it was impossible for them to obtain coal and casing, on account of the action of the United States in taking charge of coal supplies and all casing, and in prohibiting the purchase, sale, and use of casing, in wells in territory not proven.

The Supreme Court said ample time was given by the terms of the leases. The company was compelled to take notice of the climatic conditions and of the topography of the country in the vicinity of the lands; as well as of the powers of the Government over coal and iron industries. The company with knowledge of these things contracted positively that it would be certain work within a certain time, or that its rights in the premises should cease, unless gas or oil should be produced from the land, by the lessee. Neither was produced. By paying the rent provided for in the leases, the company could neglect to drill until the leases expired, but the company, if it failed to produce oil or gas from the lands, could not, by paying rent, extend the leases beyond the time fixed for their expiration, nor could excuses for non-performance extend the leases beyond that time.

The leases were declared by the court to be forfeited.

# ECHOES FROM THE FRATERNITY

## SOCIETIES, ADDRESSES, AND REPORTS

### Labor, "Capital" and Brains Discussed Before Philadelphia's Engineers

J. Parke Channing Points Out Reason for Human Engineering, Outlines Its Field, and the Object To Be Attained

"Industrial Relations" was the subject of an address made by J. Parke Channing, of New York City, before the Engineers' Club of Philadelphia, on Feb. 1 last. Mr. Channing holds that "the capitalistic system of production is the best that we know of. It is by no means perfect, but it has within itself the capacity for such advancement and improvement that it ever tends more nearly to perfection. A balancing of our altruistic and egotistic tendencies will lead to a proper solution of the problem of production and distribution.

"In industry there are three elements to be considered—labor, management and capital. Capital is nothing more or less than the savings of the prudent, which are put aside for the construction of new means of production. But labor and capital would not of themselves be capable of carrying on industry. Most important of all is management, which also contains that element of brains, which leads to discovery, invention, and the increased productivity of labor and capital. Mallock has pointed out that the century's tenfold increase in productivity has been caused by the application of brains." Logically brains should have received this increase, but in fact the larger portion goes to the manual laborer, who, in the long run, represents the consumer.

"In common with non-technical men the engineer has neglected the human side of engineering. Most technical schools in the United States, including the Y. M. C. A., now have courses in Human Engineering. We must give the men working for us an idea of economics. We must let them know what profits we possibly can make in any industry. We must also impress upon them that they are the ultimate consumers of goods and get them to recognize that a man ultimately is not paid in dollars and cents but in food, clothing, and a house to shelter him, and in the various pleasures of life. We must take him into our counsels when we consider the conditions of work, get his ideas, and arrive at conclusions that are mutually satisfactory. These results are being brought about by shop committees and by agreements with unions.

"We must not arbitrarily say that we cannot deal with unions any more than they can say they will not deal with

large aggregations of capital. The progressive labor leaders are good economists, and many of them understand the theories of production better than most employers. They practically say they do not wish to trespass upon the domain of management. What they want are good living conditions for the members of their unions and as large a part of the profits as they may economically get.

"John R. Commons has pointed out that if all employers and all managers were ideally constituted there would be no need of unions, and John R. Commons started life as a printer! . . . We have inefficiency of capital and inefficiency of management. One of the first things Herbert Hoover did when he became president of American Engineering Council was to appoint a committee on the elimination of waste in industry. His idea was to fearlessly investigate waste of effort, both on the side of the laborer and on the side of capital, and, after getting at as many of the facts as possible, to see if there was not an opportunity of stabilizing industry in the same manner in which banking has been stabilized by the introduction of the Federal Reserve system. It is a tremendous task, but unless someone gets at it it never will be done."

### Copper and Its Uses Discussed by New York Section, A. I. M. E. Engineers, Statisticians and Publicity Men Analyze Reasons and Remedies for the Metal's Troubles

At the annual meeting of the New York section of the A. I. M. E. held on Feb. 2, the general subject for discussion was "Copper Metal—From the Consumer's Point of View." The four speakers were W. S. Barstow, an electrical engineer familiar with electrification problems of national scope; Ivy L. Lee, a publicity man who has been investigating new outlets for copper for the Copper and Brass Research Committee; William S. Murray, chairman of the Superpower Survey, and H. A. C. Jenison, statistical expert on copper for the U. S. Geological Survey.

Mr. Barstow pointed out some of the possibilities for the use of copper in railroad electrification and emphasized the evil results which over-regulation of public utilities had brought about. The electrical industry is prevented by unwise laws from expanding, and copper producers should take more of an interest in this subject.

Mr. Lee read an exceedingly interesting paper which chiefly brought out how copper has been superseded by less meritorious metals, owing to

their cheapness and better advertising. Aluminum, he said, was a drug on the market twelve years ago. Now 50 per cent of the kitchen utensils sold in this country are made of that metal, 25 per cent of enameled ware and only 6 per cent of copper, which was formerly so popular. The reason—publicity; advertising. Armco iron and monel metal were also cited as metals, the sales of which were vastly increased by the interest taken by their producers in marketing their product. No such scientific effort has ever been made to broaden the uses of copper.

During the war copper and brass were hard to get, and substitutes were developed which are still used. They are in general cheaper and less satisfactory, but the consumer has not been educated to know the difference.

Mr. Lee gave some enlightening statistics on the amount of copper now used in pins, plumbing, hardware, and other fields, and of the ridiculously small amount purchased for some of the large New York buildings.

Mr. Murray explained the problems which the Superpower Survey is trying to solve. He showed how much more efficient electrified railroads in densely populated communities are, as compared with steam, and explained the advantages of immense central stations of approximately 300,000-kw. capacity situated at strategic points for supplying power. The opportunities for copper in this work are obvious. Mr. Murray seconded Mr. Barstow's remarks on the evils of over-regulation of public utilities.

The last speaker, Mr. Jenison, unfortunately had prepared a paper which covered the same ground as that of Mr. Lee. He brought out several new points, however, among them the importance of pushing the investigation and use of steel containing small percentages of copper. The anti-corrosive properties of such steel appear to be marked. Mr. Jenison also suggested that the propaganda of the aluminum producers in their effort to introduce aluminum cables for transmission purposes should be combated.

### Journal of Electricity and Western Industry

The *Journal of Electricity*, which has been one of the McGraw-Hill publications since September, 1919, is hereafter to be known as the *Journal of Electricity and Western Industry*. This announcement was made at a dinner held on Feb. 1 at the Palace Hotel, San Francisco, in recognition of the thirty-fifth anniversary of the *Journal of Electricity*. Robert Sibley will continue as editor of the enlarged publication.

## MEN YOU SHOULD KNOW ABOUT

L. W. Stephenson has been given leave of absence by the U. S. Geological Survey to accept a private geologic mission in Mexico.

D. H. Angus, former manager of the Tough Oakes mine, has been appointed manager of the Bidgood mine, Kirkland Lake, Ont.

W. A. Howard, general manager of the United States Smelting Co., in Salt Lake City, has returned from a trip to the East.

D. R. Thomas, mining engineer, has moved from Teziutlan, Puebla, Mexico, to Mexico City, where his address will be Edificio La Mutua 522.

George E. Burton, geologist, has opened an office for consultation in petroleum geology at 1216 Colcord Building, Oklahoma City, Okla.

A. M. Yonge, consulting mining engineer, has closed his office in Washington, D. C., and is now established at 2638 Russell St., Berkeley, Cal.

G. L. Harrington, of the U. S. Geological Survey, has been granted leave of absence for one year that he may engage in private work in South America.

S. R. Guggenheim has been elected president and chairman of the executive committee of Braden Copper Co., succeeding W. C. Potter, who has resigned.

Walter J. Browning, manager of the Rio Tinto mines, in Spain, was twice fired at recently while on his way to the company office. He escaped injury.

M. Gomez, administrative director of la Société des Hauts-fournaux de Bilbao, Spain, was seriously wounded during a terrorist attack.

Charles Trezona has concluded an inspection of the Gogebic Range, in the course of which he investigated developments and progress in mechanical mucking.

Thomas A. Graves, of Silver Creek, N. Y., has returned there after a nine months' trip to Peru, where he examined mining properties and petroleum territory.

James Hamet Dunn, a native of Nova Scotia and a prominent financier, who organized the British America Nickel Corporation during the war, has been made a baronet.

Arch M. Chisholm, a large holder of mineral lands on the Mesabi Range, Minnesota, is making an extended trip through the Southwest and Mexico to look over some holdings there in which he is interested.

H. C. George, chief engineer of the Wisconsin Zinc Co., succeeds A. E. Drucker, resigned, as professor of metallurgy on the staff of the Wisconsin State Mining School at Platteville, Wis.

Archie McDonald, resident manager of the Sterling Mining & Milling Co., Flesher, Mont., is devoting three months to special studies in ore testing at the Idaho School of Mines, Moscow, Idaho.

Oliver C. Ralston, superintendent of the Seattle station of the U. S. Bureau of Mines, is accompanying the supervisor of stations, Dorsey A. Lyon, on a visit to the various Western stations of the Bureau.

H. A. Guess, consulting engineer on mining and milling subjects for the American Smelting & Refining Co. and the Guggenheim interests, left early this week for a two months' trip to South America.

Eugene H. Dawson, of New York City, has just returned from a trip to South America, in the course of which his investigations involved a trip up the Amazon through Brazil and over the Andes into Peru.

W. J. Cowsert continues in charge of the construction of the new mill for C. O. D. Mines, Inc., at Kingman, Ariz. Charles H. Urquhart, general superintendent, writes that Mr. Cowsert has been in charge since the start. This is to correct a statement concerning L. F. Barber published on Dec. 11 last.

Charles Grabowsky, assistant general superintendent in the Eveleth, Minn., district for the Oliver Iron Mining Co., has been promoted to be general superintendent in the same district, succeeding the late R. J. Mitchell. W. F. Pellenz has been promoted to assistant general superintendent.

Colin G. Fink, manager of laboratories of the Chile Exploration Co., New York City, addressed the Pittsburgh Section of the American Electrochemical Society on Jan. 28. He spoke on "Modern Developments in Metallurgical Research."

Sam H. Richardson, mining engineer, identified with mining operations in the Republic district, Washington, has been elected to the Legislature. It is believed that Mr. Richardson is the first mining engineer to be elected to the Washington Legislature.

The American Committee of the International Chamber of Commerce includes among its members Herbert Hoover, of Palo Alto, Cal.; Cornelius F. Kelley, of New York City; J. D. A. Morrow, vice-president National Coal Association; and Thomas A. O'Donnell, Los Angeles, Cal.

Among engineers visiting New York City during the week ending Feb. 8 were Charles Janin, San Francisco, Cal.; Carl Nystrom, care of the Swedish Legation, Washington, D. C.; Jon A. Udden, chief geologist of Sinclair Oil & Gas Co., Tulsa, Okla.; and C. E. Macdonald, Toronto, Ont.

George C. Martin, geologist, with the Division of Alaskan Mineral Resources, U. S. Geological Survey, has resigned that position to become technical assistant to C. F. Bowen, chief geologist of the Standard Oil Co. (N. J.). Dr. Martin, who is a graduate of

Johns Hopkins University, has been with the Geological Survey since 1903, and was acting chief of division during 1917-1918. He has devoted much time and study to the coal and oil fields of Alaska, Maryland, and other states.

## SOCIETY MEETINGS ANNOUNCED

The Engineers' Club of Northern Minnesota expects to hold its annual banquet on Feb. 26 at Eveleth, Minn.

The Iron and Steel Institute, 28 Victoria St., London, S. W. 1, will hold its annual meeting on May 5 and 6 at the House of the Institution of Civil Engineers, Great George St., London, S. W. President J. E. Stead, F. R. S., will preside. The annual dinner will be held on the evening of May 5.

