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# ENGINEERING AND MINING JOURNAL

August 6, 1921



**Mining Engineers in the Swim**

Wind-up of Joint Meeting of San Francisco Section of American Institute of Mining and Metallurgical Engineers, and California Dredge Operators, at Franktown, Nevada

## The Graphite Industry of the United States and Canada

By Benjamin L. Miller

## Bureau of Mines Rare and Precious Metals Station

By George J. Young

## The Fatigue of Metals

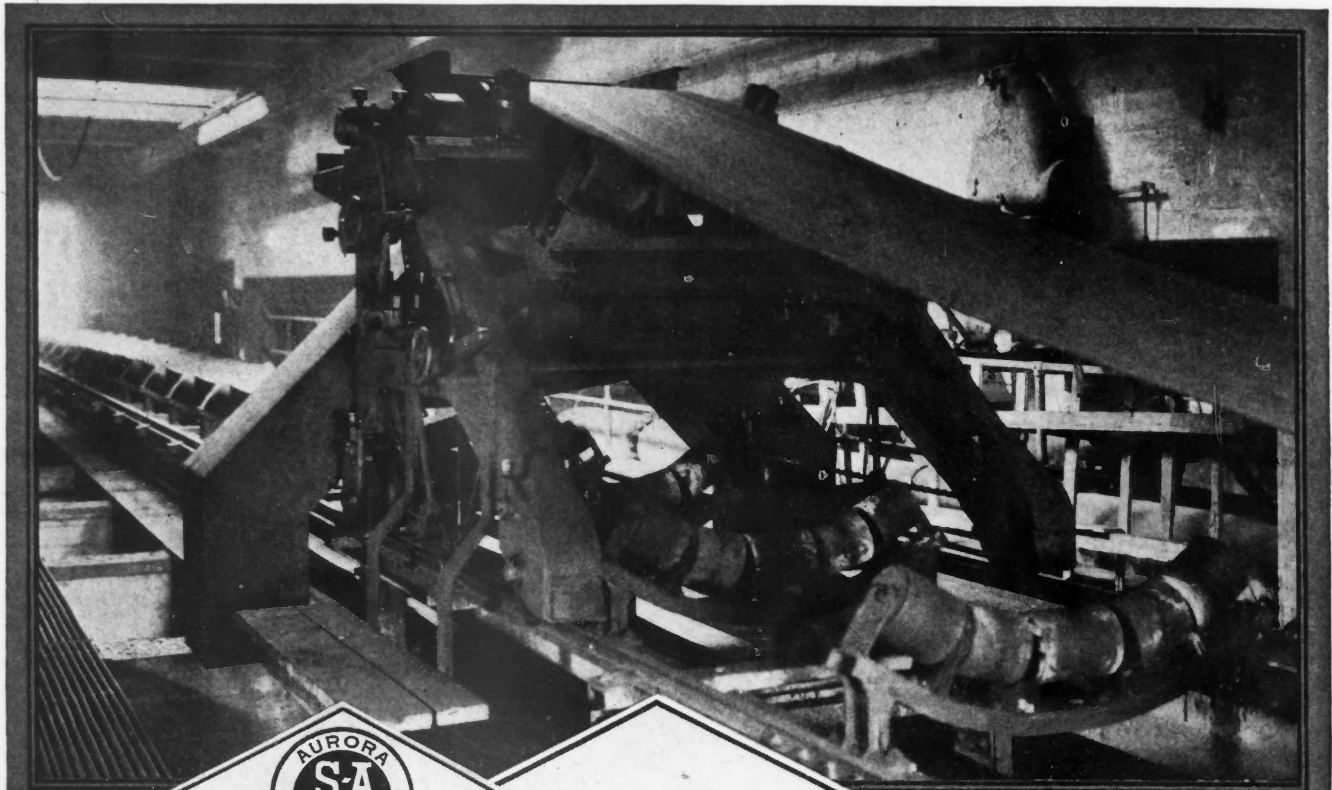
By Paul Kreuzpointner



Are copper, tin, and zinc prices now scraping the bottom? The July average prices for tin and zinc, shown on page 233, are the lowest since the panic of 1907. Prices now are even weaker than in July. The first signs of a revival will be indicated in our authoritative Market Report and may come soon. Watch for them.

The tariff is a question usually dismissed as complex, and left to those who for substantial economic reasons want or do not want an import tax on one thing or another. Nevertheless, it is one of our vital national problems, about which we should think. The Editor offers a few homely reflections on this timely subject.

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# Engineering and Mining Journal

*A Weekly Journal of the Mining and Mineral Industries*  
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Number 6

## Congress and the Tariff

**T**HE TARIFF is not a simple subject. We announce frankly that we do not plumb its depths. And in the minds of those who seek for tariffs, or oppose tariffs, we do not find any depths of understanding. "It will fatten MY pocketbook" is the sole honest argument, although each tariff bill is generally smugly prefaced by the statement that the object is to provide revenue for the National Government. The sole honest argument of the opposition in each case is: "It will tap MY pocketbook." But these reasons, excellent as they are, are not national reasons; and either of them, or a compromise between the two, cannot safely be made the basis of legislation for the hundred millions.

The two parties proposing and opposing a tariff, for example, on graphite in pencils, representing the graphite miners and the pencil manufacturers, are often absurdly small numerically, and also in proportion of money interests involved, to the population and wealth of the United States; yet this last factor, the great third party involved, is generally not considered, and Congress decides between the two intensely interested minor groups and imagines it has acted with the wisdom of Solomon dividing the child. In other cases, there is really only one interested party sufficiently involved to appear as a special pleader, the party whose pocketbook the tariff will fatten; and that makes it easy for Congress, for it is a case of the interested producers or manufacturers versus the American public, and the latter do not appear. A special attorney should be appointed to represent the hundred millions, otherwise the *consumers*, in all these arguments; and then all parties would be represented.

A great step in advance has recently been made in the calling by Congress on the Tariff Commission for information. This commission has apparently conducted itself with great discretion, holding itself impartial as to theory and only ready as a source of unprejudiced and uncontaminated facts, which Congress finds it practically impossible to obtain from the interested parties. The Tariff Commission has helped specifically; but more than that it is a most hopeful precedent, in that the busy lawmakers of Capitol Hill call upon the expert students, steeped in investigation and free from interest, at the other end of the Avenue. We hope to see this liaison perfected at all points of contact.

## The Foundation in Tariff Thinking

**I**T IS NECESSARY for each one to do his own thinking. He will often find himself rebuked for it as presumptuous: but the fact remains that he must do it, and each of the hundred millions must, too; otherwise good-by to democracy. The professional economists, we understand, have not been able to get themselves accepted as infallible in economic questions, such as the

tariff: Congress and the press does not blindly follow them, and they differ among themselves. Therefore, disagreeable and unpopular as it is, we must think.

Our thought leads us to the proposition that *any legislation which benefits more people in the United States of America than it injures is good legislation; and, conversely, any legislation that injures more citizens than it benefits is bad legislation.*

Do you accept that? It is the rule of the majority; the principle of the greatest good for the greatest number.

Second, *that in considering the relative number benefited, and those injured, heads and not dollars must be counted.* Do you accept that? Legislation to benefit one man to the extent of one hundred million dollars, and to tax one hundred million Americans to the extent of fifty cents each, is bad legislation. Do you accept that? You must accept it. It is the foundation of our Government. And if you accept it, you must accept all variations of the rule. Any legislation that benefits a hundred thousand people and taxes a hundred million is bad legislation. It tends to enrich the few for the benefit of the many; whereas our ideals are democratic, and favor the striving toward maximum equality. And this is true no matter how greatly the legislation enriches the minority; in fact, it becomes more and more true. It is heads and not dollars that must be counted. Do you agree to that? If so, we have, right or wrong, some broad, honest, fair, sporting foundation to begin with.

If you agree to that, then it follows that any one who undertakes to obtain a minority advantage over the majority—that is to say, over the country—by special legislation, is a traitor, and is conspiring against the existence and growth of this free and democratic government. You have to agree to this, if you accept the premises.

Now, the tariff is legislation; and so, humbly but honestly groping for a firm foundation, we have some point to start from when specific instances come up.

## The Many Industries in Mining

**E**VERYBODY THINKS LOOSELY: some people more so than others. A lot of people talk about protecting the mining industry. There is no mining industry as an entity. There is the coal industry, or rather the anthracite industry and the bituminous industry; the iron and steel industry; the copper industry; the graphite industry; the flint-pebble industry; and many more. They are separate industries, with quite separate problems. You cannot lump them. Their classification together is founded on the broadest of economical characterization; the mining industries for practical purposes are no more to be grouped than are the manufacturing industries. What group would be so ignorant and narrow as to try to urge uniform

legislation for manufacturing industries? Yet we find them undertaking to do it for the mining industries.

So we have arrived at a further point, that we must consider each industry separately.

### The Tariff for National Defense

**N**OW WE MUST RECORD an exception to the economic conclusions we adopted above, and make the proposition: Legislation is good legislation if it is necessary for the protection of the nation, even if it works against the economic advantage of the majority and for the financial benefit of the minority. Here is a dangerous principle, but a sound one. Legislation to support an army, coast defenses, build the Panama Canal, are instances. The reason is that what is necessary to maintain the independence and power of the nation, cost what it may, is finally for the good of all.

### The Application of the National Defense Tariff Theory

**W**E SAID ABOVE that this principle is a dangerous one, because it requires a clear judgment to apply it. Just as most of our selfish tariff measures are prefaced with the hypocritical statement that they are intended to raise revenue for the Government, just so many of these purely selfish claims are put forth with the sly statement that they are intended to provide the nation defense in time of war. Selfishness is honest: we cannot dispense with it; but smug hypocrisy is intolerable in all but ourselves. Therefore, in God's name, speak the truth, and let us get down to brass tacks.

As to the defense of the nation, there are two schools of thought that have arisen: One follows the theory that a certain mining industry should be encouraged and fanned by special legislation in order that the metal in question might be ready for the Government in case of war. The other advances the statement that the mineral supplies in question are in many cases limited, and that the legislation in question will very likely gut the ore reserves, or even exhaust them, before the next war. On looking over the ranks, we will find the special interests supporting the former view, the detached students the latter. Congress is perplexed by all this, and endeavors to face both ways at once, like the old god Janus.

The last efforts of the House of Representatives, for example, put tariffs on manganese and quicksilver to provide for the national defense by stimulating the industry, and removed the tariff on petroleum on the ground that our limited national petroleum reserves should be conserved. Yet one and the same condition applies to all three. Of course, Congress did face one way at first, and that all for the theory of artificially stimulating mineral extraction so as to have the minerals ready for war purposes. It adopted this theory, for petroleum, under the stimulation of the domestic petroleum producers; but none other than President Harding went to them and pointed out the necessity of having a national and democratic policy, not a sectional and plutocratic viewpoint, and Congress saw in the case of petroleum, but remained blind for other angles of vision. We understand that Mr. Harding was advised by Mr. Hoover, a mining engineer—one of the greatest—and, Mr. Hoover knows.

Soon afterward, the War Department comes to Congress with the opposite theory in the case of quicksilver,

and induces Congress to place a heavy duty on this, in order that the War Department might have quicksilver in time of war. Now some years ago, Mr. F. L. Ransome, of the U. S. Geological Survey, having studied the quicksilver deposits of the United States exhaustively, announced that the reserves were limited, and that any policy of artificial stimulation would ruin them very soon, in which case the nation—and the War Department—would be without domestic reserves, and would be dependent upon overseas supplies. Now, the War Department had better keep out of this. The trail of the serpent is plain in its interference; and that it is being used as a stool pigeon.

### An Answer to Prospective Correspondents

**D**O WE OR DO WE NOT represent the mining industries? We do—we represent fine and honest industries, and we try to do so finely and honestly. And we will not stand for any plan which we are not convinced is for the greatest good to the greatest number; that is to say, for the country. In other words, we shall strive to avoid being ultimately treasonable, which is as important an error to avoid now as during the blaring days of the Great War. We have the greatest mining industries in the world, and we shall see them revive with the general revival of business. You cannot keep them down permanently. But the welfare of the nation is our welfare.

### The Proposed Monazite Tariff

**W**E WOULD LIKE to discuss each proposition for a tariff on minerals separately. But we do not know enough; and there are many mining industries. One of the most absurd movements, which Congress, we are glad to say, eliminated, was for a duty on monazite. The thorium element in monazite is used in the mantles of Welsbach gas lights. Our monazite supplies are very poor and scanty: those of Brazil and India rich and abundant. Very few people indeed would have benefited by even a high tariff: but every buyer of a Welsbach mantle would have paid the tax. According to our rules laid down above, it was bad legislation, and, therefore, Congress did well to cut it out.

### The Potash Tariff

**O**N THE OTHER HAND, there is the question of potash. The House is willing to grant this tariff protection for a few years, after which it must stand on its own feet. The tariff protection will benefit only a limited amount of potash producers, and, on the other hand, will tax every farmer, and hence every eater, in the United States—and that includes most of us. By our first rule, it is bad legislation; but by our second rule, that is for the defense of the nation, we favor it. Here there is little question of conservation involved. It is true that our mineral reserves of potash salts are very limited; but our resources of manufactured potash as a byproduct or as one product of a two- or three-product manufacturing proposition are great enough to warrant the hope that a great and permanent potash industry might be established with nursing; and it would then be impossible to starve us out.

### What About Zinc?

**T**HE TARIFF ON ZINC is one of the best subjects for a real tariff argument that we know about. The zinc industry is national, not sectional—the Ameri-

can industry comprises all branches—mining, smelting and refining, manufacturing, consuming; we must grant that it is at least a fair subject in connection with which to consider national legislation. We have no firm opinion as yet on this subject, and should like to be instructed. First, do American zinc producers as a whole, including those who produce at home and those who produce abroad, desire a tariff on zinc? Second, what arguments can they present other than the understood one that they need the money—and in connection with that they must also show that they will get the money under a tariff. We hope to present some arguments on this subject from those who have studied it carefully.

The zinc people complain, among other things, that American exported zinc has been reimported into this country, spoiling the market for new American zinc. The same thing has happened in copper. Why has nobody asked for a tariff on copper?

### Flotsam and Jetsam

OUR knowledge of the Sargasso Sea, that vast stretch of still water and floating seaweed in the North Atlantic, is somewhat hazy. So it probably is with most people if not with all, for the region has rarely been visited except by the occasional mariner unfortunate enough to lose his bearings and become entangled on its edge. We have no wish to visit it save in our imagination, which route is both cheap and safe. We imagine it must be rather hot and even sticky, with plenty of flies, mosquitoes, and the like, and with only an occasional hulk, long lost and unsinkable, to break the monotonous round of days. Perhaps what was once a Spanish galleon drifts by, its hull barely showing above the surface, and, of course, filled with ducats and doubloons. This would indeed make it less monotonous for many. This region is a sort of lost and found department of Father Neptune, where the owners never apply, and where, sooner or later, all the flotsam and jetsam of the Seven Seas finds its way to its last abode.

Lest this seem like a midsummer day's dream, we assure everyone that we are wide awake, for a while at least. But we can't help but feel occasionally as if we were in the middle of a sort of Sargasso Sea as we watch the matter coming to us, much of it unsought, from all quarters of the globe, for which publicity is asked or thought advisable. The stream is never ending. And that which attracts our attention most—the Spanish galleon, as it were—is the far too frequent prospectus or advertisement of the fraudulent promoter. Some of these are funny; occasionally we reproduce one for the benefit of our readers, but most of them are wearying. Ignorance on the promoter's part or a bland assumption of his reader's ignorance distinguishes them.

It would be far better for the public were there not so much technology connected with the mining and preparation of ores. Every scientific term or phrase is an asset for the faker and a means for deceiving the untutored. The latter still respect "learning," though to a less extent than formerly, and are readily misled by the smooth-tongued fraud who, with his glittering promises, combines a glib use of technical terms.

But the flotsam keeps coming, and if, after picking it up and inspecting it, we jettison it into the wastepaper basket, the supply is not diminished. Nor will it be, so long as the laws remain as they are, and anyone, whether crook or fool, may lie to the limit about a hole in the ground and usually get away with it.

### Efforts to Widen Copper Market Still Meager

WE HAVE YET to see any public evidence of efforts to extend the uses of copper by the committee which was supposedly formed for that purpose in 1920. Possibly it is considered that the time is not propitious for publicity work. Or it may be that the various producing, manufacturing, and selling interests are not willing to co-operate to the extent of financing the project. Meanwhile there is something like three-fourths of a billion pounds of copper above ground which is serving no useful purpose and taking up valuable storage space; our copper mines, mills and smelters are generally closed down; and much personal hardship to employees is likely to result. It begins to look as if copper was destined still to find its own outlet, as it has always done, and as it will if only bought for those purposes for which consumers resist the persuasion to use iron, aluminum, nickel, or zinc.

Some commercial organizations in the Michigan copper country are reported to be trying to increase the demand for copper in various manufacturing circles. A light-weight, durable, traveling bag or sample case of lacquered sheet copper has been developed, to take the place of leather. Some candy manufacturers have been persuaded to use thin sheet copper boxes for their product, the box being sufficiently attractive, durable and useful to have a selling value apart from the candy contents. Copper strips have been found useful to place between the leaves of automobile springs. Holes are punched in the copper which hold grease for lubrication, thus eliminating squeaks. A spring so made is said to be more resilient.

Who else is to develop similar new uses for copper and tell the world about them? We should not depend on local effort, but some organization representative of the industry as a whole should handle the project. If the Copper and Brass Research Committee is not functioning, possibly one of the large advertising agencies can perfect some kind of organization in which the expense would be borne partly by the producers, in the ratio of their normal annual production, and partly by the manufacturers, in the ratio of their normal amount of business done. We do not know if any advertising agency has tried this. It would no doubt turn out to be a real man's job.

In any campaign, particular attention must be given to selling copper and brass products at a reasonable price, as we have taken occasion to mention before. Possibly retail sales agencies will have to be established. Prices continue exorbitant, even though some reductions have been made. We were glad to note the other day that copper window screening is now 12c. instead of 16c. per sq.ft., at our local hardware store, and we wondered if anything we had said had had anything to do with the reduction. We understand that jobbers expect a profit of something like 100 per cent on copper products, whereas 15 or 20 per cent is considered satisfactory in the case of iron and steel, which are looked on as standard. Copper, being a luxury, is sold in much smaller quantities and is assessed a high overhead, with apparently a few other extras hitched on in addition, to be certain that the transaction shall be a profitable one. It would appear that a big opportunity exists for some one particularly interested in the sale of copper to bridge the gap between the manufacturer and the ultimate consumer.

## WHAT OTHERS THINK

### Graphite and the Tariff on Minerals

Mr. Marc Pawl,  
New York City.

Dear Sir:

I was greatly interested in your article, "The Tariff on Minerals," published in the June 11 issue of *Engineering and Mining Journal*, especially what you wrote concerning the occurrence of graphite in the United States. Reading the article the second time prompts me to ask you your source of information concerning graphite in our country.

As a matter of information I am mailing to you, under separate cover, a small sample of our crystalline graphite, mined here in Montana. These are small lumps—that is, they have been graded down from the larger lumps. The graphite occurs in lumps often weighing several pounds, and is as pure as the sample sent you. This material was mined continually during the war and shipped to Pennsylvania. It would be shipped now if the Ceylon product (the only competitor of our grade) was not allowed to come into this country free from duty, after having been dug by some of the cheapest labor on earth.

All of this is for your information as a writer of articles which help to mold public opinion. If it were only possible for all of the writers of such articles fully to inform themselves of the facts concerning these minerals, and of our vast undeveloped mineral resources, before sending out their material to the reading public, our public opinion, which we hear so much of, would be on a more reliable basis.

With best wishes for your succeeding articles, for which I shall watch with much interest, I am,

Yours truly,

PEARL I. SMITH,  
Crystal Graphite Co.

Dillon, Mont.

Mr. Pearl I. Smith,  
Crystal Graphite Co.,  
Dillon, Mont.

My dear Mr. Smith:

In reply to your letter of July 3, received through *Engineering and Mining Journal*. It is a matter of regret to me that each person applying for a tariff on his particular product who has replied to my article on "The Tariff on Minerals" should have found the article to show so much ignorance. There is, however, a possibility that it is due to a misunderstanding of what a person's knowledge is or should be. I have examined graphite deposits from those interbedded with the schists of the Sawtooth Range near the Arctic Ocean to the beautiful amorphous deposits in Mexico, so that if my article makes me appear altogether ignorant of the subject it is because of lack of skill in writing. I have known of your deposit since it was first worked, was wholly aware of your output, and had it in mind when I wrote the paragraph on graphite. According to the figures of imports of graphite as collected by the Department of Commerce, the imports of

graphite from Ceylon in 1913, the year before the war, were 16,996 short tons, valued at \$1,674,764. In 1916, a year in which prices were exceedingly high, the imports were 42,494 tons. From then on, difficulties of shipping reduced the imports from Ceylon, until in 1918 this country received only 9,418 tons; but prices were accordingly higher.

In 1913, if I am not mistaken, your deposit had been for several years under development, but had not yet made any considerable production. In 1918, under the distressing shortage and the exceedingly high prices for graphite in this country, I should be surprised if your deposit was able to produce a quantity equivalent to much more than 2 per cent of the Ceylon graphite imported, a quantity that under a normal year like 1913 would become a much smaller proportion, probably less than 1 per cent. It is on this basis that I made my argument. Under no conditions can this country produce from its own deposits any considerable part of the lump graphite needed.

New York.

Cordially, MARC PAWL.

### A War Minerals Relief Claimant's Point of View

The camel's back is broken. The last straw is your latest philippic which appears in your editorial columns printed under date of July 2. We can no longer remain silent on your hostility toward the claimants seeking relief under the War Minerals Relief Act. Our view may be one of those which you class as "inevitably . . . personal"; but may we make so bold as to apply your own phrase to your opinion? If our memory serves correctly, we attended a meeting in December, 1918, at Washington, of war mineral producers who were seeking relief, and while there were told by you that "some 80,000 tons of chrome ore were brought into this country in spite of the embargoes, through some loose governmental machinery."

In the beginning, when you were part of the War Industries Board, meetings were held to determine a method of stimulating the production of chromite for war purposes. Requests from this board in no uncertain language were sent to us in the West. We were told "it would be a patriotic act to produce chrome in California." A brief for the claimants now should be unnecessary. Congress passed the relief measure, but the administration of relief to the claimants is opposed by the editor of the *Engineering and Mining Journal*. We thought a mining publication supported the necessities of the miners; we have evidence of this in our midst through the editorial columns of a well-known mining publication on this coast. Should the editor of a mining journal seek to obstruct relief that Congress intended the miners to have, we believe some other publication should be used. We could name many; perhaps the *Appeal to Reason* would be fitting. You commend the truculence displayed in the administering of the relief, and we think we are not far wrong in saying such a paper also has a truculent policy. All claimants we have talked to are unanimous that trucu-

lence was an "outstanding characteristic." Further than this we know not.

Notwithstanding our geographical handicap, the West went to the East by the latest mode of travel only to learn through the truculent reception that such presumption was not tolerated. Our journey should have been made on foot with pebbles in our shoes, and frankincense and myrrh in our burden. Then, perhaps, by supplication, we could have overcome the truculence and been permitted to continue on our way and sin no more.

"Honest John Shafroth" has our sympathy. We found the truculence was so outstanding that it usurped the chairmanship. Yea, we believe it would have arrogated unto itself the chief executive's chair were it possible. We do not wonder that Secretary Fall accepted the resignation of truculence. It has permeated the relief measure too long. Secretary Fall saw this from afar, and needs not the guidance of the *Engineering and Mining Journal's* vision.

Glittering objects attract weak eyes. This glittering truculence has been so outstanding that to all appearance it has not only attracted the editorially weak eyes of the *Engineering and Mining Journal*, but blinded them. Upon close approach you could only see the reflex of yourself, a pleasing thing to warped visions. Peering around, the new appointment meets your view, and no glittering truculence presents itself; so you hurl an invective, and a maladroit innuendo is cast at our Secretary of the Interior because he chooses a new commissioner from a peculiarly named West Virginian town. The quality of this thrust is not lost in attempted facetiousness. It asserts itself, as did the truculence, now terminated by Secretary Fall. Our new Secretary would not prostrate his office to its domination. He willingly combats it; he discards it; he regards it as the antithesis of relief; and he can now proceed to administer relief to the claimants as was intended by the act.

We do not attempt to disculpate ourselves in saying your malignment of Senator Fall's liberality is praise indeed. Ours may have been an erring path, but it was human; nor do we look for support or sympathy in your columns. The facts we righteously demand, and we would ask you to explain your apparent ignorance of Congressional inquiry into the truculent adjudication of the claims. We would call this inquiry the result of "the breath of criticism" you deny. In explaining, you might include the theory by which you conclude "They (the commission) have completed their work." Claims are still pending, and we cannot believe you are purposely misleading, but might infer you intend ambiguity. The second paragraph of this editorial is to the point. "We all have a tendency to 'know better.'" Undoubtedly you "know better" than Secretary Fall. You can run the Secretary's office better than he can. You can pass on the claims better than his commission.

We have often pitied the boorish orator who at his peroration resorts to mingling flag waving with his speech, arousing thereby maudlin cheers which in his surfeited bigotry he interprets as public praise. The writer can wave no flag in print, but his recourse is the unbeatable argument of protecting the taxpayer's pocket. Concluding in this way as you did affects our digestion; we expected logic.

That Secretary Fall may read this in your columns is perhaps an unreasonable desire. It is not a neces-

sity, as his fearlessness has been proven. He intrepidly overcame the truculence of the old regime, he casts aside the precedent of parsimony, and says the meaning of relief is plain. No stunted stature is his lot in life, and he strives to achieve success without prejudice; he can view from lofty heights and with human kindness be humane to the deserving.

Our hats are off to Secretary Fall and his new commission. The truculent have flourished like the green bay tree, and as we look now they are not.

San Francisco, Cal.

C. S. MALTBY.

### The National Geographic Society<sup>7</sup> Championed

Your editorial, "Science, Journalism, and Hypocrisy," in *Engineering and Mining Journal* of July 9, 1921, shows vividly how nearly dormant the mining industry really is. Have you really nothing better to do than make such a gratuitous attack upon the National Geographic Society?

Your case is so weak that it would fall of its own weight—if it had any. In the seventh paragraph you admit that anything left over from the costs of the magazine goes to support expeditions and the like, but have you attempted to find out how much of each member's \$3.50 is used in that way? Does not the fact that the society and its magazine are non-commercial, and that even part of the \$3.50 is used for other purposes than the production of the magazine, sufficiently distinguish the *National Geographic Magazine* from those of the class to which the *Engineering and Mining Journal* belongs, and justify the classification of the \$3.50 as "dues" rather than as "subscription"?

Much can be forgiven you, taking into consideration the fact that the metal markets are rotten, and that you are no doubt hot, and half mad because you have to stay in the city; but be careful how you attack the magazine of the "700,000," or some one may point out why your subscription list is 10,000, while the other is 700,000.

WALTER O. BORCHERDT.

Austinville, Va.

### The Dignity of Engineering

An article appearing in the July 9 issue of *Engineering and Mining Journal*, under "What Others Think," was given the strange title, "Not Even a Correspondence School Engineer." The last paragraph of this article, in which the writer admits that the whole thing is a series of "rambling observations," probably explains the imbecility of the comparison he tried to draw between a man educated for, and experienced in, the engineering profession, as against a would-be promoter in one case and a prospector in another. It would be necessary to "ramble" far afield to stretch the imagination to a point where such a comparison as this could be reasonably drawn.

Why should an engineer of any kind, mining, mechanical, or civil, be given preference over a minister, lawyer, or doctor, when attempting to make a comparison with a promoter or prospector? We all know that an engineer is trained to have the highest regard for facts, and cannot become a successful engineer unless he religiously applies this training to his every-day work and applies himself to engineering work and not to promoting or prospecting, or some other line of work foreign to his profession.

