

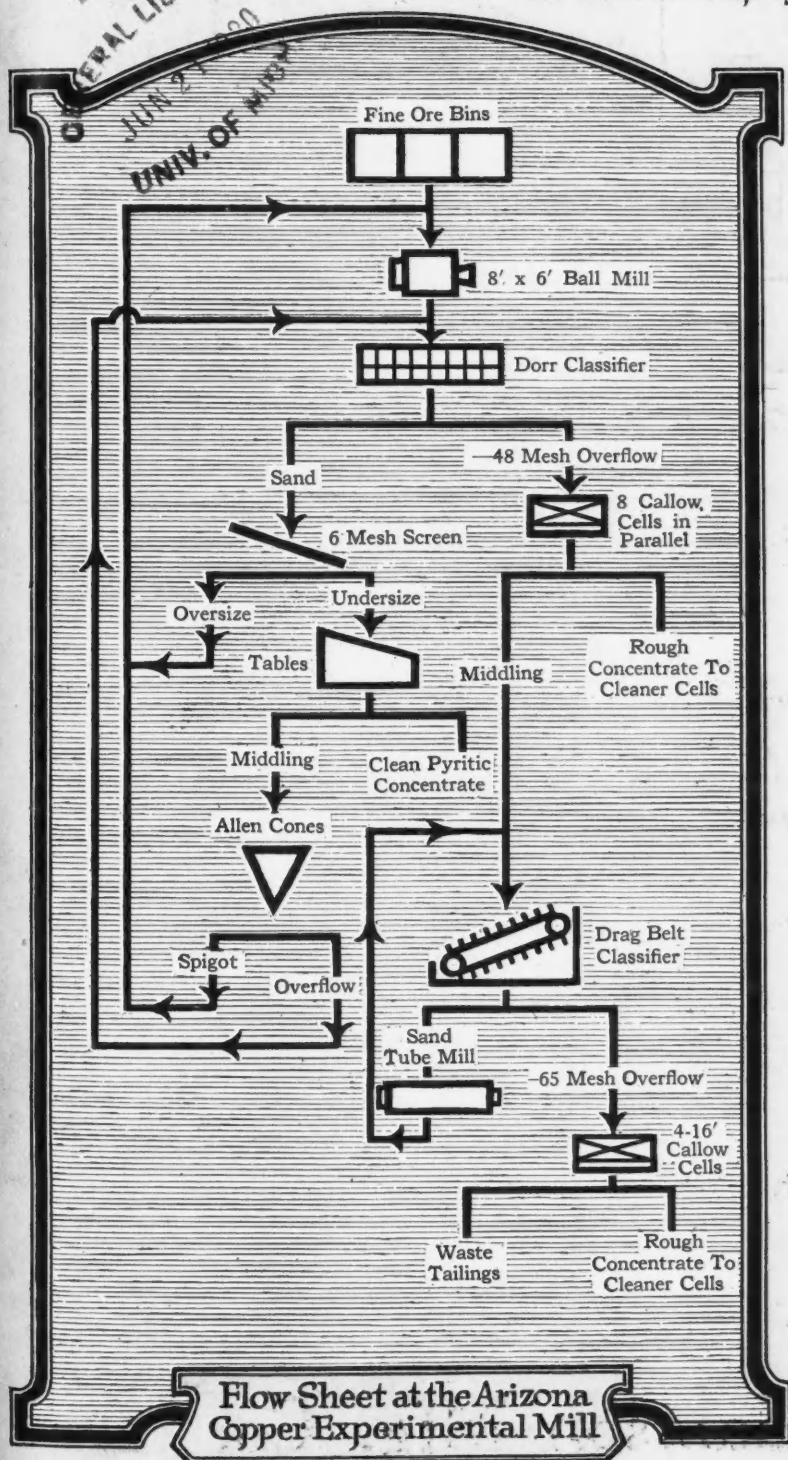
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# ENGINEERING AND MINING JOURNAL

June 19, 1920

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Flow Sheet at the Arizona Copper Experimental Mill

## Developing a Mill Flow Sheet

by Arthur Crowfoot & Ernest Wittenau

## Moving a Dredge on Sledges

by J.G. Rivers

## The Flight from Mexico with Carranza

by J.C. Pickering

## Two Bucket Aerial Tramway

by Douglas Lay

## The Petroleum Industry of Russia

by Eugene M. Kayden

Government Officials  
Influential in Mining -  
Senator C.B. Henderson  
of Nevada

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# Engineering and Mining Journal

*A Weekly Journal of the Mining and Mineral Industries*

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METALS                      NON-METALS                      PETROLEUM

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Number 25

## The Quaint Usages of Apex Litigation

A JUDGE of the United States Circuit Court, in a recent apex suit, gives the following opinion, which shows a candid even if somewhat cloudy state of mind:

"Sufficient reference has already been made to the inconsistent testimony and opinions of the distinguished geologists of the respective parties, the nature of which confirms us in the opinion that in the consideration and decision of such cases it is safer, and consequently more satisfactory, to rely upon the testimony of expert mining engineers who are familiar with the mineral formations and deposits of the particular district, and upon the actual work and observations of experienced mining superintendents who have active charge of the work in such mines."

The principal "engineer" upon whom the judge relied happened to be a geologist pure and simple, illustrating the mental confusion above mentioned. Nevertheless, the irritation of the good judge at having been bewildered and befogged, instead of being instructed, by the geologists on both sides, is probably not without justification. Such a complaint, coming from the legal profession, which we are wont to accuse of the habit of clouding issues and twisting facts, should have a special sting for the mining geologist. Let him take counsel with himself, and examine whether his code in respect to apex litigation has been what it should be.

The same criticism, although the excellent judge did not penetrate to this, of course applies to the mining engineer, for in an apex case the problems probably all fall into two groups, geological and legal; and mining engineers who are witnesses are really appearing to testify as geological experts. Theoretically, the professional geologist should be better qualified on mining geology than the mining engineer, with whom geology is a side line; actually, however, this is not always so. There are geologists and geologists, and the opinion of some of these on a mining case is likely to be worth far less than that of some mining engineers who never aspired to the scientific title. The trouble is that, too often, the geologist who is selected as a witness is chosen not so much on account of his expert knowledge of mining geology as with a view to the effect that the recital of his degrees, position, and scientific works will have on the judge or jury. Moreover, he must be a "good" witness. A "good" witness, technically speaking, is not necessarily either a good geologist, a good engineer, or a good man. He must be wily, positive, clever, alert, a good mental boxer, a good bluffer, and have a single-track mind and never jump the track, and that track must be the one he is paid to run on. That is a "good" witness, and as all witnesses are hired men, no company that has cut its eye-teeth, nor its attorneys, will hire any but a "good" witness.

Now, the science of mining geology is advanced: it is more accurate than law, grounded with more stability

than medicine. There is a clear right and wrong geological interpretation for every problem; and any one of many really expert geological engineers could state it clearly, and so assist the judges in their work of applying the law to the problem. Yet the learned judge complains that, instead, the geologists only muddy the water; and he will have no more of them. Possibly in some cases their minds are muddy, and the fault is then in those who hire celebrities, for their name and pompousness, who are really incompetent in the special matter in hand.

There is a wider difference, let them remember, between the common or garden geologist and the mining geologist or geological engineer, than there is between the latter and the mining engineer. If we assume, however, that only competent men appear as witnesses, we must lay aside the excuse of ignorance, and question fairly their good faith. Are they aware that they are following a tradition which originated before the development of the modern science of mining geology, when the laws of ore deposits were as little understood as those of theology, and the sport (as nothing was clear anyhow) was to invent a "theory" on each side to fit the needs of the man who was paying you to do it, and argue for your theory like a Philadelphia lawyer till you ran out of wind; and that there no longer exists the excuse that clarity is unobtainable?

Many distinguished engineers were the founders of this tradition, and it is easy for us now to follow the old masters; in particular, one who has long been especially revered for his sturdy character and flashing brilliancy—not only a distinguished engineer but an amateur preacher and a great Sunday school teacher—and who openly espoused the doctrine that an engineer or geologist witness in an apex suit should fight for the side he had chosen, with all the wit at his command.

The old order changeth. The duties of the engineer as a citizen are occupying nowadays our earnest thought, as never before. Let us consider this apex practice, and devise a plan whereby a selected body of engineers and geologists shall decide the facts and report them to the lawyers and judges; and let it be provided that the expense of these experts shall be paid out of a common fund put up by both litigants. Such questions might well be taken up by our national engineering and geological societies.

In the meantime, we advise the esteemed judge to lock up the witnesses for both sides in a room, and keep them there till they report a unanimous opinion.

## The Silver Market

THE silver market situation is interesting and important since the New York price dropped below \$1. We discuss the situation on page 1388 of the Market Report Section.

### Wasting Our Radium Supply

THE increasing use of radium today for making luminous watch dials and for other similar purposes is a crime against humanity. The supply of radium, actual and visible, is limited, and in this substance lies the most effective means for treating cancer yet discovered. According to *Mineral Industry*, "about 95 per cent of the radium produced in 1918 was used in luminous paint and only about 5 per cent for medicinal purposes. Some doctors in this country also sold part of their radium supply to luminous-paint producers. In Europe this practice was common, and it is probable that the permanent radium supply of the world existing several years ago, and held almost entirely by the medical profession, has been reduced in this way by one-half." During the war, there was good reason for the use of luminous paint. In night actions at the front it was highly important to know the hour and yet often risky to strike a light to look at a watch. Hence the radium dial. The illumination of gun sights facilitated accurate firing, and so had its justification. But the war is over, and the consumption of radium continues.

If luminous paint must be had, mesothorium will do as well as radium. This is a byproduct from the manufacture of thorium, which is made from monazite sand. The sources of the latter are much more abundant than those of radium. Mesothorium is also cheaper and of a much shorter life than radium, and, therefore, more suitable for use as luminous paint, which, because of its nature and uses, has only a short life.

The carnotite deposits of Colorado and Utah, our principal source of radium at present, have not many more years of life. Dr. R. B. Moore, of the U. S. Bureau of Mines, places it at seven years. Uranium ores, with which radium is always associated, have also been found at Lusk, Wyo.; in the White Signal district, New Mexico, and, in the latter part of 1919, in the township of Butt, in Ontario. At Lusk, the deposit of uranophane is said to be commercial, though small. In the White Signal district, torbernite and autunite have been discovered, but whether in commercial quantity is not determined. In Ontario, the ore is pitchblende, but it is credibly reported that nothing of merit has been found to date. Joachimsthal pitchblende, which was not available here during the war, will hardly be more plentiful now, in view of the European demand.

It is with apprehension and distaste that we read such articles as one entitled "Radium Becoming a Household Aid," that recently appeared in the Sunday supplement of a New York newspaper. One quotation is enough: "Despite its power and value, children will soon play with its byproducts as toys, while their elders use it in a hundred different ways."

The utterances of Sunday supplements are not necessarily to be taken seriously. They are intended to win popular approval rather than to spread scientific truth, though by dipping slightly into the mystery of "science" they often become the more deceptive to those of minor culture. But it is a fact that the commercial possibilities of radium are being eagerly exploited, and, if no check be imposed, the discovery of new resources will avail but little. The household and other uses to which luminous paint can be put are many and will require an amount of radium that cannot be supplied.

It is wrong that a substance whose mystery is but half explored should be frittered away in making novelties. It is worse when it has a demonstrated value for

treating such a baffling and deadly human ill as cancer.

Here is an opportunity for the conservationists and the advocates of Government control. Unless its use be restricted, our radium is apparently doomed to be frittered away. It would be well if the Government could forbid the use of radium for any except medical purposes or place the control of its distribution in the hands of the Bureau of Mines.

### The Bad Reputation of Words

WORDS are taken by the rank and file not only for what they mean, but for the odor of association that they bring with them; and thus it happens that the same word conveys ten different impressions to as many different persons. Even by common consent, when a word has been much handled, it is often held that it has become dingy. Take "politics" and "civics" for example: their meaning is identical, the first being derived from the Greek word for citizen and the latter from the Latin word for the same. Therefore, fundamentally they mean the same thing—the science of citizenship—yet what a different aroma the word has if we say we are going in for politics, or that we are going in for civics. "Politics" is shop-worn, and has become soiled, as it has been handled so much by dirty hands, but "civics" is yet fresh and white.

Similarly, "polite" and "urbane" mean the same thing, the first being Greek and the second Latin, and both signifying in English "civilized"; yet how far apart in subtle meaning the three words have wandered! A gentleman of our acquaintance, airing his French, once told a French lady that she was pretty as a picture; and it turned out to be an insult. In the French idiom "pretty as a picture" means "pretty as a picture is pretty"—i.e., because it is painted.

Such reflections are brought on by the horror of engineers—whether the new-formed Federated Societies or the established American Association of Engineers—for the word "union." They feel it an injurious term, a slander. Yet each society is a union; and as the flavor of words is redolent of their history, and the connoisseur can gage the history by the strength of the lingering association, how eloquent it is of many unpopular and discredited acts of the labor unions that this fair word should be shunned by engineers! How eloquent it is that this association should be stronger in their minds than that of "The Union—one and indivisible—now and forever"—the Union which was the cherished ideal and the beckoning angel which many thousands of our fathers followed to their deaths!

Similarly the Federated Societies, in choosing their name, were manifestly afraid of Confederated, or of Federation, on account of the company these words had kept in the past. As it is, the name was well chosen—but the engineer as well as other cultured men may also be afraid to express his aim for such a society in plain language, as every plain word carries for him a remembrance that he would fain avoid; and he is in danger of talking vaguely, beating about the bush instead of breaking into it, and failing to get his message understood. Said the esoteric poet:

"Scintillate, scintillate, little type of nebular crystallization;  
How I meditate upon thy composition"—

spurning the vulgar,

"Twinkle, twinkle, little star."

### Smelter Smoke in the Salt Lake Valley

FEDERAL Judge T. D. Johnson has recently handed down an interesting opinion in the smoke suits brought by farmers in the Salt Lake Valley against the American Smelting & Refining Co. and the United States Smelting Co. The judge's statement brings out the conflicting character of much of the testimony, and shows that little has actually been proved. The testimony of the farmers' experts, Professors Pierce and Mitchell, was weakened because they assumed that leaf markings which had the appearance of SO<sub>2</sub> burning were in all cases caused by this gas. Judge Johnson says their generalization was unwarranted and tended to make all of their testimony of uncertain value.

On the other hand, the testimony presented by the defendants, much of it incapable of proof, was also probably somewhat colored by personal feelings in the matter. The judge brought out, however, that the smelting companies, particularly the A. S. & R., have gone to considerable expense in investigating, by scientific methods, the effect of smelter smoke, and that their testimony in general had much more value for this reason.

In the opinion of the court, much of the damage laid at the door of the smelters was actually caused by frost, alkali in the soil, sun-scald following irrigation, or sun-burn resulting from lack of moisture. Nevertheless, there were cases where the damage was admittedly caused by SO<sub>2</sub>, and Judge Johnson, in concluding, advised the smelting companies to carry their investigations further and to devise some method by which the troublesome gas could be eliminated so that no cause for future complaints would exist. Failing in this, he intimated that the smelters would be denied the right to operate. Such denial, it seems to us, would be entirely unjust, and absolutely at variance with the policy that seeks to promote the greatest good to the greatest number.

Farmers' complaints in smoke cases always claim the smelter to be the source of all of their ills, and the case under review was no exception. However, practically all of the testimony, aside from that pertaining to injury to plant growth, was thrown out for lack of conclusive evidence. As to the effect of SO<sub>2</sub> on the personal well-being of the farmers, we quote from the opinion:

"The presence of SO<sub>2</sub> in the atmosphere in extreme dilution, three, four, or five parts per million, may be detected by its actions upon the senses, its smell, action upon the eyes and the membranes of the nose and throat. The smell of it is unpleasant, and if continued for any considerable length of time is distinctly disagreeable, particularly so where the subject is in that mental or physical state that the presence of the gas in the atmosphere produces nervous irritation—apparently the attitude of practically all the farmers and their families residing within the affected area. What the witness John Oberlander, an employee of the A. S. & R. Co., would not observe, would irritate the witness Mrs. Elizabeth Helm beyond measure, resulting in headaches, sleeplessness, etc. The one takes the presence of SO<sub>2</sub> in the atmosphere an unwarranted invasion of her rights, and its smell an unmitigated nuisance and a certain forerunner, as she believes, of injury to her growing crops and the vegetables growing in her garden; the other considers the presence of SO<sub>2</sub> in the atmos-

phere and the smell of it as a matter of course and part of his day's work.

"I do not find from the evidence in the case that the presence of SO<sub>2</sub> in the atmosphere, as discharged by the plants of the defendants, does physical injury or is injurious to health, except as the health may be and is affected by mental and nervous irritation as above indicated."

From our observation SO<sub>2</sub> has little or no bad effect on the health of most persons, though, without doubt, certain types of constitutions are particularly susceptible to the gas and cannot stand even moderate dilutions without being harmed. We have worked in it ourselves without ill effect, and we have known men who have spent the best part of their lives in comparatively high concentrations of the gas and still remain normal human beings. A converter shift boss who had been inhaling the gas almost daily for thirty years once told us that it seemed to have taken all of his ambition away. We strongly imagine, however, that his tired feeling was caused by the same germ that affects so many non-smelter employees.

In fact, sulphur dioxide is reported to be of some benefit in many cases. We believe it has been used to good advantage in lung affections and as a bactericide. It is, or was—and we trust this statement will not land us in the penitentiary—used for preserving beer, and no molasses can be complete without its sulphur-dioxide label.

We believe it has been definitely proved that the food value per unit weight of hay made from grass which has been burned by smelter gases is greater than the normal product, pure and undefiled. Why do the smelting companies not institute some counter-suits to recover from the farmers some compensation for the benefits derived?

### The Wink in the Dark

CALVERT TOWNLEY, electrical engineer, presiding over the organization conference of the Federated American Engineering Societies in Washington, observed that the habit of mind of the engineer was like that of the fellow who winks at a girl in the dark—he knows what he is doing, but nobody else does. This describes effectively the solemn and secret conclaves in which engineers are wont to indulge, in which they discuss laudable movements and project great reforms—but neither the public nor the industry to which they belong, nor, in the case of councils and boards of directors, even the members of their own societies which elected them, must hear anything about it. It would all be so premature if anything should leak out, and it might do incalculable damage!

Dear brother engineer, the world isn't eavesdropping at the doors of our councils: it is getting along very comfortably without us, and is not interested. The less attention we claim, the more the other speakers have the floor. If engineers wish to be any more than a Mutual Admiration Society (almost we had said a Mutual Contention Society), they must go out on the street corners and buttonhole the world, and shout their doctrine and their message into its ears till it kicks them off and goes on its way.

Antiquated and autocratic methods, bossism, and star-chamber government must be eliminated from our organizations, wherever they exist. We must clean house ourselves before we start out to reform the world.

## WHAT OTHERS THINK

### The Prospector and Mining Information

I read in your issue of June 5 that the foreign mining reports of the Bureau of Foreign and Domestic Commerce can be had only if you are in a sort of Blue Book Exporters' Index, and that a plain American citizen who wishes to prospect or mine in foreign countries is shown the door when he applies for information. I don't believe in any such aristocratic bureau, with a select list of people which it recognizes and of others that its directors won't speak to. I am a plain American prospector, if you want a classification, but I have found some good mines and started real mining in different places, and don't have to ask anybody for money or credit. If my taxes support this bureau, why can't I get its reports, if I want them, I should like to know? My father fought in the Civil War and my grandfather was one of the first pioneers in Texas. Why am I not as reliable an American as a member of some export firm born in Germany or Palestine?

This administration calls itself democratic, but as I think you once wrote in an editorial "what's in a name?" Fine democracy when government servants have to look up an American in the social register or Bradstreet's before the Government department will have anything to do with him!

I am not writing this for you to print, but you can print it if you want to. I want to get over to that Chinese country to look around and prospect a little on my own hook. I have done my share in North and South America.

FRANK HARDING.

Coatesville, Pa.

### The Three Stages of Mining

In the *Engineering and Mining Journal* of May 22 there are published two letters, "A Geologist's Dilemma" and "The Prospector Objects," which call to mind questions that have been brought to my attention frequently in the last five or six years, namely, the antagonism between the prospector and the mining engineer, and the antagonism between the mining engineer and the promoter.

I have always known there was some feeling between these, but never realized how strong it was until the Oatman boom. So pronounced was this antagonism in Oatman—and I believe the feeling is growing—that it seems to me that more than passing attention should be paid to it.

As I see it, there is nothing in the nature of the relationship that should bring about such an antagonism. I believe a great deal of it is due to misunderstanding of the part that each plays in the scheme of things.

Mining may be divided into three stages: The prospective stage, the speculative stage, and the productive stage. Each of these stages, to be conducted to the best advantage, should be carried on by three distinct groups. The prospector's part is to find and expose a vein with a few open cuts and shallow holes, which is about as far as he can generally go. After doing this he should turn it over to the speculator. The speculator

has nothing to go by excepting what shows on the surface, but takes a chance on what is below. The speculator's part is to expose the vein below to such an extent that its size and value and its character are fairly well known; that is about as far as he is generally able to go. After that he should turn it over to those who have the necessary means and knowledge to mine and reduce the ore.

By such a division of labor—a serial division—the risks of mining are lessened and fairly well distributed. Many think that the last stage is a sure-thing proposition. But consideration of the problems of mining and reduction of ores shows it to be as risky as work in any other department of mining.

Viewed in this way, one can readily understand why the prospector gets sore when asked for an engineer's report or if asked if he has a developed property. One can also understand why an engineer for a mining company asks for a developed property. He does not wish to take more chances than he really has to. The mining and metallurgical risks, he thinks, are enough, or are as much as the means at his disposal warrant him in taking. A recognition of the part each is supposed to play would make for more friendly relations.

There seems to be a shortage of money for the development of prospects, especially at this time. I think the present shortage is accounted for by the fact that the money that would normally go into the development of prospects has gone into oil speculation. The absence of the speculator would naturally bring the prospector in contact more often with the men who want developed properties; hence the prospector's more frequent complaints.