American Association of Engineers will hold a national engineering conference on public information at the Congress Hotel, Chicago, Ill., on Feb. 25. Engineering publicity will be discussed from every angle. Among the speakers will be: F. M. Feiker, of the McGraw-Hill Co. publications; Richard H. Waldo, of New York; State engineer J. G. D. Mack, of Wisconsin; and C. R. Thomas, of Forest Products Laboratory at Madison, Wis.

The Idaho Mining Association held its eighth annual meeting at the Chamber of Commerce, Boise, Idaho, Feb. 11 and 12. The discussions covered: Proposed revision of the Underwood tariff act, and of the Kitchen revenue act; the stimulation of gold production; the injustice of the "enlarged homestead" act. On the evening of Feb. 11 D. H. Ferry, manager of Yukon Gold Co., gave an illustrated talk on gold dredging, and Walter C. Clark illustrated the mining industry of Idaho.

## OBITUARY

Harry D. Symmes, mining engineer and member of the Engineering Institute of Canada, died at Niagara Falls, Ont., on Jan. 29 at the age of fifty-one. Mr. Symmes was on the directorates of the McIntyre and Temiskaming mining companies for several years, and was largely interested in oil and natural gas enterprises. He was also the manager of the first electric railroad built in Canada.

John Edyvean, a pioneer resident and copper washer, died on Jan. 10 at his home in Lake Linden, Mich., at the age of sixty-seven. He was born in England, and came to this country at an early age with his parents. At the time of his death he was foreman copper washer in the Hecla mill of the Calumet & Hecla Mining Co., and had occupied a position of trust with that company for many years.

# THE MINING NEWS

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

## LEADING EVENTS

### WEEKLY RÉSUMÉ

The second shot has been fired by Karl Eilers in his fight to oust the Guggenheim interests from the control of the American Smelting & Refining Co. Stockholders have been circularized by Mr. Eilers with a further request for proxies to be used at the approaching annual meeting. As to the industrial situation, curtailment of production and wage reduction continue the features most prominent. Anaconda has suspended development at its South American properties and will shut down its electrolytic zinc plant at Great Falls on Feb. 28, Elm Orlu also closing its mine and mill. Producers of magnesite in the State of Washington have ceased all operations, which is attributed to the competition of Austrian magnesite. In Colorado, the Industrial Commission has invited operators to attend a hearing on Feb. 15 at which the question of wage reduction (already announced and in some places now in effect) will be discussed, the point being that the state law forbids such changes without investigation first. A bill calling for the creation of a Blue Sky commission to license the issue and sale of securities in the state has passed its second reading at Denver. At Butte, counsel for Butte & Superior and Minerals Separation are expected to ask soon that a date be set for argument in connection with the accounting in the flotation case.

Little has occurred at Washington. The proposed Division of Mines and Geology has been discussed in the Senate Committee on Mines and Mining and the Senate bill for liberalizing war mineral relief legislation has been broadened as to the "request or demand" feature.

### Blue Sky Commission Called for in Colorado Bill

A bill has passed the Colorado Senate on second reading providing for a Blue Sky commission authorized to license the issue and sale of securities within the state. The bill is strongly opposed in its present form and only escaped defeat by a margin of two votes.

There is strong sentiment in favor of some sort of Blue Sky legislation in both branches of the Legislature, and the leaders say that the platform pledges of both parties for regulatory enactments regarding the sale of securities will be carried out.

### The Naica Controversy

Protest of Foreign Governments Over Recent Decision of Mexican Court Puts Famous Case Once More in Limelight—Stoppelli Heirs and Associates Awarded Property and Damages

BY JOHN E. KELLY

The recent action of the Supreme Court of Mexico in deciding in favor of the Stoppelli claimants in the celebrated Naica case has attracted widespread attention, owing to the prominence of the litigants, the amount involved and the protests of four foreign governments at the decision. The litigation is said to involve a sum not less than 10,000,000 pesos.

The heirs of Santiago Stoppelli are suing the Cia. Minera de Naica, S. A., for the return of the Maravillas mine, a surrender of all returns from the workings, and 6 per cent interest on same. The American Metals Co., Ltd., through the Cia. Minera de Penoles, S. A., of Mapimi, Dgo., is owner of 40 per cent of the stock of the Cia. Minera de Naica, the rest being held by Mexicans, Belgians, French and English subjects. The mines are situated at Naica, Chihuahua, east of Jiminez. A narrow-gauge line connects the property with the Mexican Central. The mines are extremely rich, but in common with other properties in Chihuahua, were hampered by many interruptions during the Villa rebellion.

The history of the mine dates back to 1896, the year in which the Maravillas mine was discovered and denounced by Don Santiago Stoppelli. The litigants agree on this point, but vary so widely on all subsequent happenings that their respective claims on each important point will be noted that the reader may judge for himself.

Stoppelli disclosed his find to one Don Saturnino Gonzalez, a contract being drawn up between them. The Cia. Minera de Naica claims that Stoppelli sold his right of denouncement, which was all he possessed at the time, for 500 pesos, and was granted twenty-five of the original hundred shares in the Cia. Minera de Naica, S. A. The heirs claim that Stoppelli owned the Maravillas property, that he did not sell or transfer his ownership, but that he merely permitted it to be exploited under the terms of the agreement. They further claim that he paid twenty pesos (the nominal value) for each of the twenty-five shares he received, so that instead of receiving the 500 pesos, as

alleged by the company, he paid it into the treasury in cash.

The company further states that as Stoppelli did not pay an assessment, his shares were declared vacated, and that he lived seven years after the original agreement in 1896, and four years after his shares had been declared vacated, without making any protest. The heirs' rejoinder claims bad faith on the part of the other shareholders, in that no assessment could be claimed against the fully paid shares under the law, that the meeting at which the alleged assessment was passed was illegal, as it was not advertised and other legal requisites were not observed. They quote the Commercial Code to show that a protest against an action in bad faith may be brought by the interested person or his estate at any time, no matter how long after the action of which complaint is made. In other words, that there is in this matter no statute of limitations as the company claims.

The Naica company further states that in 1905 the heirs brought suit, not against the validity of the company, but basing their claim on the vacating of the shares held by Stoppelli in 1896. That this suit was settled by the payment of 30,000 pesos to the heirs. That the heirs, despite the fact that they were enjoying the payment of the above sum, were tempted by the large returns due to heavy investment and wise management, and again brought suit. To these charges, the claimants reply that the former suit was brought by Maria Stoppelli, not by the heirs, as the majority of them were minors in 1905, and that, in any case, that action was based on the vacating of Stoppelli's shares, whereas they claim that the Maravillas property in itself is their property, as their father never ceded it, but merely permitted its operation by the company, in whose profits he was to share.

The Naica company makes a point that the original agreement plainly states that Stoppelli was to transfer entire title in the Maravillas property as soon as a title in his name should be granted by the Secretaria de Fomento.

The heirs reply that the agreement was illegal according to Articles 95, 170, and 175 of the Commercial Code, in that it does not contain a statement of the capitalization nor of the value of the real estate introduced by Stoppelli; that it does not define the number, kind, and nominal value of the original shares; that no sinking fund was provided for, and other legal details of like nature.

It is further claimed by the company that, under Article 51 of the Mining Law, the owners of a property are permitted to occupy and work it as long as taxes are paid thereon, and that as the heirs have paid no taxes on the property, they would have lost ownership in any case. This argument would seem ill-founded, for the Stoppelli interests have not been in physical possession of the property since 1896, and if, as the claimants allege, the company is in unlawful possession of the property, the taxes paid by the company during the time that it has possessed the Maravillas would be credited to the rightful owners.

#### COURT FINDS FOR PLAINTIFFS BY SIX TO FIVE VOTE

In brief, the Stoppelli interests claim that Stoppelli never relinquished ownership of the Maravillas mine, and that his heirs and their associates are entitled to a restoration of the property and all its profits, whereas the Cia. Minera de Naica contends that whatever claim Stoppelli had on the property was disposed of in 1896, in a document which the heirs declare illegal. On these facts, the Supreme Court of Mexico decided, by a vote of six to five, to uphold the action of lower tribunals directing the restoration of the property, and the payment of damages, interest, and costs by the Cia. Minera de Naica.

It is to be deplored that four foreign governments have seen fit to intervene in the domestic concerns of Mexico. It will do no good, for it will merely strengthen the determination of the court to uphold its decision. Both the Cia. Minera de Naica and the Cia. Minera de Peñoles are Mexican corporations, which are bound by their charters to abide by the decision of Mexican courts. It is true that the Cia. Minera de Naica denies that it has officially protested to any foreign government, naively adding, however, that it "cannot prevent" (*no tiene a su alcance medio de impedir*) its foreign shareholders from appealing to their governments.

Some attempt has been made to give a political color to the controversy, it being alleged that Lic. Roque Estrada, brother to the Subsecretary of War, and the late General Benjamin Hill, Secretary of War in the cabinet of President Obregon, were interested in the Stoppelli claim. A dispatch emanating from Washington after the Supreme Court's award was known pointed out that the American Metals Co. had enjoyed favors from the Carranza regime, the inference being drawn

that an anti-Carranza government had shown its resentment by an adverse verdict. But there is no evidence to show any tampering with the Supreme Court, which affirmed the decisions of two lower courts, and it should be remembered that the magistrates composing the court took office under President Carranza, were with him when he evacuated Mexico City last May, and, far from being prejudiced against Carranza or his favorites, their decisions on political matters have so often been displeasing to the present government that the Procurador General, Lic. Eduardo Neri, recently threatened to cite the court before Congress, charging them with delaying actions brought against members of General Carranza's party.

#### Leadville Mine Development Co. Organized

Leadville is to again have a strong home operating mining company which will be known as the Leadville Mine Development Co. The company was organized at the instance of the Leadville Chamber of Commerce and the property selected was the choice of almost 60 per cent of the votes of its members. The company is capitalized at \$150,000 in \$10 shares.

On the Board of Directors are Jesse F. McDonald, former Governor of Colorado; John Cortellini, president of the Leadville Chamber of Commerce; E. D. Dickerman, M. Harvey and Joseph W. Clark, all operators of mines in the Leadville district.

The property to be taken over by the home company is known as the Canterbury Hill and Prospect Mountain tunnel project and has been under consideration for several years past by several interests which for various reasons have failed to enlist the necessary capital. The proposed tunnel opens up a territory where surface development in early days along the line of the tunnel is said to have been very promising.

The initial work will be the driving of the tunnel 1,600 ft. to a point beneath the old Diamond shaft where, before the advent of the railroad into Leadville, ore was taken which ran several hundred ounces in silver, with a high percentage of lead. This property has been idle since 1894. Ultimately it is expected that the tunnel will be extended to connect with the Yak workings.

#### Washington Mining Association Elects Officers

The Washington State Metal Mines Association re-elected the following officers at the annual meeting held recently at Spokane, Wash.: L. K. Armstrong, president; E. H. Knight, vice-president; M. E. Poole, secretary-treasurer. The following, together with the officers, constitute the board of trustees: H. S. Stoolfire, M. J. Sweeny, Dan Bagnell, J. L. Drumheller and J. C. Haas. These were all former members of the board except J. C. Haas.

#### Karl Eilers Solicits Proxies Again for A. S. & R. Election

##### Recent Letter to Stockholders Repeats Charges Made in Application for Writ of Mandamus

Stockholders of the American Smelting & Refining Co. have recently been circularized by Karl Eilers, formerly vice-president and director of the company, in a further effort to secure sufficient proxies to enable him to oust the Guggenheims from control at the next annual meeting, to be held in New York on April 6. In a letter sent to each stockholder under date of Jan. 31 Mr. Eilers repeats his former charges, saying in part:

"Probably you have wondered at and perhaps been concerned about the situation in your company. Its stocks have declined far below those of other supposedly good industrials. Its net earnings have declined so as to be changed into losses. Its cash has declined so that the company has become a large borrower. Its directing head has declined and tapered down from a Daniel Guggenheim to a Simon Guggenheim. Its organization has declined in morale, efficiency and personnel. Its dividends have declined and its chances of increased dividends are steadily declining. Its business prospects are declining, particularly since the recent gift of the copper sales agency (heretofore worth more than a million a year) to Guggenheim Brothers. Why?