I think we will all agree that the average promoter has never received a special training which would prepare him to deal exclusively with facts.

The admission that all the statements in the article, "Not Even a Correspondence School Engineer," are rambling observations, does not, however, explain why the writer thinks he should term himself an engineer of any description. Just because a man failed to get through a college course, after making three attempts with three different educational institutions, and afterwards also failed to promote a number of mining propositions, is no good and valid reason why he should call himself some kind of an engineer. Neither does the lack of understanding concerning the duties of an engineer entitle him to an E. M. or a C. E.

Leaving the question of whether or not this gentleman's observations are inclined to "ramble" and whether or not he has any title to call himself an engineer of any kind, I sincerely hope that circumstances may bring him in contact with a real engineer of education and ability, of which there are many, and that through this source he will learn that the average real engineer would far rather live up to the highest standard of his profession, and execute a creditable piece of engineering work for a salary or fee, and the satisfaction of having done a good job, than be the middleman in some promoting scheme for which he would receive a large commission, which generally is not earned.

An engineer does engineering work, not because he lacks the "gumption" and ability to promote or prospect, but because he is an engineer.

B. BARNES.

Bauxite, Ark.

### Converting High-Grade Matte

I have been much interested in the problem of converting high-grade copper matte in basic-lined converters, and am offering the following comments on a recent inquiry of one of your correspondents on this subject.

From the limited account in the short paragraph in your issue of Jan. 29 it would be impossible to give an exact method of procedure for continuous operation. However, it is probable that with the proper converting equipment and a reasonable amount of care this work could be done.

To solve this problem it would be necessary to know the copper content of what is called a "combined mass of shot copper and high-grade matte," as well as the percentage of metallic copper present. It is probable that this metallic portion would contain about 95 per cent copper. It would also be necessary to know the analysis of the siliceous rock used as converter flux, particularly its silica and alumina content, as well as the elevation of the plant above sea level and the size of the converter to be used.

As a provisional answer I would say that if this work were to be done in a successful manner it would be necessary to use a basic-lined converter having a fairly large capacity, at least nothing smaller than the 10-ft. diameter Peirce-Smith converter with 30 tuyères 1½ in. in diameter, or the 12-ft. Great Falls type with 24 tuyères 1½ in. in diameter, though it is possible that a smaller size might do. The air-gage pressure at the converter tuyères would have to be at least 15 lb. if the plant were situated at sea level, or at least 18 lb. if the plant were a mile above sea level. The converter

flux would have to contain at least 85 per cent silica and less than 5 per cent alumina and be fed to the converter in a maximum size of 1 in.

If the matte is so high grade that no iron is present, the converting process would require no silica and would become an easy matter. Securing a slag that can be skimmed when the matte contains only a small amount of iron is much more difficult.

The temperature of this matte would be incidental. The fact that such a mixture could be tapped and transferred in a pot of any kind without making excessive skulls in transfer pots and launders would be sufficient assurance that its temperature was sufficiently high. It would probably be necessary to heat the converter up to at least a bright red heat for the initial charge of hot matte, but the heat from the previous charge would be sufficient after regular operation was established, provided the time lost in pouring out the copper made was not too much.

I have been able to convert a copper matte containing up to 60 per cent copper in a Peirce-Smith type of basic-lined converter at an altitude of 7,000 ft. with an air-gage pressure of 14 lb. at the converter bustle pipe. This work could not be done with a pressure of 12.5 or 13 lb. An attempt to convert a 65 per cent copper matte with 14 lb. pressure was also unsuccessful because it was impossible to "raise" a converter slag that could be skimmed. This might be partly because of the poor grade of silica flux used, which contained 62 per cent silica and 15 per cent alumina. It might be interesting to note that the 65 per cent copper matte contained 3.5 per cent "metallics" which analyzed between 92 and 96 per cent copper.

The most interesting part of the paragraph was the statement that the furnace slag contained 0.2 to 0.3 per cent copper. What was the mineralization and composition of the charge and the percentage of matte fall? What was the slag analysis?

M. S. MAZANY.

Rancagua, Chile.

Referring to the correspondence concerning the conversion of high-grade matte in *Engineering and Mining Journal* of Jan. 29, March 26, and April 30, I incline to the opinion of Mr. Grabill that Mr. Demond is putting it too strongly when he states that "it is quite out of the question to treat in a converter the high-grade reverberatory product" under discussion, consisting of a "combined mass of shot copper and high-grade matte."

At several times in my experience, matte running from 60 to 65 per cent copper has been poured into small basic-lined converters when mixed with as much as 25 to 45 per cent of its own weight of molten metallic copper, and the converting operation has been successfully carried out without pre-heating, and without the addition of fuel or any other substance the combustion or action of which would tend to add heat to the charge.

It would certainly be interesting to obtain more data as to the method of obtaining, along with the high-grade matte and copper, the reverberatory slag of 0.2 to 0.3 per cent copper, a product far cleaner than that obtained in ordinary practice, and I would add my plea to yours and that of Messrs. Demond and Grabill that your original correspondent come forward with additional data, no matter how fragmentary.

Westbury, L. I.

M. H. MERRISS.





THE CARBON MOUNTAIN MILL OF THE QUENELDA GRAPHITE CORPORATION

## Graphite Industry of the United States And Canada

Review of the Geographical Distribution of the Mineral, Various Methods  
Of Milling Now Practiced and the Present Position of the Graphite Miner  
—The Proper Marketing of Graphite an Important Problem of the Industry

BY BENJAMIN L. MILLER

Written for *Engineering and Mining Journal*

**N**OTWITHSTANDING the fact that graphite in one form or other is in almost universal use among civilized peoples, a great many erroneous ideas concerning its economic utilization are still prevalent. The most common mistake made is the assumption that only one variety of graphite exists, and consequently that the product of any region may be utilized for all the various purposes for which graphite is used. Numerous instances might be cited to prove that unscrupulous promoters have deceived their clients in this respect.

When presented with Government statistics showing that the bulk of the graphite used in the United States has been imported from far-off Ceylon, many a man has been eager to invest in a company engaged in the exploitation of a domestic graphite project, only later to learn that his product was unsuited for many purposes. Indeed, so much money has been lost in graphite ventures in Canada, New York, Pennsylvania, Alabama, and Texas that among many people the mineral itself is no blacker than the reputation of the graphite industry. In every one of these regions, abandoned mines and decaying concentrating mills bear witness to the unwise investments of capital. In fact, it is doubtful whether among the hundred or more companies formed to exploit the domestic graphite deposits there are more than four or five that have returned the capital invested. Many a man has congratulated himself when he has succeeded in selling his interests to some one less familiar with the difficulties of the business.

In many attempts to create a domestic graphite-producing industry the history is about as follows: The

discovery of graphite-bearing rock leads to the formation of a company in which all the stockholders are certain that the profits will be extremely high, owing to the early capture of all the American markets supplied by foreign concerns. A mill for concentrating the graphite is soon built at a cost of \$25,000 to \$75,000, and operations are started. After a few days of operation the mill is closed to make adjustments or to replace portions of the machinery to effect a more complete recovery or to produce a better product. In some properties short periods of running and long periods of repairing and refitting go on for years until the working capital is exhausted, the stockholders are disgusted and unwilling to advance more money, and the operations cease. Reorganizations with new capital may be effected, but the same procedure of partial or complete overhauling of the mill equipment at frequent intervals continues.

### MANY CHANGES CAUSED BY THE WAR AND ARMISTICE

The Great War brought about great changes, due to the unusual demand for crucible graphite and the difficulty of obtaining the foreign product from Ceylon and Madagascar. Renewed activity and the development of many new properties in the domestic production, especially in Alabama and Texas, occurred, followed by almost complete stagnation, which still continues. Only a high import tariff can save the situation, in view of the fact that graphite crucible manufacturers still prefer the Ceylon product, and further, the Madagascar graphite, which is similar to the flake variety produced in the United States and Canada, can

be put down in New York in quantity at less cost than that of the domestic product, according to the testimony offered by the operators in a recent Congressional hearing.

Three fairly distinct varieties of graphite, amorphous, vein, and flake, are found in various countries. The amorphous variety is soft or pulverulent, and in places occurs in beds representing metamorphosed coal beds. It is the cheapest variety, has a wide distribution in the metamorphic rocks, and is used mainly for foundry facings and paint. Some of the purest amorphous graphite from Mexico is used for lead pencils. The vein graphite of commercial importance is practically confined to Ceylon, and it has long been regarded as superior to any other for crucible manufacture. The flake graphite occurs as thin flakes disseminated through metamorphic limestones, schists, and gneisses. This is the variety that has been the foundation of the graphite-producing industry of the United States and Canada. It is especially adapted for use as a lubricant, but the better grades have also been used for crucibles and the poorer ones for paint, stove polish, and various other uses. The controversy concerning its desirability for crucible manufacture in comparison with the Ceylon product still continues.

#### NORTH AMERICAN GRAPHITE MAINLY IN THE EASTERN UNITED STATES AND CANADA

Alabama, New York, Pennsylvania, and Texas contain the principal deposits of flake graphite. Rhode Island, Michigan, and Nevada possess the amorphous variety, and Montana has the only occurrence of vein graphite of any importance. In Canada the provinces of Ontario and Quebec contain the most important deposits thus far developed.

The mining of graphite rock in the United States and Canada is very simple. Open-cut mines are the most common, but, with increasing depth, underground mining becomes necessary. In most of the mines of the United States only the decomposed rock is utilized, and few of them have been extended in depth to a point where the pit method becomes impracticable. When underground mining is done it is seldom that any considerable amount of timbering is necessary. Stoping is generally simple, as the workable beds are usually several feet in thickness and fairly uniform. As the graphite occurs in regions that have undergone considerable deformation, steep dips are common.

#### REFINING FLAKE GRAPHITE AN IMPORTANT STEP

The greatest problem confronting the flake-graphite operators is the economical and efficient separation of the graphite from its associated gangue minerals. These associated minerals may be divided into two classes: those minerals that are loosely associated with the graphite particles and easily freed, and those smaller impurities that are intimately associated with the graphite and commonly lie between the thin laminæ of the graphite flakes.

The cleaning of graphite in most mills is divided into two stages which are, in a general way, concerned with the removal of these two kinds of impurities. In the first stage, termed the concentration process, the ore as it comes from the mine is crushed and treated in various ways to free the coarser and loosely adherent impurities, the resulting product being called "concentrate." The further cleaning of the graphite by finer crushing and screening by which the more firmly

adherent impurities are removed is designated the "refining" process, and the product is called "refined graphite." In both processes the object is the same, but the methods, as well as the types of machinery employed, are, in most mills, quite unlike.

The problems encountered in the separation of disseminated graphite from its associated minerals are numerous and difficult. The ordinary processes of milling are reversed, because in graphite concentration it is the mineral with the lowest specific gravity that must be saved. If the separation be a gravity one, the difference in specific gravity of graphite and its most commonly associated minerals, quartz and feldspar, is so small that the process is delicate and a slight change in the adjustment of the machines seriously affects the separation. Graphite has a specific gravity of 2.09-2.23, quartz 2.65-2.66, feldspar 2.47-2.67, calcite 2.71, mica, 2.7-3.1. The less common minerals, such as hornblende, pyroxene, pyrite, pyrrhotite, epidote, scapolite, and limonite, with much higher specific gravities, are easily separated from the graphite except when firmly adherent to the graphite flakes, and even then can be loosened by fine grinding, after which gravity separation can be readily accomplished.

#### CRUSHING GRAPHITE A SPECIAL PROBLEM

Graphite occurrences are of two kinds, the hard ore and the soft decomposed ore. Most of the mines are operating in the soft ore, so that a minimum amount of crushing is required, but some graphite is contained in hard rocks that have undergone slight changes. In such formations the crushing is a matter of considerable expense.

In the crushing of the ore, considerable care must be taken because the softness of the graphite causes it to break much more readily than the accompanying minerals. The larger the flakes the higher the price that can be obtained for the product; consequently it is advisable to crush the ore only enough to secure the maximum amount of large clean flakes, and yet without losing too much of the graphite in the tailing, due to incomplete crushing and imperfect separation of the graphite from adherent minerals of higher specific gravity.

In hard ore the graphite is set free by the breaking of the quartz and feldspar with which the graphite flakes are intimately intergrown. Soft ore as it goes to the mill may be in lumps of a foot or more in diameter, yet the binding material is only the kaolin formed by the decomposition of the feldspar. In the crushing of hard ore, naturally more of the soft graphite flakes will be cut by the angular fragments of the quartz and feldspar, but this is partly counterbalanced when compared with the decomposed ore on account of the firmer character of the flakes. Although graphite itself is scarcely chemically affected by weathering, the physical character is changed somewhat so that the flakes crumble more readily, probably due mainly to frost action when water passes between the laminæ of the flakes and in freezing pushes them apart.

#### TWO-STAGE GRINDING GENERALLY PRACTICED

The common practice is to grind the ore wet, although some mills have been equipped with driers through which the ore passes before going to the separation machines. In almost every mill the crushing is in two stages. The ore from the quarry is passed over grizzlies

or through revolving trommels, the oversize going to gyratory crushers, jaw crushers, or directly to a Chilean mill. The second stage of crushing is accomplished by rolls, stamps, Chilean mills, or ball mills. As many as three sets of rolls may be employed in series, the product of the first set of rolls passed over screens with the oversize going to a second set of rolls and screens, and the oversize being again sent to a third set of rolls.

Stamps have been used in some of the mills, but they were not satisfactory, because of the tendency of the wet graphite to form compact smooth masses, which adhered to the walls.

Chilean mills have been found effective for the soft ore, either preceded by coarse crushing or not. When the ore is crushed wet the flake is floated off to the washing machines as soon as liberated. The product may be passed through rolls before being washed, although this is not the most common custom.

Moses,<sup>1</sup> in some experiments for the Bureau of Mines, reached the conclusion that the pebble or ball mill was the most effective fine-grinding machinery for soft Alabama graphite ore. He says:

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

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

#### GRAPHITE CONCENTRATION EMPLOYS MANY PROCESSES

After the ore has been crushed, the next step is to separate the graphite from the other minerals. In the crushing the graphite and mica have been broken into thin flakes, and the quartz, feldspar, kaolin, and other brittle or pulverulent minerals have been broken into angular fragments. The shape of the graphite and mica particles renders them more easily held in suspension in running water, and they can be floated off, although they are more than twice as heavy as the water, or if treated with an air blast will be blown much farther than the angular pieces of quartz.

Numerous methods have been devised for the separation of the graphite flakes from the accompanying minerals, so many in fact that it is not advisable to attempt to describe all of them in detail. All make the attempt to recover as great a percentage of the large flakes as possible, even though there be considerable loss in the tailing. It is not uncommon to have the largest

and thickest flakes lost, as well as considerable amounts of dust. A perfect recovery is not possible, and it may even be found practicable to permit what might seem to be an unusually heavy loss.

The practice varies also in regard to the grade of concentrate produced. Certain operators prefer to make a high-carbon concentrate with practically all foreign minerals removed except those that occur between the laminae of the flakes. Other graphite producers consider it more profitable to produce a lower grade, with the thought that the impurities will be removed in the finishing or refining mills. These matters are governed by the type of concentration machinery used, the cost of producing a clean concentrate, and partly by the personal equation of the operator.

The various processes of concentration may be grouped in the following classes:

- Water flotation processes
  - Log washers
  - Buddles
  - Concentrating tables
  - Float boxes
  - Oscillators
- Oil flotation processes
  - Minerals Separation Co. machinery
  - Callow cells
  - Simplex process
  - K. and K. flotation process
- Pneumatic processes
  - Dry screening process
  - Sutton, Steele & Steele dry process
  - Electrostatic processes

A number of mills use various combinations of two or more processes. In fact, there is a growing belief that some combination will eventually be found most efficient for all the graphite ores.

The lack of unanimity in any district, as one can often obtain from the operators exactly opposite opinions regarding the advantages or disadvantages of any particular process, renders it unwise to attempt to pronounce upon their comparative value so long as experiments performed under similar conditions and on the same type of ore are lacking.

#### WATER FLOTATION PROCESSES

*Log-Washer Process*—One of the simplest but nevertheless most efficient machines used in many graphite districts is the log washer, one of the oldest types of washing machinery used in ore dressing. In practice a number of washers are arranged in series, with the sand rewashed several times before being discarded as waste. A little oil is generally used, to hold the flakes on the surface and to prevent them from again becoming mixed with the sand. The float is washed in revolving hexagonal reels. The angle of inclination of the screw must be carefully determined by experiment, so that the graphite and a minimum amount of impurities may be floated off at the lower end of the box, and a minimum amount of graphite permitted to settle in the box and be forced out of the upper end of the box by the revolving screw.

During 1918 two Alabama plants used log washers. The process is less popular than formerly, although it possesses the advantage of cheapness, on account of the low equipment cost, and eliminates the necessity of drying the ore.

*Buddle Process*—Buddles have been extensively used in the Pennsylvania mills and have been fairly successful, although within recent years the amount of labor involved in their use has caused operators to abandon them. There seems to be no satisfactory way of getting concentrate, middlings, and tailings out of the buddles except by hand shoveling, which is both slow and expensive.

<sup>1</sup>Frederick G. Moses, "Refining Alabama Flake Graphite for Crucible Use." War Minerals Investigations Series, No. 8, 25 pp., Washington, D. C., 1918.

The buddles consisted of circular tanks about three and one-half feet in depth and about sixteen feet in diameter. The ore from the crusher was mixed with much water and poured into the center of the tank. One or more revolving arms attached to a central shaft kept the water agitated sufficiently for the graphite to be mainly floated to the side of the tank, whereas the impurities remained near the central shaft. After the tank was filled, and material allowed to partly dry, it was then shoveled out. The outer portion was composed of rather clean concentrates and the middle portion contained both graphite and impurities and had to be passed into another buddle. The inner portion, consisting of sand tailings, was discarded.

*Concentrating Table Processes*—Experiments in graphite concentration by means of shaking tables, such as the Wilfley, James, and Overstrom, have been made, but so far as known no mill has ever found them entirely satisfactory. The chief difficulty seems to be due to the large amount of middling produced. The claim is some-

larger quartz and feldspar particles, scarcely affected by air suction, drop almost vertically into the first pocket while the finer materials are carried into other pockets farther back, and the finest dust is sucked out of the box into a collecting dust chamber. The number of products made varies.

The greatest disadvantage of the float boxes is that a considerable loss of the thickest flakes always occurs, on account of the readiness with which they sink. Also, any flakes of mica present will float off with the graphite. If a small amount of oil be added to the water to aid in the flotation of the graphite, a better recovery is effected.

The most elaborate modification of this type of concentration machine is known as the Munroe washer, in use in several graphite mills in Alabama.

The Colmer washer, also used in Alabama, differs from the Munroe machine in that it is circular in form and the feed is over a revolving conical plate with ribs which throw the graphite particles on the surface of the



GENERAL LAYOUT OF THE PLANT OF THE QUENELDA GRAPHITE CORPORATION, LINEVILLE,

times made that the tables have not been given a fair trial and that they should prove successful.

*Float-Box Processes*—Several different types of machines have been constructed, all based on the principle that dry graphite flakes when thrown on the surface of water would not be wet readily and would accordingly be floated over a spillway while the irregularly shaped particles of other minerals would settle at once. In the use of this process, which Dub terms "water 'skin flotation,'" it is necessary to dry the finely ground ore before sending it to the concentrator.

In some mills the custom has been to send the unclassified ground ore direct from the drier to the concentrator, but the best results have been obtained where the material is first treated in an air classifier. In this way much of the fine dust is removed as waste and a better recovery made with evenly sized ore. The regulation of the feed and the speed of the water current can be made to suit the character of the ore when separate machines treat the different sizes.

Air classifiers are of various designs, but in the form of boxes or chambers in which a suction fan is placed at the back and the graphite ore fed in front of the top in the form of a falling sheet of fine ore. Baffle boards in the box divide it into several parts, each of which connects with a hopper or bin below. In operation, the

water in a tangential direction. It is claimed that this method of feed does not break the surface tension film of the water as readily as in the other methods.

*Oscillator or Rake-Box Process*—The principle of the oscillator or rake-box process is the same as that of the log washer, as the ore mixed with water is kept agitated and the sand is carried forward in an inclined box by rows of rakes with staggered teeth attached to an eccentric. The teeth rake the material forward, are then lifted and carried back, and again dropped in the box. Water spilling over the lower end carries the flakes from each box to hexagonal revolving reels. In one mill the sand passes through three rake boxes and then to rolls. After grinding, it passes through another rake box and is discarded. Some kerosene is allowed to drip in the upper portions of the rake boxes from suspended cans and aids materially in the flotation of the graphite flakes.

Excellent results have been obtained by this type of machine where soft ores are being worked. It bids fair to become the most approved process in the Pennsylvania graphite region.

#### OIL FLOTATION NOT NEW TO GRAPHITE PRODUCERS

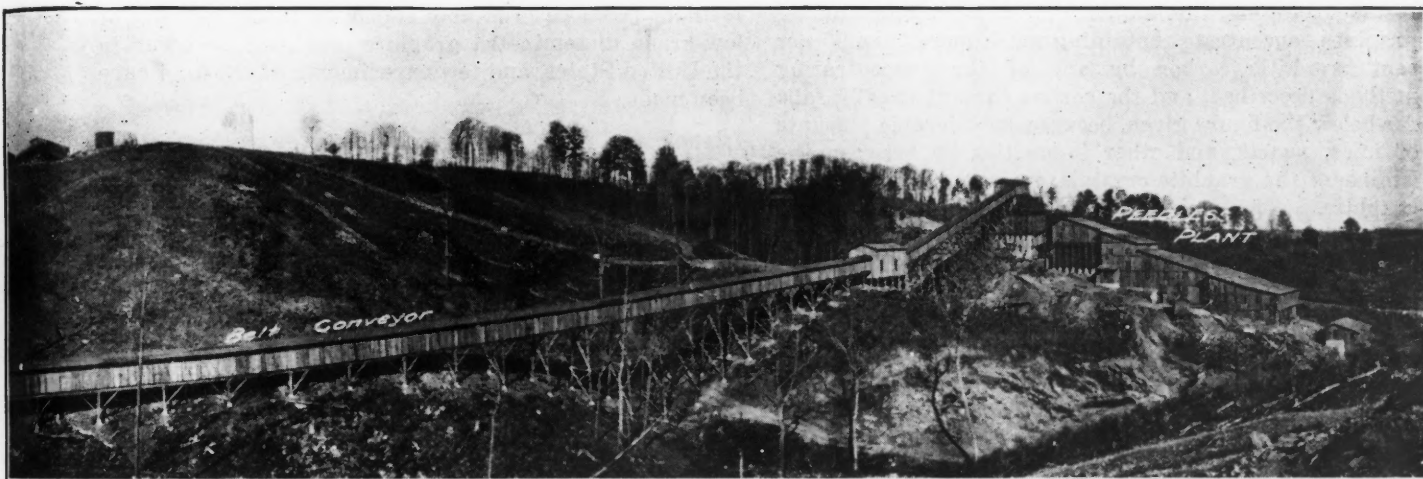
Long before oil flotation processes were devised for the separation of metallic ores from the gangue, and before the invention of special flotation machinery, oil was

used in the Pennsylvania graphite district to aid in the flotation of graphite. The discovery is said to have been made when a man carrying an oil can happened to let a few drops of oil fall on the surface of the water in a log washer, and observed that it collected and held a cluster of flakes on the surface. Accordingly, a tin can with a small hole in the bottom was filled with oil and suspended over the washer, thus permitting occasional drops to fall on the surface of the water. This simple practice is still continued, but, in addition, several more elaborate oil-flotation processes in which special machines are employed have been installed in graphite mills.

In Pennsylvania the Kraut and Kohlberg (usually known as the K. and K.) process is the only oil-flotation process ever used, and it was discontinued, but in the Alabama graphite district there are mills equipped with Minerals Separation flotation machinery, Callow cells, and the Simplex process machinery. As all of these processes are well known and contain no special

phragm immediately below the deck, which consists of a cast-iron grating covered with broadcloth. Over this grating is the concentrating top, consisting of a cast-iron frame with parallel strips of sheet brass extending diagonally from side to side, and these in turn are surmounted by another set of parallel strips diagonally in the other direction. The ball-and-socket joint permits of the top being set at any vertical or lateral inclination.

The ore is fed to the upper end of the concentrating top and aided in travel to the lower end by the rapid pulsations of the air which pass up through the broadcloth, effecting at the same time a concentration according to gravity. The lower brass strips, or riffles, carry the heavier portions to the lower side of the deck while the upper brasses or channels carry the lighter or top stratum diagonally to the upper side. At the discharge end of the deck are finger pieces which guide the various products to their respective receptacles. These machines require very accurate sizing of material, and when once set as to eccentric throw, speed, and vertical and lateral



ALA., SHOWING OPEN-CUT WORKINGS AND MILL. THIS PLANT IS NOT NOW OPERATING

features as used in graphite concentration that distinguish them from their uses in the concentration of metallic sulphides, descriptions are not necessary.

Oil flotation for graphite concentration is undoubtedly very efficacious, but the use of more elaborate types of machinery introduces problems that have not been entirely overcome. Special skill seems to be required on the part of the mill superintendent to avoid excessive waste. Some graphite producers prefer to use oil flotation in combination with water flotation, especially in fresh ore with much pyrite, as the pyrite particles are also carried off by the oil.

#### PNEUMATIC PROCESS ANOTHER CONCENTRATING MEDIUM

Although there have been few examples of air concentration for many years, it may not be out of place to include a description of the Hooper pneumatic concentrator, which has been tried in one or more mills:

"The Hooper pneumatic machine consists of a flat chest containing a diaphragm actuated by eccentrics, on a driven shaft running horizontally beneath the chest, and this chest, in turn, is surmounted with a movable deck of a peculiar design, the two separate parts being connected with a hollow ball-and-socket joint.

"The eccentrics, which are adjustable, act upon the diaphragm, causing pulsations of air to pass through the ball-and-socket joint and through a second dia-

phragm require no further care beyond cleaning the broadcloth bed, which should be done about every five hours."

*Dry Screening Process*—Within recent years a dry process that had been previously used in Canada was tried in the Pennsylvania region. The ore was dried as it came from the quarry, ground in rolls, and passed over tap screens a number of times. The chief objection to the process was the small recovery of good flakes and the excessive amount of middling, which was cleaned with difficulty.

*Sutton, Steele & Steele Process*—At least two mills in the Alabama graphite district have been equipped with Sutton, Steele & Steele dry-concentrating machinery. At the time of my visit to the region one of the mills was being overhauled and the other was in course of construction, so that no first-hand information could be secured on which to base an opinion of the efficiency of the process. Dry-concentrating tables, jigs, and dedusters were employed.

*Electrostatic Process*—The Huff electrostatic machines, with some modifications, have been used with success in one plant in the Alabama district for several years. The principle that renders the process useful is the difference in electroconductivity between graphite and its associated impurities, consisting mainly of quartz and mica.

The chief objection to the process is that it is not entirely satisfactory in working soft decomposed ores containing much limonite. The high mining and crushing costs of the hard ore render it difficult for a company working such ores to compete with companies operating in the soft ores, so that it is not probable that the electrostatic process will be widely adopted unless supplemented by other machines. If the rough concentration is first effected by water flotation, as in one of the Alabama mills, the electrostatic machines produce a high-grade concentrate. This process has been tested also in the Pennsylvania district.