WM. CROCKER.

Prescott, Ariz.

### Market Quotations

As a retired mining engineer and miner, I read the mining journals more carefully than I used to do in my younger days, when I was either too busy or was away from home on some examination trip. I have been especially interested since the new editorial policy of the *Engineering and Mining Journal* developed. One of the things which created especial attention up here was your editorial on your market quotations in which you explained just how you arrived at them, and made it clear that they were the most reliable quotations which are published, even if they are not absolutely perfect. Your frank policy and explanation has assured people in this section that they may rely on *Engineering and Mining Journal*.

Your extension of your market service to cover all metals and ores which are marketed is a great service to your readers. Formerly I knew of no way that I could find out the current market value of rare ores and metals when I had some mining proposition put up to me. I remember trying to find out the price of magnesite and uranium, and could not get at it. You have my thanks for the new arrangement.

E. L. BUTLER.

Boston, Mass.

## Developing a Mill Flow Sheet at Morenci, Ariz.

Many Different Arrangements Have Been Tested by the Arizona Copper Co. in Determining The Best Method of Treating Its Low-Grade Copper Sulphide Ores—Shallow Type of Pneumatic Flotation Cells Devised

BY ARTHUR CROWFOOT AND ERNEST WITTENAU

Superintendent and Assistant Superintendent of Concentrators,  
Arizona Copper Co., Morenci, Ariz.

Written for *Engineering and Mining Journal*

THE purpose of this paper is to present briefly the results which have been obtained the last year in the treatment of a low-grade sulphide ore in the experimental mill of the Arizona Copper Co., Ltd., at Morenci. The object sought was the development of an effective flow sheet for the treatment of the company's low-grade ore deposits.

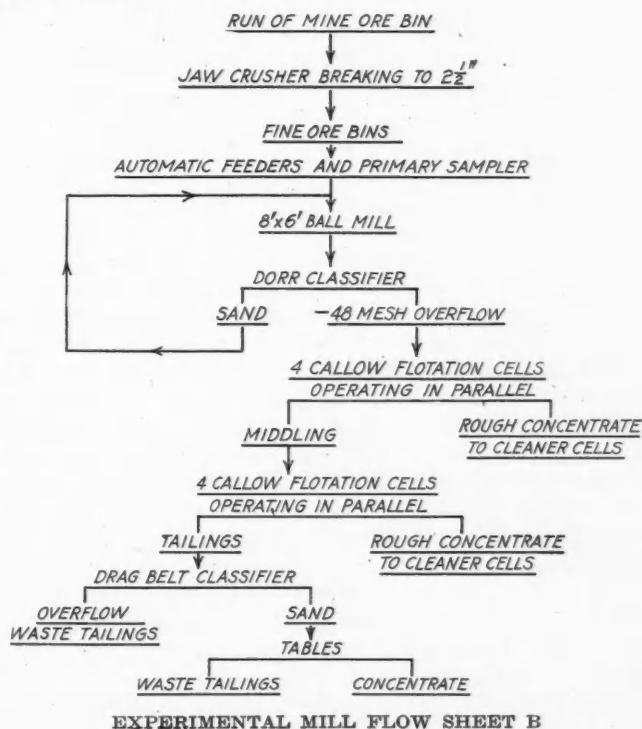
The experimental mill was completed and put into operation on Sept. 23, 1918, it being designed to treat the ore resulting from the development of a large low-grade sulphide deposit occurring in the Clay mine. The Clay low-grade orebody underlies Clay Hill, and is situated at about the center of the main porphyry stock of the Morenci-Metcalf district. The ore lies parallel to the long axis of the hill, and gradually merges on three sides into porphyry of too low a grade to be profitable. On the west side the ore is bounded by the Copper Mountain fault, which has a general strike of N. 20 deg. W. From this fault numerous shrinkage cracks were developed at right angles, in an easterly direction, which cut through the main orebody at irregular intervals. Enrichments probably followed these cracks, and formed the high-grade veins which exist as a stockwork through the porphyry mass.

Blocking out has been done on two levels (adit and second) 250 ft. apart, at right angles to the vein system. Above the adit level, raises on the corners of the 200-ft. blocks were put up to determine the height of ore. A barren porphyry capping over the orebody varies from 100 to 550 ft. in thickness, with a general average of about 400 ft.

The mill has a capacity for handling ore at the rate of 400 tons per twenty-four-hour day, and, as originally designed, was equipped with an "all-flotation" flow sheet, a table floor being installed below the flotation system to give the tailings from the flotation machines a final treatment. For the first several months of operation the mill feed was ground to a minus 48-mesh size only. Later, however, a ball tube mill was added to reduce the feed to a minus 65-mesh size.

As stated, the mill was put into operation with an "all-flotation" flow sheet; that is to say, the mill feed was first ground to a minus 48-mesh size and then treated by the flotation process as a primary concentrating operation. Standard 8-ft. Callow pneumatic flotation cells operating in series of two were used in the flotation system. Following the flotation treatment, the tailings produced by the flotation rougher cells were classified in a large duplex drag-belt classifier, the sand product being sent to tables for treatment and the slime overflow to the waste tailing launder. The tables produced a clean concentrate and a waste sand tailing product. The two waste tailing products were first sampled separately by automatic samplers, following which they were united in one stream and again automatically sampled as general tailings of the mill.

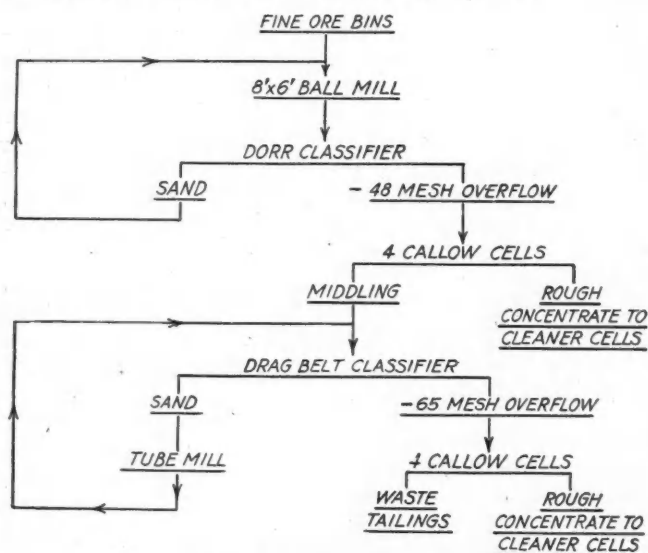
The flow sheet used at the start of operations was practically as outlined in flow sheet B, herewith presented. Several changes have been made in the operation of the mill since starting up, but the changes which mark important advances in the over-all efficiency of the mill are limited to three as far as changes in the flow sheet are concerned, and to two in respect to changes in the flotation reagent used. Charts G, I, and L illustrate variations in the flow sheet. The important changes made in the flotation reagent consisted first in the addition of sulphuric acid in conjunction with the coal tar, creosote, and pine oil formerly used without acid, and second, in the replacement of the coal tar, creosote, pine oil, and acid with alpha-naphthylamine dissolved in xylidin in the proportion of 60 parts of the first reagent to 40 parts of the second.



The equipment has not been subjected to any change since starting up the mill. However, we do not mean to convey the impression that the arrangement is final and one that will be recommended for commercial operation, as we believe that a more economical use of power may result from a different arrangement of this part of the system. The installation of the crushing and grinding equipment was governed partly by the availability of used equipment, and in a measure by conditions existing at the mill site.

The following method of handling the run-of-mine ore to a point where it is reduced to a minus 48-mesh size is common to all the flow sheets presented:

The ore is delivered from the mine by electric-locomotive surface haulage to four run-of-mine ore bins, which have a combined capacity of 400 tons. From these the ore is passed through a Farrel jaw crusher, which reduces it to approximately a 2½-in. size, and this is delivered to two circular steel bins having a capacity of 300 tons. The ore is then fed by means of automatic apron feeders and a conveyor belt to a Chalmers and Williams 8 x 6-ft. ball mill, operating in closed circuit with a Dorr classifier which has a minus 48-mesh overflow. Between the fine-ore bins and the ball mill a break in the conveying system permits the taking of a head sample by means of a traveling sample cutter.



EXPERIMENTAL MILL FLOW SHEET G, INTRODUCING 65-MESH GRINDING AND ELIMINATION OF TABLE FLOOR FOLLOWING FLOTATION OPERATION

*Flow Sheet B*—Flow sheet B may be classed as a primary flow sheet; in it the minus 48-mesh material is subjected to a flotation operation in eight standard 8-ft. Callow rougher cells operating in series of four. The rough concentrate is cleaned in two Callow cleaner cells, the middling product from the two latter cells being returned to the head of the system. The tailings produced by the second series of four cells are sent to a duplex drag-belt classifier, which produces a sand product for final treatment on tables and an overflow waste slime tailing product. The final tables produce a finished concentrate and a waste sand tailing product.

This flow sheet yielded fair recoveries in the treatment of clean low-grade sulphide ores assaying from 1.2 to 1.4 per cent total copper and about 0.12 per cent acid-soluble copper; from 70 to 75 per cent of the total copper and from 78 to 85 per cent of the sulphide copper being extracted in a clean concentrate.

Systematic investigation of the two waste tailing products showed that fine free mineral was being lost in the slime overflow tailings and that the sand tailings from the tables contained mineral which it might prove profitable to release. A study of the conditions revealed three possible methods for increasing the mill recovery. These were as follows: 1. Re-grinding of the sand tailings to a minus 65-mesh size, followed by re-flotation of the ground product. 2. The installation of a primary table floor for the accomplishment of two objects, first, the production of a pyritic concentrate, and, second, to relieve the flotation cells of part of the rather heavy mineral load which resulted

from the sulphide-iron content of the ore. 3. An extension of the flotation area available for the tonnage treated.

Early in 1919 it was realized that these changes would in all probability increase materially the extraction made by the mill, but on account of the curtailment of production at this time, and the consequent reduction of working force, the required changes could not be made at once. All changes were, however, completed during the last year in the order named.

In the meantime, during the months of February, March, and April, 1919, a modification of flow sheet B was used, which we called flow sheet C. Experiments were made in floating in acid solution, about 10 lb. of sulphuric acid being added per dry ton of material treated, in addition to the usual amount of coal tar, creosote, and pine oil.

In flow sheet C, the flotation feed, instead of passing through the eight Callow cells in series of four, was passed through the first four Callow cells, the tailings from these cells going to the drag belt, and the drag belt overflow being again floated in the second set of four Callow cells, the sand discharge of the drag belt going to the tables. This flow sheet was used to try out the effect upon the flotation process of the removal of the sand before final flotation, and served chiefly as an indicator to determine the effect of comparatively coarse sand in the flotation feed. It was a step in the direction of determining whether finer grinding was essential to good flotation results. Also, in this flow sheet the waste slime tailings were produced directly from the secondary flotation cells. The results obtained were slightly better than under flow sheet B. Following the addition of acid, a marked improvement resulted toward the end of March, 1919, as will be seen by reference to a chart which is presented on page 1353.

Our experiments with an acid pulp were discontinued when it was decided to use alpha-naphthylamine (X-cake) dissolved in xylidin as a flotation reagent, as this required a neutral or slightly alkaline pulp to produce the best results. The use of X-cake was started on April 15, 1919, in both the experimental mill and in No. 6 concentrator.

At this time the installation for 65-mesh grinding was nearing completion, but enough time elapsed between starting the use of X-cake and putting the 65-mesh grinding equipment into operation to allow us to demonstrate that the use of the X-cake and xylidin mixture was more efficient as a flotation reagent in the treatment of a minus 48-mesh pulp than the coal tar-creosote formerly employed.

*Flow Sheet G*—Flow sheet G introduces 65-mesh grinding and the elimination of the table floor following the flotation installation. A second-hand 6 x 9-ft. tube mill available at the plant was installed to receive the sand discharge from the drag-belt classifier, which formerly had been sent to the tables for treatment. The tube mill was equipped with cast-iron liners and charged with 2-in. cast-iron balls. The discharge of the tube mill was delivered back to the classifier, thus placing the two machines in closed circuit. The final product of this circuit was a minus 65-mesh overflow. It was decided to treat this overflow product by re-flotation, and, as conditions at the time were not favorable for the installation of additional flotation equipment, the following arrangement was adopted for the time being:

The minus 48-mesh overflow product of the primary



classifier was first treated in four standard, 8-ft. Callow cells operating in parallel, and the minus 48-mesh middling tailings from these four cells were sent to the closed circuit of drag classifier and tube mill, which produced a minus 65-mesh overflow product. This overflow product was treated in the second set of four Callow cells, these cells producing a rough concentrate and a waste tailing product. The above arrangement allowed us to eliminate the table floor below the flotation system, and it also resulted in the production of one waste tailing product only.

Under the conditions of this flow sheet some remarkably good results were obtained from the treatment of over 5,000 dry tons of ore. The ore treated assayed 1.47 per cent total copper, with 0.14 per cent acid-soluble copper. A recovery of 82.44 per cent of the total copper and 89.59 per cent of the sulphide copper was made in a clean concentrate assaying 15.86 per cent total copper, 0.41 per cent acid-soluble copper, 24.9 per cent "insoluble," and 24.4 per cent iron (chiefly sulphide). Some further details will be given later in comparison with results obtained under flow sheet I conditions.

*Flow Sheet I*—This flow sheet introduces a primary table installation for the recovery of a granular pyritic concentrate at about a 6-mesh size. In installing this table floor it was thought that a twofold purpose would be fulfilled. Primarily, a granular pyritic concentrate would be obtained; secondarily, the somewhat limited flotation area would be relieved of a part of the rather heavy mineral load resulting from the presence in the ore of about 5 per cent of iron as sulphide.

The installation of additional flotation equipment was under way at the time, but it was not put into operation until some months later, on account of slow delivery on the blower equipment required.

A few further remarks on the reasons for recommending a primary table treatment for a low-grade sulphide ore may be of interest. The Clifton-Morenci mining district does not produce any ores with a high iron-sulphide content, and as a general rule the district may be said to be poor in pyrite. It is, however, rich in low-grade "oxide" ores and mixed low-grade ores which are too siliceous for direct smelting, but which may be treated profitably by a leaching process or by a combined leaching and flotation process.

The highest sulphur product of the district is the current concentrate produced by the mills, this product assaying on an average about 29 per cent sulphur, and the coarser grades about 34 per cent sulphur. Any process, therefore, which promises to yield a high sulphur product is likely to be a valuable asset in a district where sulphurous or sulphuric acid will probably be a factor in future metallurgical operations.

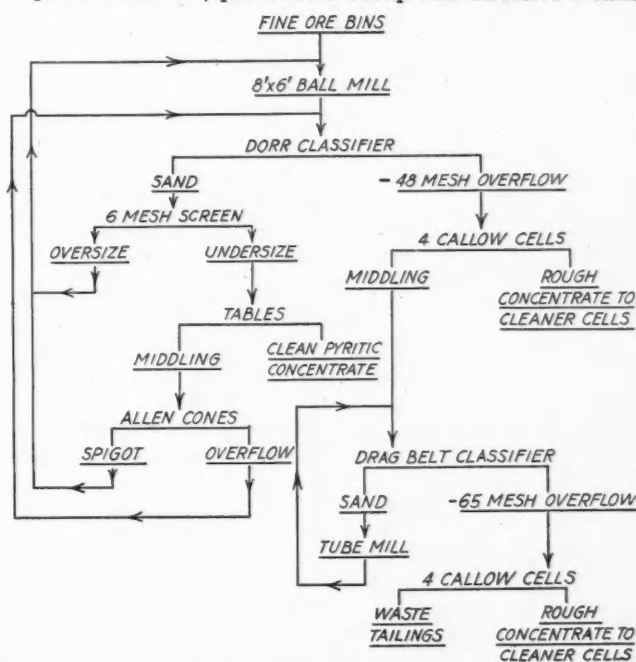
The low-grade ore from the Clay mine was found to contain about 5 per cent of iron in the sulphide form, and it was realized that a clean pyritic concentrate could be produced if the ore was given a primary table treatment at about a 6-mesh size. A primary table floor containing six Wilfley tables preceded by 6-mesh screens was, therefore, installed to work in the closed circuit of primary ball mill and primary classifier as illustrated in flow sheet I, the table middling being dewatered in Allen cones before being returned to the ball mill. This installation yielded the desired grade of pyritic concentrate and also had some effect in raising the mill recovery.

As has been stated before, the chief object in producing a clean pyritic concentrate was to render available a product with a high sulphur content which could be used in the manufacture of either sulphurous anhydride or sulphuric acid, which solvents were necessary in the recovery of copper from low-grade ores and tailing products containing acid-soluble copper.

The average table concentrate produced from the treatment of over 3,000 tons of low-grade ore assayed as follows in per cent:

Total Cu, 11.52; acid-soluble Cu, 0.19; "insoluble," 10.3; iron, 35.4; sulphur, 39.5. The 3,262 dry tons of ore tested averaged 1.47 per cent total copper and produced 162.36 dry tons of pyritic table concentrate, or 99.4 dry pounds of concentrate per ton of ore milled. Therefore, 100 tons of the low-grade ore would yield 9,940 lb., or 4.97 tons. Each 100 tons of low-grade ore milled will yield therefore five tons of pyritic concentrate of the grade shown above.

Besides being considered as an agent in the manufacture of sulphuric acid or SO<sub>2</sub> gas for leaching, the high iron content of the concentrate has also caused it to be considered as a possible source of metallic iron sponge, to be used as a precipitant for copper from lean sulphate solutions, provided a cheap and effective means



EXPERIMENTAL MILL FLOW SHEET I, INTRODUCING PRIMARY TABLE INSTALLATION FOR RECOVERY OF A GRANULAR PYRITIC CONCENTRATE

of deoxidizing the iron, following the roasting operation, is developed.

The table concentrate constitutes about 59 per cent of the total dry weight of concentrate produced from the ore and contains about 45 per cent of the total copper produced in concentrate.

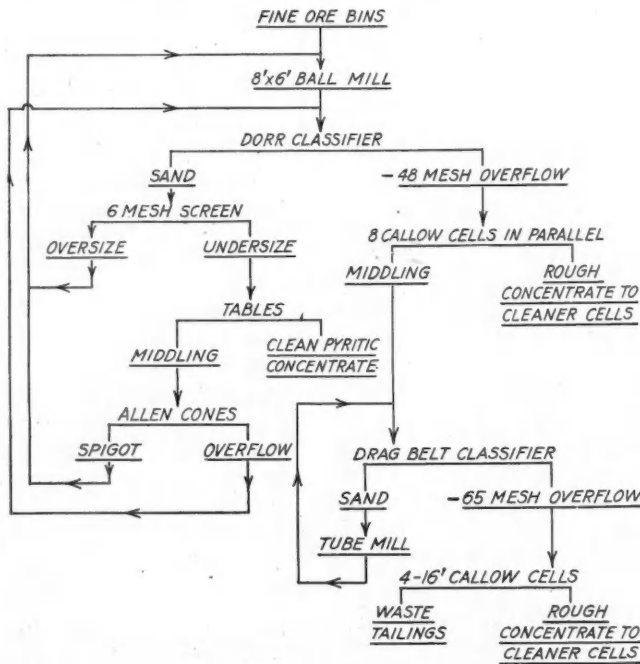
About 50 per cent of the ore treated in the experimental mill for the twelve-month period ending September last was treated under the conditions of flow sheets G and I, and the results obtained may be considered as capable of duplication in large-scale mill operations on the grade of ore shown, if the conditions of the test-mill flow sheet are closely followed. The average results from the two preceding summaries are placed in parallel comparison as follows:

COMPARISON OF FLOW SHEETS G AND I

| Mill feed:                            | Flow Sheet Used |       | Difference |
|---------------------------------------|-----------------|-------|------------|
|                                       | G               | I     |            |
| Dry tons, treated.....                | 5,286           | 6,030 | + 744      |
| Assay, per cent total Cu.....         | 1.47            | 1.44  | -0.03      |
| Assay, per cent a.-s. Cu.....         | 0.14            | 0.08  | -0.06      |
| Per cent a.-s. Cu is of total Cu..... | 9.5             | 5.5   | -4.00      |
| General concentrate:                  |                 |       |            |
| Assay per cent total Cu.....          | 15.86           | 14.67 | -1.19      |
| Assay per cent a.-s. Cu.....          | 0.41            | 0.19  | -0.22      |
| Assay per cent "insoluble".....       | 24.9            | 20.7  | -4.2       |
| Assay per cent iron.....              | 24.4            | 28.0  | +3.6       |
| General tailings:                     |                 |       |            |
| Assay per cent total Cu.....          | 0.28            | 0.20  | -0.08      |
| Assay per cent a.-s. Cu.....          | 0.13            | 0.08  | -0.05      |
| Assay per cent sul. Cu.....           | 0.15            | 0.12  | -0.03      |
| Recovery:                             |                 |       |            |
| Per cent of total Cu.....             | 82.44           | 87.12 | +4.68      |
| Per cent of sulphide Cu.....          | 89.59           | 91.62 | +2.03      |

From the foregoing comparison the following advantages for flow sheet I may be noted:

1. An increased recovery of total copper of 4.68 per cent.
2. An increased recovery of sulphide copper of 2.03 per cent.
3. A higher recovery of acid-soluble copper from a lower a.-s. copper feed on account of primary table work.
4. A cleaner general concentrate containing 4.18 per cent less "insoluble" and 3.67 per cent more iron, attributable to primary table work.
5. General tailings carrying 0.08 per cent less total copper and 0.03 per cent less sulphide copper.



EXPERIMENTAL MILL FLOW SHEET L, INTRODUCING EXTENSION OF FLOTATION INSTALLATION

The 5,000 dry tons of ore treated under flow sheet G conditions carried about the same total copper value as the 6,000 dry tons of ore treated under flow sheet I conditions, the difference being only 0.03 per cent in favor of flow sheet G, but the acid-soluble copper content of the ore was 9.5 per cent of the total copper content, as against 5.5 per cent of the total copper as acid-soluble copper in the ore treated under flow sheet I conditions. This latter condition modifies slightly the gain recorded for flow sheet I.