"The Guggenheim family formerly owned a very large stock interest—probably the actual control. They absolutely dominated the company. When either because of or in spite of this domination the company had grown and a broad market had been established for its stock the Guggenheims quietly sold out 'on the other stockholders' to the extent of practically all their stock. It then being to their interest, perhaps they really did do a good deal toward placing the company in such good position—that they could profitably sell out. At any rate, up until after that time Mr. Daniel Guggenheim gave to the matter his personal attention.

"Since then, taking their profits and investing them elsewhere, the Guggenheims have had larger financial interests in other concerns with interests conflicting more or less with those of your company. However, they have held on to the control of your company largely because of the prestige and strength it gave them in handling their own enterprises. They still absolutely dominate your company because you stockholders have not awakened to the alarming situation which has been greatly intensified by these changes. That the Guggenheims themselves are quite awake to the change occasioned by their disposal of their stock interest is shown, perhaps, by the fact that, except in matters affecting Guggenheim interests, Mr. Daniel Guggenheim has ceased to bother with the affairs of your company, and whatever vision and direction it gets has to come from his younger brother, Simon.

"They gave an illustration of their absolute domination and of their disregard of stockholders at the last election. They used the proxies, confidently sent them by the stockholders, to drop me from the board (and they now speak of me as a discharged employee), although the company's books show that I was by far the largest stockholder on the board. I happened to be personally in a financial position which allowed me to question Simon Guggenheim's plans and policies when they were not in the interest of the stockholders, and often I had found it necessary to do so. The sole ground of my removal—obligingly given in advance in writing by President Simon—was that I was not in accord with him.

"The Guggenheim management of Smelters has but just now transferred as a *gift* from your company to Guggenheim Brothers contracts for copper sales agency or brokerage which brought the company in net proceeds of over \$10,000,000 in eight years. No characterization of this amazing transaction is necessary. The Guggenheims, apparently, thought they had to say something and have sought to do two difficult, if not impossible, bits of explaining—that is, to justify this *gift* and to excuse certain past losses incurred in gambling in copper—by playing one questionable act off against another in making the absurd claim that the gambling was a necessary part of the brokerage.

"Do you, an owner of Smelters, believe that the Guggenheims, who are but slightly interested in Smelters and very largely interested in Guggenheim Brothers, should have had the 'say' as to handing over that valuable business? Should they have the say as to the making of smelting contracts with mining companies in which they are interested more largely than they are in Smelters?

Although in the *fourteen* years, ending June 30, 1920, the capitalization and debt of the company have been largely increased, no possible benefit therefrom has accrued to the stockholders. The net quick assets per \$100 of capitalization and debt show no increase. And on the contrary the dividends on the common stock have declined from 7½ per cent to 4 per cent per annum.

"The Guggenheims have resented criticism by the real owners and have run your company, with which they are little concerned, as a convenient side enterprise of their own. For instance, they have turned over to Smelters for approximately \$22,000,000 in cash and its equivalent some of their poorer mines. But by a remarkable series of coincidences neither Chile, nor Braden, nor Utah nor Nevada Con., nor any other of the wonderful successes offered to the Guggenheims ever found its way into Smelters or was offered to its stockholders, but went where the Guggenheims personally were more interested. That is, Smelters paid them for less successful mines, but never even by accident did it get any of the re-

markably good opportunities which came to the Guggenheims originally because of their positions in Smelters.

"The domination of the Guggenheims is to be regretted not only for many things which they have done, but also for many things which they have not done, and even more for many things which, by merely occupying the positions of power and initiative, they have kept others from doing. Perhaps the greatest of all the evils due to their domination is that it has prevented, and, if continued, will prevent your company from having a management of its own of responsibility and initiative.

"To remedy this is of the utmost importance, and can be done, I believe, with very few changes in the management if the directors are made to owe their position to the vote of the stockholders and not to the whims of the Guggenheim family. The removal of the Guggenheim threat with the opportunity of freedom of action to the directors and management will immediately increase the opportunities, efficiency and energy of the board and the organization, and will benefit the company almost at once and automatically.

"Very large salaries (amounts kept secret even from the directors but believed to aggregate more than \$500,000 each) have been paid by your company to a number of members of the Guggenheim family who were more interested in other concerns and who devoted most of their time and real effort to other matters. To what end were they given these offices and salaries? Since they sold out, certainly not because of their investment in the company.

"It has been the policy of Smelters and of other large industrial corporations to require their higher salaried men to make contracts to devote their 'entire time, energy and skill' to the service of the company. Were the numerous Guggenheims required to make such contracts? If not, why not?

"If so, what rights has your company in the enormously valuable Chile Copper and other properties to the organization and development of which they devoted so much of the 'time, energy and skill' which must have belonged to your company?

"The sum total of such salaries paid the members of the Guggenheim family is very large, but it is as nothing compared with the value of opportunities which the Guggenheims sent elsewhere or compared to other possible losses due to having the actual management of the company in the hands of those who were not primarily concerned with the company's financial success but were personally interested in the success of other and sometimes conflicting concerns, even if they had no intent to divert profits from your company."

#### Inspiration's Output Unchanged

Inspiration produced 5,000,000 lb. copper in January; unchanged from December.

#### Legislature Calls for Inquiry Into Golden School's Affairs

##### Bill Introduced To Place Management Under Regents of State University

The controversy regarding the Colorado School of Mines has resulted in the introduction into the General Assembly at Denver of a bill providing for the removal of the management of the school from the board of trustees and placing the institution in the hands of the regents of the State University. On Feb. 3 the House passed a joint resolution calling for an investigation of the board of regents, school of mines, its officers and the administration of the school which stated:

"Whereas, for several years past the friction and discord relative to the management of the Colorado School of Mines has brought unenviable notoriety to that institution and resulted in conditions affecting the reputation of the school which can no longer be ignored;

"Whereas, in an effort to remedy conditions relative to the administration of the school, a bill is now pending before the General Assembly which would place the control of this institution in the hands of the regents of the State University; therefore be it

"Resolved, by the House of Representatives of the Twenty-second General Assembly, the Senate concurring, that the Speaker of the House shall appoint three members and the president of the Senate two members who shall compose a committee empowered to make such investigations regarding the board of regents, the school of mines, its officers or the administration of the school, as they deem proper under the provisions of this resolution, and be it further

"Resolved, that this committee shall make its report together with such recommendations regarding the management of the Colorado School of Mines as its members believe will restore the prestige formerly enjoyed by this institution, said report to be made on or before Feb. 21, 1921."

The resolution will promptly pass the Senate and indications are that a strong committee will be appointed to carry out the provisions of the resolution.

#### Concentrator at Park City, Utah, Destroyed by Fire

The concentrator of the Silver King Coalition Mining Co. at Park City, Utah, was destroyed by fire on the night of Jan. 27. The fire is thought to have started in the boiler room. A small transformer house, about 300 ft. of snowsheds, some ore bins, and trackage were also destroyed, although a strong east wind blew the fire away from the mine buildings in time to prevent more damage. The mill was insured, and it is planned to build a more modern plant. Experiments with oil flotation have been made with some success, but it is hardly likely that wet concentration will be supplanted entirely by this newer method.



**German Attention on Plebiscite Nearing in Upper Silesia**

**Loss of Great Mineral Wealth Would Be Blow to Empire—Coal Wages Doubled in Year**

*From Our Berlin Correspondent*

The coal socialization as a center of public interest is superseded by the coming plebiscite in Upper Silesia, by which it will be decided whether the province will fall to Poland or will remain German. Upper Silesia is one of the richest German provinces, and political strife for it is running high between Germans and Poles. The population is kept in great excitement by the propaganda carried on by both sides. The fate of Upper Silesia is a source of unrest in the center of Europe and it seems a matter of the strictest expediency to settle it without delay. This delay is apparently caused by the fact that half of the population is armed and bloodshed is expected during the polling. As no steps are however taken to alter circumstances it is difficult to see how matters can be improved by further hanging fire.

Upper Silesia, which in 1871 had only 131,000 inhabitants, has now 2,200,000, of which 356,000 are employed in mining and other industries. The province contains in a narrow space probably more mineral wealth than any other part of the continent. Coal occurs in Carboniferous strata below Triassic beds which contain zinc and lead deposits, above which are rich deposits of iron ore. The area of the coal deposits is stated to be 1,200 sq.mi., and the quantity worth mining 113 billion tons. The production of coal was in 1914 43,000,000 tons valued at 400 million gold marks. It is the second largest in Germany and was nearly double the production of the whole Russian Empire and one and a half times that of the Austro-Hungarian Empire.

The zinc and lead deposits occupy two strata of from five to one hundred meters in depth, and it is estimated will last another hundred years at the present rate of output. The whole mineral production in 1916 was estimated at 1,200 million gold marks, and the capital invested in the mineral industry is approximately two billion gold marks. The loss of Upper Silesia would be an enormous blow to Germany and greatly impair her economic strength. It would materially affect the coal situation in Germany, although only half of the Upper Silesia coal is consumed in Germany, not counting local use. One quarter is taken up by the country itself, and the other quarter is being exported to neighboring countries.

The following figures show the average wages in 1920 of the coal miners in comparison to those of last year. The wages per man and day were as follows:

	June, 1920	1919
	Marks	Marks
Upper Silesia .....	49.0	20.0
Lower Silesia .....	42.0	15.50
Lower Rhine district .....	53.0	24.0
Ruhr district .....	49.50	22.50

Since last June wages have increased in the Ruhr district from 49.50 marks to 60 marks per shift. From the above figures it appears that the wages have more than doubled since last year. The total of the miners' wages in Prussia in the second quarter of 1920 was 1,991,000,000 marks compared with 1,472,000,000 marks in the first quarter of the same year. From these figures it may be taken that the situation of the mines is indeed not as rosy as it was last year.

**Mills in Ontario Not Liable to Municipal Taxation**

**Supreme Court Rules in Favor of Mining Companies in Tisdale Township Legal Issue**

A case of considerable importance to the mining industry of the Porcupine district was decided by the Supreme Court of Ontario on Jan. 31. The court rendered judgment to the effect that concentrators are not liable to municipal taxation. The dispute is one of long standing, and arose from the claim of Tisdale Township that all mills were assessable for municipal taxes. The mining companies contended that "concentrators" were specially exempted under the assessment act.

It was urged on behalf of the township that the term "concentrators" only applied to mills using mechanical processes, and that the use of cyanide, which has a chemical action, took the Porcupine mills out of the class known as concentrators. The case was appealed from court to court, with varying results, until the final appeal resulted in favor of the mining companies. The companies concerned are the McIntyre, Dome, Schumacher, Dome Lake, Porcupine Crown, and Davidson, the mill properties of which have an aggregate value of about \$2,000,000.

**Bacon Loses to Neill in Suit Over Interest in Premier**

**Neill, With Associates, Also Defendant in Similar Action Brought by Patrick Daly, of Nelson**

Action brought by Maurice W. Bacon against R. K. Neill, one of those interested in the Premier mine, for the recovery of a one-quarter interest in the property has been dismissed by Federal Judge E. H. Rudkin, at Spokane, Wash. The latter in his judgment stated that the plaintiff in two cases had influenced witnesses and had lacked good faith in not bringing the suit in 1917 when he first knew of Neill's operations instead of waiting until the mine proved of worth.