#### RECRUSHING OF CONCENTRATE MAY BE REQUIRED

In some mills no attempts are made to further clean and classify the concentrate, but after drying it is at once marketed. The concentrate contains some large flake material that may be worth more than 6c. a pound and much graphite dust that is worth less than 1c. a pound, together with many fine particles of quartz and other materials attached to the flakes of graphite or included between the laminae. It is difficult to produce graphite concentrate containing much more than 80 per cent graphitic carbon by any of the concentrating methods described, and the carbon content usually falls far below the figure given, because considerable amounts of mica, quartz, and other impurities lie between the laminae of the graphite crystals, entirely inclosed by the graphite. The only way in which these foreign materials can be removed is by separating the flakes into thin pieces by grinding the concentrate. The flakes also acquire a polish in the additional grinding. It is not uncommon to find that ash resulting from the burning of the carbon of graphite flakes will still retain the approximate shape and size of the original flakes. The interlaminated impurities can be observed in microscopic sections. They may amount to as much as 10 per cent by weight.

The concentrate also contains some detached or adherent particles of quartz, feldspar, mica, and other impurities, as it passes into the finishing mill. The mica which in most concentrating processes remains with the graphite is likely to have been made brittle in the drying of the concentrate, so that it can be readily pulverized by additional grinding, which also reduces the more angular mineral impurities to a powder.

In the refining or finishing operations of flake graphite it is advisable to have the concentrate fairly clean, as the presence of angular pieces of quartz will otherwise cut the flakes. In these steps the methods employed in all the mills are much the same. The kind of machinery employed is mainly that used in the manufacture of flour.

The concentrate from the drier is elevated to a bin, whence it can be fed into rolls or buhrstone mills. In such machines the flakes, on account of their flexibility and shape, tend to flatten out and though pulled apart along cleavage lines are not materially disintegrated, whereas the more brittle minerals are broken into fine powder. Most mills use both steel rolls and buhrs, and the material is ground several times to obtain the desired product. The more frequently the flakes are ground the cleaner the graphite becomes, but the proportion of graphite dust in comparison with the flake also increases with each regrinding.

From the rolls or buhrs the concentrate is passed through various flour-mill reels to classify the materials. The process is similar to the separation of the flour and

bran in flour mill. Successive reels have fine wire or silk cloth with various sized meshes for the separation of the larger and finer particles. The details of the construction of the reels, the kind of wire or cloth used, and the arrangement of the reels vary, but the principle is the same.

There have been wide variations in the classification or grading of the finished graphite products. Some companies have marketed as many as five grades of flake and two of dust. The tendency, however, is now to produce fewer grades, commonly No. 1 Flake, No. 2 Flake, and Dust. Differences are due mainly to the size of the graphite particles but also to the percentage of impurities, the dust having a lower carbon content.

As graphite is so slightly affected by chemicals, it is possible to remove many of the impurities by simple chemical treatments. The Germans and Austrians have used some chemical methods economically and have produced practically pure graphite carbon. Hydrofluoric and sulphuric acids are employed in the treatment of the concentrate. It seems highly improbable that these methods could be profitably employed in the refining of low-grade disseminated graphite ores such as occur in the United States, and few experiments of the kind have been made.

#### IMPROVEMENTS IN MARKETING OF GRAPHITE NECESSARY

The marketing of graphite has been somewhat haphazard in the past, and few attempts have been made to systematize it. In the first place, almost every company operating in a graphite district has produced material of different quality, and the product from any one mill may also vary greatly at different times. The manufacturers of graphite products have been hampered by this variation, and probably for this reason have acquired a prejudice against the domestic flake graphite. The Alabama Graphite Producers' Association realized the importance of standardizing the Alabama product and took measures to have all the material produced by the members of the association carefully sampled and assayed by a reliable chemist before being shipped from the district. Where this has not been done there have been many instances of shipments being declined by the manufacturers, or accepted at a lower price than that agreed, because they did not meet specifications, or were of lower grade than the sample previously submitted. Unpleasant disputes and serious losses can be traced to this lack of uniformity of the marketed product. This defect is now fully realized by the operators, and is being remedied.

The irregularity of the supply has also been a drawback in the domestic graphite industry. Operators often have made contracts to furnish definite amounts regularly, and, owing to mill defects, have been unable to meet their obligations. For that reason manufacturers have experienced difficulty in dealing directly with the operators. Where they have continued to do so they have found it necessary to lay in large stocks when the product was available, and then for a number of months they would not be in the market. Thus the operating companies with small working capital have frequently suffered financial difficulties because of inability to dispose of their product promptly.

All of these conditions have resulted in the development of middlemen, who have been ready to buy anything offered by the operators and by proper refining, blending, and classifying furnish to the manufacturers any grade of material desired and of guaranteed quality.

Naturally these middlemen take advantage of any forced sales. On the whole, they have tended to stabilize the industry, as they are practically always ready to buy, and thus relieve the financial distress which a company may encounter, and they also are able to furnish a dependable supply to the manufacturer. Notwithstanding this, the operators have long complained that middlemen are receiving excessive profits and depriving the operators of their just returns. These same dealers are often also importers of foreign graphite, and have been accused by the operators of playing the foreign producer against the domestic producer, to beat down the price and purchase to the best advantage.

#### FUTURE OF THE DOMESTIC GRAPHITE INDUSTRY

The graphite industry of the United States is in a demoralized condition, although not hopeless. At present the chief efforts of the producers are being directed toward securing an import tariff on graphite and thus eliminating the present foreign competition. A more promising plan is to perfect the refining and concentrating methods and so reduce the costs that competition with the foreign producers is not detrimental. There are reasons to believe that this may be done.

A third hope is that the graphite crucible manufacturer may be shown that domestic flake graphite is not inferior to Ceylon lump. Some of the experiments of the Bureau of Mines give encouragement in this respect, but the matter is not settled. Among several operators the idea of the producer also becoming the manufacturer is gaining favor. The middlemen and the manufacturers may be receiving more than their share of the profits of the industry, yet the difficulties are so great that the day seems far distant when such a district as that of northern Alabama will be sending manufactured graphite articles into the market.

### Twenty-three Million Dollars More From Alaska

The U. S. Geological Survey has made public figures for 1920 on the mineral resources of Alaska, prepared by Alfred H. Brooks.

The value of the mineral output of Alaska in 1920 was \$23,307,757; in 1919 it was \$19,620,913. The gain in 1920 was due entirely to the increase in the output of copper, which was 47,222,771 lb. in 1919 and 70,435,363 lb. in 1920. Eight Alaska copper mines were operated in 1920, eleven in 1919. The value of the total mineral output of the territory during forty years of mining is \$461,474,789.

VALUE OF ALASKA MINE PRODUCTION IN 1919 AND 1920

	1919	1920
Gold.....	\$9,426,032	\$8,365,560
Copper.....	8,783,053	12,960,006
Silver.....	205,273	1,039,364
Coal.....	343,547	355,668
Tin.....	73,400	16,112
Lead.....	72,822	140,000
Platinum minerals.....	73,663	160,117
Petroleum, marble, gypsum.....	143,113	266,830
	\$19,620,913	\$23,307,757

In 1920, seventeen gold-lode mines and five prospects were operated and produced gold worth \$4,473,687. The Alaska gold-placer mines have produced in all gold worth \$217,885,000. In the summer of 1920, 488 gold placer mines, large and small, employing 1,987 men, were operated, and during the previous winter 82 mines, employing 318 men.

The value of the output of gold from placers was \$3,873,000 in 1920 and \$4,970,000 in 1919.

## The Role of Acid and Slimes In Flotation

Do Concentrate Slimes Flocculate and Act as a  
Carrier for the Larger Particles?  
Some Interesting Tests

BY B. H. MCLEOD

Written for *Engineering and Mining Journal*

THE following flotation experiment, demonstrating what flocculation will do and what deflocculation will not do, may be of interest to flotation operators and experimenters:

A fresh sample of concentrates was taken from the head of a pneumatic machine, which was treating a feed running about 3 per cent copper, the minerals being chiefly chalcopyrite and pyrite. This sample of concentrates was then re-treated in a small experimental machine, with only the addition of sufficient pine oil. The tailings were discarded and the concentrates treated again in the same manner. The same percentage of solids was kept throughout, as far as possible. The concentrates from the second clean-up were carefully washed and all the slimes removed, so that the mineral left would remain on a 100-mesh screen. This coarse mineral was then placed in a machine with the addition of a small quantity of pine oil, and the machine started again. Much to my surprise, nothing happened; nothing floated at all. I added a little coal tar, with the same result; a little creosote—the same thing again. Finally a little of everything else handy gave only an oil scum, and I had to start all over.

The next time, after arriving at the point where I had spoiled things before, two drops of coal tar were added, the machine run for about two minutes to make sure that the oil was well mixed in, then about three drops of sulphuric acid, and up came the most beautiful golden froth instantly. (No slimes were present, as they had been previously washed away.)

In the original treatment of the ore no acid was used, and the pulp was neutral, so when the slimes were removed no acid was washed away, although it was possible that some salts that had caused it to float before were removed. To ascertain this a fresh sample of the concentrates was taken and washed by careful decantation, treated, and the same result was attained as before.

I then remembered that when first interested in flotation I was told that a certain quantity of sands and a certain quantity of slimes were necessary for successful operation. I never believed much in that "certain quantity," but this time I was tempted to see what would happen if the slimes were put back again. The result was the same as if acid had been added, except, of course, the slimes floated as well. Adding gangue slimes at this time was not tried, but it is doubtful if that would have brought up any concentrates.

It appears that after removing the slimes the oil will not flocculate the larger particles of mineral, but that on addition of acid or slimes the mineral is immediately flocculated.

I would be pleased to know what others think about the addition of concentrate slimes; do they flocculate and act as a carrier for the larger particles, or do they cause the larger particles themselves to flocculate?

Incidentally the water obtained by floating with the addition of acid was only slightly turbid, and that obtained by the addition of slimes was fairly clean.

## The Rare and Precious Metals Station Of the Bureau of Mines

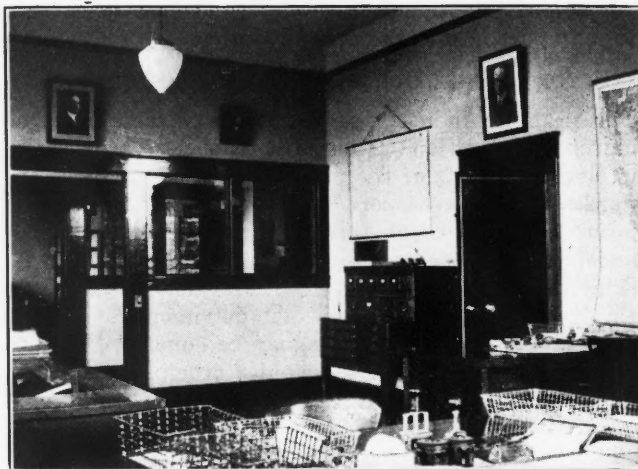
Described for First Time in Its New Location at University  
Of Nevada, at Reno—Building Cost \$40,000, Appropriated  
By State Legislature—Equipment Ample for All Purposes

Written for *Engineering and Mining Journal*

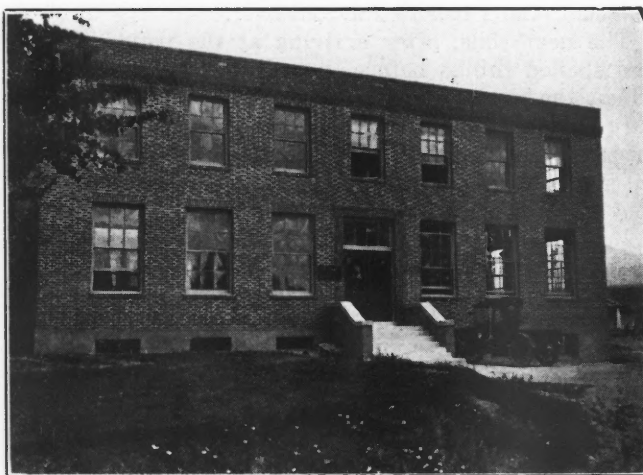
**I**N MARCH, 1919, the Legislature of Nevada voted bonds to the amount of \$30,000, the proceeds from which could be used to house a station of the U. S. Bureau of Mines at any time that one might be placed in Reno, Nev., in conjunction with the University of Nevada. In July, 1920, the Bureau decided to accept an invitation to place one of its field stations at the university, and sketch plans for the building were drawn by Walter E. Clark, president of the university, and Dorsey A. Lyon and S. C. Lind, of the Bureau of Mines, and were placed at the disposal of the state architect.

In March, 1921, the Legislature voted an additional \$10,000 for the completion of the building, which was turned over to the Bureau on April 13, 1921, since which time the installation of equipment and apparatus has proceeded to a point where the building is now completely occupied, and actual work has begun.

The building is on the campus, adjoining the Mackay



A CORNER OF MAIN OFFICE, RARE AND PRECIOUS METALS STATION



NEW BUILDING OF RARE AND PRECIOUS METALS STATION OF U. S. BUREAU OF MINES, AT RENO, NEV.

School of Mines building on the north. It is a two-story brick structure, 68 by 43 ft., with a full basement.

On the main floor there is a general office, connected with which is a private office and laboratory for the superintendent. Directly across the hall from the main office is the library, which adjoins three other private offices.

On the second floor there are two large general laboratories for analytical and research work, each equipped with a private office and balance room. There is also a large technologic and metallurgical laboratory equipped with small porcelain mills, and Janney, Colburn, Ruth, Groch, and other mechanical-type flotation machines. In addition, there are two small private laboratories, one fitted up for special investigational work and the other for work in radioactivity. The

laboratories are provided with alternating and direct current, and are equipped with electric heater, water still, hot plates, combustion furnace, muffle, and electric ovens. Hoods are provided to carry away all noxious fumes. All laboratory benches and hoods have Alberene stone tops.

A sampling and ore grinding room is in the basement. For the preliminary crushing of the largest sizes there is provided a Case crusher and a laboratory size gyratory crusher. For the next step Colorado Iron Works laboratory rolls are used; and the final reduction to finer sizes is done in a Braun disk pulverizer. Several sets of Jones sample splitters, a Tyler Ro-tap machine with complete set of screens, bucking boards, a large work table, and ample shelves for holding the various ore samples complete the equipment. In this room there are also two sets of line shafting, each directly



LIBRARY OF RARE AND PRECIOUS METALS STATION



connected to 2-hp. motors which are mounted on concrete piers.

The major part of the basement is taken up by a laboratory to be used for technologic and metallurgical work. The equipment consists of an experimental-type 6-in. belt Wetherill magnetic separator, small experimental hydraulic classifiers, an experimental-size Wilfley table, a small compressor, filter presses, leaching tanks, precipitating tanks, a Caron-Clevenger reduction furnace, and various other small apparatus. There are two sets of line shafting to supply power for the magnetic machines, concentrating tables, an Abbé silex-lined ball mill, and subsidiary small miscellaneous machinery.

In the basement there are also located an acid storage room fitted up with shelves and benches; a general storage room for surplus supplies; a dark room fitted up with a vault; a chemical assay room with hood and chemical benches; tool room; and furnace room in which are two oil-fired chemical furnaces and a 50-kw. single-phase electric furnace. The electrical equipment has a voltage range of from 20 to 85 volts, and is especially adapted for carrying out experiments on 100-lb. bullion charge.

The present staff of the station consists of Samuel C. Lind, superintendent; John Gross, metallurgist; John P. Bonardi, assistant chemist; Charles W. Davis, assistant chemist; D. C. Bardwell, assistant physical chemist; J. Walter Scott, junior chemist; Claude Gordon, senior clerk; Mattie J. Brown, junior clerk, and James T. Blake, janitor.

### Gröndal Flotation Process Introduced Into German Concentrating Plants

During the war efforts to introduce flotation processes into German ore-dressing plants were abandoned, but after the Armistice more attention was paid to this modern method of concentrating. Several plants have experimented with the so-called Gröndal process, which is somewhat different from either the pneumatic or mechanically agitated cells used in America. Compressed air is admitted to the bottoms of the cells and is there broken up into fine bubbles, but just how this is done is not disclosed by A. Macco, the author of an article in *Metall und Erz* from which this information was obtained. The illustration, however, gives an idea of the cell construction.

The Gröndal flotation machine consists of an agitation compartment from which the pulp flows through a slit into a settling chamber or spitzkasten. Here the froth, which carries most of the mineral, overflows, and the impoverished pulp slides down the sloping chamber floor to the next adjacent agitation chamber, where the process is repeated. The agitation compartments are about 2 m. high, rectangular, and of 0.15 to 0.25 sq.m. cross-sectional area. The floor converges toward the middle of the rear part of the chamber. At the lowest point the compressed air enters, the pressure being barely sufficient to overcome the 2-m. head of water. From eight to twelve units are used in each machine. Wood is used for construction, which is simple and cheap. The consumption of compressed air is between 0.6 and 1 cu.m. per minute for each unit, and the total power consumption is only about 6 hp.-hr. per machine. From

0.2 to 0.3 kg. per metric ton of domestic oil is used for floating the mineral.

Machines of this type have been used by the Boxbach Gewerkschaft at Breidenbach, Kries Biedenkopf; at the neighboring Gottesgabe tetrahedrite mine; by the Antweiler Erzgesellschaft at their Wilhelm mine in the upper Ahr valley, now under the control of the Wilhelm Gewerkschaft, and also by Beer, Sondheimer & Co. at the Friedrich-August-Hütte, Nordenham, on lead-zinc ore.

At Boxbach, from the crude ore, a pyrite carrying 1.56 per cent copper, over 90 per cent of the copper was recovered in the form of a 20 to 25 per cent concentrate, with 0.1 to 0.15 per cent of copper in the tailings. Similar results were obtained at the Wilhelm mine. At the Gottesgabe, manganese and iron caused some difficulty, the tailings running about 0.4 per cent copper, owing to the copper content of the "glasköpf," which had to be run to waste. At the Friedrich-August-Hütte, the zinc-lead ore contained about 37 per cent of barytes, which had to be reduced in the concentrates to less than 5 per cent. The following results were secured:

	Zinc, per Cent	Lead, per Cent	Silver, G. per M. Ton	Barytes, per Cent
Crude ore.....	21	11	140	36.8
Concentrate.....	34	21	320 to 350	5
Tailings.....	4	1.5 to 2	.....	86
Recovery.....	85 to 90	87 to 93	90 per cent	.....

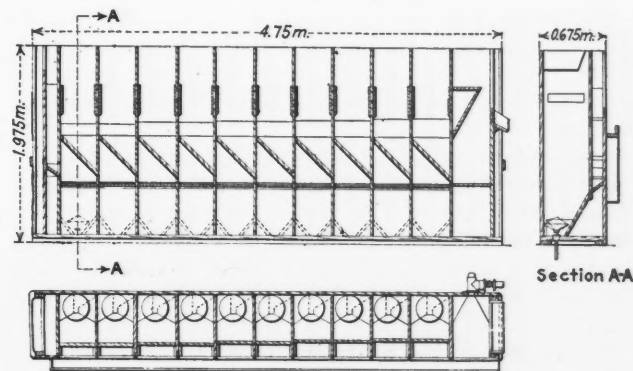


DIAGRAM OF GRÖNDAL FLOTATION MACHINE

The number of cells required was found to vary with the amount of concentrate made rather than with amount of ore treated. At the Gottesgabe and F-A-H plants, about 100 metric tons were treated per twenty-four hours, the former installation containing two machines of ten cells each, and the other, six machines of twelve cells each. The F-A-H plant, however, had eight times as much concentrate to handle per ton of ore treated as the other.

### Production of Potash Increasing in Alsace-Lorraine

All of the potash pits in Alsace-Lorraine are at present being enlarged, so that the number of laborers employed in this industry had to be increased from 3,000 to 6,000. Up to May 31, 1921, the French Republic had spent for repair works and enlargement of the potash plants, the amount of 37,000,000 fr. Of this sum, 11,000,000 fr. was for new buildings and 26,000,000 fr. for the purchase of modern machinery and tools. Since Jan. 1, 1920, the sale of the entire output of the mines is being handled by a special company formed for this purpose.

<sup>1</sup>Vol. 18, No. 9, page 197, May 8, 1921.

## The Fatigue of Metals

Steel More Sensitive to Working Stresses Than Is Ordinarily Supposed  
— Continuous Vibration Produces a Weakened Condition Conducive  
To Sudden Fracture—Regular Periods of Rest Promote Recovery of  
The Equilibrium of Internal Forces and Restore Original Efficiency

BY PAUL KREUZPOINTNER

Written for *Engineering and Mining Journal*

**C.** M. CARTER, in *Engineering and Mining Journal* of May 14, describes his experience with fatigued and rested drill steel. Recently troubles of this nature have been frequently reported and it may be of interest to users of steel in mines to review certain facts regarding the phenomena of the fatigue of metals and the beneficial influences of rest.

As the fatigue of metals is the result of a complex condition of chemical constituents, mechanical mill work, heating and cooling, subsequent heat treatment and of the extraneous forces which tend to destroy the metal while in service, the time of the appearance of fatigue or the degree of its progress is reduced to mathematical calculations. However, starting with a well-defined chemical composition, knowledge of the effects of the mechanical forces tending to strengthen, or to weaken, the metal while it is being subjected to various mechanical forces, and the judicious application of this knowledge will aid considerably in avoiding disastrous consequences arising from unexpected breakages.

Steel under routine mechanical operations exhibits a propensity to become fatigued, which indicates a diseased condition of the metal. Speaking of a diseased, or pathological, condition of steel, it may be assumed that steel is not such a rigid, inanimate body of crystals as is generally imagined. However, metals even as hard as steel are not such lifeless substances as they appear to the average observer.

The sensitiveness of steel is considerable, and even moderate shocks or blows cause vibrations of all particles, or molecules, through its mass in almost the same manner in which sound is produced by vibrations on striking a bell.

### REPETITION OF SHOCK-FORCE PRODUCES FATIGUE

As an illustration of this sensitiveness I was at one time preparing to take the elastic limit of a test piece of spring steel, but was interrupted. Someone pulling at the loose end of the test piece pulled hard enough with his hands to make a contact with the electric bells already set. Such sensitiveness was considered incredible, but after six persons had tried the trick, and each had succeeded in stretching the piece enough to make contact, there was no longer doubt of such sensitiveness. With high-power electro-telescopes movements in steel to 0.025 millimeter have been observed.

A frequent repetition of vibratory forces produces fatigue, and if no rest period intervenes and the steel is of good quality detail fracture will be the result, with final fracture. To the experienced eye the fineness of the part which broke in detail is indicative of the quality of the steel.

The limit of elasticity is the criterion of the ability to withstand fatigue and breakdown by detail fracture, always provided there are intervals of rest and remembering that high elastic limit means low ductility.

As in organic life heat is a determining factor in the nature of the organism, so is the resisting power of steel determined by the finishing heat to which the metal was subject, provided the previous treatment was normal. A diseased condition of steel is often induced by not taking into consideration the fact that steel is a composition of several elements, each of which has a different melting point. Thus, the heating should proceed sufficiently slowly to give each element time to melt and fuse intimately into the other elements according to their natural affinity. If this precaution is carefully observed, the steel will be healthy, with consequent greater resisting power to shock and vibrations and easier rearrangement of the molecules during periods of rest. Thus heat, that highly beneficial agency in promoting life, may also change the life of steel into one of usefulness or uselessness.

Experimenting in that direction, I have often succeeded in raising the strength and elongation of steel castings from 2,000 to 6,000 lb. per sq.in. and 4 to 8 per cent elongation, showing to what extent the careful application of heat can prevent as well as remedy diseased conditions of steel.

Briefly stated, then, steel is an agglomeration of molecules, arranged into crystalline form on the metal cooling from a fluid state, the hardness of the crystals and their cohesive power being determined by the proper proportion of chemical elements, freedom from foreign matter, and uniform heating, which permits the freest exchange and interchange of molecular activity while the metal is vibrated by shocks and by various strains and stresses. It is this vibration, this interchange and exchange of the molecules, composing the crystals, vibrated by shocks, which causes a condition of fatigue. If the movement of the molecules continues without intervals of rest, the crystals begin to slide, to disintegrate, to break up; microscopic cracks appear, and fracture in detail begins, resulting in breakage sooner or later, according to the physical condition of the steel and the circumstances with which the destructive forces are applied.

### EFFECTS OF REST UPON FATIGUED STEEL

If the fatigue of steel (or other metals) is the result of too long-continued or too frequently repeated vibratory motions of the molecules forming crystals, and cessation of vibrations for a longer or shorter period postpones or prevents fatigue, what is the nature of the forces counteracting the effect of vibrations?

If steel is strained beyond the elastic limit, and the load is removed and the metal allowed to rest, a reaction sets in whereby the vibrations of the molecules cease their motion and restore the equilibrium of the internal forces that resist the extraneous forces at work to break the structure. Or, in other words, the elastic limit, which was lowered during the strain, reaches its former position, and, if the rest continues

long enough, say for months or years, elastic limit may even be raised higher than it was originally. In that case, however, the ductility of the metal will be lowered. By repeated stretching and resting of test pieces during three years, in one instance I raised the elastic limit 6,000 lb. per sq.in. The object, then, of resting a tool or structural material is to give time for the disturbed and more or less dislocated molecules and crystals of the metal to rearrange and to relocate themselves into a state of equilibrium for increased resistance to the extraneous forces of destruction. However, in the case of tool and drill steels and steels which are hardened and tempered, this phenomena of fatigue and rest is more complicated than it is in non-hardened structural steel.

Steel is a solid solution of various elements, which, for the sake of symplifying the illustration, are in equilibrium and uniform in structure after annealing, and therefore there is uniform elasticity and plasticity in the structure. In steel which has been hardened and tempered there is no such equilibrium and uniformity. In non-hardened steel the cohesive force reacts uniformly through the solution; that is, the mass of the steel.

In hardened steel the solution is condensed in proportion to the degree of hardness. In addition, this density is not so uniform as to produce a difference of hardness, however slight, between the center and circumference. This presupposes a difference in structure, with consequent differences in elastic limit and variability of resisting power to fatigue.

Thus, in hardened steel there is maintained a more or less unstable solid solution, more sensitive to fatigue, hence more in need of intervals of rest. Steel is a solution of carbon in iron, and the instability in hardened steel arises from the incomplete change of the carbon into a hardened state. The process of tempering has freed some of the carbon from its solution with the iron. This difference in condition of the molecules produces a constant effort on the part of the softer and harder molecules to equalize, thereby making a pressure within the solid solution which is called the osmotic pressure. Thus, in addition to the cohesive power of the crystals in hardened and tempered tool steel, there is developed the osmotic pressure caused by the difference in their nature of the harder and less hard molecules of the solution of iron and carbon. It is obvious that under these circumstances hardened steel is more sensitive to fatigue than non-hardened steel, and requires more frequent periods of rest if such hardened steel is subjected to repetitive shocks like drill steel in a mine.

#### Filtering Flotation Concentrates At Mount Lyell

The following particulars of the work done by a drum filter on flotation concentrates at the Mount Lyell mill, in Tasmania, are taken from the *Proceedings* of the Australasian Institute of Mining and Metallurgy, No. 38. The filter used was an 8 x 8-ft. Oliver, having a filter area of 200 sq.ft. The concentrates contain chalcocopyrite and pyrite, about 6 per cent remaining on a 65-mesh Tyler screen and about 77 per cent through a 150-mesh. The feed averages 52 per cent water; the cake, 11.5 per cent; the thickness of the cake,  $\frac{1}{4}$  to 2 in.; the vacuum, 22 in.; the speed, one revolution in eight minutes; and the capacity, 600 lb. per sq.ft. per twenty-

four hours. The depth of the pulp varies, submerging the drum up to 3 ft. 6 in., lower levels yielding a drier cake and higher levels, greater capacity. Raising the temperature of the pulp by steam has not been tried, but would no doubt yield a drier cake and increase capacity.

The filter drum is wound, over the canvas, with 14-gage copper-clad steel wire, the turns being about  $\frac{3}{8}$  in. apart. It takes about sixteen hours to re-canvas and re-wire the drum. The canvas lasts about eight months and the hessian under the canvas two years, one recent canvas handling 5,157 tons of concentrates. The canvas is occasionally hosed and scrubbed, and the scraper requires particular attention, it being periodically filed reversed, or renewed.