**Flow Sheet L**—Flow sheet L introduces an extension of the area available for the flotation process. In making this extension it was decided to double the flotation area previously used and at the same time to make an

attempt to lower the air pressure. Preceding the extension of the flotation area, we were floating approximately three dry tons of solids per square foot of porous bottom in operation, which tonnage was apparently excessive in treating an ore carrying comparatively high combined copper and iron sulphide-mineral values.

While making an extension to the flotation system it was decided to double the area of the porous medium previously used. Four cells were, therefore, constructed which had the same width as the Callow cells formerly used but twice the length, two standard 8-ft. bottoms being placed end to end. The special feature of the new 16-ft. cells is their shallowness, the depth being only 15 in. at the feed end and 17 in. at the discharge end. The cells are practically flat launders equipped with a porous bottom.

The principal dimensions of the standard 8-ft. cell and the new 16-ft. cell are paralleled below.

CELL DIMENSIONS

| Name of Cell  | Length, in Feet | Width, in Inches | Slope of Bottom | Depth, in Inches, at Feed | Center | Discharge |
|---------------|-----------------|------------------|-----------------|---------------------------|--------|-----------|
| Standard 8ft. | 8               | 25½              | 3 in. per ft.   | 20½                       | 33½    | 46½       |
| Shallow 16ft. | 16              | 25½              | ½ in. per ft.   | 15                        | 16     | 17        |

There are no baffles in the 16-ft. cells except one at the discharge end for the overflow of waste tailing material. The bottom slope of ½ in. per foot has given no trouble with minus 65-mesh grinding. The new cells were installed in the mill in August, 1919, but were not put into operation until the last of November, as air was not available.

The cells worked satisfactorily from the start. An important advantage secured is a saving of about 30 per cent on blower horsepower, the pressure requirement at the cell being reduced from an average of about 4½ lb. per sq.in. to about 3½. The average pressure requirement when using X-cake and xylidin is slightly higher than when using coal tar, creosote, and pine oil, provided it is necessary to add lime to the mill feed to maintain the pulp in a neutral or alkaline condition.

A comparison of the results obtained from the treatment of over 3,000 tons of ore treated under flow sheet I conditions in November with the results obtained from the treatment of 2,600 tons of ore treated under flow sheet L conditions in December will illustrate the effect of increased flotation area on the extraction of copper.

The comparison of the work of the two flow sheets follows:

COMPARISON OF WORK DONE BY FLOW SHEETS I AND L

|   | Flow Sheet I, November | Flow Sheet L, December | Difference |
|---|------------------------|------------------------|------------|
| Moist tons treated.....                         | 3,435.9                | 2,654.8                | -781.1     |
| Per cent moisture.....                          | 2.97                   | 3.25                   | + 0.28     |
| Dry tons treated.....                           | 3,333.6                | 2,568.5                | -765.1     |
| Mill feed:                                      |                        |                        |            |
| Assay per cent total Cu.....                    | 1.20                   | 1.24                   | + 0.04     |
| Assay per cent a.-s. Cu.....                    | 0.06                   | 0.06                   | .....      |
| General concentrate:                            |                        |                        |            |
| Assay per cent total Cu.....                    | 11.97                  | 10.45                  | - 1.52     |
| Assay per cent a.-s. Cu.....                    | 0.13                   | 0.15                   | + 0.02     |
| Assay per cent "insoluble".....                 | 20.2                   | 26.7                   | + 6.5      |
| Assay per cent iron.....                        | 30.9                   | 25.5                   | - 5.4      |
| General tailings:                               |                        |                        |            |
| Assay per cent total Cu.....                    | 0.20                   | 0.16                   | - 0.04     |
| Assay per cent a.-s. Cu.....                    | 0.05                   | 0.06                   | + 0.01     |
| Assay per cent sulphide Cu (by difference)..... | 0.15                   | 0.10                   | - 0.05     |
| Recovery:                                       |                        |                        |            |
| Per cent of total Cu.....                       | 84.74                  | 88.45                  | + 3.71     |
| Per cent of sulphide Cu.....                    | 87.96                  | 92.42                  | + 4.46     |
| Ratio of concentration: tons into one.....      | 11.63                  | 9.87                   | - 1.76     |

Flotation reagent used: 60 per cent X-cake + 40 per cent xylidin in both cases.

The grade of the ore in both cases was about the same as far as the copper content is concerned, but, unfortunately for comparison with results given previously for flow sheet I, the ore was about 0.2 per cent lower

in copper than the average up to and including the month of October, as it was from different development work. Flow sheet I, used in November, 1919, has already been described. Flow sheet L, used in December, employs eight standard 8-ft. Callow cells in parallel for primary 48-mesh roughing flotation, followed by drag-belt classification, tube ball-mill grinding of sand to minus 65 mesh, and four 16-ft. shallow Callow cells, operating in parallel, for secondary roughing flotation.

The use of the secondary flotation cells is shown to increase the recovery of total copper from 84.74 per cent to 88.45 per cent, an increase of 3.71 per cent, and to increase the recovery of sulphide copper from 87.96 per cent to 92.42 per cent, an increase of 4.46 per cent. The comparison of pounds copper recovered per ton of ore milled is as follows:

|  | Flow Sheet I,<br>November | Flow Sheet L,<br>December | Difference |
|--|---------------------------|---------------------------|------------|
| Pounds total copper per ton of ore milled.....                             | 24.0                      | 24.8                      | + 0.8      |
| Pounds total copper recovered in concentrate per ton of ore milled.....    | 20.34                     | 21.94                     | + 1.6      |
| Pounds sulphide copper per ton of ore milled.....                          | 22.8                      | 23.6                      | + 0.8      |
| Pounds sulphide copper recovered in concentrate per ton of ore milled..... | 20.05                     | 21.81                     | + 1.76     |

The increased flotation area, in accordance with the above figures, gives an increased recovery of 1.6 lb. total copper per ton of ore milled, the December results being favored slightly by the amount of copper in the feed and by the production of a more siliceous grade of general concentrate, this latter being probably due to a drop in the iron sulphide content of the ore. The increased flotation area calls for an additional 3 kw-hr. per ton of ore milled. Against this increased cost, however, may be placed a reduction of the cost of operating the primary cells if larger units of shallower cells are adopted. So far we have found no disadvantage in operating the new shallow cells with from 3.25 to 3.5 lb. air pressure.

Before the new secondary flotation cells were operated about three tons of solids was being floated per square foot of porous medium, and this was found to be an excessive amount of feed in this particular case. With the addition of the new cells, the above-mentioned tonnage was reduced by one-half, with the results noted. To settle the question of whether we now have excess flotation area, experiments will soon be made in which this will be reduced by making one or more 12.5 per cent reductions.

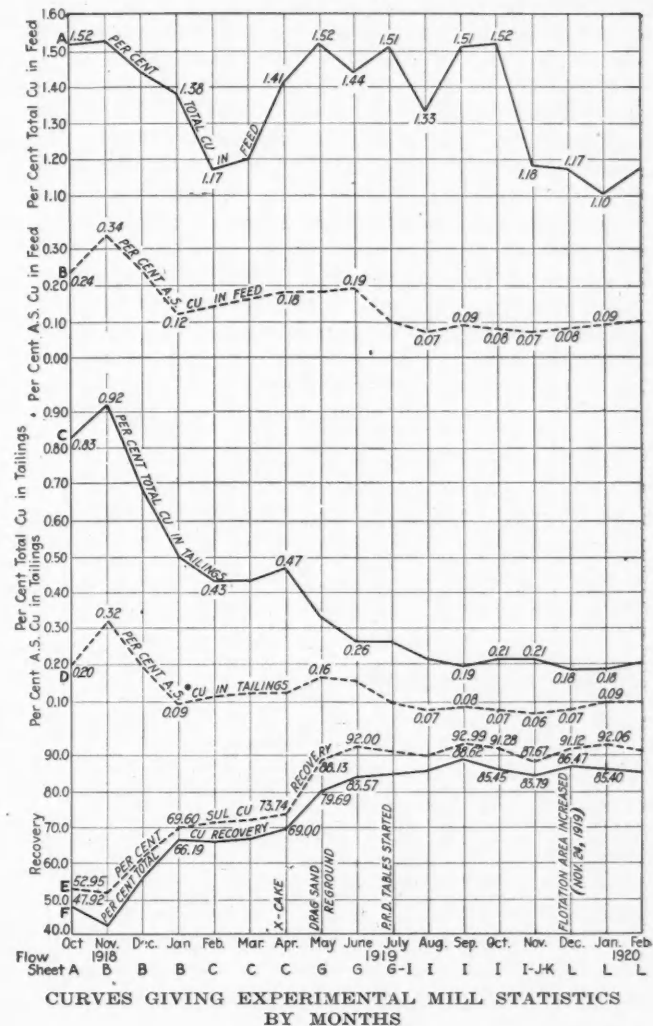
The chart herewith presented contains six curves which illustrate the progress of the work in the experimental mill from October, 1918, to February, 1920, inclusive. The curves are drawn from data obtained in the treatment of approximately 48,000 dry tons of ore, this including 3,500 tons of ore with mixed copper values, which yielded high tailings on account of the high acid-soluble copper content.

Curve A represents the assay per cent total copper in the ore milled, and shows considerable variation. The average value for the period from October, 1918, to and including September, 1919, is 1.4 per cent total copper. Coincident with the adoption of flow sheet L in the latter part of November, 1919, the ore took a decided drop in copper value. The recovery, however, was held at normal on account of the greater efficiency of the new flow sheet.

Curve B represents the assay per cent acid-soluble copper in the ore milled. The high figures for the first two months of operation are caused by some tests on a mixed ore from a different mine, this material carrying

a rather high percentage of acid-soluble copper. For the first twelve months of operation the average acid-soluble copper content was 0.13 per cent. The a.-s. Cu content decreases with the decrease of the total copper.

Curve C represents the assay per cent total copper in the general tailings from the mill, and is, in general,



a satisfactory curve, its tendency being strongly downward for the period. The peak points in October and November, 1918, are accounted for by the treatment of the mixed ores already mentioned.

Curve D represents the assay per cent acid-soluble copper in the general tailings from the mill, and is also a satisfactory curve.

Curves E and F represent the per cent recovery of sulphide copper and total copper respectively. Following the first two months of operation, these curves have an almost unbroken upward tendency. The rise in December, 1918, and in January, 1919, is caused by the discontinuance of the treatment of the mixed ores mentioned. Following January, 1919, the curves are horizontal until April, 1919. On April 15, 1919, the use of X-cake and xylidin was adopted, causing a slight rise for the month of April, and in combination with the regrinding of the 48-mesh sand, followed by re-flotation, a more abrupt rise in May, June, and July.

About the middle of July, 1919, the primary table floor was started, this change giving a slight increase in recovery against a decreasing copper value in the ore milled during August. During September and October, 1919, the ore milled assayed 1.515 per cent total

copper and the recovery curves reached a peak value for a monthly average of 92 per cent for the sulphide copper and 87 per cent for the total copper. After October the percentage of copper in the ore milled dropped considerably, but by the adoption of flow sheet L the recovery curves were held practically in line with the peak value for September and October.

The question of whether two-stage flotation is essential to the maintenance of a high efficiency in the mill is now being investigated. Tests are being made in the experimental mill on the minus 48-mesh flotation tailings and on the minus 48-mesh flotation feed from No. 6 concentrator. A comparison of the results obtained in these tests should be enlightening. Preliminary results indicate some advantage in two-stage grinding from a 6-mesh size to minus 65 mesh and in two-stage flotation at minus 48 mesh and minus 65 mesh.

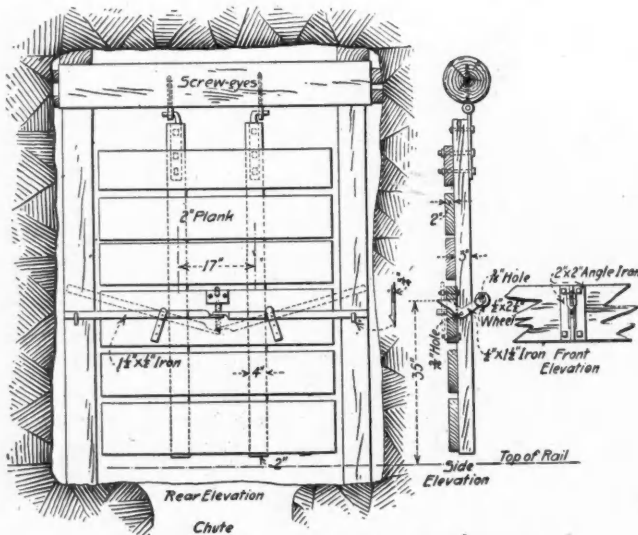
For permission to publish the foregoing data, we are indebted to Norman Carmichael, general manager of the company.

### Upright Safety Chute Door

BY J. M. FRANKEL

Written for *Engineering and Mining Journal*

The mining code of Arizona and several other states requires that a protective guard be placed in front of all chute openings to prevent trammers from falling into chutes, and several devices have been tried in the mines



DETAIL OF SAFETY UPRIGHT CHUTE DOOR

of the Arizona Copper Co., Ltd., to avoid this class of accident. The accompanying sketch shows a type of safety door which has proved most satisfactory. It was designed by G. H. Davidson, construction foreman of the mining department.

The door is hung in front of the chute, and the trammer pushes the car against the door. The front of the car strikes a projecting trigger, thus lifting the ends of the two iron bars free of the catches. The car is moved forward and dumped, and, when emptied and withdrawn, the door falls into position again and is automatically locked.

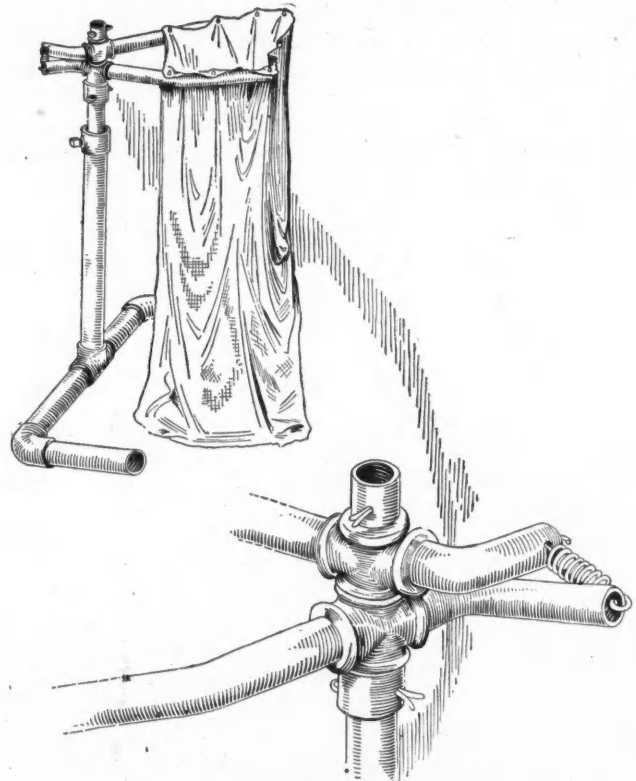
This door requires no attention after being installed, is well liked by the trammers, and removes the danger accompanying the use of the ordinary chute trap door, which must be closed by hand. Another good feature is the protection afforded.

### An Easily Made Bag Holder

BY L. V. LAUTHER

Written for *Engineering and Mining Journal*

Filling a bag with a shovel without any mechanical means of holding the bag requires a man with at least three hands if the operation is to be performed with any degree of neatness and dispatch. Bag holders can



A HANDY BAG FILLER

be purchased, of course, but the illustration shows how to make one out of old pipe fittings and a spring to hold the jaws apart. The bag can be held at any height by adjusting the set screw in the coupling.

### Vast Tonnage of Potash Washed Into Ocean

Silicate rocks, which are widely distributed over the United States, contain potash in an insoluble combination and in a form which is not available for industrial use, but they are gradually decomposed on exposure to the weather. The potash, thus rendered soluble, is dissolved by rain or ground water, and it finally reaches the ocean or inclosed drainage basins through streams or is absorbed from percolating water by clays, according to the U. S. Geological Survey, Department of the Interior.

River waters of North America contain an average of 281 parts per million dissolved salts, of which an average of 1.77 per cent is potassium. They carry annually to the ocean 8,339,800 metric tons of potassium, and the river waters of the world carry 57,892,000 metric tons. The annual precipitation of potassium in insoluble form in the ocean is 50,320,000 metric tons, leaving an annual gain of potassium by the ocean of 7,662,000 metric tons. The total potassium content of the ocean is 510,800,000,000,000 metric tons. Ocean water contains 3.30 per cent of salts, of which 1.11 per cent is potassium, corresponding to 1.38 per cent of potash (K<sub>2</sub>O).

## Moving a Dredge on Sledges

Hauled by Horses Over an Iced Road From Black Creek to Otter Creek, Iditarod, Alaska—  
Effect of Extremely Low Temperature—Launching the Dredge From the Ice

BY J. G. RIVERS

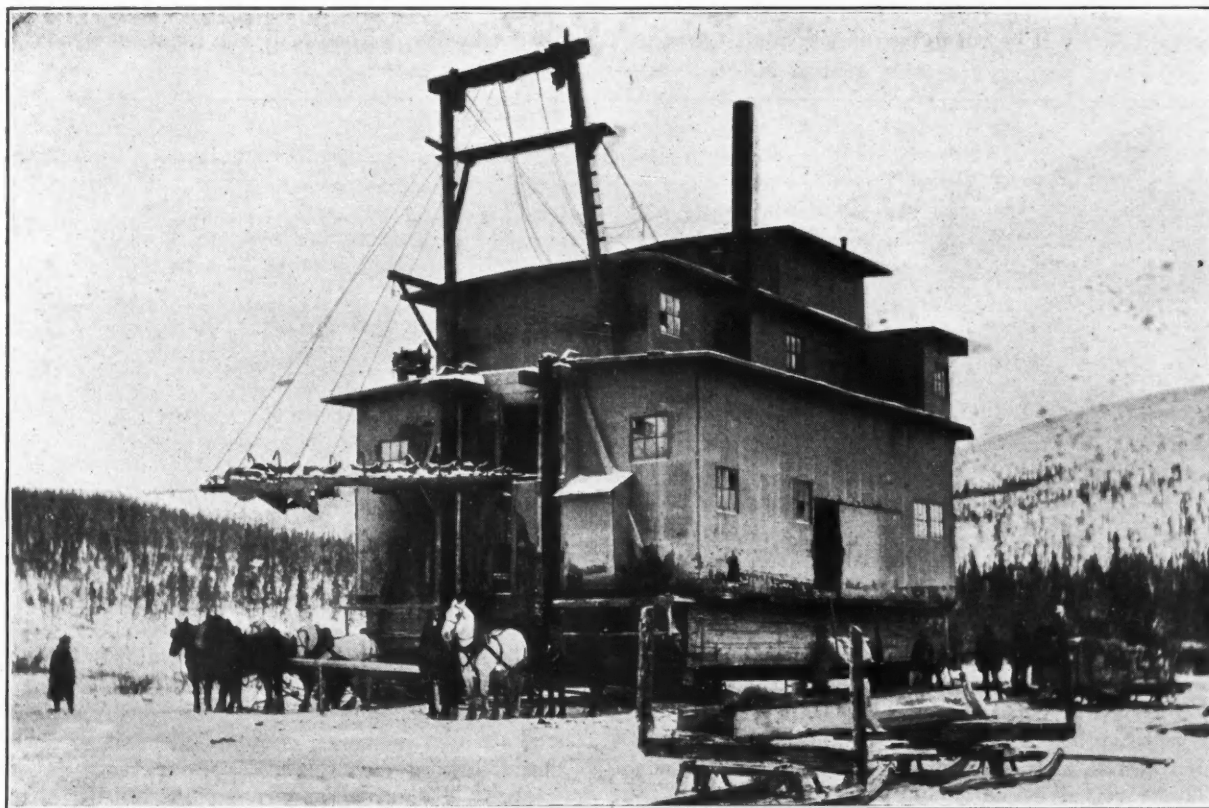
Written for *Engineering and Mining Journal*

**D**URING the winter of 1917-18, the 3½ ft. Union Dredge belonging to John Beaton, of Iditarod, Alaska, was loaded on sledges and moved in one piece from "Discovery Claim," on Black Creek, to "One Below Discovery Claim," on Otter Creek, and the sole motive power was eight horses in two sets of four each, working in parallel.

After the dredge was loaded and everything in readiness to make the start, jacks were placed behind the dredge to loosen the runners from the ice, and the horses walked away with the load at their ordinary pace

men tried blocks and rigging, but the process proved so slow that it was decided to await a moderation in the weather, which finally came a week later, when the load was landed on top of the ice which then covered the new dredge pond on "One Below Discovery."

Another problem confronting those in charge of the work was how to get the block of ice from beneath the dredge when the spring thaw came. This was accomplished by clearing a pond on the starboard side a little larger than the dredge. The ice, which was about five feet thick, was then sawed at both ends of the boat, and,



MOVING A DREDGE ON SLEDGES AT IDITAROD, ALASKA

without much effort. On this particular day the thermometer stood at about zero, the road, which had been well iced, was in fine condition, and in less than thirty minutes the load stood at the mouth of Black Creek, about a mile from the start, but as it was then well along in the afternoon a day's work was declared, and the teams were sent home for the day.

The following morning everything was again put in readiness to proceed, but it was found that the same eight horses, though able to start the load, could not keep it moving. During the night the thermometer had dropped to 20 deg. below zero, and it stood there all day. This change in the weather caused the iced road to offer increased friction to the sleigh runners, which was too much for the horses to overcome. The work-

thence from both ends along the port side toward the middle. When the two cuts nearly joined, the chunk was anchored to the main body of the ice, a charge of powder was set, lines were run ashore on the starboard side, and a strain was taken. At the moment the powder exploded and broke the ice loose from the main body, the detached block settled into the water from the weight above. The dredge took a slight list to starboard, and skidded off the ice cake into its pond, without mishap.