Patrick Daly, of Nelson, B. C., is suing R. K. Neill, R. W. Woods, A. B. Tritte and W. R. Wilson, all of whom are interested in the Premier mine, for a one-fifth interest in the same. He alleges that Neill entered into an agreement with him to finance the development of the property and to give him the share he is asking for. This undertaking, he says, was approved by the other defendants when they became partners. The Premier is near Stewart, B. C.

**Colorado Commission Inquiring Into Wage Reduction**

**Law Forbids Change Without Investigation First—Some Companies Already Under New Schedule**

In compliance with the Industrial Commission laws of the state over fifty Colorado metal mine operators since Jan. 1 have filed the required thirty-day notice, announcing a 50c. decrease in wages, effective in the metal mines and mills of the state. On Feb. 1 the Industrial Commission issued a notice to these companies that it would hold a hearing on Feb. 15 in Denver for the purpose of investigating and determining all matters and questions involved in the matter of the proposed reduction.

The law provides that pending an investigation and hearing by the commission neither the employers or the employees shall alter or change conditions of employment with respect to wages or hours.

The action of the commission has somewhat complicated the situation inasmuch as several companies have already put the lower wage scale into effect where due notice had been given, or an agreement reached with the employees. The action of the commission would seem to make all companies liable for the old wage scale up to at least Feb. 15.

**Chicago for Next Convention of Mining Congress**

The next annual convention of the American Mining Congress will be held in Chicago, it is announced. John T. Burns, assistant secretary, has recently closed a contract for the Coliseum during the week of Oct. 17. Convention and exposition headquarters have been opened at the Congress Hotel.

**Washington Magnesite Industry Shut Down**

The long heralded Austrian magnesite competition has finally attained such magnitude as to force the shut down of the Washington magnesite industry. During 1920 Washington supplied approximately 80 per cent of the magnetsite used for refractory purposes in the United States. This was produced by the Northwest Magnesite Co., the American Mineral Production Co. and the American Refractories Co. All three have now suspended operations and nearly 500 men have been thrown out of employment. The American Mineral Production Co. has erected an especially designed kiln for the burning of caustic-calcined magnesite. It is now carrying on experiments with this furnace and hopes eventually to supply a portion of this kind of magnesite, which is used in the building industries.

Anaconda produced 9,700,000 lb. copper in January, as compared with 10,500,000 in December.

United Verde Extension produced 3,219,912 lb. copper in January.

## NEWS FROM WASHINGTON

By PAUL WOOTON  
Special Correspondent

### Senate Relief Bill Broadened as to Request or Demand

Measure Thought To Have No Chance Now—Efforts To Secure Passage To Be Concentrated at Extra Session

The Senate Committee on Mines and Mining has responded to a last-minute effort on the part of Senator Robinson, of Arkansas, to broaden the "request or demand" feature of the War Minerals Relief statute. The committee instructed Senator Henderson, of Nevada, to report the bill favorably to the Senate. The bill adds a proviso to the act stating that the section with regard to "request or demand" is to be liberally interpreted so as to include all claimants "who, in response to any personal, written, or published request or demand from any of the government agencies mentioned in the act" are to be reimbursed for "such net losses as they may have been found to have incurred and are in justice and equity entitled to." The bill provides that the money must have been expended in good faith in producing or preparing to produce any of the minerals covered by the act. The bill further provides that the unexpended portion of the appropriation is to continue available.

It is generally admitted, even by those in favor of the Robinson bill, that it has little opportunity to become a law at this session. It is the intention, however, to take the matter up vigorously at the opening of the extra session in case the bill should not be passed before March 4. The chances for liberalizing the War Minerals Act during the next Congress are regarded as less probable. The fact that the war period is becoming more remote is a factor in the decrease of interest in this legislation. In addition, there will be a decided change of personnel in the next Congress. New members are expected to feel less responsibility for this type of relief. They are likely to argue that the failure to liberalize the law on the part of the Congress which adopted it should be final.

Through no fault of the War Minerals Relief Commission it was impossible to wind up its work by the first of the year as was intended. The commissioners have been required to continue their work, as it was necessary for them to handle personally a number of appeals and petitions which have developed in connection with some of the plans. These matters are being cleared up rapidly, however, and the commissioners are making their personal plans to leave the Government service some time in March.

A total of \$8,949.52 was recom-

mended for award during the week ended Jan. 29. In the tungsten claim of S. M. Summerfield an award of \$3,500.82 was recommended. The amount claimed was \$40,620.06. In the pyrites claim of Robert L. Mock an award of \$4,529.15 was recommended. The claim asked for reimbursement to the extent of \$11,189.66. In the claim of Henry E. Egan, which had been disallowed, \$919.55 was recommended on reconsideration of the claim.

### Proposed Division of Mines and Geology Discussed Secretary Payne Expected to State Views on Henderson Bill Before Retirement Next Month

That the Senate Committee on Mines and Mining takes seriously the proposal by Senator Henderson, of Nevada, to create a division of mines and geology in the office of the Secretary of the Interior was indicated on Feb. 3 when the matter was discussed by the committee. Though there is no chance of taking up this bill at this session of Congress it was suggested that the personal views of the present Secretary of the Interior would be of value. Senator Henderson has arranged to discuss the matter with Secretary Payne and it is expected that Judge Payne will reduce his views to writing prior to his retirement from the Secretaryship of the Interior on March 4.

The Henderson bill, as introduced, does not pretend to be in exactly the form that would meet the situation best. It was submitted with the idea of its being the basis for possible legislation. It provides that the division of mines and geology is to be under the direct control of an assistant Secretary of the Interior, who "shall be qualified technically by experience and education" to take charge of those duties. He is to be appointed by the President, subject to confirmation by the Senate. The salary proposed is \$10,000.

It is not the intent of the bill to disturb in any way the existence of either the Geological Survey or the Bureau of Mines as independent entities. The new division would be in the nature of a liaison agency tending to unify the work pertaining to the mining industry. The hope is expressed that from such a nucleus eventually would spring a Department of Mines and Mining.

The proposal is to draw to the new combination the powers and duties of other departments, bureaus, commissions, and agencies relating to mining, metallurgy, mining technology, classification of public lands, examination of geological structure, and mineral resources.

### Little Change in Appropriation for Bureau or Survey Increase for Alaskan Work Refused by Senate Committee—More Money for Enforcing Leasing Regulations

The Senate authorized few changes in the appropriations for the Geological Survey and the Bureau of Mines. The item for engraving and printing geologic maps was increased from \$125,000 to \$140,000, but the increase for the investigation of the mineral resources of Alaska, urged by the director of the Geological Survey, was not allowed. As only \$75,000 is made available for the Alaskan work it will be necessary to curtail activities there, especially as it costs three times as much now to do a square mile of geologic work in Alaska as it did ten years ago. Director Smith had pointed out to the committee that the Alaskan work was somewhat behind, owing to the fact that sufficient men to carry on the work during the war were not available. Dr. Smith also pointed out that the Survey had anticipated the building of the Alaskan railroad and for a number of years had concentrated work in that region. He declared, however, that there is urgent need to continue that work, so as to encourage mining activities that will give some business to the railroads.

In the appropriations for the Bureau of Mines the Senate has approved an increase from \$50,000 to \$132,000 for enforcing the operating regulations under the Mineral Land Leasing Law.

The total of the appropriations for the Geological Survey, as approved by the Senate, and which likely will be the final amount, is \$1,614,340. The Bureau of Mines total is \$1,427,400.

### Extra Session to Consider Revision of Mining Laws

Revision of the mining laws was among the matters which came before the Committee on Mines and Mining of the Senate at its meeting Feb. 3. As nothing can be gained by taking up the matter during the short time remaining of the present session no action was taken in this connection. It clearly is the intention of the committees on mines and mining of the Senate and of the House of Representatives to go into this subject early in the extra session.

The Utah Power & Light Co. is applying to the Federal Power Commission for permission to conduct extensive surveys in the Green River country in Grand and Emery Counties, to ascertain whether dams and power plants can be built to advantage along the Green River.

## NEWS BY MINING DISTRICTS

### SPECIAL LONDON LETTER

Share Market Stagnant—Technical Interest in Rand Mining Reviving—British South Africa Co. Award Disappoints

By W. A. DOMAN

London, Jan. 27—For the time being the piping of the sellers of mining shares to the public has ceased, because there is no dancing in response. Interest in mining business is nevertheless kept well alive by the movements, mostly downward, in the prices of metals. With tin at £169-5-0 and with stocks increasing, this particular industry is in a very doleful condition. A few of the Cornish companies contemplate developing the china clay deposits of the Duchy rather than cease operations completely. The pegging of the price in the Federated Malay States at £115 a picul is only temporary, for, although the government has apparently sufficient funds to continue, it is doubtful whether all the expected benefits will materialize. According to rumor this official action was not taken so much in the interests of the industry as to retain the Chinese labor in the country. At the Chinese New Year (next month) it is expected that an alteration will be made. The fixing of the price will have served one purpose—it will benefit the local companies whose books are made up in February.

In a technical sense there is a revival of interest in Rand mining. Toward the end of last year the New State Areas struck the reef in the south shaft at a depth of 3,676 ft. and twelve sections taken over the whole shaft gave an average assay value of 89.8 dwt. over 18.9 in. New Brakpan Mines has reached the reef horizon in its No. 4 shaft in the lease area at a depth of 4,218 ft. Twenty-five sections of the reef were taken, and the average of ninety-five samples gave 7.6 dwt. over 39.2 in. This result is only moderate, it is true, but it is payable, and consequently is satisfactory. In the Far Eastern district of the Rand the reef is undulating, and the payable portions are in shoots, so that to locate and sink a shaft so to speak at a venture, and happen upon a pay shoot must be regarded as encouraging. Other shafts are to reach the reef during the first half of the current year. Next month the No. 1 shaft of West Springs should attain its goal; the No. 2 shaft should reach the horizon in June, at which date, too, the No. 4 shaft of the Springs Mines should also show results. The various sinking projects mentioned represent a very extensive area, and if successful results are obtained the Union Government will doubtless offer additional leases, though the terms will not in future be so favorable from their point of view. Existing companies

are feeling the purchase consideration rather onerous.

The award of the Cave Commission in respect of the claim of the British South Africa Co.—popularly termed "Chartered"—was received with mixed feelings. The company delivered an amended statement of net expenditure showing £7,866,117. This has been whittled down to £4,435,225, and no interest is allowed. It was mainly on the score of non-payment of interest that disappointment was keenest. Another matter, which the company itself does not quite appreciate, is that it has to pay for lands appropriated to its own uses. How and when payment is to be made is not stated. After the first spasm of disappointment holders of the shares entertained a more hopeful view, assuming that as the award was so greatly reduced the chances of early absorption in the Union of South Africa had increased. When deprived of its administrative powers the company will still possess its mining and trading rights, as well as its very useful railway system. The great drawback of course is the sparseness of the white population. For the whole of Rhodesia the whites, all told, are under 40,000, which means that progress is slow.

### CANADA

#### British Columbia

Noble Five Shuts New Concentrator Down at Sandon—A.I.M.E. Section Meeting for Kootenays

Sandon — Milling operations have been suspended at the Noble Five mine following instructions received from the Dunsmuir interests, Victoria, the owners. This shutdown marks an almost total cessation of milling operations throughout the Slocan district. The concentrator, which is regarded as one of the most modern plants in British Columbia, was only completed in the summer of 1920, and is said to represent an outlay of \$250,000.

Taghum—George Gormley, formerly of Sandon and more recently of the Bosun mine, between New Denver and Silverton, and who has a lease on the Goldhill property near here, has just made a shipment of high-grade ore to Trail, the values being chiefly in gold.

Nelson—Messrs. Thompson and McKinney, operators of the North Star group, Kimberley, with assistance of Andrew G. Larson, of Spokane, have recently been making an examination of the Granite-Poorman property.