The air lifts and emergency air agitation pipes were not found satisfactory and were discarded. The speed of the mechanical agitators was increased to 74 r.p.m. The original agitator shaft consisted of a heavy 3-in. pipe flanged to stub shafts on each end, but it was soon found necessary to use a solid 3-in. shaft. Wrought-iron paddles spaced 9 in. apart, and alternately right and left hand to avoid thrust, have been used, but on account of the presence of copper in solution, cast-iron paddles are now being tried.

The flotation attendant also operates the filter, which requires a minimum of attention.

#### Anaconda's Accident Percentage Low

During the six years 1915 to 1920, inclusive, a total of 16,460,767.5 shifts were worked by employees at the mines of the Anaconda Copper Mining Co. in Montana. According to D. Harrington in the U. S. Bureau of Mines *Reports of Investigations*, in this period there were only 2,005 serious and fatal accidents. Of these, 200 were fatalities, leaving 1,805 serious accidents (a serious accident being one in which fourteen or more days' time is lost). This is at a rate of 9,120 shifts per serious accident and at a rate of 82,304 shifts per fatality.

The record includes accidents occurring not only at the company's copper mines, but also at mines whose chief product is gold ore, or silver ore or silver and lead, or zinc, or manganese. Some of the smaller mines are shallow (less than 1,000 ft. in depth), many of the mines are comparatively deep (over 2,000 ft.), and several have mined ore below the 3,000-ft. level. Some of the mines were heavy producers of ore, some were chiefly in the development stage; two (the Leonard and High Ore) have the main pumping plants for nearly all the mines of the Butte district, and at times also produce ore; the Reins is occupied wholly with fire fighting and slime filling of fire regions of the West Colusa, Leonard, and Tramway mines.

The accident rate for all the metal mines of the United States during the six-year period averages about 2,000 fatal plus serious accidents per 10,000 shifts. A table accompanying Mr. Harrington's report shows that for the six-year period only two of the thirty-two mines operated by the Anaconda company in Montana have exceeded this average for the country, and one of these mines is a small one, which had a total of nine accidents. Even the yearly records of these mines show comparatively few instances where individual mines have exceeded the country's average of approximately 2 serious plus fatal accidents per 10,000 actual working shifts.

## BY THE WAY

### A Matter of Ethics

Is scientific enthusiasm leading the Bureau of Mines astray at its Reno station, where, with the aid of radium, efforts are being made to give color to colorless gem stones, thereby improving their market value? If this can be done, it will increase the commercial value of gem stone material found largely in the West, it is said, which value is lessened because of the stone's lack of desirable tint. This is like putting soap into moonshine whiskey to give it a bead and tobacco juice to make it look like rye, tricks familiar to the hillbillies of the South. Will not all gem stones be discredited if these experiments be successful? Or will so much radium be consumed in the process of tinting a stone that the cost of production of the gem will be greatly increased? If the latter be true, we are reconciled, and the work may proceed. We are opposed, however, to anything that will lessen or tend to lessen the value of our own jewels in the slightest degree. The public must be protected against deception even by bureaucrats.

### Always There

We are informed that the ether is ubiquitous, not the sleep-producing kind of ether, but that all-pervading something or other that even vacuums are full of. Nature abhors a vacuum, so she fills it up with ether, so they say. Very few things are ubiquitous. There are some things, however, that approach the ether in ubiquity. Of these the best known, of course, is the Ford, the creator of which is fast approaching his creation in the quality of being everywhere. Once upon a time Mr. Ford was content to turn out the flivvers and rake in the nickels, but now that is all past. So much wealth must be employed. We read of iron lands, timber lands, and a railroad that have been acquired by Ford, and now he is after the Government's nitrate plant at Muscle Shoals. It would be unfortunate were this interesting project allowed to come to nothing, especially after so much has been spent on it, and Mr. Ford is to be complimented on his nerve in venturing so far afield. Or is he merely rambolling, seeking a multimillionaire's amusement as he goes? At any rate, if the Government accepts his proposal, we feel sure that he will be getting the nitrate out by Christmas.

### An Interesting Fact

A. G. Walker and E. De Decker, British experts, find that a miner gives off 96 calories per hour per square meter of body surface and a shoemaker but 32; the miner works hardest of all men with his hands, they say, while cobbling is sedentary work. Such figures are very interesting, and the authors are to be congratulated on having contributed to the world's store of knowledge. In a measure it makes up for the burning of the Alexandrian library. But do miners burn the most calories? Are they the most energetic at their work? Does not their output of energy vary directly as the proximity of the shift boss? Or does it? Does not the rate of pay enter into the matter? They'll say it does; witness a hundred strikes. On the other hand,

the calory output of those in sedentary pursuits is not a trifle. Much of earth's hot air comes from those seated at desks, "coral tinted ear," and dictaphones. We, of course, stand or walk at our work. Nevertheless, the conclusions of the British experts are interesting. They keep one guessing. In particular, how do they calculate the number of square inches of body surface?

### Removal Notice

A thief has taken the platinum tips, valued at \$400, from the tops of the four lightning "rods" on the 275-ft. stack of the International smelter at Miami, Ariz. It is rumored that the company will build a 12-ft. fence around the stack to prevent similar occurrences in the future. Had it not been that the ends of the conductors were bent downwards by the thief, the loss might still be unnoticed.

### The Honest Salter

"I have 40 lb. of litharge going \$10 in gold, some that was left at Delamar. It is good to fix up a claim if you know anyone." This from a practical miner to a custom assayer of our acquaintance in Nevada strikes us as being very practical. Anyone desiring to know how the salt shall be salted when it has lost its savor should get in touch with this gentleman. Truly such simple-minded folk as these are among the salt of the earth. Theirs not to deceive; nor are they mercenary souls. The honest gold digger long has known that the joy of discovery is the keenest pleasure to be had in mining. And, noble that he is, in entire innocence he puts gold where it has not been before, that others may share his pleasure.

### Comin' h'off Shif'

By D. E. A. CHARLTON

We are 'eaded for tha landin' w'ere tha motor trains is standin',

There's a rumblin' soun' a-comin' from the stopes,  
An' h'each one that's done 'is blastin' is a-'opin' that its lastin'

Till tha nex' shif' 'as a chance to go tha ropes.

There's a pushin' an' a runnin', from the stopes an' drif's they're comin',

There's tha landin' o' tha cage h'upon tha chair,  
An' we're crowdin' for a footin', for a place w'ere we can put'en

An' then h'up we gaws to get a bit o' h'air.

Oh tha chap 'oo 'as tha lever in tha h'engine-'ouse is clever,  
An' 'ee naws jus' 'ow to regulate 'is speed.

Firs' we starts h'out slow an' h'easy, then we 'its up pretty breezy,

An' tha nex' thee naws tha bloody top we've see'd.

Son, tha h'outside h'air is bracin', soon thee's steppin' forth an' facin'

Toward tha dry-'ouse that's a step across tha way,  
There's tha shower if its 'andy, an' soon thee's slick an' dandy,

An' thee feels like startin' h'in h'another day.

There's tha gossip as we's walkin'. Min' you—never 'eard such talkin',

For we've got to tell h'each h'other w'ot we've done:  
'Ow tha back ain't 'ardly breakin', an' 'ow many cars we've taken

From tha stope since firs' she started h'out to run.

Since the dry law there's no treatin', but thee's boun' to get a greetin'

From tha missus an' the young 'uns gathered roun',  
An' its thanks to 'Im you're givin' for providin' o' tha livin',  
For tha miner's work 's tha bes' that can be foun'.

## HANDY KNOWLEDGE

### Socketing Hoisting Ropes With Zinc

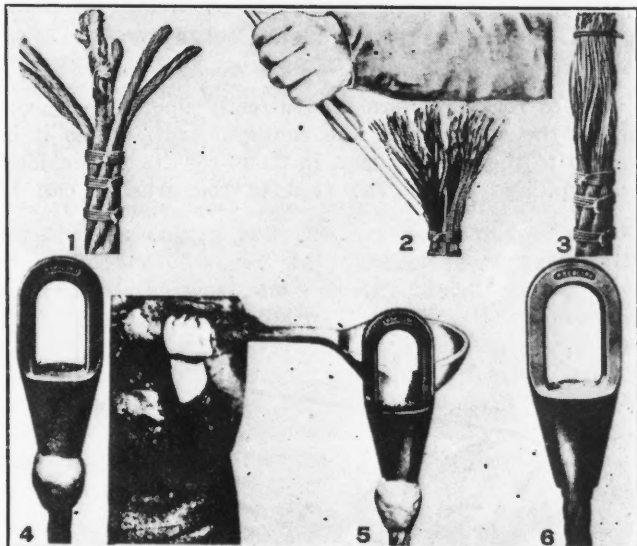
BY RICHARD V. AGETON

Written for *Engineering and Mining Journal*

THE "spelter" or zinc method of socketing hoisting ropes is gaining favor in the Lake Superior district. The Quincy Mining Co. has used this method on all ore skips and man cages for two years and has found it entirely satisfactory.

When first used, this method was tried on the smaller cables of from  $\frac{1}{4}$  in. to  $\frac{3}{4}$  in. diameter. At present the Quincy company is using the zinc method on a  $1\frac{1}{2}$ -in. cable in one of its deep shafts, for hoisting a 9-ton skip up a 50-deg. incline from a depth of more than 6,000 ft. The zinc method has many advantages over the other methods of using babbitt or clamps.

Babbitt is not entirely satisfactory, because it is an anti-friction metal, and as such it is only a question



COURTESY OF U. S. BUREAU OF MINES  
CORRECT METHOD OF SOCKETING HOISTING ROPE  
For explanation see text

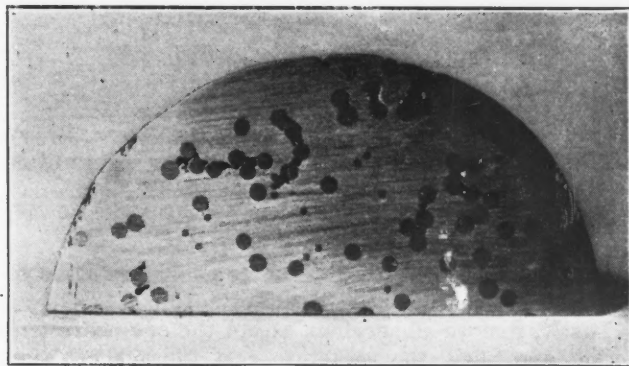
of time before the wires will pull out through the babbitt in any socket attachment. This fact seems to be well known in the mining industry, and to overcome this disadvantage it has been the standard practice to bend the wires back to prevent them from pulling out through the babbitt. This is a questionable procedure, as the process of bending the wires back is quite difficult unless the wires are annealed, and heating the wires may reduce their strength by 50 per cent.

After the wires have been bent it is then necessary to drive this bunch of bent wires back into the socket, and as it is always easier to drive one strand further than another, it is possible to get an unequal tension on the wires. Under this condition a hoisting rope may be operating with only two or three of the six strands carrying the load. It is not necessary to bend the wires when using the zinc method, as the individual wires in the cable are held in the zinc by amalgamation.

In both the babbitt method and the zinc method the fastening of the wires all takes place within the socket, and consequently is not open to inspection. However, with the zinc method the amalgamation of the zinc and steel wires is such that they cannot be separated.

The hoisting rope may also be attached to its load by means of a socket around which the whole rope is bent, the loose end of the rope being clamped to the main rope. This method of fastening develops, at most, only about 85 per cent of the strength of the rope, and also bruises and crushes the rope where the clamps are applied, thereby lessening its strength. In addition to this, clamps are likely to slip, especially when subjected to unusual strain. However, the clamp method has the decided advantage that it is easily applied, can be readily inspected, and requires little skill in making.

Rope makers recommend the zinc method of fastening sockets, as this method, if properly made, never fails. The zinc amalgamates with the individual wires to form an alloy similar to galvanized iron, and consequently it is not necessary to bend the wires back. Thus practically the full strength of the rope is obtained, for



END SECTION OF ZINC SOCKET

If wires are not properly and evenly distributed throughout the basket, they will group together, as in the upper right-hand corner, thereby lessening the possibility of contact between the wires and the zinc, thus weakening the joint.

it is impossible for one strand to carry more than its due proportion of the load when the wires are properly distributed in the basket of the socket before pouring.

To socket hoisting ropes properly by the zinc method first serve or tie the end of the rope and cut off square. Next measure from the end of the rope a length equal to the basket of the socket, and serve or tie the rope (see Fig. 1) at this point with not less than three wraps. Remove the tie at the end of the rope, open up strands, and cut out the hemp center.

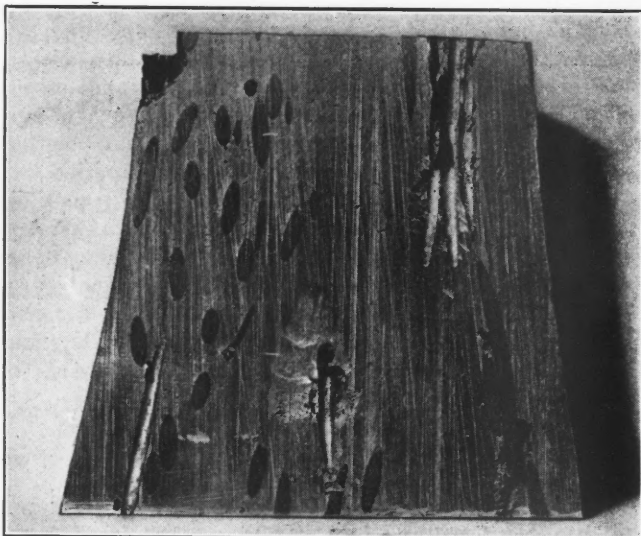
Next separate the individual wires in the strands and straighten them by means of an iron pipe, being careful (see Fig. 2) not to twist or bend any of the wires. Clean the wires thoroughly with kerosene, benzine, or gasoline, and then dry.

After the wires have been thoroughly cleaned and dried, dip the cable into 50 per cent muriatic (hydrochloric) acid solution, and keep the wires in there long enough to remove any particles of grease or dirt (thirty to sixty seconds). Dip into boiling water to which has

been added a small amount of soda, to neutralize the effect of the acid, and wipe dry. Serve or tie the wires so that the socket may be slipped on over the end (Fig. 3).

After the cable has been placed in the socket, cut the tie wire at the end of the cable and distribute all wires evenly throughout the basket and even with the top of the basket. Next place the basket in an upright position and calk up the bottom of the socket with fire clay. If the atmospheric temperature is below 65 deg. F., the socket and rope must be warmed slightly to prevent the zinc from cooling too rapidly, as a too rapid cooling will retard the amalgamation of the zinc with the individual wires, and weaken the joint (Fig. 4).

The zinc is then heated to the melting point (that is to a temperature at which it will just char a piece of



LONGITUDINAL SECTION OF SPELTER SOCKET, SHOWING AMALGAMATION OF WIRES AND ZINC

Wires were removed from the socket (upper right and lower left) to show how firmly they were imbedded in the spelter.

wood that is dipped into it) and is poured into the top of the socket basket until the socket is full (Fig. 5).

Lastly, remove all servings except the one nearest the socket and allow the socket to cool for a short time, after which it will be ready for use (Fig. 6). After socketing the rope and attaching it to the cage it should be tested by making several trips under a heavy load before men are allowed to ride, to be sure that the amalgamation has been thoroughly accomplished.

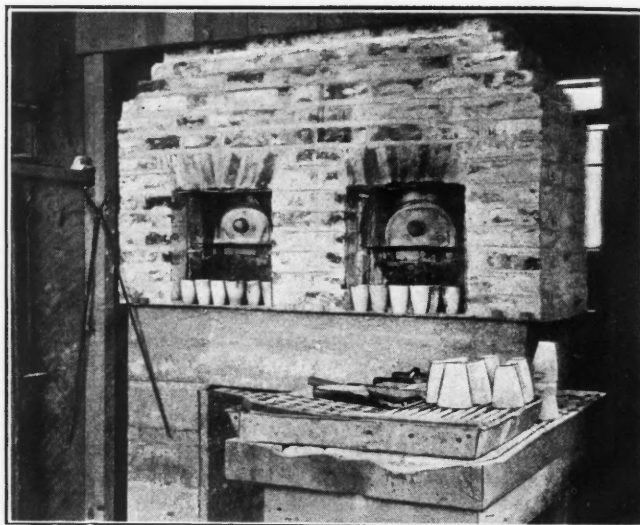
When the height of the sheave wheel above the surface landing permits, safety chains should be attached to the cage and to the cable a little above the socket.

### Keeping the Assay Laboratory Cool

Written for *Engineering and Mining Journal*

Oil-fired muffle furnaces of the ordinary steel-incased type radiate a considerable amount of heat into the laboratory, and during hot weather the interior of the laboratory may reach an uncomfortable temperature. An outer shell of red brick can be readily built about the furnaces, as shown in the illustration, and the heat radiated can be confined within the brick housing.

To carry off the fumes at the front of the muffle a 2-in. open space is provided across the full width of the muffle between the outer flat arch and the inner brick-work. This communicates with the chimney, and the draft is sufficient to induce a constant current of air from the room. The two furnaces shown are supported



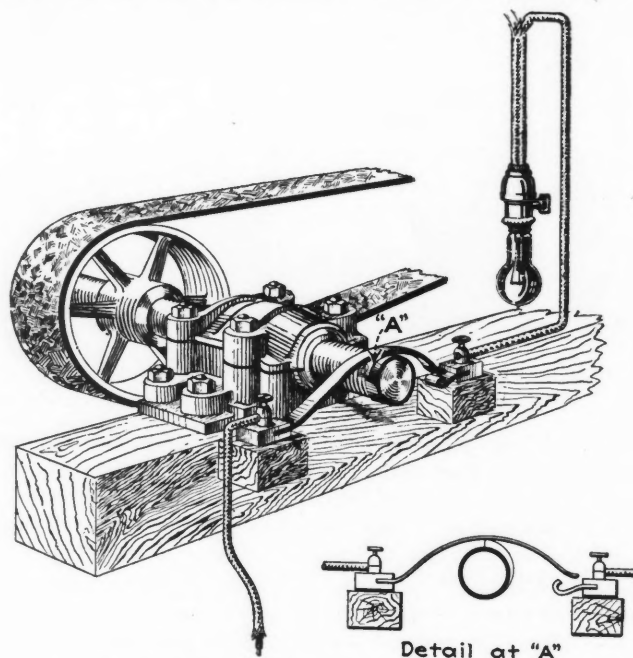
BRICK SHELL ABOUT MUFFLES TO KEEP LABORATORY COOL

on a concrete pier 42 in. high, a  $\frac{1}{8}$ -in. plate being placed on the top of the pier. The muffle height is 4 ft. 5 in. A ventilating pipe is placed in the roof above the furnace. The furnace shown is in use at the laboratory of the Carson Hill Gold Mining Co., Melones, Cal.

### Indicator for Belt Conveyor

Written for *Engineering and Mining Journal*

Where rock crushers feed directly upon a belt conveyor, the stoppage of the conveyor belt, unless it be known to the crusher man in time, results in considerable spillage before the feed to the crusher can be



LAMP INDICATOR FOR BELT CONVEYOR

shut off. To give warning of such stoppage the device shown in the sketch is used at the mill of the Carson Hill Gold Mining Co., at Carson Hill, Cal. An electric light is suspended so as to be visible to the crusher man. In the lamp circuit is a make-and-break switch which is operated by a cam on the shaft of the drive pulley. The flickering of the light continues as long as the conveyor belt is running.

# THE PETROLEUM INDUSTRY

## Argentine Oil and Labor Conditions

Certain Drawbacks Handicap Oil-Seeking Traveler in Distant Comodoro Field—Labor Now Favors Open-Shop Practice, Following An Attempt by Leaders at Bolshevik Regime

BY MARK R. LAMB

Written for *Engineering and Mining Journal*

**I**N PLANNING A TRIP to the oil fields of Argentina be sure not to depend upon the railroad to deliver your car on time, nor with all the tools and spares—in fact, expect the same kind of deliveries that are made in the States, and plan for lost time and shortages.

The trip to Rio Colorado is made from Buenos Aires in eighteen hours by train. From here to Comodoro is 800 miles in auto, over desperately sandy roads. The brave, deliberate travelers take a large car with plenty of baggage; those in a hurry and those anxious to be sure of arriving take a Ford or two, besides a spare one in the tool box.

There are several rivers to cross, the largest being the Rio Negro. On account of the depth of the water, special arrangements must be made to prevent drowning the passengers and the engine. The drivers on this route have adopted the periscope from the moving pictures of the war, and only the tenderfeet find any difficulty in using it. There is a knack in keeping the tube in the mouth and holding it steady while the stream is trying to drag it away. As for the engine, it is only necessary to carry the suction high enough, and this rarely needs to exceed two meters. The periscope is to be taken down until another river must be crossed.

### ARGENTINE FEARS STANDARD MONOPOLY

Parties are going through here with suspicious frequency. Suspicion also arises from the fact that expense is no object, and when no objection is made to a charge of \$200 for an 800-mile trip we feel sure that it must be Standard Oil. You should be told, in order to realize what this means, that all Argentine is said to be afraid that Standard Oil will secure concessions in the oil fields, and will monopolize the oil industry in Argentina, and the people have Mexico before them as an unhappy example of oil difficulties. For this reason, "Standard" is a bugbear to be greatly feared.

The new well, No. 128, has made a fine showing, and is shut off only because there is not sufficient storage for its production. As fast as the steamers can take the oil away, the well is opened. Meantime, the gusher has aroused the cupidity of the other companies, with the result that much drilling machinery has been purchased. It is not arriving, and these companies will feel pretty poor from now on until they strike oil. It

has been a fine field for well supplies until the last month.

So far there has been no co-operation among the private companies, with the result that all depend upon the government for their oil transportation. This means that until more tankers are available, the outlet for the oil of private companies is practically nil.

The journey to the field can be made by steamer, if the trip can be timed to correspond with the sailing date, but as there is nothing sure about the steamers, either coming or going, the auto is safer and surer—and much more expensive.

### CONCERNING GEOLOGISTS AND GEOLOGICAL REPORTS

A member of the staff of the Commercial Attaché recently made a report on the field, which will soon be available at the Bureau of Foreign and Domestic Commerce. Many engineers and geologists in private employ have visited the field, but their reports will probably not be published. Recently, an Argentine capitalist, who is also an engineer and knows a little about geology, said something about geologists which is rich, and which you should not publish. He takes his geologists' reports, reads them carefully, understands them as much as possible, and then discusses them with the geologists. Observations and conclusions are discussed thoroughly, and then he goes to the field with the geologist and has the observed facts pointed out to him. Again the conclusions are discussed thoroughly and he finds that they have become contaminated with a considerable percentage of imagination. He finds that geologists are prone to form conclusions. In spite of this attitude, the gentleman uses geologists constantly and expensively.

### ARGENTINE NOW OPEN SHOP

From being a labor-ridden country Argentina has changed overnight to a free-labor country as the result of the stand taken by the president of the republic. The labor unions have been very strong, not because the members have been unified, but because the leaders, who are said to be foreigners, have not permitted secret ballot and have ruled with an iron hand. The published edicts read like Soviet Russia. Some of these follow:

"Members of the union are advised that they must never recommend anyone to their employer, always referring him to the union!"

"By resolution of the assembly, all members who are working are assessed a day's pay per month for the benefit of those who are not working. . . . A register has been opened in the office of the secretary of the union, in which will appear the names of the members who pay the assessment, as well as of those who do not pay it."

"Members are advised that the names of those in arrears for more than three months without just cause will be published in the *Centinela* (union organ)."

"Members should obtain the required pass before leaving the city for the interior."

"Boycott—Laborers: if you do not wish to be execu-

tioners of your own brothers, do not smoke the cigarettes made by Picardo y Cia, or of the Tobacco Trust of the following brands: 43 Reina Victoria, Ideales, Goal, H. P., Excelsior, Barrilete, and Caras y Caretoas. (Signed) Blockage committee against Picardo y Cia and Cia Argentine de Tabacos."

"Important—Members are instructed to call for their copies of the *Centinela*."

And all of the above in a single advertisement in the daily paper. At present, the city is in revolt against the unions, and these are singing very low. Anyone can work on the docks and drive a taxi, and as a result of an anti-patriotic proclamation of the taxi drivers' union, the public is insisting upon a flag appearing on every taxi for a week. This unexpected freedom from unionism has had a very favorable reaction on business. Business men are gaining confidence, and are now able to move their goods.

#### GERMAN COMPETITION OVERESTIMATED

Items in many lines of goods are running short, with a resulting sudden rise in prices, as no one is at present brave enough to order from abroad. German competition is a myth, so far as concerns any of the items in which I am interested, and I will give you one example, as follows: Tanks quoted by Reeves, \$21,000, delivery one month; tanks quoted by Krupp, \$26,000, delivery beginning with two months and completed in six. No one should be permitted to talk of European competition without having concrete examples with authentic data, and all the terms and conditions. In the above case, the Krupp offer was conditional upon Allied permission and upon the buyer taking the risk of the export.

### Daily Average Petroleum Production Shows Decrease During June

Stocks of petroleum were increased by more than 7,000,000 bbl. during June, according to the U. S. Geological Survey, despite decreased daily average production and increased consumption. Pipe-line and tank-farm stocks, plus stocks of Mexican petroleum held in

the United States by importers at the end of the month, amounted to the new record figure of 161,000,000 bbl., a quantity sufficient to meet consumption at the current rate for 112.8 days.

The first decrease in production of petroleum since January is reported for June, the daily average of the month, 1,346,833 bbl., being 9,393 bbl. less than that for May. Decreased daily production is reported for Texas, Louisiana, Wyoming, Kentucky, Illinois, West Virginia, Montana, New York, and Colorado. California, Oklahoma, Kansas, Arkansas, Ohio, Indiana, and Tennessee are credited with increased daily production. Arkansas, during its fourth month as a commercially producing state, with a yield of 880,000 bbl., jumped in rank from twelfth to seventh place, surpassing Illinois and ranking next below Wyoming.

The estimated value of the wells of the oil produced during June, \$52,900,000, is considerably less than half of the value of the production for the month of June, 1920, which amounted to \$116,200,000, although the production in June, 1920, was 3,000,000 bbl. less than in June, 1921.

Imports during June, amounting to 10,205,000 bbl., increased more than 1,000,000 bbl., but exports of crude oil decreased 279,000 bbl., almost 50 per cent of the month's total.

During the first six months of 1921 production amounted to 236,675,000 bbl. (an annual rate of more than 473,000,000 bbl.), as contrasted with a production of 211,360,000 bbl. during the first half of 1920; imports increased more than 27,000,000 bbl.; exports increased 412,000 bbl., and consumption increased 12,500,000 bbl. During the first half of 1921 more than 38,000,000 bbl. of petroleum was added to stocks, whereas, in the similar period of 1920, 868,000 bbl. was withdrawn from storage.