Canadian Gold Production, according to the Canada Department of Mines, is divided among the provinces as follows: Nova Scotia, 0.2 per cent; Quebec, 0.3 per cent; Ontario, 58.8 per cent; Manitoba, 0.9 per cent; British Columbia, 25.2 per cent; and the Yukon, 14.6 per cent.

## The Flight From Mexico City With Carranza

A Report of the Ill-Fated Attempt of the Late President of Mexico To Escape, by a Mining Engineer Who Accompanied His Train

*The following personal letter from J. C. Pickering is published with his consent:*

My dear Mr. Spurr:

I have recently returned from a trip to Vera Cruz on the ill-fated train of Carranza. Some incidents of the journey may prove of interest.

My wife—whom you have met—was due to arrive in Vera Cruz on May 9, and I had contemplated being there to meet her. Upon my arrival in Mexico City from Zacatecas on May 5 I learned that the El Paso, Laredo, Tampico, and Vera Cruz railway lines had all been cut, and consequently the prospects of my getting to Vera Cruz by any conceivable route were gloomy—to say the least.

Early on May 6 it began to be rumored that Carranza

At Villa Guadalupe—on the outskirts of Mexico City—we came to a dead halt, and in due course about 200 cavalry rode up and inspected the train and passengers. Their political affiliations were, at that time, unknown, but it developed shortly that they were "Obregonistas." Someone fired a shot, and the fight was on. The engineer had business elsewhere, but the fireman stuck to his locomotive, opened the throttle, and we slowly got under way, being subjected to a running fire for about half an hour. All passengers promptly dropped to the floor and stayed there—this being the accepted course of conduct in such contingencies. A number of casualties among the military, on both sides, unfortunately resulted from this encounter; but civilians were, so far as I could learn, uninjured. By midnight of that day we had traveled, without further incident, about ninety



WRECK OF THE TRAIN IN WHICH CARRANZA FLED FROM MEXICO CITY

Wide World Photos

contemplated moving his seat of government to Vera Cruz and that he would leave Mexico City that night. I accordingly decided, if possible, to go with him, and set about getting the necessary permission.

J. H. Durrell, of the National City Bank, had likewise decided to go. We consequently joined forces in the matter of securing passes. After numerous interviews with officials, permission to accompany the convoy was duly given, and we boarded the train on the night of Thursday, May 6.

Durrell and I were assigned to seats in a day coach—the rest of the passengers in that particular car being telegraph operators, railroad clerks, and their wives and kiddies. The protection of the train was in the hands of students from the military school in Mexico City. The total presidential convoy—we afterward learned—consisted of twenty-one trains, carrying about 5,000 cavalry and infantry and a similar number of "soldaderas" and civilians. Our car was on train No. 19. We were shunted about the Buenavista railway station all Thursday night, and Friday morning about 11 o'clock started on our journey. W. A. Body, the British Consul in Vera Cruz, had by that time joined us.

kilometers, and then lay up for the night. The train of General Murguia, the latter being in command of military arrangements for the entire convoy, was in our immediate rear.

The following day (Saturday) our train got under way about 9 a.m., and by noon we reached Apizaco, approximately fifty kilometers distant. There we found Carranza and the remainder of the convoy. Incidentally, we also found a place where food was obtainable—this being then our principal concern. Rations up to that time were scanty, although we brought a small quantity of food. There were skirmishes in the vicinity of Apizaco throughout the day.

About 10 a.m. of the following day (Sunday) the convoy started to move, the reported destination being San Marcos (a station with adequate facilities for watering locomotives), forty-three kilometers distant and 182 kilometers from Mexico City. Owing to engine trouble, our train did not get under way until 4 p.m. Leaving Apizaco, we were fired on at long range, resulting in a number of casualties among the military. We arrived near San Marcos about 11 p.m., and lay up for the night.

The entire convoy spent Monday, the 10th, at San Marcos, pending repairs to the track ahead. We were able to buy some food, and that evening Don Pancho Gonzalez (a member of Carranza's party) invited us to dinner in the presidential train—a courtesy which was greatly appreciated. Repairs to the track having been completed, the entire convoy started forward about 11 p.m. and wound up at kilometer 193 at 4 a.m. of the following (Tuesday) morning.

At this point troops under General Mireles were strongly entrenched, and further advance was, for the time being, impossible. The battle opened about 9 a.m., and by noon no decision had been reached. Carranza led troops to meet those that were attacking his left flank. In the afternoon General Murguía effected an encircling movement, which resulted in the capture of over 300 of General Mireles' troops. One of the prisoners volunteered the information that the track had been mined, and showed locations to military officials. I was told that 2,000 of Carranza's forces were engaged. Casualties were fairly heavy on both sides, and General Mireles had to evacuate his positions. This action is usually referred to as the battle of Rinconada.

After the battle, and while on the way to our train, about three kilometers to the rear, we were advised by Don Pancho Gonzalez that Carranza desired us to move with our effects to the presidential cars—an invitation which we accepted with pleasure. Our next step was, of course, that of paying our respects to Carranza and thanking him for his courtesy and thoughtfulness. We were received informally and cordially in his private car, and all retain, I believe, most pleasant recollections of the interview.

We moved our effects that evening. Our advent into an already overcrowded train caused undoubted inconvenience to the officials and officers with whom we thereafter shared the car. Don Pancho made the introductions, and we were received with usual native hospitality and extended every courtesy. Durrell and I slept together in a sort of Pullman berth—a great relief after sitting up for five nights in a day coach. By that time, however, even the presidential cars were getting very short of food and drinking water—a situation which became more acute thereafter, as the trains were stocked only for a short journey. I hold the most pleasant recollections of the many attentions and courtesies shown us thereafter by all the Carranza party, and this same state of affairs continued when we subsequently fell into the hands of General Treviño.

The way having been cleared, through the defeat of General Mireles' forces, the advance of the convoy was resumed, and by 5 a.m. of Wednesday, the 12th, we had reached Rinconada (kilometer 201).

The problem of watering and oiling—principally watering—the twenty-five locomotives employed in hauling the twenty-one trains had now become serious. The delay in fighting the Rinconada action had practically exhausted the water supply of several engines, and as pumping facilities at Rinconada station were decidedly limited, it became obvious that part of the convoy would have to be abandoned. The railway line connecting Mexico City with Vera Cruz is single track, with sidings only at the principal stations. The twenty-one trains covered a stretch of four kilometers.

During the morning of Wednesday such water as was available at Rinconada station was distributed among the head engines, and the convoy moved forward. A

long up grade, ahead of Rinconada, introduced added difficulties, and it was for a time feared that the advance movement of the trains might be halted. Fortunately, however, a deposit of water was located about one-half kilometer from the track, and a bucket-passing brigade, consisting of over 500 civilians and "militares," was organized and put into action. Every conceivable container of water was employed, including the drinking-water holders from the Pullmans. Two important engines, one of which belonged to Carranza's private train (No. 9 in the convoy), were so watered in about two hours. The net result was that the main portion of the convoy, consisting of about twelve trains, was able to proceed that day to kilometer 210. The track ahead of this point was, however, destroyed as far as the eye could see, and troops of General Guadalupe Sanchez in large numbers were in the distance.

The advance of Carranza's trains was here brought to a halt. Efforts were, of course, made to repair the line ahead, but progress was slow, several engines were entirely without water, and it became evident therefore that further advance by train was impossible. This point, i.e., kilometer 210, practically half-way to Vera Cruz, was the limit of the advance. As previously stated, it had become necessary to abandon—for lack of water—a number of trains at Rinconada, ten kilometers back. Most of the occupants of these trains covered the distance on foot, carrying their personal effects.

The advance from Apizaco had been so slow that it was possible to cover the rear of the convoy with cavalry. At night the flanks were protected by both cavalry and infantry, and we were rarely bothered at that time, which was most fortunate.

About noon of Thursday, the 13th, an attack on the convoy began with cavalry raids on Carranza's front. It developed into a general frontal and flank action, in which both cavalry and infantry participated. Some artillery was used on both sides. The battle eased off about 5 p.m. without apparent advantage to either side. The outlook was, however, gloomy. The night was moderately quiet.

By daybreak of the following morning (Friday, the 14th), abandonment of the convoy by civilians started. A steady stream of men, women, and children, all loaded with personal effects, filed past the cars. Their immediate destination was San Andres, on the way to Vera Cruz and about ten kilometers distant, where water and food were supposed to be obtainable. About 10 a.m. the battle was renewed on Carranza's front and flanks, and the stream of civilians was driven back on the trains in great disorder, and panicky conditions prevailed. The troops were vigorously defending the trains, but with apparently small prospects of maintaining their positions.

In anticipation of the expected forced abandonment of the trains, we had, on the preceding day (Thursday), requested of Carranza a safe conduct through his lines, and it was arranged that a large Packard car, which was one of several carried on the trains, would very kindly be placed at our disposal.

The unloading of these motors started early on Friday under difficulties and in the midst of great confusion. About 1 p.m. we obtained the car assigned to us and after paying our respects to, and thanking, Carranza, members of his cabinet, and the others who had extended us so many courtesies and considerations under most trying conditions, we finally got under way with

a white flag (a gift from Don Luis Cabrera) about 2 p.m.

The objective of the trip being Vera Cruz, we started in that direction. On getting near Carranza's front lines we came under artillery and rifle fire, and it became evident that advance in that direction was suicidal. We accordingly turned back, went through Carranza's rear lines, and soon fell into the hands of General Treviño's outposts. Here again we were shown every consideration, finally being conducted to the headquarters of General Treviño at Rinconada. After a courteous reception by that general we were given a military pass, and proceeded to San Marcos, where we sent telegrams under a military "visto bueno," and finally spent the night in his private car. General Treviño arrived at San Marcos before daybreak, and early the following morning (Saturday) we asked his advice as to the best way of reaching Vera Cruz. I judge that the general spent the best part of two hours making telegraphic inquiries, and he finally advised our going by way of Puebla, thence over the narrow-gage railroad to Esperanza, and from there via standard-gage to Vera Cruz. The Packard car remained at our disposal through the kindness of General Treviño, and, after paying our respects, we got under way about 10 a.m., reaching Puebla—a square meal and a bath—that (Saturday) night.

Durrell and I left on the narrow-gage early the next morning, reaching Vera Cruz about noon of Monday, the 17th. I there found my wife as well and comfortable as possible under the circumstances, although she had received none of the numerous telegraphic messages which my friends and I had sent her during the last two weeks. This is possibly fortunate, as otherwise she would have learned of my presence on the presidential train—the wildest and most extravagant stories being current as to the happenings on that eventful trip.

The journey to Vera Cruz occupied ten days. My wife and I left that city for Mexico on Thursday, the 20th, and completed the trip in fifteen hours—practically schedule time.

I have since come across several "compañeros" who were with us on the presidential trains, and I learn that the confusion was, if possible, accentuated after we left (Friday, the 14th, about 2:30 p.m.), and that about 5 p.m. of that day the entire convoy fell into the hands of the Obregon-Gonzalez forces. I am told that casualties among civilians were fortunately very few, but both of the opposing military forces suffered heavily, considering the numbers engaged, say 3,000 on a side.

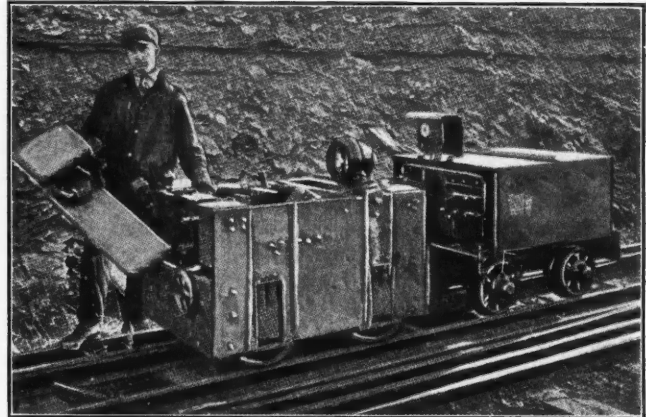
Carranza, his cabinet, other civilians, and military forces—principally cavalry—in charge of General Murguia, left the convoy, I am told, about 4 p.m., striking north. The tragic fate of that party is now, of course, known.

I hope you are well and enjoying your new work, and with kindest regards I am,  
Sincerely yours,  
J. C. PICKERING.

**Production of Magnesite in the United States during 1919** was about 162,000 tons, according to the U. S. Geological Survey; California produced 42,000 tons of crude magnesite, or about one-half the production in 1918. Producers in the State of Washington shipped about 55,000 tons of dead-burned magnesite, which is equivalent to about 120,000 tons of crude magnesite, or 20 per cent less than in 1918. The material shipped from the State of Washington went to manufacturers of refractory wares and steel mills east of the Mississippi River, except about 500 tons that was distributed in Montana, Washington, California, and Texas.

## A Midget Mine Locomotive

What is claimed to be the smallest practical mine locomotive ever constructed is operating satisfactorily at the Real del Monte mine, in Mexico, according to the April number of *The Grid*, a publication of the Edison Storage Battery Co. The locomotive was designed for underground service and to meet unusual conditions in mine development work. It is rated at two tons, for operation on 20-in. gage track, and at three miles per hour has an effective drawbar pull of 400 lb. Over all it measures 48 in. in length, 34 in. wide and



THE MIDGET LOCOMOTIVE AT REAL DEL MONTE MINE

a height of 35 in., with a removable step and operator's seat, so that it can be run on a cage and hoisted and lowered to the different mine workings as the occasion requires. The two trailer trucks carrying the Edison batteries are likewise of small dimensions. Two are required, so that the locomotive can operate continuously, each of the trucks being equipped with fifty-five cells of type A4 Edison storage batteries.

A special feature of this locomotive is the adaption to it of a motor which renders feasible the use of a single reduction gear drive. The saving of the energy in the elimination of gears, pinions, countershafts, and like parts gives the locomotive a much greater radius of action on each charge of the battery.

## Comparatively Low-Grade Ore Now Treated At the Sunnyside Mill

In the April 10 issue of *Engineering and Mining Journal* we published the average analysis of the ore treated by the Sunnyside Mining & Milling Co., as reported to the Bureau of Mines. For the last two years, however, the ore actually handled in the Sunnyside mill has been of considerable lower grade than the reported figures show. The actual analysis has been: Gold, 0.08 oz.; silver, 4.5 oz.; lead, 4.8 per cent; copper, 0.4; zinc, 6.8; and iron, 3.2 per cent. These figures serve as an indication of the kind of ore it is possible to treat by selective flotation methods.

## Exploitation of Mica Deposits in Rumania

It is reported in a recent issue of *Commerce Reports* that rich veins of mica have been explored and are now being exploited in the district of Mehedintz, Rumania, by a company hastily created with a capital of 5,000,000 lei. In a relatively short time the company has produced fifteen carloads of mica, which is valued at 1,000,000 lei per carload.



# Design of Two-Bucket Aerial Tramway

Simple Carrier Adopted To Lowering Ore From a Mine to a Terminal Below the Mine Outlet—  
Loading and Discharge Bins—General Layout of Line—  
Formulae for Power

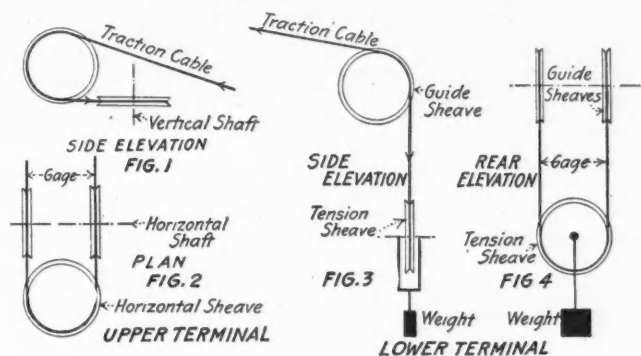
BY DOUGLAS LAY

Written for *Engineering and Mining Journal*

THE reversible two-bucket aerial tramway, also known as the "jig back" and "baby" tram, is in wide use at mines situated in mountainous districts. Although a tram of this type is usually regarded as an endless-cable system, to which is attached at each end a bucket, which moves alternately up and down, it is really an example of main and tail rope aerial haulage. The traction cable on the lower side of the buckets does not necessarily perform any other function than that of steadying the buckets and rendering high speed possible, apart from the fact

eter of each of which is equal to the gage of the tramway. The idea of three sheaves is, of course, to give ample lap of cable, and so prevent any slippage, when brakes are brought into action, and which might occur if only a single sheave were used. It is obviously necessary that sheaves should be of ample diameter, otherwise the life of the traction cable will be short.

In this case of the lower terminal standard construction signifies three sheaves, two guide sheaves and a tension sheave, the diameter of the last being equal to the gage of the tramway. The arrangement is diagrammatically illustrated in Figs. 3 and 4. Having regard to the life of the traction cable, the diameter of the guide sheaves must be adequate, and it is sound policy with this arrangement to have guide sheaves of the same diameter as the tension sheave. A rigid dumper or tripper operates a latch on the bucket, causing the latter to dump automatically on its arrival at the terminal.



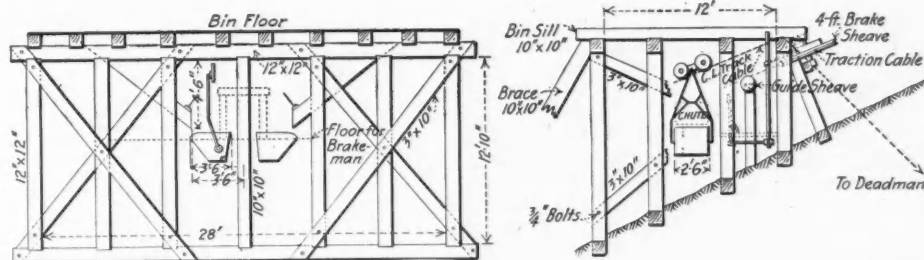
FIGS. 1, 2, 3 AND 4. ARRANGEMENT OF SHEAVES IN TWO-BUCKET AERIAL TRAMWAY

that the ascending cable is always balanced by an equal length of descending cable. From a purely theoretical standpoint, the system could be operated without any traction sheave at the lower terminal, and with only a traction cable length equal to the distance between the two terminals.

## SIMPLIFIED CONSTRUCTION OF TRAMWAY

The construction shown in the working drawings, Figs. 5, 6, 7, 8 and 9, has proved quite satisfactory in my experience. The dimensions given are taken from an actual tramway embodying the ideas of others as well as my own. It will be understood that certain dimensions will require modification where the arrangement is to be adapted to other conditions.

For grades up to twenty degrees, and with a total load of 1,250 lb. (including the weight of one bucket), one brake sheave, preferably with two brake bands applied in opposite directions, will suffice at the upper terminal. The usual allowance of brake surface is



FIGS. 5 AND 6. FRONT AND SIDE ELEVATIONS OF UPPER TERMINAL

The standard type of construction of the two-bucket tramway, though affording ideal running conditions, is nevertheless somewhat expensive. Details are given herein of a type which departs from standard, but is comparatively inexpensive and satisfactory in operation. To explain the difference between the two types, it is necessary to describe what I have called the standard type of construction. Referring to Figs. 1 and 2, in the case of the upper terminal, it will be seen that the traction cable passes over three sheaves, the diam-

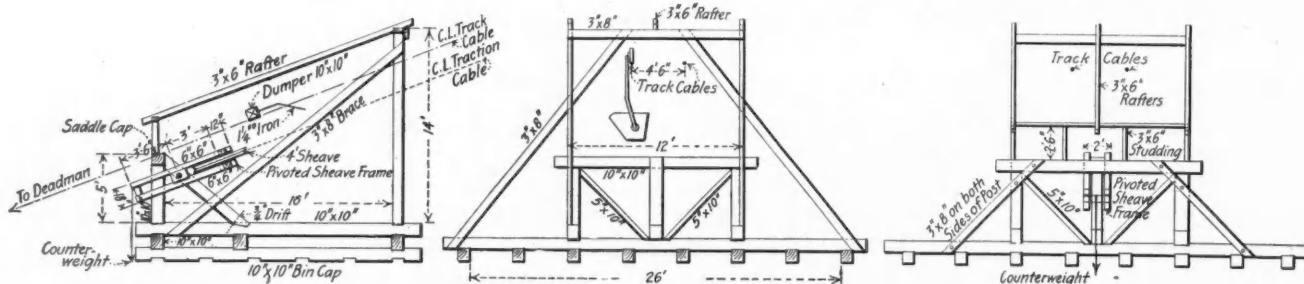
seventy-two square inches for absorption of each horsepower generated by the tramway. It will be noted that inasmuch as the traction cable does not lap the guide sheaves, these can be of small diameter, and considerable expense is thereby saved.

The preferable arrangement for the loading bin is a flat-bottomed bin with chutes attached thereto, as shown in Fig. 5. To begin with, fine waste is first dumped into the bin, until it is filled with waste up to the points of intersection of the lines forming

the various angles of repose. Superfluous waste is next drawn off by operating the tramway until no more fine waste is discharged. The waste remaining in the bin will get harder and harder as time goes on, forming an excellent cushion and preventing the wear and tear of planking. Moreover, no valuable ore need be locked up.

Only one sheave is required at the discharge terminal. The sheave around which the traction cable

the other hand, a rigid tripper necessitates a rigid track in the lower terminal; otherwise, the sag of the cable, varying with temperature conditions, may cause the bucket latch to miss the tripper. Moreover, it is highly desirable that there shall be no saddle or rigid track at the discharge terminal to be traversed by the loaded bucket, so that the approach may be made at a reasonable speed without any jar. It is also to be kept in mind that the grade of the track at the discharge end



FIGS. 7, 8 AND 9. SIDE, FRONT AND END ELEVATIONS OF LOWER TERMINAL OF TWO-BUCKET AERIAL TRAMWAY

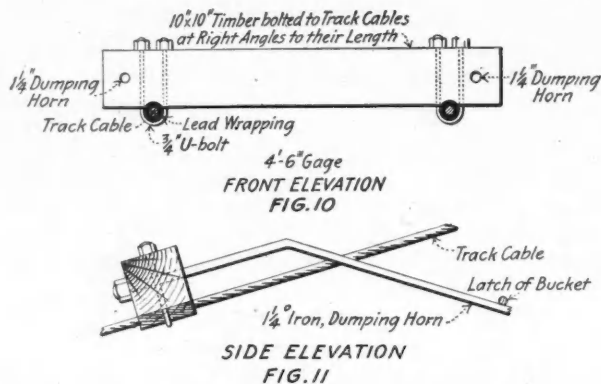
passes is fixed in a counterpoised pivoted frame, and can thus accommodate itself to every sag and movement of the cable. This insures the minimum of wear and tear upon the cable. The counterweight hangs down vertically over the back of the bin. The discharge terminal bin may have either a flat bottom

is usually considerably less than that at the upper end, and consequently the running resistance has the greatest effect at the point of dumping. The dumper illustrated has proved capable of dumping a run-a-way bucket without accident of any kind.