Present plans are that the Columbia section of the A. . M. E. will hold a midsummer session in the Kootenays in 1921. Negotiations are now being conducted with a view to having the engineers visit Nelson and Trail at the time of the annual International Mining Convention which if held this year will take place in June or July.

Urging Nelson as the proper site for location of projected federal government ore-testing plant in British Columbia, E. W. Widdowson, assayer and provincial analyst, points out that for all-round requirements a concentrator equipped to give ores a primary treatment would prove of the greatest advantage. Location of such a plant at coast points would be of very little advantage, Mr. Widdowson claims, as the bulk of ore to be treated would come from Kootenay-Boundary points, and if the material had to bear long haul freight charges to the coast and the product a similar freight rate charge back to Trail advantage otherwise gained by shippers would be lost.

Ainsworth — The new government floating wharf at Princess Creek, two miles north of here, has been practically completed and ready for use. This will prove of much value to mining operators at Princess Creek.

Trail—Ore shipments received at Consolidated smelter during the week ended Jan. 31 totaled 13,306 tons, as follows:

Mine	Location	Net Tons
Bell Mine,	Beaverdell.....	16
Gold Hill,	Taghum.....	33
Horn Silver,	Chopaka.....	92
L. T. Mine,	Slocan City.....	11
Paradise,	L. Windermere.....	29
Company Mines.....		13,125

#### Ontario

Opposition Developing to Proposal To Increase Mine Taxes

Toronto—A great deal of opposition is being developed to the proposal of the Minister of Mines for Ontario for an increase in mining taxes. At the present time the mines, with the exception of the nickel companies, pay 3 per cent on profits over \$10,000 a year. It is now proposed to raise this rate to 4 per cent, and when profits exceed \$1,000,000 to make the rate a straight 7 per cent. The latter rate is also proposed for the nickel companies. The new rates would mean that in some cases the taxes would be doubled.

The mining companies show no desire to evade their fair share of taxation but they want it to be fair. When the Royal Ontario Nickel Commission, appointed by the Ontario government, made its report it stated that the maximum tax which the mining industry could afford to pay was 5 per cent of the profits. In addition to the hardships under which the miners labor on account of their location the companies have to build their own road, build houses for employees and provide electricity, water service, protection and mail service for themselves and their employees, which with other industries in the older centers are furnished by the community.

## MEXICO

## Coahuila

**Torreón Smelter To Be Blown in Soon;  
Coal Shortage Over**

**Torreón**—The Torreón smelter is again receiving ore shipments and will shortly blow in after its idleness caused by lack of fuel. It now has on hand a good supply of coal and coke with several large shipments en route.

**Saltillo**—Eutimio Elizondo has filed on a group of twelve claims in the San Marcos Mountains, district of Monclova. The survey includes the old San Marcos mines, on which two prospect shafts were sunk, prior to the revolution, developing some good silver and lead deposits.

Henry Miller has applied for titles to six claims in the Sierra de Purisima, in the Monclova district, to be known as the San Pedro group. William A. Couley, a mining engineer of La Reforma, is making the surveys of these properties.

J. F. Mendoza is developing a newly acquired group of six claims in the Minerva Mountains near Muzquiz. Samples taken from the first prospect shaft show good values in silver.

## CALIFORNIA

**Ample Water Supply for Mining Operations Anticipated—Bureau of Mines Men Meet at Berkeley**

**San Francisco**—Of general interest to industry in California, particularly to power and mining, is the fact that the present accumulation of snow at Summit is 10 ft. deep. This signifies that the prolonged water shortage is at last over and there will be ample water for alluvial mining and for power throughout 1921.

During the week beginning Jan. 24 a conference of U. S. Bureau of Mines officials was held at the Pacific Experiment Station, Berkeley, Cal. D. A. Lyon, E. A. Holbrook, O. C. Ralston, Thomas Varley, C. E. Van Barneveld, L. H. Duschak and others of the bureau attended. Of University representatives, Milnor Roberts, of the University of Washington; F. C. Lincoln, of the University of Nevada; J. F. Merrill, of the University of Utah; G. M. Butler, of the University of Arizona, and F. H. Probert, of the University of California, were present and took part in the meetings. The purpose of the meetings was to bring about closer co-ordination of the work of the bureau and the several universities at which experiment stations have been established.

In California, gold mining operations are being gradually resumed. The Bunker Hill mine has started milling operations. Development has begun in the upper levels of the Fremont Consolidated. Announcement has been made that the Angels Deep will put its mill into operation early in February. At the Morgan mine ten 1,250-lb. stamps, three 8 x 22 Hardinge

mills and other necessary equipment have been added to the twenty-stamp mill, and the new addition is expected to be in operation this month. The enlarged mill will have a capacity of 12,000 tons per month. The shaft has reached a depth of 3,160 ft. and a new level has been established at 3,110 ft. Plymouth Consolidated Gold Mines, Ltd., reports 8,350 tons milled during December, 1920, and that its main working shaft has reached a depth of 3,170 ft. Unwatering at the Kennedy has proceeded to a depth of 3,440 ft., or within 10 ft. of the 3,450 level.

Falling prices and an abundant supply of labor have bettered the position of the gold mines, and there is a more optimistic feeling than for some time.

## NEVADA

**Railroad Bill Introduced in Legislature  
by John T. Reid**

**Rochester**—The report of the Rochester Silver Corporation shows that for December last \$64,810.84 was recovered from 5,005 tons of ore milled, an average of \$12.95 per ton. The ore carries .102 oz. gold and 12.28 oz. silver.

**Candelaria**—The Vanderbilt tunnel will be extended to cut the veins in the Hecla group at a depth of about 1,000 ft. from the surface, according to present plans of the Candelaria mines company.

**Jarbridge**—The Jarbridge-Buhl Mining Co. is planning a large amount of development work for the coming summer, according to J. C. Finch, secretary. There is said to be considerable ore already blocked out in the property, which is in the "crater" section of the Jarbridge district.

**Carson City**—John T. Reid, mining engineer of Lovelock, has had a bill introduced in the Legislature to grant an extension of the franchise for building a railroad from either Parran or Hazen, in Churchill County, to a point in Lander County. There is some good mineral territory along the proposed route, in which Mr. Reid is interested.

**Bristol**—In spite of severe weather and heavy snow, freight teams are reaching the new camp in the Silver-Horn district near Bristol. Lumber is being hauled and boarding house equipment recently shipped from Cima has arrived at Pioche and will immediately be installed at the properties. A number of men are now working in the district. New York and Tonopah capital is heavily interested and increased activity is expected this spring. An assay office will be built. C. E. Blount, of Salome, Ariz., is in charge.

**Pioche**—Ore shipments from the Pioche district for the week ended Jan. 27 were curtailed owing to heavy snow. They were: Prince Cons., 1,510 tons; Virginia Louise, 745, and Lyndon mine, Comet, 35; total, 2,290.

**Ely**—Theodore Taraldson, the principal owner of the Lake Valley mine, has gone East to complete arrangements for financing the property. A mill will be erected this summer.

## MONTANA

**Anaconda To Stop Development at  
South American Properties**

**Butte**—Anaconda has suspended development work at its South American properties. East Butte will reduce its operations at its flotation plant from seven to five days per week. Anaconda will also suspend operations at its electrolytic zinc plant at Great Falls at the end of this month. The zinc concentrator has also shut down at Anaconda, Mont., with the Elm Orlu zinc mine and mill, which furnished Anaconda with zinc concentrates, also suspending, all owing to market conditions.

In consequence of developments on its lowest levels, Anaconda has ore which it will not reach for twelve years at the prevailing rate of production, it is said in engineering circles. Anaconda has 1,500 miles of drifts and crosscuts and is interested in contiguous properties.

At present the company has on its payroll 4,500 persons. About the only activity displayed is in connection with its plans for the production of fertilizer, which are going steadily forward.

With the completion of its air shaft from the 2,700 level to surface the Davis-Daly will curtail forces at the Colorado mine and reduce its output from 300 tons daily to 200 and its working forces to one shift of about 225 men as compared with 400 several weeks ago. Operations at the Hibernia mine will not be curtailed. Shipments from this property are averaging around 6,000 to 7,000 tons monthly.

Counsel for Minerals Separation, Ltd., and for the Butte & Superior company are expected to appear in the United States court soon and agree on a date for hearing argument in connection with the accounting in the flotation infringement suit, the settlement of which now awaits the fixing of the amount of damages due Minerals Separation from the Butte & Superior for patent infringement. Shaft sinking chiefly is engaging the attention of the Butte & Superior at the Black Rock mine at present.

North Butte has made a further slight reduction in its forces at the Granite Mountain and Speculator mines, but the ore output will stand around 450,000 lb. of copper monthly.

Sinking by the Tuolumne company is progressing rapidly at the Main Range shaft with the timbering now below the 1,350 level. High-grade copper ore is continuing to come from the 1,200 level. The output is around 50 tons daily.

The Butte & Western Silver has started sinking from the 200 level with the 300 level as objective.

**Elkhorn District**—The Boston & Montana concentrator at the Elkhorn mines is now under cover with all the machine foundations completed and awaiting installation of milling equipment. At the mine, it is said, sufficient ore to permit operation of the mill is being blocked out.

## UTAH

## Western Utah Copper Shipping Low-Grade Arsenical Ore—Two-Cent Duty on Lead Asked by Utah Operators

Salt Lake City—Utah lead producers are asking a duty of 2c. per lb. on lead to meet the difference between the cost of production at home and that abroad, Mexico being the chief competitor with easier mining and lighter labor costs. Ernest Bamberger, testifying for Utah producers before the House Ways and Means Committee in Washington recently, explained that the industry was not looking forward to a period of artificially high prices, but that it merely sought to keep going. The present cost of production is over six cents a pound, he said, and costs are not likely to grow less. Bonanzas have been worked out and Utah ores are produced from deep workings. The mines are expensive to explore, to develop and to operate. Work is done largely through shafts.

Gold Hill—The Western Utah Copper is shipping up to 300 tons a day of low-grade arsenical ore, consisting chiefly of scorodite, anhydrous arsenate of iron, and carrying 2 or 3 per cent lead and a few ounces of silver. The ore is shipped to one of the valley smelting plants and the arsenic as well as the silver and lead recovered.

## MICHIGAN

The Copper Country  
Quincy Again Reduces Wages—Isle Royale Stops Mining in No. 6 Shaft

Houghton—The Quincy Mining Co. has announced a further reduction of wages and salaries effective Feb. 1, 1921. This cut amounts to 10 per cent and is entirely due to present conditions in the copper business. It will affect all employees.

The annual meeting of the Arcadian Consolidated Copper Co. was held in Houghton at the office of the company on Feb. 8, 1921. Plans for further development of the property were discussed. Shaft sinking is still in progress at the New Baltic shaft.

The Seneca Mining Co. produced 98,000 lb. of copper in December. The concrete work is being done in the shaft between the 5th and 6th levels. When completed drafting will begin in both directions on the 6th level. One of the raises at the south end of the 13th level of the Gratiot shaft has holed through to the 11th level and the other raise will soon follow.

The mining department of the Michigan Copper Mining Co. is completely closed down, but the company is cutting some timber off its lands. This timber is mostly pulp-wood, and will help in meeting the annual tax bill, which this year amounts to about \$18,000.

The management of the Isle Royale Copper Co. has decided to cease mining for the present in the No. 6 shaft, confining attention to the three northerly shafts, Nos. 1, 4 and 5.

## COLORADO

## Portland Makes Rich Strike on 2,450 Level—North Boulder Creek Mill Running

Georgetown—Retimbering the main shaft of the Capitol Mining Co. is in progress, and development and operation will be resumed soon under a leasing system.

Boulder—The new mill of the North Boulder Creek Mining Co. was started recently, and is treating ore from the Blue Bird mine. Test shipments of crude ore and concentrates will be made. Recent underground development was encouraging. J. E. Pherson is superintendent.