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

#### PETROLEUM PRODUCED IN THE UNITED STATES IN MAY, 1921, JUNE, 1921, AND JUNE, 1920

(Barrels of 42 U. S. Gallons)

	May, 1921 (a)		June, 1921		June, 1920	
	Total	Daily Average	Total	Daily Average	Total	Daily Average
California (b).....	10,448,000	337,032	10,120,000	337,333	8,190,000	273,000
Oklahoma.....	10,048,000	324,129	9,736,000	324,534	9,049,000	301,633
Central and Northern Texas.....	6,228,000	200,903	5,848,000	194,933	5,888,000	196,267
Coastal Texas.....	2,669,000	86,097	2,448,000	81,600	1,908,000	63,600
Kansas.....	3,505,000	113,065	3,480,000	116,000	3,168,000	105,600
Northern Louisiana.....	2,391,000	77,129	2,131,000	71,033	3,116,000	103,867
Coastal Louisiana.....	152,000	4,903	146,000	4,867	134,000	4,466
Wyoming:						
Salt Creek.....	1,185,000	38,226	1,180,000	39,333	944,000	31,467
Big Muddy.....	176,000	5,677	164,000	5,467	174,000	5,800
Rock Creek.....	205,000	6,613	147,000	4,900	72,000	2,400
Grass Creek.....	182,000	5,871	130,000	4,333	130,000	4,333
Elk Basin.....	69,000	2,226	59,000	1,967	65,000	2,167
Other districts.....	159,000	5,129	177,000	5,900	240,000	8,000
Total Wyoming.....	1,976,000	63,742	1,857,000	61,900	1,625,000	54,1677
Arkansas.....	550,000	17,742	880,000	29,333	.....	.....
Illinois.....	863,000	27,839	815,000	27,167	931,000	31,033
Kentucky.....	826,300	26,655	735,000	24,500	753,000	25,100
Central and Eastern Ohio.....	466,000	15,032	463,000	15,433	463,000	15,433
Northwestern Ohio.....	191,000	6,161	191,000	6,367	191,000	6,367
West Virginia.....	712,000	22,968	633,000	21,100	695,000	23,167
Pennsylvania.....	678,000	21,871	615,000	20,500	648,000	21,600
Montana.....	118,000	3,806	114,000	3,800	7,000	233
Southwestern Indiana.....	81,000	2,613	80,000	2,667	53,000	1,767
Northeastern Indiana.....	26,000	839	25,000	833	27,000	900
New York.....	104,000	3,355	78,000	2,600	89,000	2,967
Colorado.....	10,000	323	9,000	300	10,000	333
Tennessee.....	700	22	1,000	33	1,000	33
Totals.....	42,043,000	1,356,226	40,405,000	1,346,833	36,946,000	1,231,533

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



# ECHOES FROM THE FRATERNITY

## SOCIETIES, ADDRESSES, AND REPORTS

### International Chamber of Commerce Considers Political and Business Obstacles to World Trade Resumption

Business leaders from Sweden and Holland, Japan and Italy, Poland and Czecho-Slovakia, France and England, Belgium and Denmark, Australia and America, appreciating the gravity of the world situation, worked, at the first Congress of the International Chamber of Commerce at London, to bring about "a common document, a common law, a common practice, which will be accepted by all the nations, and which will make it easier for commercial men to carry on international business," writes Merle Thorpe, editor of *The Nation's Business*.

Upon scrutiny, the obstacles in the way of a restoration of the world's commerce fell into two classes—those political, and those purely of the business world.

Attacking the first, the delegates reached the following conclusions: The most important factor in the resumption of normal trade is the restoration of confidence. A conviction that governments will endure and peoples will work and pay will beget adequate credit and financial resources. Financial reform of governmental expenditures is urgent if grave disaster is to be avoided. It should be apparent that confidence and prosperity cannot be restored until all governments, without delay, remove burdens so largely responsible for widespread unemployment and paralysis of industry.

If governments sincerely wish the advice of business men on this business subject, it may be summarized as follows: Drive the knife deep into governmental expenses; stop printing paper money; study carefully the effect which the Inter-Allied debts and the payment and use of the German reparations will have on exchanges; disarm, according to the treaties, and thereby reduce budgetary expenses; support export credit organizations, but let private enterprise create and run them; to governments with depreciated rate of exchange—don't contract new external debts; grant the greatest possible liberty to all commercial and financial transactions; remove the system of double taxation; support the Ter Meulen plan of export credits; don't harass a foreign bank; don't make it so hard for commercial travelers, with burdensome, complicated, and difficult formalities as to their samples, and the slow and irritating procedure of identification; simplify passports, abolish exit visés, fix moderate fees for entrance and transit visés, and prevent

government control or operation of business that renders trade conditions uncertain and artificial.

The following are some of the tasks business may do without the help of government in clearing away obstructions: Arrange for a combined rail and ship bill of lading, and for a uniform ocean bill of lading; interpret f.o.b. and other trade terms to importers, exporters, bankers, forwarding agents, ship owners and underwriters of each and every country; reduce waste in the production and use of raw materials; learn definitely the status of construction in each country; secure accurate statistics on materials essential to the world's economic life, and make them promptly available; set up machinery to settle trade disputes by arbitration, thus eliminating the law's delay and the fear of the law's delay; confer with science and religion in an effort to adopt an unchangeable calendar; standardize in factories and eliminate multifarious parts; establish on great international traffic routes through freight trains; work together for improvement of international telegraph, cable, telephone, and wireless communications; create free zones for re-exportation of goods; restore and extend pre-war international postal services; pay losses promptly, and extend to all countries the system of declared values.

### Ore-Dressing Methods Discussed at Co-operative Meeting of Coeur d'Alene District

An important technical conference between mine operators of the Coeur d'Alene district and officials of the U. S. Bureau of Mines and of the Idaho State Bureau of Mines and Geology took place at Wallace on July 21. Francis A. Thomson, dean of the University of Idaho School of Mines and ex-officio secretary and director of the State Bureau of Mines and Geology, reviewed the work in ore-dressing which has been done at the university by the various co-operating agencies during the past four years. Following this A. W. Fahrenwald, ore-dressing engineer in charge of the Federal work at Moscow, explained briefly the present research in the application of surface tension measurements to the determination of the adsorptive capacities of certain minerals for different oils. This exposition led to a good deal of discussion by different operators and millmen, who expressed themselves as feeling that this line of work will be of great assistance to flotation operators everywhere.

R. B. Elder, of the School of Mines staff, spoke briefly of the results se-

cured by a method of decontaminating creek slimes before flotation, the "decontaminator" affording a pre-flotation treatment by bubbling and elutriating, thereby removing from the slime certain surface-tension lowering constituents prejudicial to flotation. Thomas Varley, of the U. S. Bureau of Mines station at Salt Lake, discussed the volatilization process and its applicability to Coeur d'Alene ores.

Messrs. Stanly A. Easton and J. F. McCarthy, speaking for the operators, expressed themselves as well pleased with the progress being made and urged a continuance of the present program. Mr. Easton took occasion to point out that flotation, though a fruitful field for research, is by no means the only one, and urged that some attention be given to other ore-dressing problems, such as classification, in which, as R. S. Handy remarked, much remains yet to be done despite the great work of Prof. R. H. Richards. Rush J. White commended the fundamental and scientific nature of the work being done.

About twenty persons, including managers and representatives of all the producing mines, were present at the meeting, which by courtesy of Mr. McCarthy was held in the Hecla offices.

### Charleston, W. Va., Section of A. I. M. E. To Be Organized

A meeting of a committee appointed to arrange for the formation of the Charleston Section of the American Institute of Mining and Metallurgical Engineers was held in the office of Carl Scholz, chairman, Professional Building, Charleston, W. Va., on July 23, at which the following members were present: Carl Scholz, J. S. Cunningham, E. M. Merrill, O. Cartlidge, and J. M. Clark, resident members, and Thomas H. Claggett, from Bluefield, W. Va. It was decided to arrange for a meeting to organize the Charleston Section on Sept. 6, 1921, at which time officers for the remainder of the current year will be elected and bylaws adopted, with a banquet served at the close of the meeting.

### Alabama University Offers Research Fellowships in Mining and Metallurgy

The School of Mines of the College of Engineering of the University of Alabama offers five fellowships in mining and metallurgical research in co-operative work with the U. S. Bureau of Mines. The fellowships are open to graduates of universities and engineering schools who have the proper qualifi-

cations to undertake research investigation. The value of each fellowship for 1921-1922 is \$540 per year of nine months, beginning Oct. 1. Fellowship holders will be required to register as graduate students and to become candidates for the degree of master of science in mining engineering or metallurgical engineering unless an equivalent degree has previously been received. The fellowships have been established primarily for the purpose of undertaking the solution of various problems being studied by the U. S. Bureau of Mines that are of especial importance to the State of Alabama and the Southern states. The investigations consist primarily of laboratory work directed by the Bureau technologists and School of Mines staff.

The following subjects have been selected for investigation for the year 1921-1922:

1. Beneficiation of Iron Ores.
  - a. The crushing, grinding and concentration of iron ores preparatory to smelting.
  - b. The metallurgical treatment of iron ores, especially the fundamental reactions involved in the blast furnace smelting.
2. The preparation, treatment and uses of non-metallic minerals such as barite and ochre in the industries other than ceramics or chemical industry.
3. Metallurgical coke.
  - a. Relation of cell structure of coke to combustibility, or
  - b. Relation of cell structure of coke to solubility in carbon dioxide.

Applicants should send a copy of their collegiate records from the registrar's office of the institution where they have graduated. They should also state their professional experience and give names and addresses of at least three persons who are familiar with the training and ability of the applicant. Applications are due not later than Sept. 1 and should be addressed to H. D. Pallister, Professor of Mining Engineering, School of Mines, University of Alabama, University, Ala.

### MEN YOU SHOULD KNOW ABOUT

M. G. Gulley is examining the geologic structure in the Elk Basin oil field of Wyoming.

Henry H. Armstead, president of Armstead Mines, Inc., is in New York for a few weeks.

Charles A. Richardson, manager of the Chambers-Ferland mine, Cobalt, recently sailed for London.

Forest Rutherford has returned to New York after completing mine examinations in northern Ontario, Canada.

Sidney Paige, of the U. S. Geological Survey, is making an inspection visit

to various of the geologic field parties doing work in the West.

Alfred H. Brooks, head of the Alaskan Division of the U. S. Geological Survey, will sail from Seattle on Aug. 12 for Seward, Alaska.

L. C. Mosburg has been assigned by the U. S. Geological Survey to the Eldorado oil field of Arkansas, where he will make geologic studies.

W. Forster Browne, who has been examining Canadian properties of the British Empire Steel Corporation, recently returned to London.

John Borg, president of the Callahan Zinc-Lead Co., is spending a month's outing at the mine near Wallace, Idaho. He is accompanied by his family.

F. W. Bradley, president of the Bunker Hill & Sullivan Mining & Concentrating Co., is at Kellogg, Idaho, inspecting the company's operations.

S. L. Mather, secretary of the Cleveland-Cliffs Iron Co., Cleveland, Ohio, recently made a tour of inspection of the various properties of that company on the Mesabi Range. He later inspected the company's mines in Michigan.

J. D. Northrop, who has been engaged in private petroleum geological work for the last two years, has resumed his connection with the U. S. Geological Survey and has been assigned to the mineral division of the Land Classification Board.

E. F. Neiman, general superintendent of the Harmony Mines Co., Baker, Idaho, and J. F. Inglis have opened an office at Salmon City, Idaho, under the name of Neiman & Inglis. The firm will conduct general consulting work in geology, mining, metallurgy, and mill design.

Cleveland Abbe, Jr., for the past two years assistant editor on the staff of *Engineering and Mining Journal*, has resigned to accept a position on the teaching staff in the Economics Department of the College of the City of New York. Mr. Abbe is a graduate of Harvard and Johns Hopkins universities and was also a student at the Imperial University, Vienna. Directly previous to his connection with the *Journal*, Mr. Abbe was associate editor in charge of the *Scientific American Supplement*, New York. Mr. Abbe's association with the *Journal* has been mutually enjoyable, and he leaves with the heartiest wishes of the staff for success in his new undertaking.

Mining engineers and metallurgists recently in New York City included: Harry M. Wilten, Chicago, Ill.; H. S. Emlaw, Trona, Cal.; Harrison Souder, Cornwall, Pa.; E. A. Strout, Guadalupe, Zac., Mexico; Alexander Grosberg, La Paz, Bolivia; W. George Waring, Webb City, Mo.; L. D. T. Greery, Chuquicamata, Chile; Sherwin F. Kelly, Lawrence, Kan.; R. A. Walter, Reading, Pa., and Oscar Lachmund, Spokane, Wash.

### SOCIETY MEETINGS ANNOUNCED

The American Institute of Mining and Metallurgical Engineers holds its 124th meeting at Wilkes-Barre, Pa., Sept. 12, 13, 14 and 15. The local committee, under the chairmanship of R. V. Norris, has arranged an interesting program of technical sessions and excursions. The latter, as well as the banquet, will be given to the members as a compliment from the members of the local committee and from the anthracite region. A meeting of the Society of Economic Geologists will be held at Wilkes-Barre in conjunction with the Institute meeting. This society has extended an invitation to all Institute members to attend its sessions. Among the interesting discussions expected during the Institute meeting may be mentioned a paper on "The Stratigraphy of the Anthracite Region," which is to be discussed by Prof. J. F. Kemp. A paper on the "Lynch Plant of the United States Coal and Coke Co.," which is illustrated by lantern slides and moving pictures, is to be present by Howard Eavenson. The control and prevention of mine fires as practiced in the coal districts will be fully described.

The Industrial Relations Committee will hold a session under the chairmanship of Robert Linton. A visit to the Ashley planes, discussed in the paper of C. H. Stein, will be one of the interesting events. Irem Temple has been reserved as the Institute headquarters in Wilkes-Barre. The Women's Auxiliary, through its local committee, has arranged an elaborate program, including various excursions and visits through the districts. Further details will be announced later.

### OBITUARY

John J. Keating, superintendent of the Comstock Exploration mine at Virginia City, Nev., died suddenly on July 21. He was a son of the late R. P. Keating, a noted Comstock mining engineer of pioneer days.

General M. V. Woodhull, former head of the Consular Bureau of the State Department, died at Watkins, N. Y., on July 22. He was a director of the Utah Consolidated Mining Co. and of the Old Dominion Copper Co.

Tito A. Parroci, assayer and mine operator, died at Torreón, Coahuila, Mexico, on July 25. The greater part of Mr. Parroci's life was spent in Mampimi, where he was connected with the Penoles Mining Co. He was owner of the Hidalgo mines, in the San Diego district, near Velardena, and was shipping ore up to a few months ago.

# THE MINING NEWS

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## LEADING EVENTS

### Power Users in Utah Protest Against High Rates

Called "Excessive and Unjust" by Operators in Petition to State Public Utilities Commission

Users of electric power numbering more than 250 in the State of Utah petitioned the Utah Public Utilities Commission on July 26, protesting the present high power rates. The petition states that the rates, rules, and regulations charged and imposed by the Utah Power & Light Co. are excessive and unjust, and specifically sets forth that "the rates upon which the defendant is basing the charges it is exacting from the complainants and others for electrical power and energy supplied to them are unreasonable, unjust, and excessive as a whole, and are greater than the value of the service rendered, as well as greater than the reasonable cost to the defendant for furnishing such service, and are producing and will produce a greater revenue and profit to the defendant than the defendant is required or entitled to receive upon the value of its plant."

It is also alleged that the rates are higher than those for similar service in effect in adjoining states; that the methods of computing power bills are arbitrary, unreasonable, and unjust, and that rule 43-A of the defendant company is discriminatory in that it provides a different rate for different classes of industries using the same amount of power.

### New Smelting Rates Announced by Bunker Hill Smelter

Frank M. Smith, smelter director of Bunker Hill & Sullivan Mining & Concentrating Co., has announced a change in custom smelting rates for ore handled at the Bunker Hill smelter at Bradley, near Kellogg, Idaho, following concessions made by the Great Northern Railway on ore freight rates. The revised rates provide for a freight charge of \$3.75 for \$30 ore from Nelson, B. C., ranging to \$5.50 on \$100 ore. Libby, Mont., and Porthill, Idaho, will pay a smelting rate of \$3.25 minimum and \$5 maximum. Boundary and Ymir, B. C., and Republic, Wash., take rates of \$3.50 minimum and \$5.25 maximum. Troy, Mont., will have a rate of \$3 to \$4.75; Nighthawk, Wash., \$4.95 to \$6.70; Oroville, Wash., \$4.83 to \$6.60; Ruby, Wash., \$5 to \$6.75, and Tonaske and Okanogan, Wash., \$4.75 to \$6.50.

### WEEKLY RESUMÉ

At Washington, amendments to the War Minerals Relief Act have been discussed behind closed doors by the House Committee on Mines and Mining, and it is understood that certain of them are to be recommended. No developments of importance regarding the metal schedule of the Tariff bill are reported.

In the Pacific Northwest, the Bunker Hill & Sullivan company has readjusted custom smelting rates following concessions made by the Great Northern Ry. In Utah, over 250 users of power have complained to the State Public Utilities Commission that the rates charged by the Utah Power & Light Co. are unwarrantably high. In California and Nevada, three mines on the Mother Lode and the United Comstock, at Virginia City, have made an agreement with the Bureau of Mines to co-operate in experimental work with "gunite." Conditions at Tonopah and Divide are reported to be improving; the Tonopah-Divide Mining Co. has resumed operations. The Shasta Zinc & Copper Co. is reported to have filed a \$600,000 mortgage to the Equitable Trust Co. of New York, securing the payment of certain debentures. On July 25 the Interstate Commerce Commission began its hearing on iron ore freight rates in force in the Lake Superior district.

In Canada, in the Sudbury district, the International Nickel Co. has made a further cut in wages. Operators in the Cobalt district are reported more optimistic over the prevailing situation. A consular report states that the Boleo company in Baja California, will build its own converter plant.

### Lawyers' Fees Fixed in Utah in Compensation Cases

The State Industrial Commission of Utah on July 25 fixed attorneys' fees in workmen's compensation cases. The commission decided that 5 per cent of the compensation award, with a minimum of \$10, was the proper amount, reserving the right, however, to ignore the 5 per cent clause at its discretion. The proposal to ignore the 5 per cent clause will particularly apply in cases where the services of an attorney are not specially required and where the compensation is large. In such cases the commission has declared that it would not feel justified in allowing the 5 per cent award as such allowance would be excessive.

### Belgian Metal Market Affected By German Competition

Special Cable by Reuters to "Engineering & Mining Journal"

Brussels, July 27—German competition is becoming disastrous in Belgium, accentuating the uneasiness now being felt in the metal market.

### Cornish Tin Company To Sink New Shaft

Special Cable by Reuters to "Engineering & Mining Journal"

London, Aug. 2—The Eastpool & Agar, Ltd., a tin mining company of Cornwall, has decided to sink a new shaft on its property at a cost of £60,000. Work in this connection will be started at once.

### Spain May Increase Duties on Lead and Iron Ores

Special Cable by Reuters to "Engineering & Mining Journal"

Madrid, July 29—Owners of lead mines in Cartagena and Linares are protesting against the proposal to increase the export duties on lead ores. Some anxiety is also felt in regard to the consequences of the proposed export duties on iron ores, as it may involve the closing down of some mines.

### International Nickel Co. Cuts Wages Again

The International Nickel Co., Sudbury, Ont., put another wage cut into effect on July 15, when surface labor was reduced from \$3.80 to \$3.50 a day. In addition the working force was still further reduced and between thirty and forty men were laid off. Only half of the matte produced is being shipped to the refinery. The company has about 75,000,000 lb. of nickel on hand and in process, including that in the roast yards.

### Boleo Copper Company To Build Converter Plant

A consular report states Compagnie du Boleo, at Santa Rosalia, Baja California, Mexico, intends to install a converter plant for the purpose of refining its copper matte instead of shipping it to Tacoma, Wash., as in the past. It is said that the company has issued \$1,000,000 in bonds to cover the cost. The equipment has been purchased in the United States, it is said. The bullion will be shipped to New Orleans and Galveston via Panama on the company's steamers, thence by rail to New York.

### Co-operating in Experiments With "Gunite"

Three Mother Lode Mines and United Comstock To Work With Bureau of Mines in Testing and Investigating

Four mines, the Plymouth, the North Star and the Empire, in California, and the Gold Hill mine of the United Comstock Mines Co., Gold Hill, Nev., have entered into an agreement with the U. S. Bureau of Mines for co-operative research in the use of "Gunite" under the conditions present in the respective mines. The cement gun is being furnished by the Cement-Gun Co., Inc. The experiments will be in charge of B. O. Pickard, of the Bureau of Mines, Berkeley Station. L. K. Freeman, of the mining department at the University of California, will have charge of the details of the application of the "Gunite." He will be assisted by E. D. Gardner and Mr. Pickard, of the Bureau. The expenses for the cement-gun operator, labor, and materials used will be paid by the respective mining companies and other expense by the U. S. Bureau of Mines.

The proposed investigation is planned to cover such points as fire prevention, timber preservation, prevention of slabbing and control of swelling ground, protection of permanent haulage, bulkheading, and minor operations. An inquiry into the effectiveness and cost of "guniting" is also to be made. The details of the most economical use of "Gunite" are to be especially studied.

Stanley L. Arnot, superintendent of the Plymouth; R. A. Hardy, superintendent of the United Comstock Mines; A. B. Foote, manager of the North Star mines; and F. W. Nobs, superintendent of Empire Mines, will cooperate with the Bureau's officials in the work.

### Arizona & Sonora Ry. Project Still Under Consideration

No decision has been reached yet regarding the construction of the proposed Arizona & Sonora railway, a route for which has been surveyed from Ajo, Ariz., to Rocky Point, Sonora, on the Gulf of California, a distance of not quite 100 miles. It is said that a man prominent in San Francisco shipping circles is now making a report on the dock site, shipping rates and other matters connected with the project and has two months in which to complete his work.

### Iron-Ore Rate Hearing Begun

The iron-ore rate hearing before the Interstate Commerce Commission, affecting all independent mining companies and all iron-ore carrying railroads of the Lake Superior district, began July 25. The date of the hearing has been advanced many times, owing to the volume of business before the commission. It is believed that no order of the commission will be effective during the present shipping season, as the testimony will not be completed for many months. The mining companies are prepared to present evidence to uphold their contentions that the rates are too high and in some instances discriminatory.

### Oliver Iron Mining Co. Cuts Wages Again

The Oliver Iron Mining Co. further cut the wages of mine employees 10 per cent Aug. 1. At present it is employing about 10,000 men, but not all on full time. Various working schedules are in force on the different ranges. These schedules are devised to provide as much employment for as many of their employees as possible.

### Hecla Stockholders To Hold Special Meeting

Important Matters To Be Considered—  
Report on Property by Fred Searls, Jr., To Be Read

A meeting of the stockholders of the Hecla Mining Co. will be held in Spokane on Aug. 18, at which matters of unusual interest and importance will be acted upon, according to the official notice calling the meeting. The stockholders will be asked to ratify the action of the trustees in settling the apex litigation with the Federal and Marsh companies, through which the company acquired the old Tiger-Poorman property, and all of which involved a payment by the Hecla company of \$750,000. The stockholders will also be asked to ratify the action of the trustees in joining the Bunker Hill & Sullivan in the purchase, development and operation of the Star mine. The purchase price is given at about \$875,000, payment of which will be shared by the Hecla and the Bunker Hill on a 50-50 basis. The call states that \$150,000 is now due and that \$100,000 is payable by Nov. 1, 1923. The balance, \$625,000, is payable in annual installments of \$175,000 beginning in three years. The Star will receive a royalty of 25 per cent on net returns for all ore shipped, which will apply on the purchase price, and it is expected that shipments from the Star will meet all deferred payments. All the details of the Star deal will be submitted at the meeting, and the stockholders will be asked to approve them.

A highly interesting feature of the meeting will be the report of Fred Searls, Jr., on the physical condition of the Hecla mine. The examination of the mine is now being made, Mr. Searls having been engaged in the work for several weeks.

## NEWS FROM WASHINGTON

By PAUL WOOTON  
Special Correspondent

### Assessment Work Bill, Amended, Passes House

Measure Provides That Annual Period  
Shall End July 1 at Noon—Allows  
Six Months Longer for 1921 Work

The bill providing that annual assessment work on mining claims may be performed during the fiscal year rather than during the calendar year has been passed by the House of Representatives with the amendment that the annual period ending Dec. 31, 1921, shall continue to twelve o'clock meridian, July 1, 1922. The change in making the annual period expire at noon rather than at midnight will add greatly to the convenience of those taking up claims and will avoid confusion and misunderstanding, it was argued.

During the course of the debate it was pointed out that the change to the fiscal year will make it possible to do two years' assessment work in a single season. The 1921 work, for instance, could be done in June and the 1922 work in July. This will make for important economies, it was declared, as materials need not be transported twice to the claim and the work for two years can be made practically a continuing operation. Another important saving will be made in many cases, in that road repair will be reduced. In many instances roads are washed away during the winter. If the present bill should become a law, the road will have to be made passable each second year only. In this way effort and money will be saved.

### Hayden Against High-Tariff Wall

Fordney Bill Cannot Help Copper Industry, He Holds—Will Only Raise Costs for Arizona Mine Owners

Representative Hayden, of Arizona, in the course of a speech in the House on the tariff bill, among other things, said:

"Since there is no way in which the copper-mining industry can be directly benefited by tariff legislation it follows that the industry is injured if a high-tariff wall is erected, which has the effect of increasing the price of the materials or commodities that are used in mining operations. And that is exactly what this bill does as reported to the House. The Committee on Ways and Means has recommended that an import duty be collected on fuel oil. The

tariff rates are materially increased on all articles such as pipe, rails, drills, machinery, and so forth, made of iron and steel, vast quantities of which are used in the metal-mining industry. The same is true of almost everything else in the way of mine supplies, except explosives and mine timbers, which remain on the free list. But, worst of all, this bill is especially designed to keep up the cost of living for the men employed by the mining companies of Arizona, for most of the things they and their families eat or wear are to be taxed even higher than under the Payne-Aldrich law.

"The copper-mining industry of my state could probably survive the handicaps that I have just stated, but this bill, which is avowedly designed to reduce importations, deals it a much more serious blow. The only way to restore prosperity in the copper camps is to find a market for all the copper that can be produced. The demand in the United State does not equal more than half the supply. How are the people of other nations to pay for the other half which must be sold if our copper mines are to have full payrolls and the smelters are to be operated to their capacity? They have no gold, and we will not take their depreciated paper money. They can only pay by sending us manufactured products for our raw materials, and this bill is expressly designed to prevent such an exchange. No nation can long enjoy a large volume of exports without imports. The world over, the two must balance or commerce dwindles and prosperity departs. There can be no other conclusion than that the enactment of this bill into law, with its high rates of duty on all manufactured products, postpones the time when the copper-mining communities of Arizona will again enjoy real prosperity."

**Government's Silver Purchases**

Purchases of silver under the Pittman Act during the week ended July 30 totaled 2,079,000 fine ounces. This brings the total purchases under this act to 65,390,816 fine ounces.

**Tariff Schedule Displeases Representative Rhodes**

**Wants Higher Rate on Barytes and Cobalt Compounds Produced in His State**

Representative Rhodes, chairman of the Committee on Mines and Mining of the House of Representatives, is far from being satisfied with the Fordney Tariff Bill, as passed by the House, for the reason that cobalt and cobalt ore are on the free list, and barytes ore is dutiable at only \$4 per ton. Mr. Rhodes believes there should be a duty of 1c. per lb. on barytes ore. Though he is pleased that the bill carries a duty of 20c. per lb. on cobalt oxide and a 25 per cent ad valorem duty on cobalt sulphate and other cobalt compounds, he favors a higher rate for cobalt sulphate. If American valuations are allowed to apply, he believes the 25 per cent ad valorem duty will be very beneficial to the American industry. In support of his contention as to barytes, Mr. Rhodes said:

"We should have a duty of one-half of 1c. per lb. on the crude ore; a duty of 1c. per lb. on ground barytes or barium sulphate; a duty of 1½c. per lb. on all sodium sulphite crystals; a duty of 1½c. per lb. on all barium sulphide; a duty of 2c. per lb. on barium carbonate; a duty of 2c. on precipitated barium sulphate; a duty of 2½c. per lb. on barium hydrate; a duty of 2½c. per lb. on barium chloride; 2½c. per lb. on all lithopone; a duty of 2½c. per lb. on all concentrated sodium sulphide; a duty of 5c. per lb. on barium nitrate; a duty of 8c. per lb. on all barium peroxide, and a 50 per cent ad valorem on each and every other barium compound and barium chemical. We should also have the same duty on witherite that we ask on the crude barytes ore, because it is used in competition with certain barium products.