GENERAL LAY-OUT OF LINE

In laying out a two-bucket tramway line, it is essential to bear in mind that the upper and the lower ends are critical points. The only starting force is the weight in one bucket, and this has to overcome the inertia of the system; consequently, the starting resistance is much greater than the running resistance. Again, if the approach to the discharge terminal is too flat compared with the approach to the upper terminal, the tramway will cease to generate power before the lower end is reached, and in such a case, the bucket can only reach the latter point by reason of acquired momentum. To dump a bucket under such conditions requires a very skilful brakeman, and such a lay-out is, therefore, to be avoided.

The location of towers, diameter of track cables, and weight of loaded bucket are important factors, and should be studied in connection with the profile. The speed should be at least 1,000 ft. per min. It is impossible to run over towers at this speed; conse-



FIGS. 10 AND 11. FRONT AND SIDE ELEVATIONS OF DUMPING DEVICE OF TWO-BUCKET AERIAL TRAMWAY

(in which case the back may be filled with waste up to the angle of repose, as described before) or a sloping one. In the latter case, as the dumping of the buckets from a considerable height causes great wear when the bin is empty, I have found it an excellent plan to fix two or three old Blake crusher jawplates on the floor of the bin immediately below the dumping place of each bucket. This expedient costs little and is an excellent preventive of wear and tear.

By far the best and simplest dumping device in my experience is that illustrated in Figs. 10 and 11. It consists of a balk of 10 by 10 in. timber laid across, and bolted to, the track cables, in a direction at right angles to their length, at the desired point. The tripper, which engages the latch of the buckets, is a piece of 1 1/2-in. round iron, bent in the form shown, and bolted to the timber over each track cable.

The great advantage of this type of dumper, apart from its extreme simplicity, over the rigid type, is its positive action. It sags with the cable, and conforms to every movement of the latter, and consequently the latch of the bucket cannot escape it. On

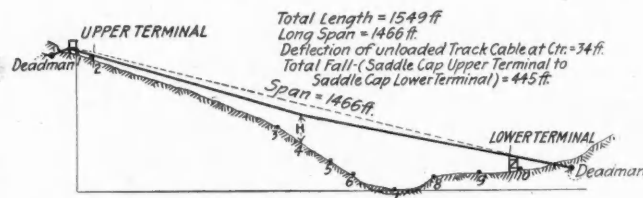


FIG. 12. PROFILE OF AERIAL TRAMWAY

quently, the fewer towers the better. Especially must towers be kept out of the central portion of the line; otherwise it will be necessary to slow down at the point where maximum speed is desirable from consideration of output. The longer the last span before the discharge terminal, the greater the sag and the less the grade of approach.

Sag may, of course, be reduced and grade increased by employing a track cable of larger diameter. In fact,

this expedient may eliminate the necessity of a tower. The tramway profile given, Fig. 12, furnishes an illustration of this. With bucket and load weighing together 1,250 lb., if 1-in. track cables were employed, trouble would be experienced through buckets failing to reach the lower terminal, but this trouble can be eliminated by using 1½-in. cables.

Track cables must be anchored at both ends to deadmen. At the lower end, if at all possible, it is advisable so to place the deadman that there is no thrust to be overcome against the terminal structure. If this is possible, there is no necessity for bracing the terminal, which necessity will arise if track cables are deflected by a saddle on the structure. Turnbuckles are of course necessary to take up the slack in the cable from time to time.

### Building Stockpiles by Means of Scoop Conveyors

**A**N INTERESTING application of scoop conveyors for storing coal is shown in Fig. 1, illustrating five machines used to unload coal from hopper-bottom cars direct to storage pile. Four of these machines are 12 in. wide x 24 ft. long, the other one being 12 x 20. Each is equipped with its own electric motor and can be operated singly if desired.

These machines provide a convenient, efficient, and flexible arrangement. The first machine is practically self-feeding from the hopper doors of the car and the other four machines may be swung around at any angle to cover a wide storage area. Five machines arranged in this manner can be operated by one or two men. They

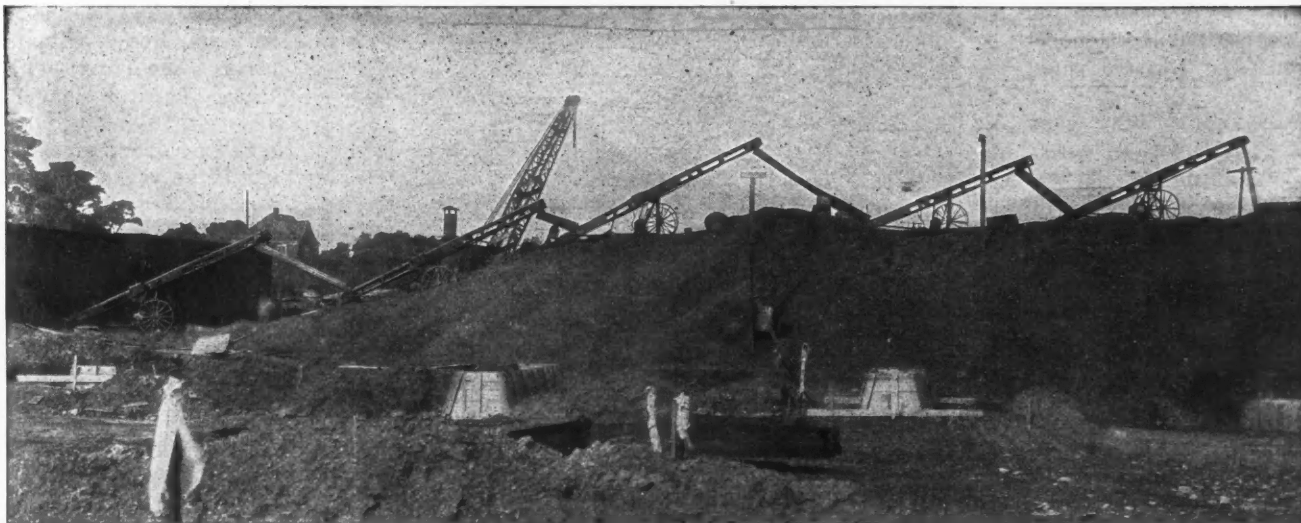


FIG. 1. UNLOADING COAL A DISTANCE OF 150-Feet WITH FIVE SCOOP CONVEYORS

When raising track cables, care must be taken not to apply an excessive tension. A good way to insure application of the proper tension is to calculate the deflection at the centre of the unloaded cables and then measure off the height of the cables above ground at this point, as shown by profile survey. In raising, while the cables are a few feet off the ground, attach to each cable at this point a weighted cord of length equal to the distance  $H$  on the profile. When the cables are raised so that the ends of these cords are just touching the ground, the tension will be correct.

The following will be found of practicable use, and are applicable to both multiple and two-bucket tramways:

$W$  = total weight of traction cable in pounds.

$w$  = total weight of empty and loaded buckets

$v$  = speed of tram in feet per minute

Then horsepower absorbed by friction =  $\frac{(W+w) \times 3\% \times v}{33000}$

$H$  = difference in elevation between upper and lower terminals in feet

$s$  = spacing of buckets in feet

$y$  = weight in one loaded bucket in pounds

$v$  = speed of tram in feet per minute

Then gross horsepower =  $\frac{H \times y \times v}{S \times 33000}$

Net horsepower developed is equal to gross horsepower minus horsepower absorbed by friction.

can also be used to convey material direct from a storage pile to the point where it is wanted. When desired, one machine can be used to load a car mounted on a storage-battery truck as shown in Fig. 2.

A great advantage of using the scoop conveyor to unload hopper bottom cars is the fact that no track hopper or pit is necessary. This makes it possible to unload cars at any point along the track. To unload a



FIG. 2. LOADING ON A STORAGE-BATTERY TRUCK

car, the scoop or feed end of the machine is placed near or under the car hopper. The hopper door is then released and the scoop conveyor belt carries the material away as fast as it flows through the hopper opening.

# Government Officials Who Influence Mining

## Senator Charles B. Henderson

BY PAUL WOOTON

**A**MONG the incongruous things which Congress does is to assign members to the Mines and Mining committees who have had no previous knowledge of the mining industries. As a rule, the chairmen of the committees on Mines and Mining, who always become chairmen through their seniority right, have had no first-hand knowledge of mining. An exception to this general rule is Charles Belknap Henderson, who was chairman of the Committee on Mines and Mining when his party was in power and who during the last Congress has been the ranking member of the committee. Senator Henderson was reared in a Nevada mining camp. His father was a mine operator, and Senator Henderson, since boyhood, has been financially and actively interested in the production of minerals. His boyhood was spent in the Bullion district in northeastern Nevada, where his father operated several mines. One of the Senator's early vivid recollections is a thrilling experience which nearly cut short his life at a tender age. One of his father's properties was being

worked through an inclined shaft. The incline was very steep. One day the boy, without the knowledge of the hoist man, essayed to come out of the mine, where he had been taken by one of the workmen, in the empty car. It was the practice of the hoist man to hoist the car rapidly unless it contained passengers. Not knowing that the car carried human freight, he followed his custom, pulled the throttle wide open, and was whipping the car out of the shaft at maximum speed. Half way up, it left the rails and smashed its way ahead against the timbers, first on one side then on the other. Through some unusual good fortune, young Henderson managed to keep within the car, but he reached the surface in almost as badly battered condition as was the upper end of the shaft.

Senator Henderson is fond of riding in the air. He is a frequent passenger with the Army pilots stationed at Bolling Field. Now and then he flies to New York as a passenger in the mail plane. He accounts for the fact that he has no initial fear in the air, because of

the many thrills in his early life in traveling back and forth in the car in that inclined shaft at Bullion. The Senator's training has been typical of that of the Far Westerner. For years he participated in every rodeo in his part of the state. He has ridden after cattle and

has been an eye-witness, on several occasions, when men died with their boots on. He was a first lieutenant in the Second Regiment of Torrey's Rough Riders during the war with Spain. Senator Henderson, although he has lived in Nevada since he was three years old, was born at San Jose, Cal., June 8, 1873. He was graduated from the University of the Pacific in 1892. He took a special course at Stanford University, but received his final education at the University of Michigan, receiving the degree of LL.B. there in 1895. In 1901 he was married to Miss Ethel Smith, of Elko, Nev., and they have two sons. He began his political career in 1905, when he was elected to the Nevada Legislature. For eleven years he has been a regent of the University of Nevada. Mr. Henderson and all of his family are and have been



CHARLES B. HENDERSON

Democrats; his grandfather, Lewis R. Bradley, was one of the first governors of Nevada. He entered the Senate first by appointment by Governor Emmet D. Boyle, to fill a vacancy caused by the death of Senator Newlands. In November, 1918, he was elected to fill out the unexpired portion of Senator Newlands' term.

Senator Henderson is a specialist in mining legislation, as is natural, both in view of his early environment and the great mining state which he represents, which has produced the Comstock, Goldfield and Tonopah, as well as many other famous camps. The prospector is apt to say of the larger part of Nevada that, being a desert, it isn't good for anything but mining, so it stands to reason that God Almighty put mineral there. It is a great country, though, with its level sagebrush plains and its high desert ranges. When debate gets dreary in the Senate, Henderson probably sighs with the poet, Oh, for a breath of the scented winds o'er the sagebrush plains that blow;  
Oh, for a glimpse of the mountain peaks, with their fields of drifted snow.

## BY THE WAY

### The Horrible Example

WE NOTIFY our readers that Hoover was not nominated at Chicago. The delegates set us all a horrible example of spineless gregariousness and gang spirit, drifting hither and thither as this boss or that blew his whistle. The bosses steered carefully around all outstanding personalities, all figures of international or national proportions, and picked a Figurehead, the Village Orator of Marion, Ohio—a good follower and a man who could be depended on not to try to lead. He carries a printer's rule in his pocket, and would rather make up the front page of the *Marion Star* (a paper his father bought for him) than be President. God bless us! We also would rather have him do that. It was a great nomination for the Democrats. As to Hoover, republics are not yet grateful, nor are they yet wise; but tomorrow is another day. The engineer is organizing and will take a hand in the future.

### In Rumania

"You are too happy in this country. You have no idea of conditions in Europe," remarked a Rumanian, who recently dropped into our office before leaving New York for his native country. To point his remark he added, "The *Engineering and Mining Journal* at its subscription price abroad of \$9 per year costs 45 lei in our currency at normal exchange. But now, at the prevailing rate, it costs 378 lei and is out of the reach of most engineers. A certain government official draws a salary equivalent at present to \$70 per year in your money, and he simply cannot live on it, though living costs less there than here."

### A Timely Hint

Even a lawyer would know better today than to steal, purloin, lift, or otherwise convert to his own purposes the certificate of another for shares in a gold mine. But a decade or so ago, the temptation was greater, and, one of the legal fraternity stumbled. Inquiry as to his identity has recently been made of the Colorado Commissioner of Mines in the following letter:

Between twelve and fifteen years ago a certificate of 200 shares in a Colorado gold mine was stolen from my wife by an attorney named Moses. I do not know the name of the mine, and my wife does not remember.

What I want to find out is whether or not this mine is still operating, and, if possible, locate the man who stole the certificate. The certificate was originally made out to Yeomans or Crowell.

Can you obtain this information by going over the list of the present stockholders of the different mines? At the time the certificate was issued the company had not declared a dividend. I do not think it was a large mine at that time.

Any information you can give me will be greatly appreciated. If you want more details let me know and I will try and get them for you.

It is of importance that this crook be apprehended, as a lesson to others. When Congress passes that premium bill next December gold stocks will surely advance. No doubt even now the foresighted thief is laying in his securities. All having knowledge of suspicious-looking lawyers in their vicinity will please inform the commissioner at Denver.

### Just Gossip

One of our staff writes us as follows from his travels in Arizona: "Everywhere the *Journal* is spoken well of, and its improvement noted. The American Association of Engineers is very strong down here, principally because younger engineers feel that it will do something for them, i.e., raise salaries. Jones, at the — mine, a shift boss, pointed out to me a man shoveling concrete, and said that he was getting more than the young engineers."

### Bandit Proof

In the early days of gold mining in Arizona, the bullion bars usually were escorted to the nearest express office by a mine guard that looked like a cavalry troop. To cut down this expense, the English owners of the Harqua Hala, at one stage of that mine's productive periods, hit upon the scheme of casting their gold into a great cone, that might be valued at from \$70,000 to \$85,000 and that needed a wagon and something like a derrick for its handling. With only an outrider ahead, one such cone was started for Wickenburg. Half way along, a casual glance into the back of the buckboard disclosed the fact that the gold was gone. A few miles back the bullion was found, where it had slid from the buckboard into the road at the passage of a desert wash. Thereafter a horseman rode also to the rear of the bullion transport.

### Abroad

Certain members of the Birmingham Metallurgical Society in England are forming a Freemason's Lodge, that is to be called the Lodge of Metallurgy. It is said that this is the only lodge bearing this name.

### A Safety-First Bulletin

The safety inspector of a large copper-mining company somewhere in Mexico asked his assistant to write a "safety-first" bulletin for the previous month. Now, it so happened that the young man was violently in love with a beautiful, dark-eyed señorita, and it being in the mellow springtime, when a "young man's fancy lightly turns to thoughts of love," he could express ideas only in a mode poetical. The following bulletin resulted:

#### SAFETY-FIRST BULLETIN, APRIL, 1920

No fatal accident occurred this April, 1920, Although of minor injuries there certainly were plenty. It is apparent more and more when *hombres quiero*,\* They can and will protect themselves, "*seguridad primero*." To inculcate a new idea takes time, but we should worry, In Rome do as the Romans do; in Mexico don't hurry. By using workers from the mines we find there's less deflection, Since men get interested when they make their own inspection.

Like every innovation, when at first it was presented, The "*Mayordomos*" fussed a bit, but soon became contented, For very soon it dawned on them, and one dawn was sufficient,

That "Safety First" was daily making miners more efficient. There was a time not long ago when the "*Jefes*" used to greet us

With frowns; but now they smile and say they're glad to meet us.

Now, with co-operation from the workers and the "bosses," We find the accidents decrease, as well as other losses.

We may not set the Thames on fire, nor win the fame of Nero,

But "Safety First" will in the end write accidents thus, 0 (zero).

\*Spanish not guaranteed.—EDITOR.

## CONSULTATION

### Workable Gold Placers

"Some friends have acquired control of a placer-gold deposit in Tennessee. I recently visited this section and panned out a cubic yard of gravel in a long tom. The gold was extracted by mercury and amounted to \$1.55.

"What my friends would like to know is whether, under the present prices, they could work this deposit of gold."

Speaking generally regarding gold placers, the content of \$1.50 of gold in the gravel per cu.yd. represents a high-grade deposit. However, everything depends upon the depth, position, nature, and quantity of the gravel, as this will determine whether it can be worked by dredging or by some more expensive method, such as drift mining. As regards the quality of gold-bearing gravel, there are two extremes with which it is difficult to cope—extreme coarseness and extreme fineness. Under the first-named condition, the gravel may contain boulders which are difficult and expensive to handle; in the latter case, the gravel may contain a mixture of much clay, which is quite as bad. In Tennessee it is unlikely that you would have the former difficulty, but the latter is to be guarded against in all deposits in the Southeastern United States. If there is much clay, it may prevent the separation and the amalgamation of the gold flakes, so that it would be difficult to work the deposit on a practical scale.

### The Mica Market

"I desire to secure reliable information regarding the grading and marketing of mica. The *Engineering and Mining Journal's* quotations are based, apparently, on six different grades of mica. To myself, at least, (not being in the trade) the figures given do not convey definite information. Do they refer to sheeted and cut mica or to mica intended to be used only for electrical purposes? What do the various grades (Nos. 1, 2, and so on,) signify? Are prices quoted on mica used for other than electrical purposes, and, if so, where can such quotations be obtained?"

"Our company will soon be in a position to place the product of its mines (i.e., high-grade muscovite) on the market; and we wish to obtain the above information at as early a date as possible.

"Would you be kind enough to let me have the names and addresses of several other reliable persons who would be able to furnish me with accurate information as to the data a prospective producer should have to handle his product to best advantage?"

The value of mica is attributable to the useful physical properties of the material, such as cleavage, flexibility, transparency, elasticity, resistance to decomposition, insulating property or non-conductivity of heat and electricity, and its lack of color in thin sheets. These characteristics have made mica indispensable in the electrical industry, which consumes most of the domestic and imported material. Stove mica is a variety that is used in the manufacture of furnaces and stoves and commands a higher price than the mica for electrical purposes. Cut stove mica may be worth from two to five times as much as that of electrical grade.

Mica, as it is mined, presents a different appearance from the finished product. The rough run-of-mine blocks require treatment to separate the sheets of mica

from the adhering rock, and then are rough trimmed with a knife, to be subsequently graded according to size and quality. These steps necessitate the expenditure of time and money, and hence greatly increase the value of the run-of-mine mica. It has been found by the U. S. Geological Survey that in the United States an average of 10 per cent of finished trimmed sheets is yielded by the rough blocks that are mined. Limits vary from 2 to 33 per cent. The scrap mica is usually ground and sold in powdered form.

Thin sheets of mica ready for the trade may contain inclusions of dark minerals (iron oxide), in which case it is termed "speckled mica." "Clay-stained" mica, as its name implies, contains clayey matter between the sheets.

Besides depending upon impurities, the value of mica is influenced greatly by its size. The larger the mica sheet, the more valuable it becomes. Mica in sheets several feet wide is especially valuable, but not of common occurrence. The following table indicates the grades of mica that are accepted and used by the trade and which are referred to in the *Engineering and Mining Journal* quotations:

GRADE NUMBER AND EQUIVALENT SIZES OF MICA.

| No.           | Size in Sq. In. | No. | Size in Sq. In. |
|---------------|-----------------|-----|-----------------|
| Extra Special | 60 and up       | 3   | 10 to 15        |
| AA            | 48 to 60        | 4   | 6 to 10         |
| A1            | 36 to 48        | 5   | 3 to 6          |
| 1             | 24 to 36        | 6   | - to 3          |
| 2             | 15 to 24        |     |                 |

The quotations as given in the *Engineering and Mining Journal* do not classify the material according to uses. It should be understood that with this material, and, for that matter, for any in which there are so many variables that may make the material useful or useless, quotations are necessarily flexible.