Victor—Rich ore has been opened on the 2,450 level of the Portland. The ore is reported to be equivalent in value to that on the 2,300 level and the strike is considered important.

Sherman—Work is progressing on the new power plant and mill which the Colorado Consolidated Mining Co. plans to have ready for operation by June. A consignment of machinery was delivered on the ground recently.

Capitol City—W. E. Mendenhall has secured a lease on the Excelsior-Broker properties and development work has begun.

Denton—The shaft of the Emma mine is being unwatered preparatory to resuming development on the 6th level under James Clamp's direction.

## MINNESOTA

## Minnesota Steel Co. Shut Down by Gas Explosion

Duluth—The Minnesota Steel Co.'s plant has been shut down temporarily by a gas explosion in the blast main, which did considerable damage and injured several employees.

## Mesabi Range

## Interstate Iron Co. To Shut Down Four Mines—Oliver Iron Drilling on Mesaba Lake

Hibbing—The Interstate Iron Co., which operates many mines on the Mesabi Range, has decided to shut down four of them, namely, the Lincoln mine, at Virginia, and the South Agnew, Leetonia and Mississippi, at Hibbing. The construction work on the concentrator at the Hill-Annex mine will be continued. Several days before this notice had been posted announcing a 15 per cent reduction effective Feb. 1.

Aurora—Active drilling is being done by the Oliver company on Mesaba Lake, which lies in the S. W.  $\frac{1}{4}$ -N. W.  $\frac{1}{4}$  of Section 27-59-15. The drills are set up on the ice.

The Mohawk mine, a Pickands-Mather property, has laid off one shift, affecting about sixty men. The mine will operate on a one-shift basis.

Gilbert—Pickands-Mather recently announced a 15 per cent wage reduction effective Feb. 1. This affects the Scranton, Albany and Utica mines, of Hibbing, the Elba and Corsica, of Gilbert, the Belgrade, of Biwabik, and the Mohawk, of Aurora.

## CHRONOLOGY OF MINING

## January, 1921

Jan. 1—Wages reduced by many companies in Michigan, Minnesota, Idaho, Nevada and elsewhere. — Reduced freight rates on ores from Cœur d'Alene to East Helena, Mont., in effect.—Zenith Furnace Co., Duluth, Minn., blew out furnaces for indefinite period.—Guggenheim Brothers began acting as sales agents for copper companies formerly selling output through American Smelting & Refining Co.

Jan. 3—Colorado Metal Mining Association met with Colorado Chapter of American Mining Congress at Denver, Col.

Jan. 12—Hearings on tariff revision on metal imports opened by House Ways and Means Committee.—T. F. Ward, president of Ward Copper Co., found frozen to death near Teller, Alaska.—Operators in Mohave County, Ariz., met at Kingman and decided on general reduction in pay, beginning Feb. 15.

Jan. 14—American claimants to Naica mining property, Mexico, file memorandum with U. S. Department of State.—Purchasing agents for copper mines and smelters in Southwest met at Bisbee, Ariz.

Jan. 15—Calumet & Sonora Mining Co., Cananea, Sonora, started new power plant.—Silversmith mill at Sandon, B. C., stopped by water shortage and market conditions.—New Jersey Zinc Co., Palmerton, Pa., reduced wages 10 per cent and dropped 8 per cent bonus system.

Jan. 17—Superintendents of Bureau of Mines experiment stations west of the Mississippi River met at San Francisco to plan future investigations.—Rex mine, Herb Lake, Ont., started mill. Hearing held at Wilmington, Del., on supplemental bill to bring Minerals Separation North American Corporation into its suit against Miami Copper Co., argument being set for Feb. 21.—Cananea Consolidated Copper Co. completed shutdown at Cananea, Sonora.—Davidson Consolidated shareholders decided to sell out to English syndicate.

Jan. 19—Arguments concluded in suit between Silver King Coalition and Conkling mining companies at Park City, Utah.

Jan. 20—Experiment station at Reno, Nev., opened.—California Legislature adopted resolution endorsing the McFadden Gold Bonus Bill.

Jan. 23—Rico Consolidated Mining Co., Rico, Col., awarded decision in apex suit against Rico Argentine Mining Co.

Jan. 24—Superintendents of the Western experiment stations of Bureau of Mines met at Berkeley in a two-day conference.—U. S. Supreme Court set aside sale of Alice Gold & Silver Mining Co. to Anaconda Copper Co. on ground of an inadequate price.

Jan. 26—Minnesota Senate Commission reported on the iron and peat deposits on state lands.

# THE MARKET REPORT

## Daily Prices of Metals

Feb.	Copper, N. Y. net refinery*	Tin		Lead		Zinc
		99 Per Cent	Straits	N. Y.	St. L.	St. L.
3	12.50	27.50	30.75@31.00	4.60	4.50	4.95@5.05
4	12.50@12.75	29.00	31.75@32.50	4.60	4.45@4.50	4.95@5.05
5	12.50@12.75	29.00	31.75@32.00	4.60	4.45	4.95@5.05
7	12.75	29.00	33.00@33.25	4.60	4.40	4.95@5.05
8	12.75	28.50	32.25@32.75	4.60	4.35	4.95@5.05
9	12.75	27.75	31.75@32.00	4.60	4.35	4.95@5.05

\*These prices correspond to the following quotations for copper, "delivered": 12.75, 12.75@13, 12.75@13, 13, 13, and 13c.

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

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

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

## London

Feb.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
3	68½	68½	76	155½	161½	22½	23	23½	24½
4	69½	70½	76½	164	169½	22½	23½	24½	25
5									
7	72	72½	77	166½	172	22½	23½	24½	25½
8	72	72½	78	164	169	22½	22½	25½	26½
9	72	72½	78	161½	167½	21½	22½	25½	26½

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

Feb.	Sterling Exchange	Silver			Feb.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
3	383	99½	63½	37½	7	383	99½	60½	36
4	383½	99½	60	36½	8	385½	99½	61½	36½
5	382½	99½	60	36½	9	387½	99½	62	37

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, Feb 9, 1921

No real change can be noted in the attitude of consumers during the last week, though the copper and lead markets have been governed somewhat by outside influences. Most of the metal now on the market is in fairly strong hands, so that sharp and continued declines are not to be expected. On the other hand, consumers show no inclination to take advantage of existing low prices to lay in stocks and are not therefore likely to start any heavy buying movements which would cause a pronounced advance. Most of them have no surplus cash to finance such buying.

Transatlantic freight rates to England have at last been reduced somewhat, and yesterday \$11 per long ton was quoted on copper and \$9 on lead and zinc, a reduction of \$2 from former prices.

### Copper

Up to the hour of going to press no official announcement has been made as to the plans of financing export sales of copper. The information we gave last week, however, seems to be substantially accurate, and we can confidently say that 400,000,000 lb. of copper will be taken off the domestic market by this plan. It is said that the National City Bank and the Guaranty Trust Co. are to take care of the \$40,000,000 debenture issue which is to be

made. The companies which will pool part of their copper surplus for this purpose are apparently the same as those that make up the Copper Export Association, although it is understood that invitations to share in the arrangement have been extended to other companies.

Since these plans were announced, consumers have taken a little more interest in the market, and domestic sales have been in more satisfactory volume. Export business continues good also, the metal going principally to England, France, and Germany. Prices have tended firmer, and no copper can now be obtained for less than 13c. delivered for February-March delivery, or 13.25c. for the second quarter. As long as it can be sold for export at these prices or better, there is no chance of a reduction.

### Lead

When all was going smoothly in the lead market, certain interests in St. Louis found, apparently, that they had more of the metal than they could handle, and on Monday began to take strenuous measures to unload. The price was depressed, and yesterday business was done at 4.35c. The credit situation is reported to be more acute in the Middle West, and the banks there are apparently refusing further to advance money on metal stocks. Just how much of this lead is to be thrown on the market we do not know. One rumor says close to 10,000 tons. Some sales have been made in New York above the price which we quote; in fact, we have reports of lead sold last Saturday at 4.82c. On the other hand, we have heard of good corroding lead which ordinarily commands 15 points premium, selling for 4.675c. As rather large tonnages have been marketed at 4.60c., we consider this a fair price. At present there is little if any difference between prompt and forward delivery. It is unlikely that the depressed St. Louis price will affect New York unless the difference exceeds 50 points, which is approximately the freight rate between the two cities.

### Zinc

No perceptible change can be noted in the zinc market, which continues dull, with many producers out of the market. The majority of American zinc smelters are closing down. High-grade zinc in fair demand at 7c.

### Tin

The Straits government, it is rumored, has reduced the price which it will charge for the product of that country from the equivalent of £236, London, to £203. This has not been confirmed, but the report is generally given credence here. The New York

market continues quiet, with a few small sales for February, March and April delivery.

Straits tin for future delivery: Feb. 3d, 32@32.50c.; 4th, 32.75@33.50c.; 5th, 32.75@33.50c.; 7th, 33@33.75c.; 8th, 33.25@33.50c.; 9th, 32.25@32.50c.

Arrivals of tin, in long tons: Feb. 1st, Straits, 625; Marseilles, 25; London, 250; 3d, China, 10; 4th, Straits, 50; 8th, Liverpool, 35; London, 25.

### Silver

The local market has fluctuated within a range of about 2c. for the last week and the volume of business has been small. In London a wide spread again appeared between the spot and future quotations, spot being quoted today at 37d., whereas futures are 2d. lower at 35. This condition is also reflected in the price which London is bidding for prompt shipment from New York, which is below London spot price. There is evidently a squeeze for spot delivery in London, but whether this is on account of scarcity of silver for immediate shipment to India, or attributable to covering by shorts, is uncertain. Another factor which tended to bring about this condition in London was the closing down of refineries at the end of the year, thereby causing a temporary shortage of supplies; but as they are again working and there is plenty of melted silver coins in London, the position should soon become more nearly normal.

Mexican Dollars.—Feb. 3d, 48½; 4th, 45½; 5th, 45½; 7th, 45½; 8th, 46½; 9th, 47½.

### Gold

Gold in London: Feb. 3d, 106s. 9d.; 4th, 106s. 9d.; 7th, 107s.; 8th, 106s. 6d.; 9th, 106s.

### Foreign Exchange

Sterling continues its advance toward \$4, and other foreign exchanges show firmer tendencies. On Tuesday, Feb. 8th, francs were 7.18c.; lire, 3.645c.; and marks, 1.66c. New York funds in Montreal, 13 per cent premium.

### Other Metals

Aluminum.—List prices of 28@28.5c. are nominal. Outside market 24@25c.

Antimony—Chinese and Japanese brands, 5½c.; market quiet. W.C.C. brand, 6½@6½c. per lb. Cookson's "C" grade, spot, 9½c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony<sup>1</sup> (200 mesh), 7@7½c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb<sub>2</sub>O<sub>3</sub>, wholesale lots, 7c.

Bismuth—\$2.25@2.35 per lb., 500-lb. lots.

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, \$325 per oz.

Magnesium—Crude, 99 per cent, \$1.25@1.35 per lb., f.o.b. Philadelphia.

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

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

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

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

Palladium—\$65@70 per oz.

Platinum—Firm at \$70 per oz.

Quicksilver—Nominally \$50 per 75-lb. flask. San Francisco wire missing today.

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<sub>2</sub>O<sub>3</sub> foreign ore with a maximum of 6 per cent silica, 50@55c. per long ton unit, f.o.b. Atlantic ports.

Manganese Ore—35@40c. per unit, seaport; chemical ore (MnO<sub>2</sub>) \$60 per gross ton, lump; \$65@70 per net ton, powdered.

Molybdenum Ore—85 per cent MoS<sub>2</sub>, 55@60c. per lb. of contained sulphide, New York.