"The district I represent in Congress has for the last fifty years prior to the late war produced more barytes ore

than all the rest of the United States combined. During that period the total American production was from 30,000 to 89,000 tons of crude ore annually, with an annual importation of from 10,000 to 35,000 tons of crude ore.

"The average freight rate from southeast Missouri points, including war tax, to New York is \$10 per ton, making it cost the Missouri shipper \$20 per ton to deliver his ore to the New York market, thus permitting the German importer to undersell the Missouri producer about \$11 per ton. In addition to this difference in favor of the German importer, he gets the benefit of the high value of our money as against the low value of the German mark. It should also be remembered that our prices are based upon the short ton of 2,000 lb., and that the German prices are quoted upon the long ton basis of 2,240 lb. So, it is evident that nothing less than one-half of 1c. per lb. will afford us any protection on the crude ore. The situation six months ago in Missouri with regard to ground barytes was as follows: At St. Louis the price was \$27.50 per short ton, f.o.b., with freight rate added, which made it cost \$37.50 delivered f.o.b. New York. The German importer now offers to sell the same product for \$15 per long ton f.o.b. New York, making the difference of \$21.50 per ton. The present difference in exchange and the difference of 240 lb. on each ton entitled us to at least 1c. per lb. on the ground ore, in order to cover the difference and give us any protection at all."

**Amendments to War Mineral Act Discussed in Secret**

Amendments to the War Minerals Relief Act were discussed at a closed meeting of the Committee on Mines and Mining of the House of Representatives on July 29. A number of amendments are said to have been agreed to by the committee, but pending the submission of the committee's formal recommendation to the House, all announcement as to their scope is being withheld.

**NEWS BY MINING DISTRICTS**

**London Letter**

**General Mining & Finance Corporation's Showing Improved—Rhodesia Broken Hill To Pay 10 Per Cent Dividend**

BY W. A. DOMAN

London, July 19.—While the General Mining & Finance Corporation makes a much better exhibit for the last calendar year than for a long time past, it is still a somewhat dismal document that the directors present. The disappointment of course is in the huge item of depreciation. For the past three years the stock and share and debenture holdings and depreciation have stood as shown in the accompanying table.

It will be seen that securities on

which £1,857,000 has been expended have lost something approaching two-thirds of their original value. In the

	1918	1919	1920
Stocks, etc., at or under cost.....	£ 1,745,658	£ 1,795,418	£ 1,856,922
Depreciation.....	1,106,196	1,066,100	1,189,744
Difference.....	639,462	729,318	667,178

ordinary way one does not regard depreciation as absolute loss; but although the directors of the General Mining Corporation are inclined to be hopeful, they are perfectly candid and do not mislead, for they point out that "any material improvement is largely contingent on the re-financing of certain of the companies under the corporation's control, in which it holds large interests and which require additional working capital for the re-commencement and continued prosecution of mining operations."

With the exception of the Meyer & Charlton, the corporation's group of gold mines happens to be of the low-grade order. For the last three years the income of the corporation has been as follows:

	1918	1919	1920
Profit on shares, etc. sold.....	£ 11,323	£ 17,798	£ 44,673
Dividends, etc.....	44,049	42,241	59,460
Total.....	55,372	60,039	104,133

As shown above, the stocks, debentures, and other securities cost the corporation £1,856,992, so that spreading the income over these assets it averages less than 6 per cent. The capital of the corporation is £1,875,000, in addition to which there are sundry creditors—presumably bank loans—amounting to £371,594, so that the working resources may be put down

approximately at £2,246,000. On the capital employed therefore the income is less than 5 per cent. After allowing for expenses the following surpluses are shown as profit: 1918, £25,434; 1919, £5,116; and 1920, £53,913. Last year's profit was equal to about 2.4 per cent on the capital employed. This profit, added to the sum brought from 1919, and totaling £133,701 is carried forward, so that for a full decade shareholders have received no dividend. Apart from the Meyer & Charlton the General Mining group of gold mines is dependent upon the gold premium. What appears to be a substantial and promising asset is Transvaal Silver & Base Metals, Ltd. This is the old Transvaal Silver Mine on which operations ceased some years ago. The old shaft has been reopened, and a second shaft is being sunk about 3,000 ft. to the east. So far 124,534 tons of ore is developed, of which 2,595 tons is proved unpayable, and 54,500 tons is not yet valued. The balance shows thus: 67,439 tons; 11 per cent lead; 10.5 oz. silver; width 44 in.; value per ton unsorted, 75/6. This is on a farm named Dwarsfontein. On the neighboring Brakfontein the lode has been proved by surface trenching for a distance on the strike of approximately 5,000 ft. The first unit of a concentrating and smelting plant to produce 750 tons of bullion monthly is being erected.

Last year the Rhodesia Broken Hill Development Co. smelted 42,806 tons of ore for a production of 14,602 tons of lead. In ten months of 1919 11,213 tons of lead was produced from 33,084 tons of ore. The average price obtained is not stated in the report, but the profit and loss account shows for last year "sales of lead" £461,677 and for 1919 £366,851. Costs have risen very considerably as can be seen in the following:

	Working Expenses £	Shipping Expenses £	Royalty £	Profit £
1919.....	113,464	125,957	9,856	100,889
1920.....	191,202	154,161	12,952	89,949

A dividend of 10 per cent is to be paid the same as a year ago. Apparently less in the nature of exploring was done in 1920, because the only reference in the report is that the works which were in operation in the previous year were continued "and valuable information was obtained in regard to the mode of occurrence of the ore-bodies." It is interesting to note the definite statement that the cementation process has proved successful, and that shafts can be sunk through the water-bearing dolomite country. The dolomite was at first regarded as a great drawback.

### Gold at Bourkes Station

A discovery of rich gold ore is reported about two miles from Bourkes Station, in Ontario. Some spectacular samples have been brought to Cobalt, but the vein is understood to be quite narrow.

## JAPAN

### Copper Output of Kwansai District Drops — Manufacturers Discuss Question of Regulating Copper Market

Reuter Service (By Mail From Japan)

Osaka, June 29th—The following is the copper production in the Kwansai district classified according to prefecture within the jurisdiction of the Osaka Government Mining Bureau during the fiscal year 1920-21:

	Quantity, Lb.	Value, Yen
Hyogo.....	4,272,522	1,598,264
Ishikawa.....	3,793,468	1,418,057
Shimane.....	694,974	259,695
Okayama.....	953,672	356,673
Kagawa.....	3,624,515	1,355,568
Ehime.....	18,991,617	8,014,462
Kochi.....	19,192	7,167
Totals.....	32,349,960	13,209,856

The output compared with that during the previous year shows a decrease of 2,209,880 lb.

The "Wednesday" meeting of the Osaka copper manufacturers, for the purpose of mutual protection by adopting a united policy, was held on June 22, when the question of regulating the movements of the domestic copper market was the main topic of discussion. The arsenal, which has, up to now, been using domestic copper almost exclusively, now uses imported material. Production in Japan is on the decrease while the demand is increasing. Under these circumstances, the meeting discussed the question of regulating the market and production. The question of imports was also discussed. The Furukawa, Fujita, and Kuhara firms do not regard imports as menacing to their interests to any great extent, but the Mitsubishi company strongly objects to it. The Sumitono company, one of the most influential copper makers in the country, has withdrawn from the conference and is acting independently.

## MEXICO

### Coahuila

#### Tin Discovered Near Muzquiz—Shareholders' Meetings in Saltillo

Saltillo.—Native miners of the village of Acuna are reported to have discovered tin near Muzquiz. The ore is said to carry silver. A group of nine claims has been filed on under the name of El Consuelo, and development work is to be done.

The Negociacion Minera Jesus Maria, a mining company in which the Madero brothers are largely interested, is to hold a general meeting of stockholders at the offices of Ernesto Madero & Bro. in Saltillo this month. The object of the meeting is to elect new directors, to review the business transactions for the last year and decide on plans for the future.

A number of other mining companies are to hold general shareholders' meetings in Saltillo this month. An effort

is being made by these home companies to keep up the payment of their taxes and carry on development work to avoid being compelled to abandon their properties during the dull period. Some of them have been obliged to levy light assessments to meet these expenses.

## Chihuahua

### Erupcion Mining Co. To Have Rail Connection

Chihuahua—Engineers have recently been engaged in surveying a railway route from the Mexican Central Ry. to the property of the Ahumada Lead Co. and the Erupcion Mining Co. in the Sierra de los Lamentos in northern Chihuahua. This road, for which the Mexican government has granted a concession, will be about fifty miles long. Stockholders of the Erupcion company will vote Aug. 8 on a proposal to increase the capital stock from 1,000,000 to 1,500,000 shares. If this increase is authorized, sufficient stock will be offered at intervals to stockholders at \$1 per share to enable the Erupcion company to pay its share, which is two-thirds of the cost of the road.

## CANADA

### British Columbia

#### Premier Mine Rushing Work on Aerial Tramway—Dolly Varden Shipping

Invermere.—A prospectus has just issued announcing the organization of the East Kootenay Prospectors' Development Co., Ltd., the head office of which is to be at Cranbrook, B. C. The provisional directors are Major Clement Hungerford Pollen, engineer; Walter Van Arsdalen, prospector; John Foster Huchcroft, prospector; John Leask, police magistrate; Eric Herbert McPhee, merchant, all of Cranbrook, and Charles G. and Evan William Evans, prospectors, of Marysville, B. C. J. F. Huchcroft is the provisional secretary. The capital asked for is \$10,000, divided into shares to the number of ten thousand at one dollar each. The chief objects of the company are to hold and assist in the development of likely mining properties throughout the East Kootenay district.

Slocan City.—Indications are that the balance of the season will be fairly active in this district. Initial runs of the small mill put in for handling the product of the Ottawa mine by Biggar, MacGuire & MacPhee, who have a lease and bond from the Consolidated M. & S. Co., were made the middle of July. The plant will have a capacity of 50 tons per day, and will be connected with the mine by a 2-bucket tram, 2,000 ft. long. From the storage bin the material passes over a grizzly, the plus 1½-in. product going to a 7 x 10-in. Blake crusher and passing to a 50-ton storage bin. Crushed ore is automatically fed to a 5 x 22-ft. tube mill, thence going to a drag classifier, the minus 200-mesh slimes being elevated by bucket to a 9-cell Minerals Separation machine. Sands from the classifier are

returned to the tube mill. The mill tonnage in sight at the Ottawa is estimated at 35,000 and runs 10 to 20 oz. silver.

Other property to be worked this season includes the V. and M. group at the head of Lemon Creek; the Black Prince, at the head of the north fork of Lemon Creek; the Anna group, adjoining the Ottawa; the L. T. and the Arlington.

**Greenwood**—Operations may be resumed soon at the Jewel mine, a gold property near Greenwood.

**Edgewood**—The crosscut tunnel on the Rampolla group of claims, in the Lightning Peak district, is now in about 460 ft. and is reported to be nearing the vein. Other mining activity around Lightning Peak this season is noted at the Lompy and Lightning Peak (leased). Waterloo and Detector are likely to be active before the season ends and a number of prospectors are doing assessment work.

**Trail**—Ore shipments received at the Consolidated smelter during the week ended July 21 were as follows:

Mine	Location	Tons
Anna, Slocan City		20
Gold Hill, Taghum		42
Knob Hill, Republic		47
Surprise, Republic		283
White Water, Retallack		36
Company Mines		7,977

The proposed incorporation of Tadanac, where the Consolidated M. & S. smelter is situated, as a municipality, is the cause of considerable discussion locally. A joint committee representing the Trail Board of Trade, the city council and the school board has been in session a number of times with officials of the smelting company regarding the matter.

**Stewart**—Work on the tramway to the Premier mine is being hastened at all high level points, in order that a possible early snowfall will not retard progress. With this finished, what is to be done at lower points along the line will receive attention. About seventy of the ore buckets to be used have arrived. Almost forty-six miles of cable will be used. Much of it is on hand and has been distributed along the line.

The Lake View group, in Glacier Creek, in the Bear River section, is being reopened. The old workings are being cleared out, and it is possible that a shipment of high-grade silver bearing ore will be made soon.

On the Silverado, in the same district, a 40-ft. tunnel has been driven, and from two to three tons of high-grade ore is being sacked each week.

A tunnel has been started on the Montrose and Waterloo claims of the Red Cliff.

**Alice Arm**—Shipments have begun from the Dolly Varden mine. There is about 3,000 tons to be brought to tidewater and thence shipped to the smelter. Development, meanwhile, is to be pushed.

**Ashcroft**—Gold is reported to have been taken from placer ground situated

on the Douglas Lake Indian Reserve. As Indian lands are now open to location on the securing of a permit from the Indian Agent, and as gold and silver may be taken from such locations, considerable local interest is evinced in the recently staked diggings.

#### Manitoba

##### Gold Samples Brought From Elbow Lake

The Murray brothers, who recently made an important discovery of gold at Elbow Lake, Manitoba, have arrived at The Pas with spectacular free gold samples, the display of which has caused some excitement. These samples, it is claimed, were taken from various parts of an extensive quartz porphyry body.

#### Ontario

##### Cobalt Operators More Optimistic—Coniagas Passes Dividend—Wright-Hargraves at Kirkland Lake To Treat 175 Tons Daily

**Cobalt**—During June 276 tons of ore was shipped from Cobalt by the following mines: Coniagas, 156 tons; Bailey, 47; La Rose, 41; and O'Brien, 32. Of this 185 tons was shipped to Canadian smelters and 91 tons to United States smelters.

During the week ended July 15 there were shipped from Cobalt three cars containing 226,500 lb. of flotation concentrates. The Coniagas shipped two cars and the La Rose one car.

The continued strength of silver in London and generally improved conditions throughout the world as regards the metal, together with the small annual production, is giving rise to a more optimistic feeling in the Cobalt district. Though a considerably higher price of silver would have to be realized to permit of the reopening of any of the mines now closed, the present price does minimize the possibility of further shutdowns and will permit ore unprofitable at the lower prices recently prevailing to be treated.

The Coniagas has passed the quarterly dividend due Aug. 1. During the year the company has paid 20 per cent, 15 per cent of which was from former projects, or a total of \$800,000. The mine is producing more silver, at a lower price, than last year, but the market is not as favorable, so the directors think it would be better to maintain a strong cash position.

The Casey Mountain syndicate is pushing development on its property, about fifteen miles from Cobalt, and has a shaft down 165 ft. The formation in this section is similar to that at Cobalt, but the country is largely covered with a heavy clay overburden. So far only one mine has been discovered, but this was a good producer.

The Peterson Lake company is making a further appeal to the shareholders to purchase preference shares to pay off floating debts and permit of further development underground. The company estimates that it has 2,000 tons of 25-oz. ore ready to be stoped,

15,000 tons of 8-oz. ore on the dumps, and about 1,200,000 oz. in tailings. The dumps and tailings cannot be treated profitably at the present silver price.

The financial statement of the Nipissing, as of July 2, shows cash and investments of \$3,076,210, and ore and bullion on hand in transit \$706,098, or a total of \$3,773,309. The Canadian income tax for 1919, amounting to \$146,000, was paid in June.

During June the Bailey custom mill treated 4,250 tons, of which 3,250 came from La Rose mines and 1,000 from the Bailey mine.

The Crown Reserve is sampling some of its old surface dumps with a view to treatment.

It is understood that the new vein on the McIntyre, located some time ago by diamond drilling, has been proven by a crosscut on the lower level, which shows 30 ft. of \$20 ore. The main shaft is being deepened and a station is being cut at 1,625 ft. When this is completed the shaft will be continued to 2,000 ft. At present ore is sent by aerial tram from the main shaft to the mill across the lake. The company is planning to move its crushers, ball mills and tube mills to a new location adjoining the shaft, and pump the pulp to the present building. This would permit of a considerable increase in capacity without any addition to the present mill building, in addition to effecting a substantial saving over the present system.

**Kirkland Lake**—The Wright-Hargraves mine in Kirkland Lake will soon be treating 175 tons of ore a day, a larger tonnage than that handled by any mill in the camp. Development is progressing satisfactorily, and the property is in good condition. Mill heads are about \$13 a ton.

The Teck Hughes will install additional grinding and classifying machinery to bring its mill capacity up to 160 tons a day. The ore is averaging over \$10 a ton, with costs below \$6. No further information is available regarding the proposed reorganization, but the proposal to increase the mill capacity indicates that the affairs of the company are in good order.

The Lake Shore has returned to the dividend-paying class by the declaration of a 2 per cent dividend, payable Aug. 10. Total dividends to date are \$360,000.

Surface work on the Wood Kirkland is being continued, and to date eight veins have been found.

The mining plant of the Comfort Kirkland is arriving on the property, and as soon as installed a contract will be let for sinking the shaft.

The Tough Oakes officials believe that the reopening of the mill will be delayed for some months in order to permit the development of sufficient ore for continuous operations.

Harry Oakes, president of the Lake Shore, is dewatering the McIvor, which lies about three miles from the Lake Shore.

The foundations are practically all in for the Ontario Kirkland mill, and ma-

chinery should begin to arrive on the ground within a few days.

American and English interests will unite in the underwriting of the stock of the Sylvanite. This company has 400,000 shares of \$5 par, of which 320,000 shares have been issued. The syndicate will underwrite the remaining treasury stock, and the company will then be reorganized and will have a capital of \$3,000,000, of which \$2,000,000 will be issued.

**Porcupine**—Hollinger has declared the usual four-weekly dividend of 1 per cent, payable Aug. 12, which brings the disbursements for the present year up to \$1,958,000, or at the rate of \$3,198,000 for the full year.

The Hollinger continues treating between 3,200 and 3,300 tons a day. Good progress is being made in the building of additional houses for workmen, the construction of 150 of which has been contracted for.

A development report has just been received to the effect that the main vein of the Keora has just been cross-cut on the 250 level, about 250 ft. from the shaft, where it has a width of at least 8 ft. with the face of the cross-cut still in ore.

The Dome is now producing at the rate of about \$225,000 a month. Development work on the 10th level is on a large scale, and is producing satisfactory results. With the earnings running at the present rate, the company should soon be able to start on the scheme of capital reduction, which officials have been considering for some time.

Arrangements are being made to complete the consolidation of the West Dome and the Dome Lake properties.

The Allied Porcupine is the name of a new company which has taken over the Three Nations, La Palme, and other adjoining properties. The workings are being dewatered, and development will start as soon as possible.

**Sudbury**—The merchants of Sudbury, Ont., who have lost a good deal of business owing to the closing down of the nickel companies, are endeavoring to revive trade by encouraging prospecting for gold. They have organized under the title of the Mines Service Corporation, with a membership of about one hundred, each contributing \$100, and have engaged a prospector to make explorations. It is claimed that the district should produce gold as well as nickel-copper, and it is stated that a promising prospect has already been found a few miles to the northeast of Sudbury.

**Goudreau**—The Ontario Department of Mines has received a report from A. G. Burrows on the showings of gold near Goudreau, a station on the Algoma Central Ry. north of Sault Ste. Marie. The discovery was made by Thomas Murphy last April, and a number of claims have been staked. The report states that a number of samples obtained from points along the vein showed gold ranging from a few cents to \$28 per ton. In addition, two assays were made of specimen quartz, carry-

ing a high percentage of sulphide, from a pit a few feet west of the rich gold showings, which gave \$31.20 and \$48.80 in gold. The main vein shows high-grade ore for at least 40 ft. near the discovery, but extensive work will be required to determine the possible ore shoots along the vein, as the large portions of the vein are concealed by drift.

**South Lorrain**—The electric motor which drives the twenty-stamp mill of the Keeley silver mine has been burned out, and the plant is temporarily closed.

#### WASHINGTON

**Four Metals Co.'s Mill Ready in August**  
—Caaba May Sink 200-Ft. Shaft

**Nighthawk**—The Four Metals Co., which is installing a 50-ton mill on its property, three miles north of Nighthawk, is employing twelve men on mill construction and outside work. It is planned to have the mill ready for operation in August. Equipment will consist of ball mills, two jigs, five tables and flotation machines.

Caaba mine, which has attained a depth of 300 ft. vertically, may be developed by shaft an additional 200 ft. Two cars of concentrates have been accumulated since milling was started at the Ruby mine concentrator. The ore is said to run about 80 oz. per ton.

**Northport**—Gorien and Harris, who have been operating the Maki zinc mine for the last year, are now installing a small concentrator to treat their ore. The yard of the Northport smelter is being used for this temporary installation to take advantage of power and water facilities. The deposit was discovered only a year ago. It is a small deposit of high-grade smithsonite, and during the relatively short period of operation it has yielded a number of cars of ore which were shipped to Mineral Springs, Wis. The orebody along the strike is about 100 ft. long and averages 2 ft. in thickness. A shaft has now been sunk on the deposit to a depth of 180 ft.

#### OREGON

**New Body of Quicksilver Ore Cut in Force Property Near Gold Hill**  
—Norling Mine in New Hands

**Gold Hill**—A large body of cinnabar ore running 40 to 60 per cent quicksilver has been uncovered in the Force group of quicksilver mines in the Gold Hill district. This mine is owned and operated by David Force, of Gold Hill, and is situated twelve miles north of the town. Like all other quicksilver mines in the district it has closed down its furnaces owing to the low price of quicksilver. Several of these mines are going ahead with development work.

This mine, with the Chisholm group and the War Eagle group, two adjoining mercury properties, has been a steady producer since 1916, operating on ore that averages about 17 per cent mercury. The War Eagle group is equipped with a twenty-five ton Scott furnace and two 12-pipe furnaces, and the Force and Chisholm groups are

each equipped with a twelve-pipe furnace.

The War Eagle group, consisting of thirty-five claims, was formerly owned and operated by a Utah mining company. It was equipped and developed at an expense of about \$60,000. Recent development shows that the ore carries many byproducts, including a large percentage of arsenic, also gold, silver, zinc, nickel, and cobalt. The present company, composed of local investors and with its main office at Medford, announces that it will add equipment to recover several of these byproducts before resuming.

**Medford**—Discoveries of rich ore at the Norling mine, three miles west of Jacksonville on Jackson Creek, has aroused interest locally. A new company recently organized by C. C. Clark and Etha Wall, of Medford, has acquired the property and will resume operations at once. This company is known as the Medford Mining & Milling Association, with its head office at Medford. C. C. Clark is president and M. P. Schmitt secretary and treasurer. Both are of Medford. The main adit of the mine is at an elevation of 3,130 ft. The gold is chiefly in the quartz. The country rock is a dark massive andesite; and pyrite is more abundant in the rock adjoining the vein than in the vein itself.

#### IDAHO

**Cœur d'Alene District**  
**Chicago-Boston Finds Long Sought Ore Shoot—Sunshine Mill Nearing Completion**

**Wallace**—The long sought ore shoot in the Chicago-Boston has been found in drifting from the top of a raise from the 400 to the 200 level. A large ore shoot on the 200 was not found as expected on the 400. The drift in which the shoot was found shows 18 in. of high-grade lead-silver ore on the foot wall and about 6 in. on the hanging wall side, with about 3 ft. of milling ore between. Its position indicates that the ore rakes strongly to the east, which carries it beyond the end of the drift on the 400 level. Control of the Chicago-Boston is owned by the Callahan Zinc-Lead Co.

**Kellogg**—The 100-ton mill being constructed by the Sunshine Mining Co. on Big Creek is nearing completion. The company controls what is familiarly known as the Yankee Boy mine, locally famous as a producer of high-grade silver ore. About thirty-five men are employed in leasing operations on the property. The lessees are said to have left a large amount of good milling ore after sorting the high grade, and this will be available for the mill while new ground is being opened in tunnel No. 5, the lowest level.

**Murray**—H. A. Morse, a mining engineer of San Francisco, has secured a bond for \$80,000 on the Terrible-Edith, a property which has a record of extensive shipments of lead and zinc ore, but which has been idle for several years.



The North Side Railway Co. has filed articles of incorporation, the purpose of the company being to reconstruct the Prichard Creek branch of the O. W. R. & N. company's line. The total length of the branch is about fourteen miles, and it is estimated that 9½ miles will have to be rebuilt. It was washed out by the high water of the winter of 1917.

#### Other Districts

**Sandpoint**—The Blacktail Mining Co., operating a property near Talache, Pend Oreille Lake, plans to drive a 200-ft. tunnel, which will give a depth of about 100 ft.

**Cabinet**—It is announced that the Carpie Mining Co., which is developing a property with values chiefly in copper, will sink an additional 200 ft., from the 300 to 500 level.

**Mackay**—A car of hand-sorted ore, averaging about 30 per cent copper, has been shipped from the Valley View claim of the old Weimer Copper Co.'s property, in Skull Canyon, Birch Creek. The output has to be hauled 40 miles to Dubois for shipment. Operations at the Empire Copper Co.'s property, also in this vicinity, are being conducted principally by 60 lessees. The output for June was 30 cars, the largest in any month this year. Development on the 900-level has been gratifying, with an orebody opening up showing from 18.5 to 29.5 per cent copper.

#### MONTANA

##### Tuolumne Copper Co. Cuts Spread Delight Vein—Reported Anselmo Company Has Cut Body of Copper Ore

The Anaconda company is reported to have opened a body of high-grade copper ore at a depth of 2,800 ft. in a section of the district somewhat north of what has been understood to be the general copper zone.

The Tuolumne Copper Mining Co. has cut the Spread Delight vein on the 1,600 level of the Main Range mine. From the well-mineralized condition of the quartz found it is believed that when a point is reached under which ore is had on the 1,200, a commercial tonnage will be disclosed. The face of the crosscut has been improving, and assays of the breast run up to 46 oz. of silver.

The Davis-Daly company is continuing to open up more new ore than is being mined in the Colorado mine, and is hoisting more than 325 tons daily. Crosscutting is under way on the 2,700 level for another vein, the position of which has been worked out by the geological department. This fissure already has been opened on the upper levels.

Butte & Superior is daily expecting to cut on the 2,200 level the copper vein uncovered on the 2,050 level of the Black Rock mine.

The East Butte Mining Co. has practically got out of the oil business so far as direct participation in the venture is concerned, according to unofficial reports. This flier is said to have

cost the company about a quarter of a million dollars. A moderate amount of development work is under way at the Pittsmonth properties.

The Hesperus Mining Co. will sink from the 250 level to the 450 level with the development of the Hesperus vein of the Davis-Daly's Colorado mine in view. The Hesperus is operating through the old Butte-New England shaft, and is situated just to the southeast of the Colorado mine, with a number of the Davis-Daly fissures striking through. An orebody of mixed milling and first-class ore 6 ft. wide has been opened on the 250 level, and a crosscut is being driven to open three other ledges. An electrical hoisting plant, good for 750 ft., and a larger air compressor are being installed.

Butte & Western has opened its Stanislaus vein on the 500 level.

The Anselmo Mining Co. has opened a body of copper ore on the 1,200 level, according to unofficial reports. The property of this company, which is backed by the Beer Sondheimer interests, is somewhat on the western edge of the Butte district proper and to the northwest.

The Barnes-King Development Co. produced bullion in June to the amount of \$30,052.09, as compared with \$21,587.02 the preceding month.

#### UTAH

##### Work on Silver King Coalition Mill Progressing—Centennial Eureka and Bullion Beck Mines Resume

**Alta**—The South Hecla is making shipments of good fluxing lead carbonate ore. Between fifty-five and sixty tons a day has been shipped since July 1. Most of this ore comes from the No. 2 west stope about 1,600 ft. in on the Dwyer tunnel level.

The Sells, adjoining the South Hecla, is mining ore and making shipments of approximately fifteen tons a day. A new cable has been laid on the Michigan-Utah's aerial tramway, and shipments of lead ore have been started. A considerable tonnage has been stored in the mine awaiting the completion of the cable installation.