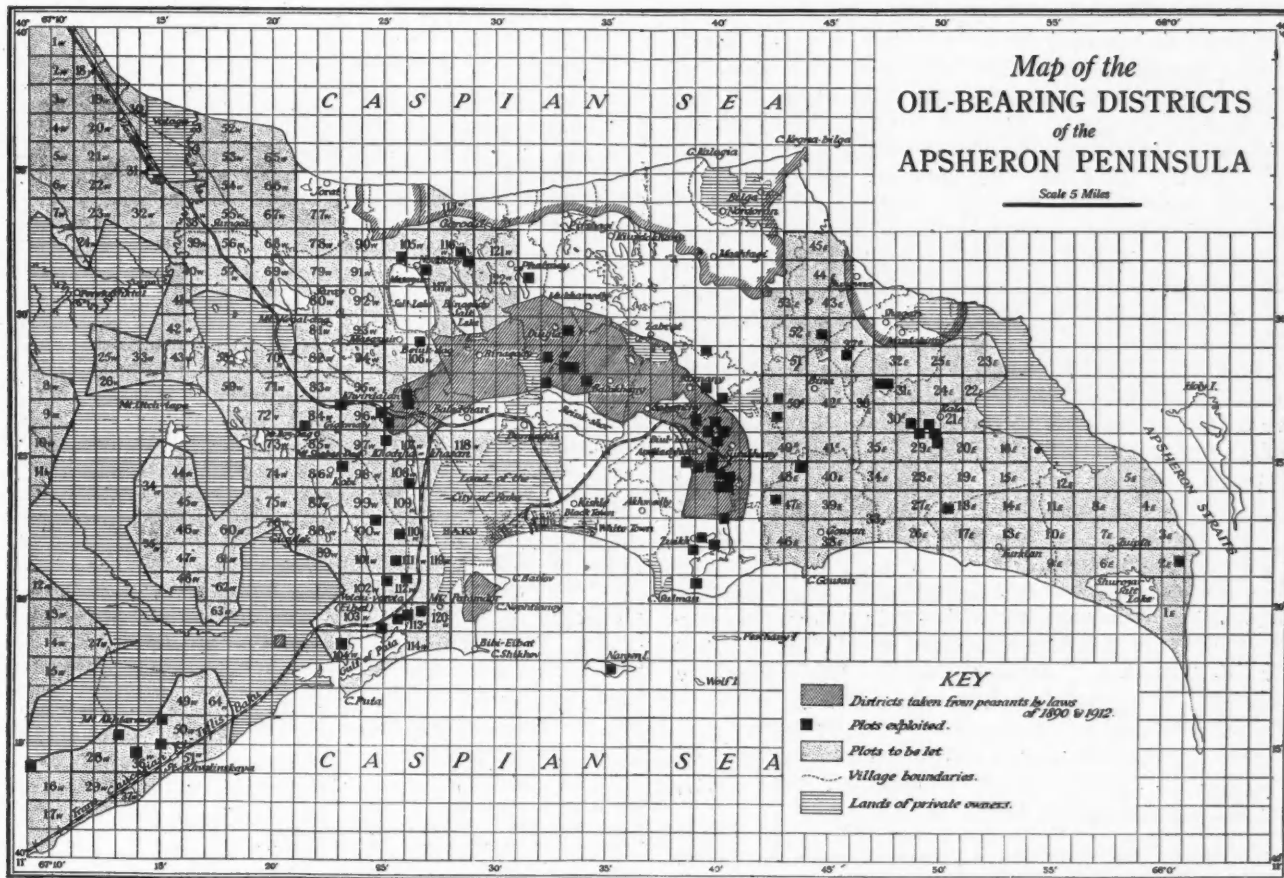
As to production figures and data regarding mica that will prove helpful in obtaining a knowledge of the general scope of the industry, the published reports of the U. S. Geological Survey and U. S. Bureau of Mines will be found of great assistance.

### War Minerals

"Is not the term war minerals a misnomer? A catalog of the metals useful in war would seem to me to include nearly every metal produced in this country, yet surely this expression is not intended to include all of them. I would thank you to enlighten me on this subject."

The expression "war minerals" is somewhat misleading. It does not refer to the minerals that are useful *only* in war time, nor does it apply to *all* the minerals that serve war purposes. The commonly accepted definition includes such minerals as chrome and manganese, for an adequate supply of which this country has normally had to depend upon foreign sources, and the domestic production of which was strongly encouraged during war by the War-Minerals Committee in Washington. In fact, it was this body which first coined the expression and included in the term such metals and minerals as chrome, manganese, tungsten, pyrites, anti-mony, arsenic, platinum, potash, and graphite.

# THE PETROLEUM INDUSTRY



## Petroleum Industry of Russia\*

A Review and Compilation, Chiefly From Russian Sources, of the More Important Facts About Russian Oil Fields—Baku, Grozny, Surakhan, Sviatoi (Holy) Island, Maikop, Emba-Ural and Other Fields—Position Since Revolution

BY EUGENE M. KAYDEN

**T**HE Apsheron Peninsula, which projects into the western side of the Caspian Sea, in the Caucasus, is still the most remarkable single oil field in the world. The peninsula is the center of a prolific oil-bearing area, extending to the west and northwest through the Caucasus mountain range, the Balkans, and

the Carpathian Mountains. This area is oil-bearing in Galicia and Rumania, reaching highest productivity in the Apsheron Peninsula. The oil-bearing sands of the region extend even further to the north slopes of the Caucasus, where rich fields have been tapped at Grozny and Maikop, and then to the east and northeast, the trans-Caspian and Ural oil districts at present being but little exploited.

The ultimate resources of the oil fields about the Caspian Sea are said to be very great. It has been estimated that Russia's oil fields cover an area of at least 14,000 square miles, in a region little touched heretofore, but where signs of oil and gas promise large yields in the future.

The geographical position of the Caucasian and Caspian districts, their proximity to the Middle and Near East, will be important factors in the industrial development of those countries, aside of the needs of

\*All sources from official Russian publications: The chief source for this study was "The General Survey of the Principal Branches of the Mining and Metallurgical Industry," published in Petrograd, 1915, by the Department of Mines. Practically all the data and statistical information to the end of the year 1914 were drawn from this publication, and unless otherwise specified the tables may be credited to this chief Russian source. Among other references may be enumerated "Torgovo-Promyshlennaya Gazetta," abbreviated T. P. G.; "Promyshlennost i Torgovlia," abbreviated P. T.; the Explanatory Memorandum of the Minister of Finance to the Budget of the Empire; "Viestnik Finansov Promyshlennosti i Torgovli," abbreviated V. F. P. T.; and the "Gorno-Zavodskoe Dielo," Nos. 21-22, of June 10, 1916.

Russian units of measure are:  
 VERST = 3,500 feet = 0.6629 mile.  
 SAZHEN = 7 feet.  
 DESSJATIN = 2.7 acres.  
 POOD = 36.11 lb. = 0.0161217 long tons.  
 1,000 poods = 16.1217 long ton.

Russia itself. The wide markets of Asia's enormous population would increasingly call for more and more oil, both in the running of extensive trans-continental railway lines, which are to be constructed throughout the whole of Western Asia and the Middle East, and as a fuel in the operation of industries.

That the Caucasian oil fields are in only the initial stage of development is apparent from the fact that, previous to 1903, practically all of the Russian petroleum came from an area less than ten square miles in extent, in the Baku region. The Russian petroleum industry may be said to date from 1877, when the excise tax was abolished after being in operation for five years, and six years after the first oil well was drilled on the Balakhan field. Before 1871 all the Russian petroleum was obtained from hand-dug wells or surface pits, none of them over 50 ft. in depth, and the oil was conveyed to the refineries in barrels on two-wheeled Tartar carts.

The advent of the Nobel brothers, Ludwig and Robert, who were the first to build and operate a modern refinery at Baku, and also the first to construct a pipe line from the Balakhan field to the refineries at "Chorny Gorod," or Blacktown, the oil-industrial suburb of Baku, gave a further impetus to the petroleum industry. By 1882, the production of petroleum rose to about 50,000,000 poods, climbing steadily until it reached the record mark of 706,300,000 poods in 1901, after which date it declined, owing to the slow exhaustion in the four old oil fields of Baku proper.

The foreign export of petroleum products from Russia was growing simultaneously with the increase in production, until it reached the maximum of 93,500,000 poods in 1903. In the following decade, 1904-1913, the foreign export declined by about 50 per cent.

Table I shows the important facts respecting production, export, and domestic consumption of petroleum oil in Russia, in millions of poods (16,121.7 long tons), from 1883 to the end of 1914.

TABLE I. PRODUCTION, EXPORT, AND CONSUMPTION OF RUSSIAN PETROLEUM

| Year | Production<br>— Millions of Poods | Foreign<br>Export | Domestic<br>Consumption |
|------|-----------------------------------|-------------------|-------------------------|
| 1883 | 66.7                              | 15.7              | 51.0                    |
| 1885 | 120.5                             | 26.5              | 94.0                    |
| 1887 | 155.0                             | 22.0              | 133.0                   |
| 1889 | 192.0                             | 43.9              | 148.1                   |
| 1891 | 275.0                             | 52.1              | 222.9                   |
| 1893 | 325.0                             | 59.5              | 265.5                   |
| 1895 | 377.0                             | 58.2              | 318.8                   |
| 1897 | 449.8                             | 58.3              | 391.5                   |
| 1899 | 550.4                             | 75.7              | 474.7                   |
| 1901 | 706.3                             | 85.2              | 621.1                   |
| 1903 | 630.2                             | 93.5              | 536.7                   |
| 1905 | 455.9                             | 48.5              | 407.4                   |
| 1907 | 523.7                             | 37.0              | 486.7                   |
| 1909 | 563.3                             | 38.8              | 524.5                   |
| 1911 | 559.2                             | 45.2              | 514.0                   |
| 1913 | 561.7                             | 48.0              | 513.7                   |
| 1914 | 556.9                             | 26.3              | 530.6                   |

Table I also shows clearly that the rate of domestic consumption has been fairly well maintained since 1901, owing chiefly to the decline in the foreign export trade and the discovery of new oil fields.

#### RUSSIA'S SHARE IN THE WORLD'S PETROLEUM

In 1901, when Russia's production of crude petroleum reached the record mark of 706,300,000 poods (85,200,000 bbl.), Russia occupied first place in the total world's production of a little over 167,400,000 bbl., producing thus 50.6 per cent of the total, the United States following with about 69,390,000 bbl. But since then Russia has yielded her pre-eminence to the United States. In 1913, Russia produced only 17.8 per cent of the world's total, and the share falling to our own country rose from

41.2 per cent in 1901, to 62.4 per cent in 1913. For the quinquennial period 1911-1915, Russia's annual production was 18 per cent of the world's total. Table II shows the average world's production of crude petroleum by separate countries, in 1911-1915, calculated in barrels of 42 gallons.

TABLE II. WORLD'S PRODUCTION OF PETROLEUM 1911-1915

|                        | Barrels     |
|------------------------|-------------|
| United States.....     | 247,759,461 |
| Russia.....            | 66,521,168  |
| Mexico.....            | 22,125,546  |
| Rumania.....           | 12,498,984  |
| Dutch East Indies..... | 11,682,452  |
| India.....             | 7,422,098   |
| Galicia.....           | 7,212,964   |
| Japan and Formosa..... | 2,225,852   |
| Peru.....              | 1,931,546   |
| Germany.....           | 1,007,077   |
| Trinidad.....          | 523,852     |
| Egypt.....             | 269,787     |
| Canada.....            | 238,556     |
| Argentina.....         | 196,475     |
| Italy.....             | 51,886      |
| Other countries.....   | 18,000      |
| Total.....             | 381,705,694 |

In dealing with the general production of crude petroleum in Russia, it is necessary to consider the various fields situated chiefly in the Caucasus. They are, first, the four old oil fields of Baku, and then the smaller districts of Surakhan, Binagad, and Sviatoi (Holy) Island, belonging logically to the Baku group. Outside of the Apsheron Peninsula, there are the following oil fields: Grozny and Maikop, on the northern slopes of the Caucasus range; Cheleken Island, lying near the eastern shore of the Caspian Sea; Emba-Ural oil fields, to the north and east of the Caspian; and, finally, Ferghana, in Turkestan. All of these last-mentioned fields are of smaller importance than the Baku group, and some of them are still either not working to their full capacity or are in the experimental stage of development.

The distribution of crude petroleum by separate regions in the period 1910 to 1917, inclusive, is shown in Table III, in millions of poods.

TABLE III. THE REGIONAL DISTRIBUTION OF PETROLEUM IN RUSSIA, 1910-1917, IN MILLIONS OF POODS

| Regions                         | 1910  | 1911  | 1912  | 1913  | 1914  | 1915  | 1916  | 1917  |
|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| The Baku Region                 |       |       |       |       |       |       |       |       |
| The four old fields.....        | 478.2 | 425.4 | 419.1 | 389.8 | 338.0 | 344.3 | 329.4 | 263.1 |
| Binagad and hand-dug wells..... | 11.9  | 13.2  | 22.6  | 32.7  | 35.9  | 41.3  | 44.3  | 36.3  |
| Surakhan.....                   | 10.4  | 19.7  | 31.4  | 39.7  | 51.3  | 60.6  | 96.4  | 96.0  |
| Sviatoi (Holy) Island.....      | 1.4   | 2.6   | 3.3   | 4.7   | 5.9   | 6.9   | 6.8   | 6.9   |
| Total Baku group.....           | 501.9 | 460.9 | 476.4 | 466.9 | 431.1 | 453.1 | 476.9 | 402.3 |
| Grozny oil field.....           | 74.0  | 75.2  | 64.5  | 73.7  | 98.4  | 88.1  | 102.7 | 94.8  |
| Cheleken Island.....            | 6.3   | 13.3  | 13.0  | 7.2   | 5.0   | 4.0   | 3.0   |       |
| Maikop district.....            | 1.3   | 7.8   | 9.2   | 5.3   | 4.0   | 7.7   | 2.0   |       |
| Emba-Ural district.....         |       |       | 1.1   | 7.2   | 16.6  | 16.7  | 15.5  | 21.1  |
| Ferghana district.....          | 1.7   | 2.0   | 2.0   | 1.4   | 1.8   | 1.8   | 2.0   |       |
| Total all other.....            | 83.3  | 98.3  | 89.8  | 94.8  | 125.8 | 118.3 | 125.2 | 115.9 |
| Total for all of Russia..       | 585.2 | 559.2 | 566.2 | 561.7 | 556.9 | 571.4 | 602.1 | 518.2 |

The source for 1910-1914 is the publication of the Russian Mining Department of 1915, "General Survey of the Principal Branches of the Mining and Metallurgical Industry," p. 279. Data for 1915 are from the Explanatory Memorandum of the Minister of Finance to the Budget of the Empire for 1917; data for 1916 and 1917 from "Torgovo Promyshlennaya Gazetta," April 20, and May 12, 1918. References to the last-named source in this paper are under the abbreviated title of T. P. G.

A cursory examination of Table III shows that, for Russia as a whole, the output of crude petroleum has remained fairly stationary since 1910. As to the four old oil fields of Baku, the output for 1915 was actually less than that for 1914 by about 35,000,000 poods, if the fact be taken into consideration that, owing to strikes, the output for 1914 was reduced by 40,000,000 poods. Again, because of the war and the difficulty of obtaining the necessary machinery and materials, boring



operations were restricted. On the other hand, production in the new fields, such as Grozny, Surakhan, and Emba, continually increased, with the result that the total production was well maintained down to the revolution. It is plain, nevertheless, that the four old Baku oil fields have lost the comparative pre-eminence that they held in the decade 1902-1913, as may be gathered from Table IV, which gives percentages of total production.

TABLE IV. PERCENTAGE PRODUCTION OF RUSSIAN OIL FIELDS

|                       | 1902  | 1913  |
|-----------------------|-------|-------|
| Four Baku fields..... | 94.6  | 69.5  |
| Grozny.....           | 5.0   | 13.2  |
| Surakhan.....         |       | 7.1   |
| Binagad.....          |       | 2.6   |
| Surface wells.....    | 0.4   | 3.2   |
| All others.....       |       | 4.4   |
| Total.....            | 100.0 | 100.0 |

THE OLD BAKU FIELDS

The four oil fields of Baku are Balakhan, Sabounch, Roman, and Bibi-Eibat, the last lying three miles to the south of the town of Baku. The maximum production of the four fields was reached in 1901, when the output amounted to 671,000,000 poods, but it has since steadily declined. The greatest decrease has taken place in the Roman and Bibi-Eibat fields. In 1902, 14.9 per cent of the oil produced at Baku was fountain oil, but in 1914 that variety of oil was only 3.1 per cent of the total. At the same time, the wells had to be sunk to greater depths, increasing from an average of 238 sazhen in 1902 to 371 sazhen in 1914. (A sazhen equals seven feet.) The production of each of the four fields in millions of poods is given in Table V.

TABLE V. PRODUCTION FROM THE OLD BAKU OIL FIELDS

| Year | Balakhan | Sabounch | Roman | Bibi-Eibat | Total |
|------|----------|----------|-------|------------|-------|
| 1904 | 82.0     | 218.1    | 133.5 | 181.1      | 614.7 |
| 1906 | 67.9     | 157.0    | 95.4  | 127.7      | 448.0 |
| 1908 | 70.3     | 198.8    | 73.3  | 119.6      | 467.0 |
| 1910 | 68.4     | 195.0    | 95.1  | 118.7      | 478.2 |
| 1912 | 65.3     | 170.4    | 78.8  | 104.6      | 419.1 |
| 1914 | 67.2     | 143.6    | 55.0  | 72.2       | 338.0 |

The development of the four Baku fields was due largely to the enterprise and ability of Robert Nobel, who came to Baku in 1873. The number of boreholes increased from 13 in 1873 to 458 in 1893, and to 2,036 in 1901. Table VI shows the changes that have taken place in the conditions and manner of exploitation since that date.

TABLE VI. DETAILS OF PRODUCTION IN OLD BAKU OIL FIELDS

| Year | Production in Millions Poods | Number of Productive Borings | Average Depth of Borings in Sazhens | Limits in Depth of Borings in Sazhens | Average Daily Production of Each Well in Poods |
|------|------------------------------|------------------------------|-------------------------------------|---------------------------------------|--|
| 1904 | 614.7                        | 1,998                        | 165.2                               | 41-329                                | .....  |
| 1906 | 448.0                        | 1,954                        | 167.9                               | 34-339                                | 920  |
| 1908 | 467.0                        | 2,495                        | 175.4                               | 38-365                                | 710  |
| 1910 | 478.2                        | 2,840                        | 177.0                               | 24-416                                | 627  |
| 1912 | 419.1                        | 3,142                        | 184.7                               | 34-419                                | 472  |
| 1914 | 338.0                        | 3,624                        | 185.0                               | 32-444                                | 349  |

Thus, in the eleven-year period from 1904 to 1914, the number of productive wells increased from 1,998 to 3,624, the average depth increased from 165.2 sazhen to 185 sazhen, and the maximum depth rose from 329 to 444 sazhen. At the same time, the average production of the wells decreased by almost three times, and the total output of the four oil fields decreased 45 per cent.

The number of working wells depends on the boring activities taking place each season. With the fall in prices of petroleum in 1909, the number of new wells decreased also. Operations showed an increase in 1912 as the prices advanced. The co-ordinate relation of the prices of petroleum and the boring operations is shown in Table VII.

The workingmen's strike in Baku in 1914 was responsible for the decline in boring operations from 65,169 sazhen (456,183 ft.) in 1913 to 51,012 sazhen in 1914, or to 357,084 ft. The war, with the resultant embarrassments in credit and difficulties in obtaining machinery and materials, further decreased boring operations. The aggregate depth of drilling in 1915 was 47,005 sazhen (329,035 ft.), and for 1916 it was estimated at about 301,000 ft.

TABLE VII. RELATION OF NUMBER OF WELLS TO PRICE OF PRODUCT

| Year | Price per Pood in Kopeks | Aggregate Depth of Borings in Sazhens | Number of Wells Boring | Number of Wells Made Deeper |
|------|--------------------------|---------------------------------------|------------------------|-----------------------------|
| 1904 | 14.7                     | 62,351                                | 692                    | 292                         |
| 1906 | 25.6                     | 48,110                                | 574                    | 168                         |
| 1908 | 21.6                     | 56,863                                | 600                    | 223                         |
| 1910 | 15.1                     | 48,432                                | 385                    | 320                         |
| 1912 | 34.8                     | 53,811                                | 485                    | 390                         |
| 1914 | 36.5                     | 51,012                                | 563                    | 317                         |

In this connection it is interesting to note the relationship between production and the depths of wells. In 1913, in the four old oil fields of Baku, 2.8 per cent of the total oil came from wells under 100 sazhen deep; 42.1 per cent from levels of 101-200 sazhen; 23.2 per cent from levels of 201-250 sazhen; 18.0 per cent from levels of 251-300 sazhen; and 13.9 per cent from levels above 300 sazhen. Compare with this the record of 1897, when only 23 per cent of the oil came from levels of 200 sazhen. All this points to the gradual exhaustion of the above-named fields, a fact which is as true of the new wells as of the old.

THE GROZNY OIL FIELDS

The Grozny oil fields, on the northern slope of the Caucasian Mountains, in Terek Province, have a history of about twenty years, although the presence of oil has been known for a longer period; but previous to 1903 only hand-dug wells were utilized there. On Jan. 1, 1915, the area under exploitation was 2,471.5 dessiatins, or 6,673 acres. The oil resources of Grozny are said to be extensive. Grozny oil contains a high percentage of kerosene and benzine. A pipe line serves as an outlet to Petrovsk, on the Caspian Sea.

The total production of crude petroleum at Grozny increased rapidly. It was only 17,000,000 poods in 1896, but rose to a little over 30,000,000 poods in 1900. Production since 1905 is shown in Table VIII.

TABLE VIII. PRODUCTION OF GROZNY OIL FIELD IN MILLIONS OF POODS

| Year      | Production in Millions of Poods | Year      | Production in Millions of Poods |
|-----------|---------------------------------|-----------|---------------------------------|
| 1905..... | 43.1                            | 1912..... | 64.5                            |
| 1906..... | 38.2                            | 1913..... | 73.7                            |
| 1907..... | 39.4                            | 1914..... | 98.4                            |
| 1908..... | 52.1                            | 1915..... | 88.1                            |
| 1909..... | 57.0                            | 1916..... | 102.7                           |
| 1910..... | 74.0                            | 1917..... | 94.8                            |
| 1911..... | 75.2                            |           |                                 |

Thus, the increase for the decade 1905-1914 was better than 128 per cent. Since then, with the exception of the record year of 1916, a slight drop has taken place. The decrease of 10 per cent in the output of the Grozny field in 1915, as compared with 1914, was due to the decrease in fountain petroleum. The output in well petroleum showed an increase. The production at Grozny is remarkable when the steady decline in annual boring operations is considered. The aggregate borings were: 1914, 39,781 sazhen, or 278,467 ft.; 1915, 25,590 sazhen, or 179,130 ft.; 1916, estimated at 150,000 ft.