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

Titanium Ores—Ilmenite, 52 per cent TiO<sub>2</sub>, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO<sub>2</sub>, 12c. per lb. for ore, with concessions on large lots or contracts.

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

Uranium Ore (Carnotite)—Ore containing 1½ per cent U<sub>3</sub>O<sub>8</sub> and 5 per cent V<sub>2</sub>O<sub>5</sub> sells for \$1.50 per lb. of U<sub>3</sub>O<sub>8</sub> and 75c. per lb. of V<sub>2</sub>O<sub>5</sub>; ore containing 2 per cent U<sub>3</sub>O<sub>8</sub> and 5 per cent V<sub>2</sub>O<sub>5</sub> sells for \$2.25 and 75c. per lb., respectively; higher U<sub>3</sub>O<sub>8</sub> and V<sub>2</sub>O<sub>5</sub> content commands proportionately higher prices.

Vanadium Ore—\$1.50 per lb. of V<sub>2</sub>O<sub>5</sub> (guaranteed minimum of 18 per cent V<sub>2</sub>O<sub>5</sub>), New York.

Zircon—Washed, iron free, 3c. per lb.

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

### Zinc and Lead Ore Markets

Joplin, Mo., Feb. 5—Zinc blende, per ton, high, \$28.80; basis 60 per cent zinc, premium, \$22.50; Prime Western, \$25@20; fines and slimes, \$20@17.50. Average settling price, all zinc ores, \$27.29.

<sup>1</sup>Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead, high, \$52.10; basis 80 per cent lead, \$47.50@45. Average settling price, all lead ores, \$50 per ton.

About three-fifths of the 5,600 tons bought this week was purchased Saturday, Sunday, and Monday on \$25 basis, the price dropping in midweek to \$22.50 and today to \$20 basis.

Shipments for the week: Zinc blende, 4,775; lead, 857 tons. Value, all ores the week, \$173,370.

Reports that the Waco mines would close tonight lack confirmation, but the larger producing company is seriously considering closing down. About fifty mines have been operating in the Oklahoma-Kansas area in the last week, several of which cannot meet operating expenses, with today's offerings of zinc blende down to \$20 basis.

Platteville, Wis., Feb. 5.—No quotations for zinc or lead ores. Shipments for the week: Zinc ore, 446; lead ore, 40 tons. Shipments for the year: Zinc ore, 4,645; lead ore, 430 tons. Shipped during the week to separating plants, 908 tons blende.

### Non-Metallic Minerals

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

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

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

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

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

Fluorspar—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$25 per ton, f.o.b. Illinois mines, and \$25.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, \$60; lump, \$15, f.o.b. Tonuco, N. M. In Canada

85 per cent calcium fluoride sells for \$20 per ton, f.o.b. Madoc; output limited. Canadian price generally \$18 (Canadian currency) per ton, f.o.b. mines.

**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, 7½c.; high-grade amorphous crude, 3c. No change.

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

**Kaolin**—See China Clay.

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

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

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

**Mica**—India block mica, slightly stained, per lb.: No. 6, 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**—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$13; 75 per cent, \$11.50; 75@74 per cent, \$11; 70 per cent, \$8.35; 68 per cent, \$7.85; 68@66 per cent, \$7.60. Finely ground Tennessee rock sells for \$8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, \$9; both prices f.o.b. Centerville, Tenn.

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

**Pyrites**—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

**Quartz**—(Acid tower) fist to head, \$10; 1½ to 2 in., \$14; rice, \$17; all net ton, f.o.b. Baltimore; lump, carload lots, \$5@\$7.50 net ton, f.o.b. North Carolina mines.

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

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

**Talc**—Paper making, \$11@\$20 per ton; roofing grades, \$8.50@\$13; rubber grades, \$11@\$18; all f.o.b. Vermont. California talc, \$18@\$45, talcum powder grade. Southern talc, powdered, carload lots, \$12@\$15 per ton; less than carload, \$25, f.o.b. cars; freight to New York \$5.25 per ton, carload lots; less than carload lots, \$9.25. Imported, \$40@\$50; Canadian, \$20@\$40 per ton.

### Mineral Products

**Arsenic**—White arsenic, 10½@11c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

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

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

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

### Ferro Alloys

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

**Ferrocobalt**—Per lb., \$12@\$15.

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

**Ferromanganese**—Domestic 76 to 80 per cent, \$100, f.o.b. furnaces; resale, \$90, delivered; English, \$100, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, \$40@\$45, 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@\$65; 50 per cent, \$78@\$80.

**Ferrotungsten**—Domestic, 70 to 80 per cent W, 55@60c. 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.

**Ferrovanadium**—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, 21½c. per lb.; wire, 15½.

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

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

**Yellow Metal**—Dimension sheets, 19½c.; sheathing, 19½c.; rods, ½ to 3 in., 16½c.

<sup>1</sup>Furnished by Foote Mineral Co., Philadelphia, Pa.

**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 Cr<sub>2</sub>O<sub>3</sub>, \$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, \$100 per net ton; 9-in. arches, wedges and keys, \$105; soaps and splits, \$120.

**Silica Brick**—9-in., per 1,000: Chicago district, \$65@\$70; Birmingham, Ala., \$56@\$61; Mount Union, Pa., \$50@\$60.

### The Iron Trade

Pittsburgh, Feb. 8, 1921

The chief change in the steel situation is that the United States Steel Corporation's operations are now beginning to decline with considerable speed, more than four months after independent mill operations began to decline, the difference in position being due to the large amount of stable business the Corporation had put on its books in 1920 when it maintained Industrial Board prices while the independents made large advances. During the four months the Steel Corporation has had even heavier production than in the four months preceding, when there were serious transportation difficulties. Independent mill operations are at about 30 per cent of capacity, and the Steel Corporation's production is probably now below 90 per cent.

A mild improvement in buying of steel products is to be expected for March, but hardly such as would warrant production at as heavy a rate, in the aggregate, as now obtains.

Prices of steel products are well maintained, with the exception of quotations for plates. The steadiness of prices betokens no fundamental strength however, being attributable chiefly to the absence of inquiry involving desirable orders. Plates can be had at 2.50c., against the Industrial Board price of 2.65c., maintained by the Steel Corporation and some independents.

**Semi-finished Steel**—Quotations continue nominal at \$45 for billets and \$47 for sheet bars.

**Pig Iron**—Foundry iron is offered at \$29, Valley, or \$1 under the previous nominal market. Bessemer and basic remain nominally quotable at \$32 and \$30, Valley basis.

### 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, \$6@\$6.50.



# Increase of Post-War Copper Consumption in Germany

Special Foreign Correspondence of the "Engineering and Mining Journal"

**B**ERLIN, Feb. 1—Soon after the outbreak of the war, the copper shortage made itself felt in Germany and rendered the employment of substitute metals necessary. Of the many materials that were put to a practical test and which proved their serviceableness to a greater or less extent, iron, zinc, and aluminum played an important rôle, and it was generally assumed that a restriction in the consumption of foreign copper in favor of approved inland substitutes would enter into consideration for economical reasons after the war.

Two years have passed since the conclusion of hostilities, and though the raw-material problem presents one of the most burning questions to German industry, owing chiefly to the enormous depreciation of the German currency, it is interesting to know that, contrary to expectations, the consumption of copper is steadily increasing in spite of its high cost. In the electrical industry—which heads the list of the copper-consuming industries, with 40 per cent of the total consumption prior to the war—substitute materials have almost disappeared, and in the other industries, too, the process of "substituting the substitute by the real thing" is progressing apace.

This fact is accounted for principally by two reasons: First, it is increasingly recognized that even the best of substitutes are lacking some of the most peculiar and important properties of copper. Its high conductivity, chemical resistance, malleability, ductility—to mention only the pressing and stamping of small brass parts—are features of which no substitute material of construction can boast.

By far the most important fact, however, responsible for the unanticipated increase of copper consumption, a fact which it was impossible to predict during the war with any fair degree of accuracy, is the enormous increase in cost of labor. The average wages for a turner in Germany prior to the war were approximately 0.60 to 0.70 marks an hour, whereas 6 to 7 marks an hour are being paid at the

present time, and experience has conclusively proved that the cost of manufacture for copper and copper-alloy parts is in almost every case lower than for parts made of any other material, particularly of iron. This fact is especially noticeable in the making of smaller parts requiring many operations, where, according to a report by one of the leading German electrical concerns, it was found more economical to make certain small screws of brass rather than of iron, despite the disparity in the costs of material.

Aluminum proved by far the most suitable substitute for copper, and the all-round serviceableness of that material was of great advantage to the German war-material industries, particularly during the later stages of the war, when the scarcity of other metals made itself severely evident. There can be no doubt that aluminum as a material of construction for all-round purposes has come to stay, with the exception, perhaps, of the cable and insulated-wire industry. The employment of aluminum in lieu of copper in this particular industry is gradually decreasing, owing to the fact that the greater electrical resistance of aluminum renders an increase in the sectional area of the wire necessary, the saving in the cost of the metal thus becoming illusory, particularly in view of increased production costs.

In conclusion, it may be stated that the increase in copper consumption is, in a measure, also due to competitive reasons. The German industry meeting with stiffening competition in the world's markets, greater care than heretofore must be bestowed upon the turning out of "quality first" work, and it is realized that "Ersatz" will be unable to hold its own against the "real thing" in the long run—even in the face of lower prices. The realization of this fact finds expression in propaganda and advertising matter where stress is laid upon the absence of all substitutes. "Warranted Peace-Time Material," "No Substitutes Enter Into the Construction of Our Products," "No War Substitutes Employed," are slogans frequently noted.

## Average Prices of Principal Metals for Twenty-Six Years—1895-1920

Year	Copper		Lead		Tin		Zinc			Anti-mony, New York	Quick-silver, New York	Alum-inum, New York	Silver, New York	Plat-inum, New York
	Electrolytic New York	Standard London	New York	London	(f) New York	(o) London	New York	St. Louis	London					
1895	10.76 <sup>(b)</sup>	.....	3.23	.....	14.05	63.333	3.63	.....	.....	7.560	39.58	58.66	65.250	.....
1896	10.88 <sup>(b)</sup>	.....	2.98	.....	13.29	59.496	3.94	.....	.....	6.650	37.00	50.75	67.060	.....
1897	11.29 <sup>(b)</sup>	.....	3.58	12.367	13.67	61.400	4.12	.....	.....	6.750	38.50	39.00	59.790	.....
1898	12.03 <sup>(b)</sup>	.....	3.78	12.983	15.70	71.204	4.57	.....	.....	8.690	40.70	30.58	58.260	.....
1899	16.67	.....	4.47	14.933	25.12	122.429	5.75	.....	.....	9.430	43.63	32.72	59.580	15.22
1900	16.19	.....	4.37	16.987	29.90	133.575	4.39	.....	.....	9.500	51.00	32.72	61.330	18.09
1901	16.11	.....	4.33	12.521	26.74	118.633	4.07	.....	.....	8.250	47.00	33.00	58.950	20.00
1902	11.626	52.460	4.069	11.262	26.79	120.720	4.84	.....	.....	6.120	48.03	33.00	52.160	19.00
1903	13.235	57.970	4.237	11.579	28.09	127.320	5.40	5.191	.....	6.000	41.32	33.00	53.570	18.91
1904	12.823	58.884	4.309	11.983	27.99	126.733	5.100	4.931	.....	6.371	41.00	35.00	57.221	19.50
1905	15.590	69.465	4.707	13.719	31.358	143.083	5.882	5.730	25.433	10.250	38.50	35.00	60.352	20.34
1906	19.278	87.282	5.657	17.370	39.819	180.646	6.198	6.048	27.020	21.730	40.90	35.75	66.791	28.04
1907	20.004	87.007	5.325	19.034	38.166	172.638	5.962	5.812	23.771	14.840	41.50	45.00	65.327	30.98
1908	13.208	59.902	4.200	13.439	29.465	133.124	4.726	4.578	20.163	8.004	44.84	28.70	52.864	16.32
1909	12.982	58.732	4.273	13.042	29.725	134.774	5.503	5.352	22.185	7.466	46.30	22.00	51.502	24.87
1910	12.738	57.054	4.446	12.920	34.123	155.308	5.520	5.370	23.050	7.386	47.06	22.25	53.486	32.70
1911	12.376	55.973	4.420	13.970	42.281	192.353	5.758	5.608	25.281	7.540	46.54	20.07	53.304	43.12
1912	16.341	72.942	4.471	17.929	46.096	209.420	6.943	6.799	26.421	7.760	42.46	22.01	60.835	45.55
1913	15.269	68.335	4.370	18.743	44.252	201.679	5.648	5.504	22.746	7.520	39.54	23.64	59.791	44.88
1914	13.602	61.524 <sup>(c)</sup>	3.862	19.076 <sup>(c)</sup>	34.301	156.564 <sup>(c)</sup>	5.213	5.061	22.544 <sup>(c)</sup>	8.763	48.31	18.63	54.811	45.14
1915	17.275	72.532	4.673	22.917	38.590	163.960	13.230	13.054	67.533	30.280	87.01	33.98	49.684	47.13
1916	27.202	116.059	6.858	31.359	43.480	182.096	12.804	12.634	72.071	25.370	125.49	60.71	65.661	83.40
1917	27.180	124.892	8.787	30.500	61.802	237.563	8.901	8.730	52.413	20.690	106.30	51.59	81.417	102.82
1918	24.628 <sup>(d)</sup>	115.530	7.413	30.100	(e)	330.138	8.159	7.890	54.180	12.581	123.47	33.53	96.772	105.95
1919	18.691	90.796	5.759	28.590	63.328	257.601	7.338	6.988	42.879	8.190	92.15	(e)	111.122	114.61
1920	17.456	97.480	7.957	37.832	48.273	295.866	(e)	6.671	44.372	8.485	81.12	32.72	100.900	110.90