The Wasatch, at Alta, is building a short road to connect with the Little Cottonwood Transportation Co.'s railroad.

The Woodlawn, in Big Cottonwood, near the head of Honeycomb Gulch and adjoining the Prince of Wales, now owned by the Michigan-Utah, has recently made a strike of good silver-lead ore. The ore was opened 1,200 ft. in from the portal of the main tunnel and has been followed by a winze for 90 ft. It is up to 8 ft. wide in places. W. J. Lawrence is manager.

**Eureka**—Ore shipments from the Tintic district for the week ended July 22 amounted to 156 cars, the same as of the week preceding. The shippers were: Tintic Standard, 51 cars; Chief Consolidated, 36; Iron King, 14; Iron Blossom, 12; Victoria, 11; Dragon, 10; Eagle & Bluebell, 7; Swansea, 4;

Gemini, 3; Colorado, 3; Mammoth, 3; Eureka Mines, 1, and Sunbeam, 1.

The Centennial Eureka and Bullion Beck mines, controlled by the U. S. Smelting, Refining & Mining Co., resumed operations last week. About seventy lessees were working at these properties when they shut down a few months ago.

Some ore has been opened at the Iron Blossom in new territory. The Dragon is shipping a regular tonnage of iron fluxing ore, and the Tintic Milling Co., at Silver City, controlled by the Knight interests, is treating low-grade siliceous silver ores from this property and from other mines. At the Little May, in South Tintic, a new electrically driven compressor and hoist is being installed. Ore carrying silver, copper, and gold is being mined on the 200 level.

The Eureka Lilly, in East Tintic, is drifting on the 500 and on the 1,400 levels. On the 500 level the face is in mineralized ground, and some high-grade bunches of silver-lead copper ore have been cut on the 1,400 level. This work is being done to prospect for the continuation of an orebody which was opened from the surface to the 300 level in the early history of the property.

The Iron King, in East Tintic, is mining 500 to 600 tons of fluxing ore a week, and a small amount of lead-silver ore. Thirty-two men are employed, eight of them on company account and twenty-four for the A. S. & R., under the direction of Alfred Frank. At the Grand Central, at Mammoth, lessees are working and are making shipments. It is understood that operations on company account are to be resumed soon.

**Park City**—Ore shipments for the week ended July 22 amounted to 1,273 tons, as compared with 1,475 tons the week preceding. The shippers were: Silver-King Coalition, 565 tons; Judge allied companies, 390, and Ontario, 318.

Good progress is being made by the Silver King Coalition Mines Co. on the erection of the new mill, steel for which has begun to arrive. About seventy men are employed in the excavating, building concrete foundation and other work. Construction will soon be started. Mine development continues good, and further ore has been opened in new territory. About 300 men are employed.

The recent cave-in at the Judge Mining & Smelting Co. on the 200 level, which partly blocked the shaft for a short time, has been cleaned up, and operations are being carried on.

George H. Rothman and other California stockholders have been making a visit of inspection to the American Flag mine, with a view to resuming operations.

A bond and lease has been taken on the Park City King, adjoining the Silver King Coalition and Silver King Consolidated on the southwest, and near the head of Thaynes Canyon, by I. C. Thoresen, U. S. Surveyor General. The bond was given by the estate of James McGregor and by Robert Gorkinski.

## COLORADO

**Eurades Mining Co. Shuts Down—Road Construction Under Way in Red Mountain District**

**Ouray** — The Eurades Mining Co., after operating for eighteen months, closed down suddenly. A small amount of high-grade ore was discovered not long ago and a shipment is now being made. The cause of shutdown is given as the closing of a prominent Chicago bank, one of whose officers was the principal backer of the mine.

Pickering Bros., of the Utah Construction Co., have been awarded the contract to build the new highway between Red Mountain and the Joker Tunnel, and are in the market for road machinery and are advertising for men. This is a fairly large contract and will mean lively activity in the Red Mountain district. The district is now practically abandoned but the new road will mean improved transportation facilities and prospecting will undoubtedly be stimulated. L. M. Spencer, of Del Norte, has been awarded the contract for the stretch between Bear Creek and State Bridge along the same highway and is advertising for men and machinery also. Both these projects, involving nearly \$100,000, are Federal aid projects and will mean a vast improvement to the road between Ouray and Silverton, cutting hauling costs on ore and stimulating mine operations.

## ARIZONA

**Duncan Mining & Milling Co.'s Property Sold to J. M. White—Shattuck-Arizona Drops Men**

**Kingman**—Development work has been started in the Katherine district on a large dike on the Nevada side of the Colorado River on what is believed a continuation of the Katherine vein. The property, known as the Homestake group, has been located for years. It has been renamed the Katherine-Nevada, and is being operated by Shaw, Cashman, Cushman & Chaffey.

**Prescott**—The Howard Copper Co., in the Black Canyon district, is installing a hoist and compressor, with the intention of sinking the shaft from the present 200-ft. depth to 500 ft.

The former property of the Verde Apex Copper Co., including seven claims and surface equipment, has been finally transferred on sheriff's deed to C. M. Raible, of Prescott, following judgment of \$28,000.

**Bisbee**—Shattuck-Arizona has completed a program of development work entered upon last November and has dropped sixty men, after pulling its pumps.

Work of concreting the Dallas shaft of the Copper Queen from the 1,300 to the 1,800 level has been started. It is expected to take three months.

**Clifton**—The property of the Duncan Mining & Milling Co., situated about ten miles east of Duncan, has been sold at receiver's sale to James M. White, of El Paso, former manager of the property. It is stated that the

receiver will pay all claims against the old corporation.

## CALIFORNIA

**Yankee Gold Dredging Co. Bankrupt—Shasta Zinc & Copper Co. Secures Payment of Debentures**

**San Francisco** — The Yukon Gold Co. has shipped a dredge hull and superstructure for a 7½-cu.ft. dredge to its tin-mining properties in the Federated Malay States. Another dredge will be shipped later in August. The hydro-electric plant at Dawson has already been sent there.

**Grass Valley** — Operations are reported as rapidly reaching normal. Almost a full crew was put on at the Empire, and the number at work is being gradually increased at the North Star after a month's cessation of mining, although pumping was continued. At the Idaho-Maryland the water has been removed from almost the lowest workings, and encouraging results are being obtained in development.

**Redding**—According to local reports, the Shasta Zinc & Copper Co. has filed a \$600,000 mortgage to the Equitable Trust Co., of New York, to secure payment of debenture bonds. Bonds bear 8 per cent interest and run four years. The company is now producing and is embarking on an active campaign of mine and smelter operations. The Tom Head mine, forty miles west of Red Bluff, has been taken over by a new company organized by N. A. Goyot.

**Mercer** — The Yankee Hill Gold Dredging Co. was declared bankrupt July 14. This company lost its dredge in a flood. Dredging was being done in the Stanislaus River near Knights Ferry at the time.

## NEVADA

**Conditions at Tonopah Improving—Tonopah Divide Resumes—Gold Discovered South of Mina**

**Mina**—What may prove to be an important strike has recently been made in the Gold Range Mountains about nine miles southwest of Mina. The values are in gold. The vein has been traced and prospected for over 600 ft. by shallow shafts and trenches, and commercial values have been found for this entire distance. The vein is at times as much as 100 ft. in width.

**Round Mountain**—The Round Mountain Mining Co. shipped \$8,000 in gold bullion on July 12. This was produced by lode lessees. Results of the placer clean-up have not as yet been announced.

**Tonopah**—Conditions in the Tonopah district are improving. There are at present 290 men working at the Belmont, out of a normal crew of 340, and 180 at the Tonopah Extension, out of a normal crew of 235. The Tonopah Mining Co. has made no attempt to resume operations. The Belmont is milling 300 tons of ore per day and the Tonopah Extension 200. Recent bullion shipments reported are: Tonopah Extension \$26,000; and West End,

\$60,000, representing clean-up of operations for the first half of July.

**Divide**—The Tonopah Divide mine resumed operations July 20 with part of its crew, paying the reduced scale of wages. The crew will be increased as operations become normal. This is the first work done in the mine since April 16. The regular development campaign is to be followed and ore shipments made to the Belmont mill at Tonopah.

The south crosscut on the 900 level of the Kernick shaft is reported by the management to have cut stringers carrying values for the last 100 ft. No drifting has been done, as the crosscut has not yet reached the objective in Hasbrouck ground. The Hasbrouck company has entered into an agreement with the Western Divide and the Hasbrouck Annex, whose ground it was necessary to cross with the crosscut from the Kernick shaft in order to reach the Hasbrouck ground, that in exchange for the development of the two properties by the crosscut each company grants it a three-year lease on a strip of territory 100 ft. on each side of the crosscut, and without royalty.

## MINNESOTA

## Mesabi Range

**La Rue Mine at Ely Renamed Armstrong Bay—Albany and Utica Stockpiles Being Shipped**

**Chisholm**—A further reduction of operations by the Oliver Iron Mining Co. has been announced, which effects the Fraser and Wellington mines. At the Fraser, which is a new open pit, all stripping has been discontinued, effecting about 110 men. All underground operations have been suspended at the Wellington mine, a new underground property which became a shipper this season, but it has been announced that the miners affected will be taken care of at other properties on a curtailed schedule.

**Hibbing**—Ore loading at the Mahoning mine, operated by the Mahoning Ore & Steel Co., has stopped for this season. About 275,000 tons of ore has been forwarded to the docks, but this is only a small tonnage in comparison with that which could have been shipped by working at full capacity and for the whole season.

The stockpiles at the Albany and Utica mines, operated by Pickands Mather, are being loaded, and shipments made daily to the docks. The removal of any stockpile on the range during the existing depression is always accepted as a good sign, as it would permit the mine to operate this winter should conditions sufficiently improve to warrant underground work.

**Ely**—The La Rue mine, operated by the Chippewa Iron Mining Co., has been renamed the Armstrong Bay, to avoid confusion with a mine of the same name on the west end of the Mesabi Range operated by the M. A. Hanna Ore Co.

# THE MARKET REPORT

## Daily Prices of Metals

July	Copper, N. Y., net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
28	11.75	25 625	26.50	4.35@4.40	4.20	4.20
29	11.75	25.625	26.50	4.35@4.40	4.20	4.20
30	11.75	25.625	26.50	4.35@4.40	4.20	4.20
Aug. 1	11.75	25.875	26.75	4.35	4.20	4.20
2	11.75	25.50	26.375	4.35	4.15@4.20	4.20
3	11.75	25.00	25.75	4.35	4.15@4.20	4.20

\*These prices correspond to the following quotation for copper, "delivered": 12c. for the week.

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

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
28	70	70 <sup>3</sup> / <sub>4</sub>	75	159 <sup>1</sup> / <sub>2</sub>	161 <sup>1</sup> / <sub>2</sub>	23	23 <sup>1</sup> / <sub>2</sub>	25 <sup>3</sup> / <sub>4</sub>	26 <sup>3</sup> / <sub>4</sub>
29	70 <sup>1</sup> / <sub>4</sub>	70 <sup>3</sup> / <sub>4</sub>	75	159 <sup>3</sup> / <sub>4</sub>	161 <sup>1</sup> / <sub>2</sub>	23	23	25 <sup>3</sup> / <sub>4</sub>	26 <sup>1</sup> / <sub>4</sub>
30	...	...	...	...	...	...	...	...	...
Aug. 1	...	...	...	...	...	...	...	...	...
2	70 <sup>1</sup> / <sub>4</sub>	70 <sup>3</sup> / <sub>4</sub>	74 <sup>1</sup> / <sub>2</sub>	158 <sup>1</sup> / <sub>2</sub>	160 <sup>1</sup> / <sub>2</sub>	23	23 <sup>1</sup> / <sub>2</sub>	25 <sup>1</sup> / <sub>4</sub>	26 <sup>3</sup> / <sub>4</sub>
3	70 <sup>1</sup> / <sub>4</sub>	70 <sup>3</sup> / <sub>4</sub>	74 <sup>1</sup> / <sub>2</sub>	157 <sup>1</sup> / <sub>2</sub>	159 <sup>3</sup> / <sub>4</sub>	23	23 <sup>3</sup> / <sub>8</sub>	25	25 <sup>3</sup> / <sub>4</sub>

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

July	Sterling Exchange "Checks"	Silver			Aug.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
28	357	99 <sup>1</sup> / <sub>4</sub>	62 <sup>3</sup> / <sub>8</sub>	39 <sup>1</sup> / <sub>2</sub>	1	356 <sup>1</sup> / <sub>2</sub>	99 <sup>1</sup> / <sub>4</sub>	61 <sup>3</sup> / <sub>4</sub>	...
29	356	99 <sup>1</sup> / <sub>4</sub>	61 <sup>1</sup> / <sub>2</sub>	38 <sup>3</sup> / <sub>8</sub>	2	356	99 <sup>1</sup> / <sub>4</sub>	61 <sup>1</sup> / <sub>4</sub>	38 <sup>3</sup> / <sub>8</sub>
30	356	99 <sup>1</sup> / <sub>4</sub>	61 <sup>1</sup> / <sub>2</sub>	39 <sup>1</sup> / <sub>2</sub>	3	356	99 <sup>1</sup> / <sub>4</sub>	61	38 <sup>3</sup> / <sub>8</sub>

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

## Metal Markets

New York, Aug. 3, 1921

General business conditions seem to be slightly improved, but the non-ferrous metal market has not yet been affected.

### Copper

The demand has been of fair volume for the last week, at the 12c. level generally quoted for August deliveries by producers. We have heard of no large orders being placed, and consumers continue to buy merely for near-by requirements. Some of the more anxious sellers are willing to sell September copper at the 12c. price, but there seems little disposition to cut under this figure. On a firm bid for a good tonnage of spot copper where a low freight rate

applies, 11<sup>7</sup>/<sub>8</sub>c. delivered might be done, but this is not the general price. The jobbers' lot of 225-lb. wire bars is not yet all sold, and is offered at 11<sup>7</sup>/<sub>8</sub>c. f.o.b. warehouse, with apparently no takers. It may have to be sold at even a lower price. Foreign demand has been quiet, sales being made largely to Germany and Japan through the Copper Export Association, whose European price is reported to be 12.50c. c.i.f.

Domestic and foreign sales for July were probably in the neighborhood of 70,000,000 lb., which represents a gain of 20,000,000 lb. over June, but is considerably below the figure reached in May. It is almost three times current production in North and South America, but, even so, the copper surplus is disappearing but slowly.

## Monthly Average Prices for July

<b>Copper:</b>	
New York Electrolytic.....	12.170
London Standard .....	71.155
London Electrolytic .....	75.286
<b>Lead:</b>	
New York .....	4.410
St. Louis .....	4.260
London .....	23.399
<b>Silver:</b>	
New York, foreign .....	60.260
New York, domestic .....	99.250
London .....	37.481
Sterling Exchange .....	362.565
<b>Zinc:</b>	
St. Louis .....	4.239
London .....	26.262
<b>Tin:</b>	
99 per cent .....	26.755
Straits .....	27.655
London .....	164.530
Antimony .....	4.735
Quicksilver .....	44.950
Platinum .....	70.440

## Lead

The American Smelting & Refining Co. is continuing its official contract price of 4.40c., and no early change is likely.

Demand for the last week has been quiet, but not entirely absent. Every day has seen a few inquiries, and several orders for one or two hundred tons have been placed. One lot of 1,000 tons was marketed. The storage-battery and paint business continues satisfactory, and these lines form the principal outlet for the metal. It is likely that producers are accumulating small stocks under present conditions, but they are not sufficiently large to cause them worry; nor are they expected to be. Corroding lead is selling for 4.40@4.50c., Chicago.

## Zinc

The market is unchanged, almost all business being transacted on a 4.20c. East St. Louis basis. No improvement in demand is noticeable, although reports from iron and steel centers indicate a slight betterment in the iron trade. Production has been cut severely by the large zinc producers. It is the smaller zinc companies that are pressing metal on the market and keeping production at a higher level than is necessary.

## Tin

Demand has been confined largely to five- and ten-ton lots, and the market has continued quiet at the low levels. Electrolytic is practically off from the market. The total visible and invisible stocks reported last week as about 65,000 tons include a visible supply of 18,000 tons; Straits tin held in the East, 20,000 to 25,000 tons; Banka tin, 5,000 tons; Chinese, 3,000 to 5,000; in

Bolivian ores in storage, 10,000 tons; and in consumers' hands, 4,000 tons. These figures are of course partly guesses, but they are believed to be an intelligent estimation.

Tin for forward delivery is nominal at the same prices as for spot.

Arrivals of tin, in long tons: Total for July, 1,500; Aug. 1st, London, 100; Rotterdam, 50; Straits, 30; China, 5.

#### Gold

Gold in London: July 28th, 114s. 10d.; 29th, 115s. 2d.; Aug. 2d, 115s. 5d.; 3d, 115s. 5d.

#### Foreign Exchange

The exchange market has been generally inactive during the last week. Sterling "cables" continue to be quoted one-half cent above the "demand" figures given in the table on page 233. On Tuesday, Aug. 2d, francs were quoted at 7.6275c.; lire, 4.2275c.; and marks, 1.22c. New York funds in Montreal, 11½ per cent premium.

#### Silver

The New York market has been quiet, and prices obtainable in Frisco, based on the China exchanges, were well below the London parity. As a result the Frisco market has been a purely nominal one. The Mexican government has placed a tax, effective Aug. 1, on silver exports at the following rates:

5 % on silver valued at 60c. or under  
5½% " " " " 60c. to 70c.  
6 % " " " " 70c. to 80c.

At current prices, the new rate means an increased tax of 5 per cent, or about 3c. per ounce. Efforts are being made to have this tax law repealed or the rate reduced.

Mexican Dollars—July 28th, 47½; 29th, 47; 30th, 47½; Aug. 1, 47½; 2d, 47; 3d, 46½.

#### Other Metals

Quotations cover large wholesale lots unless otherwise specified

**Aluminum**—List prices of 24.5@25c. are nominal. Outside market, 21@23c. per lb.; 22½c. for imports, duty paid.

**Antimony**—Chinese and Japanese brands, 4.60@4.65c.; market dull. W.C.C. brand, 5½@5¾c. per lb. Cookson's "C" grade, spot 9@9½c. Chinese needle antimony, lump, nominal at 4c. per lb. Standard powdered needle antimony (200 mesh), nominal at 6@6½c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb<sub>2</sub>O<sub>3</sub>, wholesale lots, 6½@7c.

**Bismuth**—\$1.50@1.55 per lb., 500-lb. lots.

**Cadmium**—Range \$1@1.10 per lb., in 1,000-lb. lots. Smaller quantities, \$1.10@1.25 per lb.

**Cobalt**—Metal, \$3@3.25 per lb.; black oxide, \$2.35 per lb. in bbls.

**Iridium**—Nominal, \$165@185 per oz.

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

**Nickel**—Standard market, ingot, 41c.; shot, 41c.; electrolytic, 44c. Small ton-nages, spot, 35@40c.

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

**Osmium**—\$70@80 per troy oz. Nominal \$70, Los Angeles, Cal.

**Palladium**—Nominally, \$48@52 per oz.

**Platinum**—Nominally, \$65 per oz. The market has held steady, and the decline of last week has been arrested.

**Quicksilver**—Nominally, \$43.50@45 per 75-lb. flask. San Francisco wires \$46.25.

**Rhodium**—\$150 per troy oz.

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

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

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

#### Metallic Ores

**Chrome Ore**—Ore analyzing 40@45 per cent Cr<sub>2</sub>O<sub>3</sub>, crude, \$20@25 per net ton; ground, \$30; analyzing 45@50 per cent Cr<sub>2</sub>O<sub>3</sub>, \$30; ground, \$35; f.o.b. Atlantic ports. Quotations are nominal.

**Iron Ore**—Lake Superior ores, per ton, Lower Lake ports: Old Range bessemer, 55 per cent iron, \$6.45; Mesabi bessemer, 55 per cent iron, \$6.20; Old Range non-bessemer, 51½ per cent iron, \$5.70; Mesabi non-bessemer, 51½ per cent iron, \$5.55.

**Magnetite Ore**—F.o.b. Port Henry, N. Y.: Old bed 21 furnace, \$4.85; old bed concentrates, 63 per cent, \$5.75; Harmony, cobbled, 63 per cent, \$5.75; new bed low phosphorus, 65 per cent, \$8.50.

**Manganese Ore**—22c. per unit, seaport; chemical ore (MnO<sub>2</sub>) \$50@55 per gross ton, lump; \$70@75 per net ton, powdered. Nominal.

**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 tantalic acid, 50c. 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 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. Nominal.

**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.

\*Furnished by Foote Mineral Co., Philadelphia, Pa.

#### Zinc and Lead Ore Markets

**Joplin, Mo., July 30**—Zinc blende, per ton, high, \$24.25; basis 60 per cent zinc, premium, \$21; Prime Western, \$21@20; fines and slimes, \$19@18; average settling price, all grades of zinc, \$20.62.

Lead, high, \$51.70; basis 80 per cent lead, \$45@50; average settling price, all grades of lead, \$46.24 per ton.

Shipments for the week: Blende, 4,024; lead, 1,317 tons. Value, all ores the week, \$143,850. Shipments for seven months, 157,269 tons blende, 102 tons calamine, 35,355 tons lead. Value, all ores seven months, \$5,597,780.

Waco ore, which was selling \$1 above Oklahoma prices on account of 80c. freight differential, was dropped this week to \$20 and the freight, or \$20.80 per ton. Oklahoma prices continued on \$21 basis, with total district sales for the week of 4,600 tons, the largest purchase in one week since June 18.

Lead offerings were advanced to \$50 basis this week by one purchasing company, short on its supply of ore.

**Platteville, Wis., July 30**—No market for zinc or lead ore. Shipments for the week, none. Shipments for the year: Blende, 11,461; lead ore, 978 tons. Shipped during the week to separating plants, 168 tons blende.

#### Non-Metallic Minerals

**Asbestos**—Crude, No. 1, \$1,700@2,000; No. 2, \$1,200@1,500; spinning fibers, \$400@800; magnesia and compressed sheet fibres, \$275@400; shingle stock, \$95@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. South Carolina points. Foreign barytes, prime white material, \$25 per net ton, f.o.b. Atlantic seaports. Western grades are \$24.50. Crude quoted \$7@10 per long ton, f.o.b. Cartersville, Ga.

**Bauxite**—French bauxite, \$8@10 per metric ton, c.i.f. Atlantic ports. American bauxite, crushed and dried, \$8@10 per gross ton, f.o.b. shipping points; pulverized and dried, \$12@15 per gross ton, depending upon grade; calcined so as to remove most of the combined water, \$20 per gross ton, f.o.b. shipping point.

**Chalk**—English, extra light, 5c. Domestic light, 4½c.; heavy, 4c. per lb., all f.o.b. New York.

**China Clay (Kaolin)**—Crude, \$6.50@8.50; washed, \$9@10; powdered, \$13@20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, \$13@20, f.o.b. Virginia points. Imported lump, \$12@20, f.o.b. American ports; powdered, \$35@45, f.o.b. New York.

**Emery**—Turkish emery, 6@6½c. per lb., depending upon fineness. Inferior grades, 3½c., f.o.b. New England points.

**Feldspar**—No. 1 soap grade, \$7@7.50 per ton, f.o.b. North Carolina points; No. 1 pottery, \$6@6.50; No. 2, \$5@5.50. Market dull. Large stocks are available and quotations are nominal. Producers report cancellations of orders. No. 1, Canadian, ground, \$26 f.o.b. cars.

**Fluorspar**—Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, \$20@22.50 per ton, f.o.b. Illinois and Kentucky mines; acid, glass, and enamel grades, \$40@55; ground, suitable for acid, chemical or enameling purposes, \$32@35; lump, \$13.50, f.o.b. Lordsburg, N. M. Ground acid grade, 97 per cent CaF<sub>2</sub>, \$30, New Mexico.

**Fuller's Earth**—16 to 30 mesh, \$21; 30 to 60 mesh, \$23; 60 to 100 mesh, \$19; 100 plus mesh, \$15, f.o.b. plants, Pennsylvania. California grades, \$15@25, f.o.b. mines. Imported, English, \$24@27, f.o.b. Atlantic ports.

**Graphite**—Ceylon lump, first quality. 6@7c. per lb.; chip, 4½@5c.; dust, 3@4c. No. 1 flake, 5@6c.; amorphous crude, ¾@2¼c. Market exceedingly dull and reflects general business conditions. When manufacturing plants are idle there is no demand for graphite.

**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**—Crushed, New York State shipping points, ¾ in. size, \$1.40@1.75 per net ton; 1½ in., \$1.35@1.70. Prices for other sizes practically the same. Agricultural limestone, \$2.50@4.50 per net ton, f.o.b. eastern shipping points, depending upon analysis.

**Magnesite, Calcined**—Crude, \$12@15 per ton. High-grade caustic calcined, lump form, \$30@40 per ton. Plastic calcined, \$45@50 in barrels, carload lots, f.o.b. California points. Atlantic seaboard, \$60. Temporarily dull market on account of building stagnation.

**Dead-Burned**—\$33 per net ton, Chewelah, Wash.; \$58@64, Chester, Pa. Austrian grade, \$53.80 per ton, f.o.b., Chester, Pa. (Magnesite brick—See Refractories.)

**Mica**—India block mica, slightly stained, per lb.: No. 6, 35c.; No. 5, \$1.20; No. 4, \$2.50@3; No. 3, \$3.50@4; No. 2, \$4.50@6; No. 1, \$5.50@6.50. Clear block: No. 6, 50c.; No. 5, \$1.75; No. 4, \$3.25; No. 3, \$5; No. 2, \$6.50; No. 1, \$8; A1, \$6.50@8.50; extra large, \$25; ground, wallpaper grade, \$90@160 per ton (depending upon quantity); ground roofing mica, \$25@70, all f.o.b. New York.

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

**Phosphate Rock**—Per long ton, Florida ports: 77 per cent tricalcium phosphate, \$11.65; 75 per cent, \$10.65; 75@

74 per cent, \$10.15; 70 per cent, \$6.25; 68 per cent, \$5.75; 68@66 per cent, \$5.50.

**Pumice Stone**—Imported, lump, 3@40c. per lb.; domestic lump, 5c.; ground, 5@6c., all f.o.b. New York.

**Pyrites**—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 12c.; Spanish lump, 12@14c.; domestic fines, f.o.b. mines, Georgia, 11@12c.

**Silica**—Glass sand, \$2.25 per ton; sand-blast material, \$2.25, both f.o.b. Indiana points. Amorphous or decomposed variety, soft silica, 250 to 500 mesh, \$16@30 per ton. Ganister, crude, \$2.50 per ton, f.o.b. Illinois points. Molding sand, building sand, glass sand, \$2.25@3, f.o.b. Pennsylvania points. Market reported dull.

**Sulphur**—\$16@18 per ton for domestic; \$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, \$16@35, talcum powder grade. Southern talc, powdered, carload lots, \$7.50@11 per ton; less than carload, \$25, f.o.b. cars. Imported, \$35@40; Canadian, \$20@40 per ton.

#### Mineral Products

**Arsenic**—Prices have been reduced and are now about 6c. per lb. It is reported that Japanese arsenic in 100-ton lots has been sold recently as low as 5c. per lb.

**Sodium Nitrate**—\$2.30@2.50 per cwt. ex vessel, Atlantic ports.

**Sodium Sulphate**—For 95 per cent material, \$16@18 per ton, f.o.b. Western mines, spot and six months' contract; \$33@35 per ton, New York.

**Potassium Sulphate**—Powder, domestic, \$1.35 per unit, basis 90 per cent, f.o.b. New York.

#### Ferro-Alloys

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

**Ferrocerium**—Per lb., \$12@15.

**Ferrochrome**—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 14c. per lb. of chromium contained; 4 to 6 per cent carbon, 15c., f.o.b. works.