Twenty-four companies were operating in the Grozny district in 1914, of which only nineteen were oil producers. Four were well-boring companies, and one was

not operating. Of the total amount of petroleum produced in 1914, about 70 per cent fell to the share of four companies: I. A. Akhverdov & Co. (31.5 million poods), Shpiss Co. (19.1 million poods), North Caucasus Co. (15.5 million poods), and the Russian Grozny Standard (11.6 million poods). The companies with an individual production of over 10,000,000 poods claimed 78.9 per cent of the total output, companies producing 1,000,000 to 10,000,000 poods claiming 18.2 per cent of the total. The group producing less than 1,000,000 poods each, claimed only 2.9 per cent of total.

The development of boring operations, the fluctuation in the number of productive wells, and their average production are shown in Table IX.

TABLE IX. DETAILS OF GROZNY OIL FIELD

|   | 1905  | 1910   | 1912   | 1914   |
|---|-------|--------|--------|--------|
| Number of productive wells.....                           | 134   | 178    | 223    | 315    |
| Average depth.....  | 224.6 | 224.6  | 259.0  | 269.3  |
| Aggregate depth in sazhen.....                            | 5,715 | 12,548 | 17,024 | 39,402 |
| Average yearly production of one well in 1,000 poods..... | 248.9 | 317.0  | 234.9  | 226.3  |

The low and high limits in the depths of the wells in 1914 was between 37 and 528 sazhen. The maximum depths of the Grozny wells are thus greater than those of the Baku wells. Of the total number of wells, those having a depth less than 200 sazhen made up 33.1 per cent of the total number; those having a level of 200-350 sazhen constituted 42.1 per cent of the total; levels of 350-500 sazhen, 23.4 per cent; above 500, only 1.4 per cent.

Although the average yearly production at the Grozny wells declined somewhat in the decade 1905-1914, nevertheless, they are almost twice as productive as the Baku wells. Boring operations have increased considerably since 1912. During 1914, in the 298 wells boring or in process of being made deeper, it reached 39,402 sazhen, an increase of 37.7 per cent above the preceding year. The war, with the consequent difficulties in securing machinery and material, the shortage of labor, and the further decrease of exports and the enormous accumulation of petroleum at the wells, resulted in a decrease in drilling activities which amounted during the first six months of 1915 to 45.4 per cent as compared with the corresponding period in 1914. The conditions improved in 1916, when drilling was actively resumed, despite the fact that boring operations had to be carried to a depth of 4,200 ft. through hard ground. The number of active wells was 487 in 1916, and their production reached the record mark of 102,700,000 poods.

#### THE SURAKHAN OIL FIELD

The Surakhan oil field is the most productive of the new oil territories. Its development began only in 1907, although the presence of a highly refined volatile petroleum of a straw color, called "white oil," has been known for a long time. This product has a specific gravity of 0.780, and its composition is: Benzine, 48.9; kerosene, 43.9; other oils, 7.2 per cent.

This naturally purified oil is found only in small quantities, in the Sabounch oil field as well as in Surakhan. The presence of this oil, and the conditions under which distillation and condensation could take place, have not been accounted for scientifically. It is probable that "white oil" is more widely distributed around Baku than is commonly believed.

The maximum depth of the wells in 1914 was 404 sazhen (2,828 ft.). The greatest productivity was noticed at levels 172-179 sazhen, which yielded 45 per

cent of the total petroleum. The growing output of the Surakhan field is due chiefly to the intensive boring activities which have taken place since 1910. The aggregate depth drilled in 1911 was 3,169 sazhen; in 1912, 8,251 sazhen; in 1913, 13,002; in 1914, 14,783 sazhen. The average depth of the finished wells was 201 sazhen in 1914, and the average daily productivity 4,386 poods. Boring activities continued on the increase in the following years. According to "The Metallurgical Industry" ("Gorno-Zavodskoie Dielo," No. 21-22, June 10, 1916), the number of wells on March 1 was as follows:

|                       | 1915 | 1916 |
|-----------------------|------|------|
| In operation.....     | 32   | 46   |
| In boring.....        | 104  | 93   |
| In making deeper..... | 11   | 15   |

The output of the Surakhan field since 1907 is given in Table X, in millions of poods.

TABLE X. OUTPUT OF SURAKHAN OIL FIELD

|           |      |           |      |
|-----------|------|-----------|------|
| 1907..... | 0.2  | 1913..... | 39.7 |
| 1908..... | 0.3  | 1914..... | 51.3 |
| 1909..... | 1.7  | 1915..... | 60.6 |
| 1910..... | 10.4 | 1916..... | 96.4 |
| 1911..... | 19.7 | 1917..... | 96.0 |
| 1912..... | 31.4 |           |      |

The quantity of oil produced by the Tartan method has increased, which indicates that a still greater output may be expected in this field. Up to the beginning of 1915, 35 per cent of the total output was due to the Tartan method; 65 per cent to spouting wells. The following products were obtained in 1914 in thousands of poods: Gas, 1,655; white oil, 586; black naphtha, 51,289. Twenty-two companies were operating in Surakhan in 1914.

#### SVIATOI (HOLY) ISLAND OIL FIELD

Sviatoi Island lies three miles off the Apsheron Peninsula. Up to the beginning of 1908, its petroleum production was not in the aggregate over 500,000 poods, which increased to 1,000,000 poods in 1908, growing steadily until it reached 5,900,000 poods in 1914. The greatest oil producers in this district are the Nobel Brothers and the firm of Shibaiev. The total drilling in 1914 amounted to 1,042 sazhen, and the average depth of wells was 213.9 sazhen. The spouting wells produced about 10 per cent of the total in 1914.

#### CHELEKEN ISLAND OIL FIELD

Cheleken Island, lying near the eastern shore of the Caspian Sea, in the Bay of Krásnovodsk, only recently reached a high mark in production, but a decline has set in since 1913. The oil produced is brought to Baku for refining. It contains a high percentage of paraffin, leaving on refining a heavy residue of thick tar. The production of petroleum on Cheleken Island was 3,000,000 poods in 1909, which increased to 13,000,000 in 1913, after which it steadily declined. Four companies were operating in this field in 1914, and the boring activities amounted to 1,229 sazhen.

#### THE MAIKOP OIL FIELD

The Maikop region, situated on the northwestern slope of the Caucasus range, in the Kuban district, began to yield petroleum oils in 1910, but after a short boom a large drop occurred in its output. Prolific oil, high in motor spirits (11-13 per cent) and illuminants (31-38 per cent), was found at a shallow depth. In location, this is the most favored petroleum region in Europe. It is only fifty miles from Tuapse, on the Black Sea, with which port it is connected by a pipe line and by the Armavir-Tuapse railway.

The total production of oil at Maikop was 100,000 poods in 1908, which suddenly rose to 9,200,000 poods four years later. But since then a drop has taken place, and the excitement about Maikop subsided, only to be revived temporarily in 1915. In 1914, there were 242 wells in operation, having an average depth of 70 sazhen (490 ft.) The spouting wells produced 2.7 per cent of the total oil. By 1916, only five of the 66 companies founded in London for the exploitation of this oil field were still in operation.

#### THE EMBA-URAL DISTRICT

The Emba-Ural region covers the southern half of the Uralsk province, its northern boundary being a line drawn from Alexandrovski Gai on the western side of the province to the town of Temir on the east, then following the course of the Emba River to the Caspian Sea. It would be premature to estimate the extent of these fields, or to present opinions as to whether or not the whole area is oil-bearing, but the signs of oil are widely distributed, and, on the basis of the Emba wells already flowing, the untouched resources must be large. A number of oil fields lie also to the south of Emba, extending about 100 miles east of the Caspian.

Production in the Emba field began in 1912, which yielded then 1,016,000 poods, and then increased to 16,640,000 poods in 1914. The two principal centers of production are Dos-Sor, in the Emba district, and Novo-Bogatinsk. The first is still practically the only one from which oil has been exported. The shipping port for petroleum from Dos-Sor is the fishing village of Rakusha, lying at a distance of sixty-five versts on the northeastern coast of the Caspian. The refineries at Rakusha are connected with the Dos-Sor field by two six-inch pipe lines.

Three companies were operating at Dos-Sor in 1914. The greatest production fell to the Ural-Caspian Co. (9.7 million poods). Then followed the Emba Co. (Nobel Brothers) with 6.5 million poods, and the Emba-Caspian company with 0.4 million poods. There were, altogether, forty-six productive wells in 1914. At present the advantages of this region are offset by the difficulties of transportation and imperfect exploration.

The trial distillations of crude petroleum for the Ural-Caspian company, in the period April to October, 1914, gave the following results: Gasoline, 0.36; kerosene, 23.66; residues, 74.92; loss, 1.06 per cent.

The oil of the Dos-Sor gusher No. 3, of the Ural-Caspian company, is of specific gravity 0.861, and greenish in color. Lighter oils were also obtained from other wells, of specific gravity 0.85, 0.828, and 0.839. Others ran up above 0.9 specific gravity.

At Diusa, in the province of Turgai, east of the Ural province, a good oil of light specific gravity had been obtained at comparatively shallow depths. The situation of all these fields east and west of the Ural River is of prime importance to the Russian home trade, because of their proximity to the Caspian and to the Volga River.

#### OTHER OIL FIELDS

The Ferghana fields, in the central part of Turkestan, offer possibilities for greater development in the future. Production is carried on there in four regions, Shar-Sou, Mali-Sa, Chimion, and Sel-Rokho. In North Russia new oil fields have recently been discovered in the southeast corner of the government of Archangel, along the stream Ukhta. The oil-bearing area is estimated at ten million dessiatins (twenty-seven million acres), with a possible

production of 250,000 poods to the acre (T.P.G. No. 65, July 12, 1918). In Siberia oil in small quantities is found in the vicinity of Lake Baikal, and on Sakhalin Island.

#### THE OIL SITUATION SINCE THE REVOLUTION

For the first half of 1917 the total production of petroleum in Russia was 282.3 million poods, which compares well with the corresponding periods in 1913, 1914, and 1915, although it was somewhat below production of January-June, 1916, when it reached the figure of 303.7 million poods. The great decline occurred in the second half-year, after the first revolution, which brought the total for the whole year of 1917 down to 518.2 million poods, or a decrease of 83.9 million poods from the figures of 1916.

In the Baku district, in the four old oil fields alone, production for the first five months of 1917 was 157.7 million poods (P.T. No. 36-37, Sept. 30, 1917, p. 202), which was better than the corresponding period for 1916, when production stood at 141.6 million poods. But a heavy decline set in after the revolution. The data of 1917, so far as the Grozny field is concerned, comprise a production of only ten months, but as there was hardly any production at Grozny in November and December, as a consequence of riots and incendiary fires, the 1917 production, 518.2 million poods, may be regarded as complete.

#### DECREASE OF PRODUCTION IN 1918

The year 1918 was catastrophic for Russia's petroleum industry, and, except for the principal fields, complete data for all oil fields are not available. The continued falling off in production may best be studied in the Baku region. Thus, the five principal Baku fields (the four old oil fields and Surakhan) produced in the first quarter of 1918, 71,321,000 poods, as against 93,512,000 poods for the corresponding period in 1917, the decrease amounting to 22,191,000 poods, or 23.7 per cent (T.P.G. No. 27, May 26, 1918). In the second quarter, production fell off still further, the total for six months being 38.1 per cent below that of 1917 (T.P.G., No. 77, July 26, 1918). The monthly decline ranged from 28.4 million poods in January, to 17.5 million poods in June, 1918.

The total production for these fields for the first six months of 1918 was 116.8 million poods, as against 188.8 million poods for the first six months of 1917. Even if one should allow 7.3 million poods for the missing thirteen days in May, caused by the change in the Russian calendar (the Gregorian calendar was introduced on June 1, 1918, with a deletion of thirteen days, so that the nominal length of May was only eighteen days), the decrease would still be 35 per cent of the total for the latter period.

The chief causes of the decline were a partial cessation of boring activities, and a shortage of money and provisions, which caused 5,000 workmen to migrate. The drilling of new wells in 1918 declined by 60 per cent as compared with the number drilled in 1917. Under these circumstances, the Naphtha Committee of the Soviet of National Economy expected only 275 to 300 million poods from all Russian oil fields, including 200 million poods from Baku ("Ivestia," June 22, 1918), from which amounts should be deducted the fuel needs of the wells and the requirement of the Caucasian railways and the naphtha fleet.

According to a report from the economic section of

the British Military Mission in South Russia, published in "The Board of Trade Journal" for Feb. 5, 1920, the output of oil at Baku for the first half year of 1918 was 117,352,484 poods (the Russian estimate was 116.8 million poods), and 53,149,805 poods during the second half-year. Thus, in round figures, the production of the five principal Baku fields during 1918 was 170,000,000 poods, or about 48 per cent of 1917. The situation was clearly reflected on individual properties, as the Royal Dutch Co., for instance, the production of which during the first eleven months of 1918 amounted to 411,476 tons, as compared with 689,311 tons for the corresponding period in the year preceding, a falling off of 42 per cent ("Oil and Gas Journal," Sept. 26, 1919).

#### IMPROVEMENT IN BAKU FIELDS

In 1919 the situation at Baku improved considerably. Baku, on the whole, experienced little in property destruction, and the fields have remained intact. According to the British Military Mission, the production of the Baku fields in the first half-year of 1919 amounted to 104,674,528 poods, or about 30 per cent of normal. The output has been growing since June, until the present normal monthly production is estimated at 20,000,000 poods.

During the whole of 1919 only 1,790 of Baku's 6,000 wells were being exploited. There is great difficulty in securing the necessary supplies of oil-well material. A satisfactory element in the present situation is the fact that fountain oil has been struck in the Bibi-Eibat, Surakhan, and Binagad fields. The production of Baku, owing to the serious falling off in exportation, has gone chiefly into stocks, until no more storage is available, and oil at present is being stored in open warehouses.

#### GROZNY FIELD NEXT IN IMPORTANCE TO THAT OF BAKU

As to the oil fields outside Baku, Grozny is of course of first importance. This field has declined heavily and been seriously damaged since the Bolshevik revolution. In August, 1918, a number of tanks were destroyed by shell fire, the damage being especially great in the eastern properties. On the Bielik-Chermoiev properties all the plants above ground were burned and some "spouters" set on fire. Fires again broke out in March and September, 1919, destroying ten oil wells, twenty-four reservoirs belonging to the Vladikavkaz railway, and consuming several million poods of petroleum. Production during 1918 and the first half of 1919 was practically at a standstill; but since the middle of the summer of 1919 there has been considerable activity there, the damage has in part been made good, and production resumed on a small scale.

#### AVAILABLE STOCKS

From the estimates it appears that the present stocks at Baku, Grozny, and Emba-Urbask total nearly 293,000,000 poods of crude and refined oil. The importance of these stocks for Russia's railroads, river fleet, and industries is significant.

The average annual shipments, in 1912-1914, of various petroleum products from Baku alone amounted to 354,200,000 poods, 82 per cent of which used to go by way of Astrakhan and then up the Volga River. Astrakhan is the natural gateway for practically all petroleum products destined for home consumption, and in addition to Baku products it receives those of the Grozny and Emba refineries.

## Activity Increasing in Oil Fields Of Rumania

During their occupation of Rumania, the Germans put into a state of production 432 out of 962 wells existing on July 1, 1916, and they raised the yield of oil to 75 per cent of that of July 1, 1916, according to the *Chamber of Commerce Journal*, of London. Since their departure, 508 wells have been put in working order, but the number of borings has been reduced from 208 to 119 through lack of material.

The gross production in 1917 was 520,000 tons, or 35 per cent of normal; in 1918, 1,200,000 tons, or 80 per cent of normal; in the first six months of 1919, 527,000 tons, or 70 per cent of normal. The pre-war production was 5,000 tons daily; the production in October, 1919, was 3,000 tons daily. At the end of November, 1919, there were 250,257 tons of oil in stock at the refineries, whose total capacity was 260,000 tons, and in reservoirs there were 35,000 tons. Before the war 1,800,000 tons of oil was produced annually, and now, with Transylvania, it is estimated that 4,000,000 tons will be the annual output.

#### The Search for Oil in France and Her Colonies

In the course of a parliamentary discussion on the régime of oil, the French Undersecretary of State for Mines made the following declaration, which appears in *L'Echo des Mines et de la Metallurgie*:

"It has been quite properly pointed out that very interesting searches for oil are to be made in our country. I may state that from the funds yielded by the liquidation of the consortium, we plan to reserve a certain amount in order to carry out the absolutely necessary investigations. Geologic studies are about to be begun in the Landes, the Bassess-Pyrenées, Puy-de-Dôme, the Jura, and Hérault. Our efforts will also extend to our colonies. The explorations in Algeria and Morocco are to be developed and co-ordinated, while Madagascar and Indo-China are particular objects of our concern."

#### Oil in Argentina

Petroleum is the most important of the mining products of Argentina, according to *Commerce Reports*. The output of petroleum from the national-owned oil wells at Comodoro Rivadavia, in the Territory of Chubut, which are operated on behalf of the government by the *Compañía Argentina de Comodoro Rivadavia, Exploración de Petróleo*, has been as follows for the years 1914 to 1918: 1914, 40,689 metric tons; 1915, 75,869 metric tons; 1916, 120,695 metric tons; 1917, 168,984 metric tons; 1918, 182,468 metric tons.

Four petroleum companies are now actually producing oil in the Comodoro Rivadavia fields, by far the most important being the government agency. There are at present seven petroleum refineries in Argentina, but only one of these is of special importance.

The prices for petroleum ranged in 1916 from 10.62 gold pesos to 25 pesos per metric ton [1 peso = \$0.965]. In 1917 they ranged between 30 and 47 pesos, and in 1918 varied between 51 and 98 pesos. At the beginning of 1919 the price had gone up to \$108.71 American currency, f.o.b. Buenos Aires, per metric ton, this being the record price for the oil, as against about \$10.61 in 1915. Later in January, 1919, the price was about \$64. The prices declined from then on.

## ITEMS FROM THE OIL FIELDS

### Advance of Oil Prices Investigated

#### Federal Trade Commission Makes Report on Causes Underlying Increases—Remedies Suggested

A report has been submitted by the Federal Trade Commission to the House of Representatives in response to House Resolution No. 561, directing the commission to make immediate inquiry into the cause of the recent advance in the prices of all petroleum products. The data contained in the report were secured from a number of sources, with such other information regarded as necessary to a complete study of the situation.

In the opinion of the commission, the advance in the price of petroleum products may be ascribed to the following: the varying conditions of supply and demand, rather than a combination in restraint of trade; the strong demand for petroleum products, coupled with the difficulty of many companies in getting adequate supplies of crude oil; the strong demand for crude oil; the decline in stocks, increased cost of drilling and producing crude oil, and the unfavorable developments in the Mexican oil field.

In suggesting recommendations, the commission says that the development of oil production by domestic operators in foreign countries should be encouraged; consideration should be given to the advisability of restriction upon the exportation of domestic crude oil and its products; a study of methods should be carefully made, with a view to correcting those which are wasteful; investigation should be made of the possibilities of oil shales, and information regarding changes in industrial and commercial conditions in the oil trade should be collected and reported by persons properly equipped to deal with conditions from all angles.

### Exploration in Western Canada

*From Our Special Correspondent*

The oil exploration program of the Imperial Oil Co., Ltd., for Western Canada is on a more extensive scale than was projected earlier in the season. There are now nine drilling equipments in different parts of Saskatchewan and Alberta ranging from the vicinity of the 49th parallel of latitude to close to the Arctic circle. The party that wintered on the Mackenzie River is being relieved by others who were expected to leave Peace River Crossing during the latter part of May. In addition to the well that is being sunk in the far North, a drilling rig is operating near Great Slave Lake and three drilling parties are working in southwestern Alberta near the foothills.

### State Department Seeks Conservation of Oil Lands

Regulations under which the oil lands embraced in the co-called Land-Leasing Law are to be operated have just been promulgated by John Barton Payne, Secretary of the Interior, and are to be administered by the Bureau of Mines. These regulations which were recently drawn up in a conference between representatives of the department and oil operators and cover the actual operations as well as the drilling of wells, production, and gaging of oils, do not supersede or conflict, but supplement, those first promulgated by the Secretary of the Interior covering the form of leases, royalties, and related matters, which are to be administered by the Commissioner of the General Land Office.

The operating regulations are based upon similar rules governing the Osage Indian oil lands in Oklahoma and modified in accordance with the varying conditions prevailing in the states where the leases will be operated. Cognizance is likewise taken of the several state conservation laws in Louisiana, Wyoming, and California, where the principal production is expected from such public lands. The first draft of these regulations was submitted to a conference of representatives of the various states and oil men.

### Dauphin District, Manitoba, Considered Unfavorable for Oil

*From Our Special Correspondent*

Prof. R. C. Wallace, Commissioner for Northern Manitoba, who with Hugh McNair, engineer of the Public Utilities Commission of Manitoba, was appointed by the government to make a thorough survey of the Dauphin district with regard to oil, has made a report recommending that a drilling outfit be sent to the district to sink a shaft of at least 1,000 ft. depth, and that Mr. McNair be placed in charge of the work. He says that the limestones of Manitoba are not considered favorable for the collecting and retaining of oil pools, and that sufficient work has been done in the southern part of the province to demonstrate that oil discoveries are unlikely. He does not think that the well already sunk in the district, in which oil was struck in the process of boring for water, has been "salted." The report concludes as follows:

"While no one who knows the situation well can feel enthusiastic at the present moment in regard to the possibilities of oil reservoirs in this district, the importance of oil is so great that no possibilities, even if merely possibilities, should be overlooked."

### Unification of Interstate Oil Operations Prohibited

#### Rules Governing Tracts in Red River Oil Lands—Dispute Between Oklahoma and Texas—News of the Louisiana Oil Fields

*From Our Special Correspondent*

In the Red River oil land dispute between Oklahoma and Texas, Attorney General Palmer has decided that the recommendation of Federal Receiver Delano, that oil operations be unified, is unconstitutional, as that would necessitate taking earnings from one property and using them on another. It is stated the Attorney General will recommend that all the lands not in the river bed, and claimed under patents from the State of Texas, be turned back to the claimants and be operated under the orders of the Supreme Court, the operators setting aside a royalty in accordance with the regulations concerning Indian lands.