(a) Prices of tin, London, from 1895 to 1914 from statistical report of Metallgesellschaft, Frankfurt-am-Main. (b) Prices 1895 to 1899 are for Lake copper. (c) Averages of nine months, no quotations being made during August, September, and October. (d) Average of 11 months, no quotations being made in December. (e) No average computed. (f) 99 per cent tin. Quotations for copper, lead, tin, zinc, antimony, and aluminum, in New York or St. Louis, are in cents per pound. Quicksilver prices are per flask of 75 lb. Silver and platinum are quoted in dollars per ounce. All London quotations are given in pounds sterling per long ton.

# MINING STOCKS

Week Ended February 5, 1921

Stock	Exch.	High	Low	Last	Last Div.	Stock	Exch.	High	Low	Last	Last Div.	
<b>COPPER</b>						<b>GOLD</b>						
Adventure.....	Boston	*60	*60	*60		Alaska Gold.....	New York	1	1	1		
Ahmeek.....	Boston	53	50	51	Sept. '20, Q	\$0.50	Alaska Juneau.....	New York	1	1	1	
Alaska-Br. Col.....	N. Y. Curb						Carson Hill.....	N. Y. Curb		22		
Allouez.....	Boston	21	21	21	Mar. '19	1.00	Cresson Consol. G.....	N. Y. Curb		1	June '20, Q	
Anaconda.....	New York	40	38	38	Nov. '20, Q	1.00	Dome Extension.....	Toronto	*45	*45	*45	
Arcaadian Consol.....	Boston	3	2	3			Dome Mines.....	New York	12	12	12	
Aris. Com'l.....	Boston	8	8	8	Oct. '18,	.50	Golden Cycle.....	N. Y. Curb	*65	*63	*73	
Big Ledge.....	N. Y. Curb						Goldfield Consol.....	Colo. Sprgs.	*8	*7	*7	
Bingham Mines.....	Boston	8	8	8	Sept. '19, Q	.25	Hollinger Consol.....	N. Y. Curb	6.70	6.45	6.60	
Calumet & Arizona.....	Boston		49	49	Dec. '20, Q	1.00	Homestake Mining.....	New York	50	50	50	
Calumet & Hecla.....	Boston	25	24	24	June '20, Q	5.00	Kirkland Lake.....	Toronto	*50	*49	*49	
Canada Copper.....	N. Y. Curb						Lake Shore.....	Toronto	1.24	1.20	1.21	
Centennial.....	Boston	10	9	9	Dec. '18, SA	1.00	McIntyre-Porcupine.....	Toronto	1.87	1.85	1.85	
Cerro de Pasco.....	New York	30	27	28	Dec. '20, Q	1.00	Porcupine Crown.....	Toronto	*22	*21	*21	
Chile Copper.....	New York	12	11	12	Sept. '20, Q	.37	Portland.....	Colo. Sprgs.	*55	*48	*60	
Chino.....	New York	23	22	22	Sept. '20, Q	.37	Reorgan. Booth.....	N. Y. Curb	*5	*4	*5	
Columbia Rexall.....	Salt Lake	*33	*32	*32	Dec. '18, Q	.05	Silver Pick.....	N. Y. Curb	*9	*7	*7	
Con. Arizona.....	N. Y. Curb						Teck Hughes.....	Toronto	*11	*10	*10	
Copper M.....	N. Y. Curb						Tom Reed.....	Los Angeles	1.15	1.06	1.09	
Copper Range.....	Boston	34	33	33	Sept. '20, Q	.50	United Eastern.....	N. Y. Curb	2	2	2	
Crystal Copper (new)	Boston Curb	*47	*40	*41	Sept. '20, Q	.50	Vindicator Consol.....	Colo. Sprgs.	*22	*17	*18	
Davis-Daly.....	Boston	7	6	6	Mar. '20, Q	.25	West Dome Consol.....	Toronto	*10	*9	*10	
East Butte.....	Boston	9	9	9	Dec. '19, A	.50	White Caps Mining.....	N. Y. Curb	*9	*8	*8	
Fiesta National.....	Boston Curb	*95	*87	*87	Feb. '19, SA	.15	Yukon Gold.....	Boston Curb			*60	
Franklin.....	Boston	2	2	2							*60	
Gaden Copper.....	N. Y. Curb			*25								
Granby Consol.....	New York	23	22	22	May '19, Q	1.25						
Greene-Cananea.....	New York	23	23	23	Nov. '20, Q	.50						
Hancock.....	Boston			3	Jan. '21, Q	.05						
Howe Sound.....	N. Y. Curb			3	Jan. '21, Q	.05						
Inspiration Consol.....	New York	35	34	35	Oct. '20, Q	1.00						
Iron Cap.....	Boston Curb	7	6	6	Sept. '20, K	.25						
Ile Royale.....	Boston	20	19	19	Sept. '19, SA	.50						
Kennecott.....	New York	20	18	19	Dec. '20, Q	.50						
Keweenaw.....	Boston	1	1	1								
Lake Copper.....	Boston	3	3	3								
La Salle.....	Boston			2								
Magma Chief.....	N. Y. Curb			*21	Jan. '19, Q	.50						
Magma Copper.....	N. Y. Curb	23	22	23	Jan. '19, Q	.50						
Majestic.....	Boston Curb			*8								
Mason Valley.....	Boston			1								
Mass Consolidated.....	Boston			2	Nov. '17, Q	1.00						
Mayflower-Old Col.....	Boston	4	4	4								
Miami Copper.....	New York	19	18	18	Jan. '21, Q	.50						
Michigan.....	Boston	3	3	3								
Mohawk.....	Boston	46	45	46	Nov. '20, Q	1.00						
Mother Lode (new).....	N. Y. Curb	5	5	5								
Nevada Consol.....	New York	11	10	11	Sept. '20, Q	.25						
New Baltic.....	Boston Curb			3								
New Cornelia.....	Boston	16	16	16	Aug. '20, K	.25						
Nixon Nevada.....	N. Y. Curb			*5								
North Butte.....	Boston	12	11	11	Oct. '18, Q	.25						
North Lake.....	Boston											
Ohio Copper.....	N. Y. Curb											
Old Dominion.....	Boston	19	19	19	Dec. '18, Q	1.00						
Oscoda.....	Boston	27	27	27	June '20, Q	.50						
Phelps Dodge.....	Open Mar.		165		Jan. '21, Q	2.50						
Quincy.....	Boston	39	39	39	Mar. '20, Q	1.00						
Ray Consolidated.....	New York	13	13	13	Dec. '20, Q	.25						
Ray Hercules.....	Boston Curb	*63	*50	*63								
St. Mary's Min. Ld.....	Boston	33	33	33	June '20, K	2.00						
Seneca Copper.....	Boston	1	1	1	Nov. '17, Q	.25						
Shannon.....	Boston	6	5	6	June '20, Q	.25						
Shattuck Arizona.....	New York			1								
South Lake.....	Boston			1								
Superior Copper.....	Boston	4	4	4	Apr. '17,	1.00						
Superior & Boston.....	Boston	1	1	1								
Tenn. C. & C.efs.....	New York	8	8	8	May '18, I	1.00						
Toulumne.....	Boston	*55	*50	*50	May '13,	.10						
United Verde Ex.....	Boston Curb	28	26	27	Nov. '20, Q	.50						
Utah Consol.....	Boston	5	4	4	Sept. '18,	.25						
Utah Copper.....	New York	57	55	55	Dec. '20, Q	1.50						
Utah M. & T.....	Boston	2	1	1	Dec. '17,	.30						
Victoria.....	Boston			2								
Winona.....	Boston			*75								
Wolverine.....	Boston	13	12	12								
<b>NICKEL-COPPER</b>						<b>SILVER</b>						
Internat. Nickel.....	New York	15	15	15	Mar. '19,	.50	Arizona Silver.....	Boston Curb	*28	*24	*24	
Internat. Nickel, pf.....	New York	80	80	80	Nov. '20, Q	1.50	Batopilas Mining.....	New York	1	1	1	
<b>LEAD</b>						Beaver Consol.....	Toronto	*37	*36	*37		
National Lead.....	New York	72	72	72	Dec. '20, Q	1.50	Coniagas.....	Toronto	2.00	2.00	2.00	
National Lead, pf.....	New York			104	Dec. '20, Q	1.75	Crown Reserve.....	Toronto	*18	*18	*18	
St. Joseph Lead.....	New York	12	11	12	Dec. '20, QX	.50	Kerr Lake.....	Boston			3	
Stewart Mining.....	Boston Curb			*6	Dec. '15,	.05	La Rose.....	Toronto	*32	*32	*32	
<b>ZINC</b>						McKinley-Dar-Sav.....	Toronto	1.15	1.05	1.10		
Am. Z. L. & S.....	New York	9	8	8	May '17,	1.00	Mining Corp. Can.....	Toronto	1.15	1.05	1.10	
Am. Z. L. & S, pf.....	New York	28	27	27	Nov. '20, Q	1.50	Nipissing.....	N. Y. Curb	8	8	8	
Butte C. & Z.....	New York	5	4	5	June '18,	.50	Ontario Silver.....	New York	5	5	5	
Butte & Superior.....	New York	14	13	13	Sept. '17,	1.25	Ophir Silver.....	N. Y. Curb	*10	*9	*9	
Callahan Zn-Ld.....	New York	6	5	5	Dec. '20, Q	.50	Peters n Lake.....	Toronto	*10	*9	*9	
New Jersey Zn.....	N. Y. Curb			157	Nov. '20, Q	4.00	Temiskaming.....	Toronto	*19	*17	*17	
Success.....	N. Y. Curb	*3	*2	*3	July '16,	.03	Trethewey.....	Toronto	*19	*17	*17	
Yellow Pine.....	Los Angeles	*59	*59	*59	Sept. '20, Q	.03						

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