**Ferromanganese**—Domestic 76 to 80 per cent, \$65@70, f.o.b. furnace; re-sale, \$90, delivered; English, \$65@70, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, \$26@25, f.o.b. furnace.

**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, \$2.50 per lb. of contained metal, f.o.b. works. Imported material, \$1.70@2.

**Ferrosilicon**—For 10 to 15 per cent, per gross ton, f.o.b. works, \$40; 50 per cent, \$65; 75 per cent, \$135.

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

**Ferro-uranium**—35 to 50 per cent U, \$6 per lb. of U contained, f.o.b. works.

**Ferrovandium**—\$4.25@4.50 per lb. of V contained, according to analyses and quantity.

#### Metal Products

**Copper Sheets**—Current New York list price, 20¼c. per lb.; wire, 14@14¼c.

**Lead Sheets**—Full lead sheets, 8.25c.; cut lead sheets, 8¼c. in quantity, mill lots.

**Nickel Silver**—31¼c. per lb. for 18 per cent nickel. Grade "A" sheets.

**Yellow Metal**—Dimension sheets 16¼c.; sheathing, 16¼c.; rods, ¾ to 3 in., 13¼c.

**Zinc Sheets**—\$10 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter.

#### Refractories

**Bauxite Brick**—56 per cent alumina. \$35@50 per ton, f.o.b. works.

**Chrome Cement**—40@45 per cent Cr<sub>2</sub>O<sub>3</sub>, \$30@32 per net ton, and \$31 in sacks, carload lots, f.o.b. eastern shipping points.

**Chrome Brick**—Straights, \$60@65 per net ton, shipping point; arches, keys, wedges, \$66; splits, soaps, \$84.

**Fire Brick**—First quality, 9-in. shapes. \$35@40 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, \$30@35.

**Magnesite Brick**—9-in. straights, \$70@75 per net ton; 9-in. arches, wedges and keys, \$77; soaps and splits, \$98, f.o.b. works.

**Silica Brick**—9-in., per 1,000: \$35@45 in carload lots, f.o.b. shipping points.

#### The Iron Trade

Pittsburgh, Aug. 2, 1921

The increase in demand upon the steel mills that began about July 15 has continued. The gains are slight, but they are plainly marked in sheets, standard steel pipe, merchant bars and a few other commodities.

As formerly, the demand experienced is wholly for prompt shipment. Single carload orders are the rule, and in sheets are estimated to represent more than 90 per cent of the total volume of business placed, outside of orders and specifications from the automobile trade and builders and repairers of box-car roofs. Steel production is now approximately 20 per cent of capacity.

On the average, prices have been declining by less than a dollar a ton a week. Bars are still quotable at 1.75c. and shapes and plates at 1.85c., with occasional concessions, and pipe and wire products have been fairly steady. Sheets have yielded sharply, to 2.40c. for blue annealed, 3c. for black, and 4c. for galvanized.

**Pig Iron**—A sale of basic iron running into four figures has been made at \$18, Valley, or \$1 under the previous market. Bessemer can be done at \$20, Valley, or 50c. decline. Foundry remains at \$19.50.

#### Coke

**Connellsville**—Furnace, \$2.75@3; foundry, \$4@4.50.

\*Foote Mineral Co., Philadelphia, Pa.

## Foreign Zinc Industry Unsettled

**American Zinc Institute Reports Conditions Affecting the Production and Marketing of the Metal Unchanged in England, Unprosperous in France, Costly in Belgium, and Chaotic in Germany—Scandinavian Production Low, and Australian Works Closed**

**T**HE secretary of the American Zinc Institute has received the following communication respecting the world production and marketing of zinc from the honorary foreign correspondent of the Institute:

The quotations on the London Metal Exchange continue to vary between £26 and £28, and since the date of my latest report the actual demand by the consumers has been so light as to have no impression on the market. Now that the three months' strike of the English and Scottish coal miners is at an end and all other strikes in Britain have been amicably settled, it is reasonable to expect an improvement in trade conditions. None of the Continental producers shows any anxiety to sell much slab zinc at present prices, and, as far as Belgium is concerned, the appreciation in the franc exchange has necessarily caused a corresponding increase in the sterling quotations for metal from that country.

*United Kingdom*—The position in the English zinc industry is entirely without change, inasmuch as it is still a physical impossibility for British smelters to produce zinc at anything like the present market price. In the past it has been customary for all virgin zinc to be classified as "G. O. B." (i.e., Good Ordinary Brands), with the result that metal of 99 per cent purity failed to command the premium to which it was entitled, except from those consumers who had found it necessary to restrict their dealings to certain brands which possessed characteristics suitable for the purposes intended. Thus the roller of sheets was satisfied to pay a premium varying from 2s. 6d. to 10s. a ton for slab zinc containing a minimum of cadmium and of otherwise good rolling quality, and he limited his brands to those which he found by experience would meet these conditions uniformly. There is no reason why the grades of higher purity zinc than G. O. B. or Prime Western should not carry the same "spread" as in America, and, in view of the fact that all the zinc which the British Board of Trade will receive under its long-term purchase agreement with Australia will be of a purity of 99.95 per cent, one would think that the board would enter upon an educative campaign among all consumers in the country for the purpose of satisfying various users that in many cases it is economical to pay premium for specific qualities. The government would be well advised to arrange for its agents to enter upon such a campaign at the earliest moment, notwithstanding that it would probably involve the earmarking of several thousand tons for distribution among all consumers by means of trial parcels at the G. O. B. price.

*France*—In France, the zinc industry is not prospering, and there is no object in output being increased even at the rebuilt smelters at Montagne-du-Nord. In any case France is not likely to produce more than her own requirements.

*Belgium*—The Federation of Zinc Smelters in Belgium is maintaining its production at about 4,500 tons per month, and a welcome revival of late in the Continental consumption has prevented any marked augmentation of stocks. Slab zinc on hand in Belgium today is 11,000 tons, but the stocks of rolled zinc sheets still remain at over 40,000 tons, mainly the property of the Vieille Montagne. The demand for ore is exceedingly light, for the reason that the Belgian smelters have sufficient calamine and blende on hand to carry them along until February, 1922, at the present rate of zinc production. The smelters have still to take delivery of a considerable quantity of Australian concentrates under contract, and the treatment of these at the price paid represents a substantial loss at the current market price of the metal. Today, under existing circumstances, Belgium can hardly afford to pay more than £4 15s. a ton for Broken Hill concentrates of the standard grade of 47 per cent Zn, 6 per cent Pb, and 10 oz. Ag.

*Germany*—Notwithstanding the obscurity of the German zinc situation, two factors stand out clearly: (1) The current production is very light, and (2) the unsold stocks are not excessive. The total production today does not exceed 4,000 tons a month, as smelting in Silesia is paralyzed pending a definite decision on the fate of Upper Silesia. The Inter-Allied Commission has found that the settlement of this question bristles with difficulties, and has not yet reached any solution of the problem. In the meantime, its task is not made easier by the active propaganda carried on by both Germany and Poland. Zinc, in common with all manufactured goods in the disputed area, is to all intents and purposes immobilized for the time being. Owners of merchandise there can only offer on the promise of delivery when transportation from Upper Silesia is resumed, and, far from any decision by the Allies being imminent, the commission only last week called in experts to investigate and report upon the position. In Germany itself the consumption of zinc is poor, and the low production is sufficient to take care of it. The unsold stocks of virgin zinc in the country are computed to be 16,000 tons, and the holders show no desire to offer this on the London market; indeed, the German government has hinted to the owners that the export of this comparatively small stock of zinc is undesirable. The British government has reduced the tax under the Reparations Act on German goods entering the United Kingdom from 50 per cent to 26 per cent, but in order to remove this disability to German exporters the German government has agreed to bear such burden itself. Were Germany, however, a seller of zinc today, there is nothing to prevent her selling to a neutral country for resale to Great Britain, as German zinc so dealt in escapes the terms of the Reparations Act. This is a fact known to few if any of the English importers of Continental metals.

*Scandinavia*—In both Norway and Sweden the zinc smelters are operating at very low capacity, which may be easily understood when it is explained that the producing costs at the hydrothermic works are certainly not less than the Belgian distillation works' cost today of £30. Although Scandinavia produces about 98.5 per cent zinc, the main quantity runs from 99 per cent to 99.9 per cent. Generally speaking, European trade has been in such a condition during the last nine months that zinc of higher purity than Prime Western has been difficult to place except in small quantities; hence, it has been no uncommon occurrence for the Norwegian and Swedish sellers of late to deliver 99 per cent purity metal against G. O. B. sales on London.

*Australia*—Both the distillation works in South Australia and the hydro-electrolytic works in Tasmania remain closed, and operations are confined to the erection of further units at the latter plant.

*Galvanized Sheets*—The British makers of galvanized sheets have lately been booking orders on the basis of delivery in four to six weeks after the termination of the coal strike, and they are now engaged in hurrying supplies of coal to their works, so by the middle of September the production of galvanized sheets should again be in full swing. The English galvanizers have, through their association, tried to fix selling prices, but any efforts to this end are doomed to failure, as certain members are always ready to undercut the basis quotation. One such attempt at price fixing was made in June, and this was defeated as much by German competition as anything else. Indeed, the British galvanizers are face to face today with stern German competition for really the first time in the history of the trade, and it is a fact that 24 and 26 gages, which Britain cannot profitably sell below £22 a ton f.o.b., are obtainable from Germany at 15s. a ton cheaper, f.o.b. Hamburg.

# METAL STATISTICS

## Monthly Average Prices of Metals

### Silver

	New York		London		Sterling Exchange	
	1920	1921	1920	1921	1920	1921
January	132.827	65.950	79.846	39.985	367.082	372.650
February	131.295	59.233	85.005	34.745	337.466	385.932
March	125.551	56.023	74.194	32.479	370.870	38.806
April	119.779	59.337	68.848	34.250	392.438	391.784
May	102.585	59.810	60.010	34.165	383.360	396.580
June	90.957	58.510	51.096	34.971	393.663	377.236
July	91.971	60.260	53.736	37.481	385.538	362.565
August	96.168	.....	59.875	.....	360.404	.....
September	93.675	.....	59.476	.....	350.370	.....
October	83.480	.....	54.197	.....	346.460	.....
November	77.734	.....	50.952	.....	342.333	.....
December	64.774	.....	41.845	.....	348.101	.....
Year	100.900	.....	61.590	.....	364.840	.....

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

### Copper

	New York		Standard		London	
	Electrolytic	1920	1920	1921	Electrolytic	1920
January	18.918	12.597	118.095	70.964	123.238	79.119
February	18.569	12.556	120.188	70.925	126.950	75.925
March	18.331	11.976	109.533	67.565	118.348	71.190
April	18.660	12.438	103.025	69.381	111.500	71.786
May	18.484	12.742	96.750	73.196	109.200	74.298
June	18.065	12.697	87.864	71.852	101.909	75.682
July	18.576	12.170	90.148	71.155	106.455	75.286
August	18.346	.....	93.935	.....	111.143	.....
September	18.144	.....	96.381	.....	111.905	.....
October	15.934	.....	93.327	.....	104.905	.....
November	14.257	.....	84.807	.....	94.614	.....
December	13.188	.....	75.702	.....	85.905	.....
Year	17.456	.....	97.480	.....	108.839	.....

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

### Lead

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

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

### Tin

	New York		Straits		London	
	99%	1921	1920	1921	1920	1921
January	61.596	36.000	.....	36.000	376.512	190.464
February	58.466	28.534	59.932	32.142	395.750	166.250
March	61.037	27.296	61.926	28.806	369.489	156.024
April	61.120	28.990	62.115	30.404	345.450	163.905
May	53.230	31.431	55.100	32.500	294.813	177.411
June	46.125	28.514	48.327	29.423	250.614	167.506
July	45.798	26.755	49.154	27.655	261.886	164.530
August	43.856	.....	47.620	.....	274.048	.....
September	41.940	.....	44.465	.....	270.120	.....
October	39.310	.....	40.555	.....	258.190	.....
November	35.667	.....	36.854	.....	241.080	.....
December	31.135	.....	34.058	.....	212.440	.....
Year	48.273	.....	49.101	.....	295.866	.....

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

### Zinc

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

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

## Antimony, Quicksilver and Platinum

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

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

## Pig Iron, Pittsburgh

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

In dollars per long ton.

## Monthly Crude Copper Production

	1921			
	March	April	May	June
Alaska shipments	4,985,259	5,615,500	4,216,920	3,234,693
Arizona Copper	2,000,000	2,000,000	2,000,000	(a)
Calumet & Arizona	3,455,672	2,204,000	(a)	(a)
Con. Ariz. Smelting	(a)	(a)	(a)	(a)
Inspiration	5,000,000	1,100,000	(a)	(a)
Magma	650,000	378,900	(a)	(a)
Miami	4,572,000	4,262,625	4,625,000	3,939,000
New Cornelia	2,220,186	1,864,772	1,327,415	1,300,000
Old Dominion	2,199,000	984,000	(a)	(a)
Phelps Dodge	6,959,000	1,461,000	(a)	(a)
Shattuck Arizona	(a)	(a)	(a)	(a)
Ray	2,940,000	(a)	(a)	(a)
United Verde	4,115,000	2,600,000	(a)	(a)
United Verde Extension	2,951,390	3,092,746	(a)	(a)
Calumet & Hecla	9,147,000	(a)	(a)	(a)
Other Lake Superior	5,000,000	5,000,000	4,500,000	4,500,000
Anacanda	11,600,000	2,935,840	(a)	(a)
East Butte	1,000,000	1,047,140	1,641,176	1,350,000
Nevada Cons.	3,100,000	(a)	(a)	(a)
Chino	3,051,838	(a)	(a)	(a)
Utah Copper	7,500,000	(a)	(a)	(a)
Eastern Smelters	1,500,000	1,500,000	1,500,000	1,500,000
Others, estimated	7,100,000	10,900,000	5,500,000	8,800,000
Total United States	91,046,345	46,946,523	25,310,511	24,623,693
Imports: Ore and concentrates, matte, etc.	9,865,917	6,539,005	3,072,707	5,129,065
Imports of blister, unrefined	12,448,823	10,109,145	5,171,662	12,531,637
Imports of refined, etc.	359,572	19,459,418	7,517,134	3,306,349
Grand total	113,720,657	83,054,091	41,072,014	45,600,744
British Columbia:				
Granby Cons.	2,617,702	2,459,250	2,539,000	2,254,639
Mexico:				
Boleo	618,222	728,000	727,098	1,433,804
Cananea	(a)	(a)	(a)	(a)
Phelps Dodge Mexican properties	2,285,000	407,000	(a)	(a)
Other foreign:				
Cerro de Pasco	4,200,000	5,344,000	4,444,000	4,012,000
Chile	6,000,000	3,993,802	3,999,016	4,008,000
Katanga	5,360,128	4,862,025	6,275,430	6,032,880
Backus & Johnston	1,642,000	1,400,000	1,600,000	1,506,000
Hampden Cloncurry	(a)	(a)	(a)	(a)
Mount Lyell	1,146,880	983,360	974,400	(a)
Mount Morgan	(a)	(a)	(a)	(a)
Cons. M. & S. of Canada	350,000	338,000	318,000	152,000

(a) No copper produced during this month.

## Comparative Annual Copper Production

	1921		
	1919	1920	1921
January	135,733,511	121,903,744	90,586,597
February	111,649,512	117,450,000	86,632,941
March	102,040,460	120,309,316	91,046,345
April	98,808,998	116,078,871	46,946,523
May	92,652,975	114,964,207	25,310,511
June	95,856,570	116,107,856	24,623,693
July	100,369,247		

MINING STOCKS

Week Ended July 30, 1921

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

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

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

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

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

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

Table listing mining stocks with columns for Stock, Exch., High, Low, Last, and Last Div. Includes sub-sections for VANADIUM, ASBESTOS, and MINING, SMELTING AND REFINING.

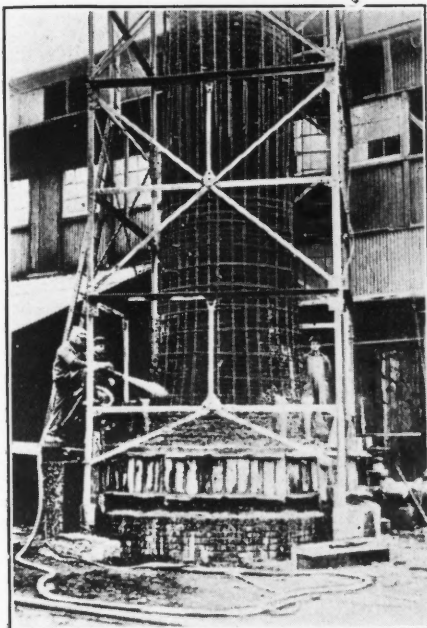
\*Cents per share. † Bid or asked. ‡ Quotations missing. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.



## INDUSTRIAL NOTES

### Conservation of Steel Stacks Weakened by Corrosion

The conservation of self-supporting steel stacks, which have corroded to the danger point, by incasing them with concrete, has become a well-established practice. Engineers and owners of power plants should be familiar with the method of achieving this result. To demolish an otherwise serviceable stack simply because the steel shell has lost its strength by corrosion, when at comparatively small expense and without even shutting down the boilers it may be converted



GUNCRETE REPLACING WEAKENED STACK

into a permanent concrete stack, would in the light of present knowledge be a serious mistake.

Rather than tear down a steel stack which was in condition requiring renewal, causing a shutdown of the pumping station at South Works Illinois Steel Co., South Chicago, it was decided to use the Cement-Gun in reconstructing the stack. By coating the outside with reinforced Cement-Gun concrete, a new self-supporting stack has been built upon the existing foundation.

This steel stack was 175 ft. high by 9 ft. in diameter. A reinforcing network of sufficient strength to make the new stack self-supporting without any help from the existing stack was built up of rods and wire mesh and secured to the existing foundation bolts. A Cement-Gun was then used to shoot Guncrete or Gunite, as it is variously called, through the reinforcing mesh against the existing steel shell. A mixture of sand and cement hydrated in the nozzle was applied with an air

pressure of about 35 lb. The Guncrete is 18 in. thick at the base, and tapers rapidly to 6 in. just above the bell base.

All the work was done without interrupting the use of the stack. The Guncrete was applied when the stack was too hot to permit holding the hand against it. The breeching extending from the side of the boiler house to the stack was also incased with 3 in. of Guncrete while it was so hot that water thrown against it boiled. The Guncrete was kept thoroughly sprinkled until set. The effect of the hot stack seemed to be that of steam curing, and after being in use for nearly three years the Guncrete is everywhere sound and shows no cracks.

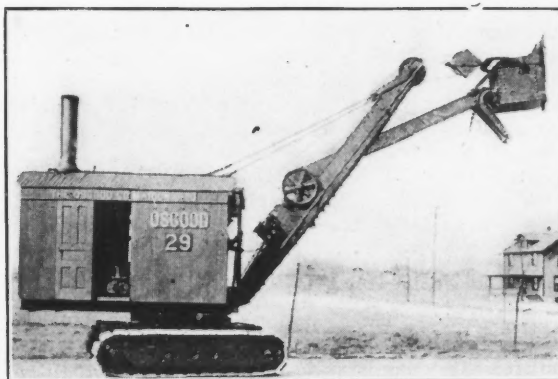
Seventeen stacks treated in this way are in daily use. Eight of them have gone through two winters. None of them show any cracks, except a few surface craze cracks, which do not penetrate perhaps more than one-eighth of an inch. Some were incased while cold, some while hot.

The photograph shows one of two stacks 68 in. in diameter and 110 ft. high done in December, 1918, with weather so cold that work had to be protected against freezing. Both stacks were in regular service. The view shows the reinforcement in place and shooting just begun.

The Woodward Iron Co. of Woodward, Ala., has just installed a new 12-in. Krogh sand pump to handle water containing coal fines. This pump is stated to be the largest sand pump ever built by the Krogh Pump & Machinery Co. of San Francisco.

### New Osgood Shovel Has Continuous-Tread Mounting

A successful continuous-tread mounting for the company's Osgood 29, one-yard revolving steam shovel has been developed by the Osgood Co., Marion, Ohio. The caterpillar mounting enables it to travel over soft or uneven ground with ease, and as the tread belts extend but a short distance beyond the truck frame they afford a minimum of interference with operations of the dipper. The treads are of three-piece construction, an open-hearth annealed



NEW OSGOOD SHOVEL ON CONTINUOUS TREAD

steel casting, to which is bolted a heavy steel pan, reinforced by heavy maple blocks, which forms a firm and smooth tread for hard use. The tread belts are constructed to permit either side to be easily and quickly adjusted independently of the other side. The shovel is so constructed that it may be equipped with steel boom, extra drums, and other parts for converting into a crane, clamshell, or dragline outfit.

### A New Colloidal Flotation Reagent, Not an Oil, Is Good Frother and Selector

Authorities on oil flotation have always believed that colloids were undesirable in the flotation of minerals. Royer Luckenbach, of Brooklyn, N. Y., the inventor of a new reagent known as "Rex," has proved by commercial tests that their contentions were erroneous, and, as one well-known writer remarked, after he had seen a demonstration, "they will all have to rewrite their books on flotation."

In the oil flotation process, as is well known, the oil is usually violently agitated with the pulp before it is in the required minutely divided condition to reach the particles of mineral. In this new reagent, there is the advantage of using an easily emulsified element that instantly breaks up in the pulp to a minute subdivision and attaches itself to every particle of mineral without any pre-mixing. Extremely high-grade concentrates are produced in the first cell, together with a high recovery.

Either an acid, alkali, or neutral circuit may be used, and as the process is entirely chemical it is at all times under the control of the operator. Good results have been secured on copper and lead carbonate without sulphidizing, as well as on sulphides and on metallic copper and silver. It will produce an unusually clean concentrate on sulphides containing gold, which can afterward be cyanided, as no interfering oil is present. The cost will average 8c. a ton. No changes in mills now using oils are necessary when this reagent is adopted.

The Canadian government made exhaustive tests at Ottawa in 1920 on ores high in iron pyrite and pyrrhotite and continuing about 3 per cent of copper as chalcopyrite. A 94 per cent copper recovery was made with practically complete elimination of the iron pyrite. Demonstrations of this process are given at the laboratory of the Luckenbach Processes, 105 Liberty St., Brooklyn, N. Y.

This reagent is both a good frother and good selector, in distinction to oils which are usually good frothers and poor selectors or the reverse. An ample, close-grained, viscous froth is produced which gives a minimum of trouble to handle.

## "Caterpillar" Matches Dog Team and Railway

By E. M. LAGRON

Freight rates which have been absolutely prohibitive to interior Alaskan points will soon be reduced from \$350 a ton to approximately \$25 a ton. This is a direct result of the advance of the new government railroad. The new rate will be effective, it is believed, with the completion of the railroad from tidewater to the interior.

Increased activities will result, and mining machinery can soon be shipped to Fairbanks, Nenana, Fort Gibbon, Ruby and other interior points. At present most of the freight to these places is sent by dog teams or "mush"



"CATERPILLAR" TRACTOR HAULING SUPPLIES IN ALASKA

over trails from the seaport towns of Valdez and Cordova.

One of the most marked improvements in transportation is shown here, the big, powerful "Caterpillar" train which operates on a sixty mile haul. These tractors are manufactured by the Holt Manufacturing Co., and haul approximately fifty ton of perishable food-stuffs and supplies over the snow and ice. They operate at times with the thermometer at 40 deg. below zero.

The recently perfected radiator frost pad enables this outfit to operate regardless of weather. Another asset of this particular machine is the articulated roller frame and the equalizer bar which join the two portions of the tractor truck and supporting roller. This latter feature enables the tractor to conform to the unevenness of the ground and assures perfect traction without slipping.

This novel means of transportation presents a practical solution of the problems which have confronted the engineers in this district for many years. This means assures the railway construction camps, in some cases isolated in the interior, a systematic replenishment of commissary stores at all times. Another great factor is that the "caterpillar" train can carry freight across Broad Pass, which is not feasible for railroads and can only be carried by dog teams or "caterpillars."

## The New Ross Rapid Computer Is Handy, Easily Read, and Accurate

An improved type of the Ross Rapid Computer has recently been perfected. It provides an all-metal, circular computer, on the principle of the polyphase-duplex rule, but is built like a transit or compass having longer and more complete trigonometric scales, is unaffected by climatic conditions, and is convertible and will be found convenient for desk or pocket use.

The computer consists of four parts. The computer proper, 5 in. in diameter, has two dials graduated directly on heavy metal. The inner dial sets flush inside of the outer dial, and both are

read by a radial hair-line, engraved under the arm, which is controlled by a thumb lock. The key to operation is given on the arm, in plain sight of the user. The magnifier sets in the hollow conical center of the computer. It is adjustable in focus, radius, and direction. When direct, less precise readings are desired, a touch of the finger turns the magnifier aside, and it is instantly detachable for separate use. Even without the magnifier the scales are plainer than seconds on a watch, but the magnifier makes the interpolations more accurate and easy. An aluminum clamp, for desk attachment, is similar to the tripod on a compass. This not only increases the personal accuracy by relieving the strain on the hand and eyes, but also permits figuring with one hand while writing with the other. A loose-leaf case contains the computer, with the magnifier and 100 standard sheets, 3½ in. x 6½ in., for personal notes.

The scales, designed on the polyphase-duplex principle, carry in addition a 360 deg. protractor, a scale of radians, cubes, and complete trigonometric scales, all of which are conveniently arranged.

The computer was invented and designed by Louis Ross, civil engineer, San Francisco, and is made by the Computer Manufacturing Co., 25 California St., San Francisco, Cal.

## TRADE CATALOGS

**Carbide Lights**—The Macleod Co., Bogen St., Cincinnati, Ohio, has issued a bulletin descriptive of several types of "Buckeye" carbide hand lights and head lights which are suitable for various purposes. Many of the lights described are particularly adapted to underground and open-pit mining.

**Valve Gears**—The Baldwin Locomotive Works, Philadelphia, Pa., has issued a well-printed and illustrated pamphlet discussing the performance of the Walscherts valve gear. The publication is described as "Record No. 100," and is indispensable to one who needs to understand this improved gear.

**Wood Pipe**—Redwood Manufacturers Co., Hobart Building, San Francisco, Cal., has issued Catalog X, "Remco Redwood Pipe." This publication, though dealing mainly with the many uses of Remco Pipe, is also a handbook of information for hydraulic engineers and contains much valuable data relating to several fields.

**Belt Conveyor Idler**—The C. W. Hunt Engineering Corporation, New York City, is sending out a folder which describes the company's all-steel, self-aligning belt-conveyor idler. The leading feature claimed is that the rotating part of the bearing is strictly self-aligning, so that all pulleys rotate freely under any conditions of operation. Other admirable features are also pointed out by the circular.

**Refractories**—Harbison-Walker Refractories Co., Pittsburgh, Pa., have sent out a small illustrated folder "A" introducing that company's "metalkase" magnesite brick for openhearth furnace bulkheads. This ingenious device of packing dead-burned magnesite into steel containers is said to greatly increase the life of the bulkhead, decrease waste, and to be superior to water-cooled installations. Other folders are to be issued.

**Ingersoll-Rand Products**—The Ingersoll-Rand Co., 11 Broadway, N. Y., has issued in loose-leaf form, with a post binder, a descriptive catalog setting forth the various products of the company. The illustrations are carefully selected and specifications and other data given are most comprehensive. Most of the Ingersoll-Rand products are too well known to warrant discussion in this column, but the convenient form of the catalog merits special mention. The various products are grouped in their respective sections under compressors, vacuum pumps, condensers, oil and steam engines, Cameron pumps, air-lift pumps, rock drills, drill sharpeners, pneumatic tools, tie tampers, and miscellaneous. In addition a section containing engineering data is included.