In the case of a well drilled or drilling in this section, except dry, abandoned or ruined wells, a five-acre block will be laid off around such well, and a lease offered to the driller or his assignee on the same terms as govern the high land, except the royalty will amount to one-fourth. The remainder of the river bed will be divided into twenty-five acre blocks and leased at public auction to the highest bidders.

Drilling must start within sixty days, not more than four wells may be drilled on a twenty-acre tract, except specially authorized offset wells, and the lessees may operate during the term of the receivership under the conditions conforming to the recognized commercial leases in force in Burkburnett and the Northwest Extension.

The Standard Oil Co. of Louisiana, according to an announcement at Shreveport, has purchased the Hunter leases in Ouachi, Union, and Columbia counties, Arkansas.

Upon application for the issuance of complaint, the Federal Trade Commission has, as required by law, the public interest appearing, cited the Dove Oil Co. of Wichita Falls, Tex., in a complaint of unfair competition in trade. Forty days are allowed for filing of answer, after which time the case will be set down for trial on its merits. The commission's complaint is directed to misrepresentations to the public in selling oil stock. The company is cited to answer averments of using false and misleading statements concerning the location of its leased oil lands, the benefits which purchasers and the public might derive from purchasing its stock.

# ECHOES FROM THE FRATERNITY

## Mineral Industry of Queensland, 1919, Fell Behind 1918

### By One-Half

Weather, War, and Peace the Chief Causes of the Decrease—Gems Showed an Increase of 250 Per Cent

W. P. Geary's review of "Mining in Australia in 1919," appearing in the *Engineering and Mining Journal* for Jan. 17, 1920, was necessarily written before complete statistics for that year were available. As far as the State of Queensland is concerned, the annual official compilation has been delayed a month later than usual through a strike of marine engineers on the Australian coast, which so disorganized the mail services of that extensive state that official statistical reports forwarded from the remote North, the chief locus of mineral production, became uncertain and were always belated.

However, the official résumé of the year 1919 has now been finished, and shows the total mineral production for Queensland worth £2,472,027 (\$11,865,730), which was, owing to things generally appertaining to mining being out of joint, a falling off amounting to no less than £1,268,898 (\$6,090,716) as compared with the yield for 1918. Three factors operated to cause this abnormal decline: (1) Reduced market values, owing to the release by the British authorities of large quantities of copper and other metals previously held in reserve for war purposes; (2) a shipping strike, which lasted eight months and held up the supply of explosives and other requisites for use in mining; and (3) dry weather conditions.

Copper alone, now the chief mineral product of the state, showed a comparative decline in yield of over £1,100,000 (\$5,280,000), the output for the year having been valued at £952,501 (\$4,572,005), and the value of tin declined from £251,755 (\$1,208,424) in 1918 to £143,167 (\$687,202) in 1919.

The yield of gold has been falling almost continuously for about sixteen years, and from 668,546 fine oz. (\$13,624,968) in 1903 dropped to 121,030 oz. (\$2,466,591) in 1919. The only item in the return for 1919 in which there has been an increased production is that relating to gems (sapphires), which shows a record output of £42,883 (\$205,838) as against only £16,600 (\$79,680) for 1918. There are indications of expansion in coal mining, although the quantity produced, nearly 1,000,000 tons, worth £952,501 (\$4,572,005), was a slight decrease, accounted for by the shipping strike. A vast area in Western Australia is opal-bearing, but the prevailing conditions there make mining difficult, and, despite the fact that the opal found ranks among

the best in the world, production has fallen to only about £600 (\$3,000).

For many years, apart from the gold yield, the production of other minerals in Queensland has grown rapidly, rising from £300,000 (\$1,440,000) in 1900 to over £3,000,000 (\$14,400,000) in 1918.

## Marsh Disaster Demonstrates Danger of Carbon Monoxide

Three men, one of them the superintendent, were killed by carbon monoxide recently in a prospect shaft a little more than 200 ft. deep at the Marsh mine, near Burke, Idaho. An official investigation of the disaster has been made by Robert N. Bell, state inspector of mines. He found that the shift working in the bottom of the shaft came off at midnight, firing a round of fifteen holes, marking up two missed holes, and turned the air on from the compressor for two hours to blow out smoke and gas. The next morning Fred Bergen, the superintendent, was lowered as usual to connect up the pump. About twenty minutes later he signalled to be raised, but when the bucket came up he was not there. Alarmed for his safety, two other men, Johnson and Connolly, went down, not suspecting gas, as they could see the light in the bottom of the shaft. Both were overcome and fell into the sump, as Bergen had, and were drowned.

Mr. Bell's investigation found that the powder in one of the missed holes had burned, causing the gas, which was held in a little crosscut that had been started and in which was an overbreak pocket in the roof a little higher than the portal in which the gas may have been sealed by the rising water and released when Bergen connected the pump. He has called special attention to the dangerous character of carbon monoxide gas.

## Idaho School of Mines Offers Research Fellowships

In co-operation with the U. S. Bureau of Mines and the Idaho Bureau of Mines and Geology, the University of Idaho offers in the School of Mines a number of fellowships, open to college graduates who have had good training in mining, metallurgy, or chemistry, and who are qualified to undertake research work. The annual income of each fellowship is \$900, beginning July 1, 1920.

Fellows will register in the University of Idaho as candidates for M. S. in mining or metallurgy (unless an equivalent degree has been earned). The greater portion of their time will be spent in research work under the direction of the Bureau of Mines staff resident at the university. Applications should reach Francis A. Thomson, Dean, School of Mines, Moscow, Idaho, before June 15, 1920.

## Committee on Standardizing Equipment Appointed

American Mining Congress Has Completed Organization—Charles A. Mitke Chairman of Metal Mines Section

The American Mining Congress has practically completed the organization of the metal mines section of the committee on standardization of mining equipment. The chairman of this general committee is Charles A. Mitke, of Bisbee, Ariz. The committee is composed of the chairmen of the various sub-committees and has a membership representing in a very special way the various divisions of the subject which must be discussed and the problems to be worked out. The chairmen of the various sub-committees are as follows:

Underground transportation, Edwin Higgins, San Francisco; underground shoveling machines, John Knox, Jr., general manager, Calumet & Hecla Mining Co., Calumet, Mich.; drilling machines and drill steel, Norman Braly, general manager, North Butte Mining Co., Butte, Mont.; mine ventilation, F. W. MacLennan, manager, Miami Copper Co., Miami, Ariz.; steam shovel equipment, C. B. Lakenan, general manager, Nevada Cons. Copper Co., McGill, Nev.; standardization of mine timbers, Norman Carmichael, general manager, Arizona Copper Co., Clifton, Ariz.; and fire-fighting equipment, William Connibear, mine inspector, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

Col. Warren R. Roberts, chairman of the coal mining section of the standardization committee, and Mr. Mitke, chairman of the metal mines division, expect shortly to call a meeting of all sub-committee chairmen of both coal and metal mining committees in Denver to discuss the program for the year in connection with the reports to be made at the twenty-third annual convention at Denver during the week of Nov. 15 next.

## Research Council's Officers Elected

The National Research Council has elected the following officers for the year beginning July 1, 1920: Chairman, H. A. Bumstead, professor of physics and director of the Sloane physical laboratory, Yale University; first vice-chairman, C. D. Walcott, president of the National Academy of Sciences and secretary of the Smithsonian Institution; second vice-chairman, Gano Dunn, president of the J. G. White Engineering Corporation, New York; third vice-chairman, R. A. Millikan, professor of physics, University of Chicago; permanent secretary, Vernon Kellogg, professor of entomology, Stanford University; and treasurer, F. L. Ramsome, treasurer of the National Academy of Sciences.

## Book Reviews

**Tungsten Ores.** By R. H. Rastall and W. H. Wilcockson. Imperial Institute Monographs on Mineral Resources. With Special Reference to the British Empire. Prepared under the Direction of the Mineral Resources Committee of the Imperial Institute, with the Assistance of the Scientific and Technical Staff. John Murray, London; 1920; pp. 81.

This pamphlet is one given out under the auspices of the Mineral Resources Committee of the Imperial Institute. "The object of these monographs," states the chairman of the committee, is to give a general account of the occurrences and commercial utilizations of the more important minerals, particularly in the British Empire." The plan and treatment somewhat resemble those of the Political and Commercial Geology papers which already have been published in the *Engineering and Mining Journal*, and the present pamphlet on Tungsten recalls the paper by Frank L. Hess in our Nov. 1 number, except that the pamphlet under review is more detailed and does not go so far into the question of commercial control as the American papers (now being published in book form).

This monograph or pamphlet is exceedingly well and carefully written, and is worthy of perusal; it is a valuable compendium of the geographic and geologic occurrences of tungsten, its uses and its extraction. It is illustrated with two production charts. In this pamphlet wolfram is used as a synonym for wolframite, and applied in a broad way to cover the whole ferberite-hübnerite group (tungstates of iron and manganese) in conformity with what is stated to be a miner's term. The use of the word "wolfram," often still more loosely used in England as a synonym for tungsten, is somewhat confusing to Americans.

J. E. S.

**Statistics in Business.** By Horace Secrist, Ph.D., Cloth; 5½ x 8½; illus; pp. 130. McGraw-Hill Book Co., Inc., New York. Price, \$1.75.

Ninety per cent of the failures in business are probably due to a very human inclination to ignore unwelcome and discouraging facts. Especially is this true of the more or less emotional American business man. Witness our decades of attempts to sell to Central and South America not what the people of those countries wanted to buy, but what we wanted to sell to them. The Germans knew better. They studied and analyzed the facts, ordered their business course accordingly—and gobbled the market. Professor Secrist insists that there is a science of business and that the method by which it is discovered and stated is the same as that employed in the natural sciences. He

points out the need of a business synthesis and study of the basic principles underlying fact analysis, contending that scientific business methods imply an unconditional demand for the truth, and that the method is (1) intelligent observation; (2) impartial analysis; (3) logical inference; and (4) sincere application of the conclusion reached to the problem to be solved. His book will prove of genuine service in promoting the study and arrangement of significant data, and may well serve also as the nucleus of a library of correct business procedure. It has for centuries been the practice of science to collect and collate all available data respecting the particular subject in hand, but business, as a rule, has been conducted strictly by rule-of-thumb. The need of a change is evident, and the value of "Statistics in Business" lies mainly in the volume's insistence on this fact. The book is well illustrated by charts and graphic-curve blocks, and will be of material assistance to all with sufficient discrimination to appreciate its character and worth.

W. N. P. R.

## Technical Papers

**Lead Smelting**—A paper by Gilbert Rigg which appeared in the May issue of the *Bulletin of the Institution of Mining and Metallurgy* will prove of considerable interest to all engaged in smelting complex lead-zinc ores. The title of the paper is "Roasting and Lead-Smelting Practice at the Port Pirie (S. A.) Plant of the Broken Hill Associated Smelters Proprietary, Ltd.," and it may be obtained from the offices of the Institution, 1, Finsbury Circus, London, E. C. 2, "at a nominal charge." Many of our readers, by the way, would like to know what this nominal charge is, and we suggest to the Institution, that the price of such papers be published.

Two classes of concentrates are smelted. Their percentage composition is as follows:

|                                      | Granular Conc. | Slimes |
|--------------------------------------|----------------|--------|
| Pb .....                             | 63.0           | 57.0   |
| Zn .....                             | 7.0            | 11.0   |
| Fe, Mn .....                         | 4.7            | 4.3    |
| S .....                              | 14.5           | 18.0   |
| CaO .....                            | 1.5            | 1.5    |
| Al <sub>2</sub> O <sub>3</sub> ..... | 1.5            | 1.0    |
| SiO <sub>2</sub> .....               | 5.0            | 3.5    |

Two methods of roasting were formerly used: (1) The two grades were mixed, and oxidized lead ore, limestone and ironstone (siderite?) added, after which the charge was partly roasted in Ropp reverberatory roasters. The product was transferred to H-H pots for a final roast. (2) The mixture of concentrates was partially roasted on a Dwight & Lloyd machine, crushed, and again passed over a D. & L. machine. The first method gave the best results,

but both were unsatisfactory. Investigation proved that the sulphur combined with zinc is more easily roasted off than that combined with lead. The only trouble caused by zinc is that the rapid evolution of heat which its roasting occasions may tend to fuse the galena. The presence of ¼- to ½-in. chunks of limestone and ironstone in the charge was also found to be deleterious. They should be crushed as fine as the rest of the charge for D. & L. roasting.

Handling the dried slime concentrates by means of screw conveyors was also found to disintegrate the lumps too much, and after installing belt conveyors much more even roasting was obtained. Water-granulated blast-furnace slag was found to be preferable to the ironstone formerly used. It also contained silica and lime, which had before been added separately. After effecting these changes, the second roasting yielded a sinter of the following percentage composition: Pb, 47.5 to 48.5; Zn, 7.5; SiO<sub>2</sub>, 8 to 8.5; FeO, 13.0 to 14.0; MnO, 3.0; CaO, 5.5 to 6.0; S, 2.5 to 3.0. The D. & L. machine will be used hereafter for the initial roasting, but whether that machine or H-H pots will be employed for the final roasting has not yet been decided. The H-H sinter is stronger than the D. & L., but is less porous. The H-H is more massive and stands rough handling better, but the blast furnaces run better on a mixture of the two.

Broken Hill zinc concentrates also presented a roasting problem. The best method of handling such material was found to be to roast in a reverberatory from 30 to 9 per cent S, and then to 1 per cent in a D. & L. The latter machine was found to eliminate 270 lb. of S per sq.ft. of grate surface per twenty-four hours.

Zinc is a trouble maker in the blast furnace only when combined with sulphur. Then, a zincky matte of a mushy consistency containing about 14 per cent of Zn lends itself to the building up of accretions inside the furnace. With more copper in the ore (Cu is less than 1 per cent at this plant), higher sulphur can be carried.

The blast furnaces, with the improved roasting, run smoothly and hot. The composition of the slag is about as follows: SiO<sub>2</sub>, 24.2; FeO, 25.6; MnO, 5.3; CaO, 11.0; ZnO, 20.0; Pb, 1 to 2. Later it is hoped to recover some of this zinc either by blast treatment or in a reverberatory furnace.

**Technical Journalism**—The sixtieth anniversary number of the *Mining and Scientific Press* was published on May 22. The principal article gives the experiences of T. A. Rickard in the field of technical journalism, and is written in the editor's characteristic vein. Most of the space is devoted to Mr. Rickard's experiences on the *Engineering and Mining Journal*. In 1905, according to Mr. Rickard, synchronously with his leaving the staff of the *Journal*, it "ceased to be the organ of the mining profession and became one of a syndicated group of trade papers"!

## MEN YOU SHOULD KNOW ABOUT

**L. S. Cates**, of Salt Lake City, Utah, was a visitor in Ray, Ariz., recently.

**F. S. Norcross, Jr.**, of Goodrich, Lockhart & Co., Valley Ranch, N. M., is in New York City.

**R. H. Gross**, accompanied by some of the East Butte officials, has been inspecting the property of that company.

**S. H. Cathcart** sailed from Seattle June 4 to engage in stratigraphic studies of mineralization on the Seward Peninsula of Alaska.

**Charles A. Burdick**, mining engineer, 120 Broadway, New York, N. Y., has just returned from examining some graphite properties in Alabama.

**William Young Westervelt**, mining engineer, announces the removal of his office to Fifth Avenue Guaranty Building, 522 Fifth Ave., New York City.

**Harry J. Wolf**, mining engineer, examined mining properties in southwestern Idaho during the latter part of May, and returned to New York last week.

**George B. Richardson** is making a trip through Texas, Oklahoma, Louisiana and Kentucky in connection with the Geological Survey's work on petroleum.

**B. L. Johnson** will be in charge of the foreign section of the Division of Mineral Resources of the Geological Survey during the absence of Eugene Stebinger.

**Charles F. Sturtevant**, Felt Building, Salt Lake City, Utah, was in New York recently, having just returned from a three-months' trip to Bolivia for New York interests.

**R. L. Chase**, of E. E. Chase & Son, mining engineers, Colorado National Bank Building, Denver, Col., is examining oil shale properties in Colorado and Utah.

**Benjamin Magnus**, mining engineer, 320 Fifth Ave., New York City, sailed for Europe on June 19, and will remain abroad for several months. Mail addressed as above will be forwarded.

**B. S. Butler** will leave the service of the Geological Survey June 30, to become associated with L. C. Graton in a study of the geologic problems of the Calumet & Hecla mines of Michigan.

**Oscar H. Reinholt**, mining engineer and oil geologist of San Diego, Cal., announces that he is now to be addressed in care of Oil and Gas Valuation Section, U. S. Treasury Annex No. 1, Washington, D. C.

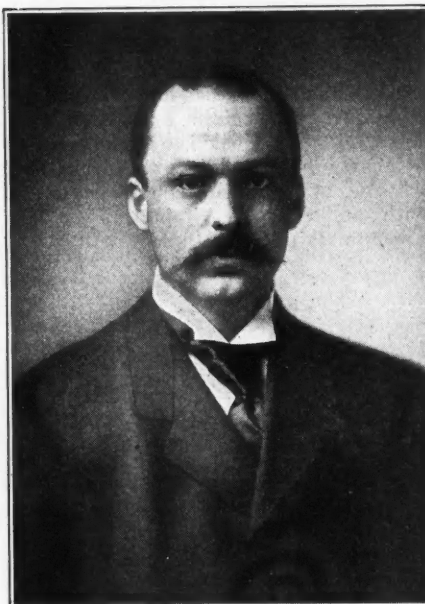
**Charles S. Smith**, president of Old Dominion Copper Mining & Smelting and the Arizona Commercial Mining companies, 50 State St., Boston, left that city on June 10 to inspect the mines at Globe, Ariz.

**G. G. Wald**, of Phoenix, Ariz., spent the month of May making examinations

in central Sonora. In the districts Mr. Wald visited mining is not handicapped by revolutionary troubles, and much development is being done.

**Ivan De Lashmutt**, who has been mine superintendent for Standard Silver-Lead Mining Co., Silverton, British Columbia, has resigned to go into private practice. Mr. De Lashmutt's address is 1012 South Maple St., Spokane, Wash.

**Richard Alexander Fullerton Penrose, Jr.**, 460 Bullitt Bldg., Philadelphia, Pa., who was recently elected with Arthur R. Ronaghan, to the Board of Directors of Chino Copper Co., is the third of



*Gutekunst, Phila.*  
R. A. F. PENROSE, JR.

four brothers well known beyond their native city of Philadelphia. The oldest brother has represented his state in the U. S. Senate since 1897, the second is a prominent physician, surgeon, and teacher, and both the two younger brothers are geologists and mining engineers. Dr. R. A. F. Penrose, Jr., (born Dec. 17, 1863), after securing his Ph.D. from Harvard in 1886, was assistant geologist on the Texas Geological Survey in 1888, and on the Arkansas survey from 1889 to 1892. He taught economic geology from 1892 to 1911, first at Leland Stanford, Jr., and then at the University of Chicago. In 1894 he held a special commission from the U. S. Geological Survey to study the gold districts of Cripple Creek, Col. He was a delegate to the International Geological Congress at Stockholm, Sweden, in 1910, and president of the Commonwealth Mining & Milling Co., of Pearce, Ariz., whose mine closed down in 1917.

Economic and chemical geology, particularly the origin of ores and other mineral deposits, have specially interested Dr. Penrose, and he has written a number of important contributions to their literature. He has been co-editor of the *Journal of Geology* for a number of years.

**Phillip S. Smith**, administrative geologist, U. S. Geological Survey, will leave Washington June 15 to do geologic work in the Yukon-Tanana region of Alaska. During his absence, **Marius R. Campbell** will serve as administrative geologist.

**William Curley**, mining engineer of Chisholm, Minn., has been made editor-in-chief of the Engineer's Manual being prepared by the Engineers' Club of Northern Minnesota. Mr. Curley was formerly with the Oliver Iron Mining Co. at Hibbing, Minn.

**J. C. Pickering**, mining engineer, has opened an office at Avenida Juarez No. 83, Mexico City, Mexico. He may also be addressed at Apartado 534, that city. Mr. Pickering resigned from the U. S. Bureau of Mines about a year ago, to resume private practice.

**E. J. Erickson** now has general supervision of the operating department of the Tonopah Divide Mining Co. **William Watters** has resumed his position as mine superintendent, and **George H. Garey** has been appointed consulting geologist to that company.

**R. S. Merriam**, of the mining engineering firm of Merriam & Merriam, Wallace, Idaho, has recently opened an office in the Sherwood Block, Spokane, Wash. Mr. Merriam is in charge of the Callahan Zinc-Lead Co.'s molybdenum mine at Climax, Col.

**F. J. Crossland**, mining engineer, 1019 Metropolitan Building, Vancouver, B. C., has been commissioned to examine and report to the provincial department of mines on the Whitewater River limonite deposits. He expected to start for the Whitewater early in June.

**J. W. Bell**, associate professor of mining at McGill University, is conducting a class of seventeen students in mining through the principal mines of the Kootenay. The party has a private car and uses it as a hotel during the trip. Professor Bell is assisted by **E. G. Harding**, a graduate of the University of Johannesburg, Union of South Africa.

**Max W. Ball**, of Cheyenne, Wyo., formerly general manager of the Rocky Mountain Division of Roxana Petroleum Corporation, is now general manager of the Matador Petroleum Co., of Cheyenne, Wyo. The Matador company has been organized to take over the activities in the Rocky Mountain States, of the Roxana Petroleum Co. of Oklahoma, Roxana Petroleum Corporation and the Shell Co., of California.

**Charles Camsell**, of Vancouver, who has been in charge of geological work for the Dominion government in British Columbia, has been appointed Deputy Minister of Mines at Ottawa. He is a son of a Hudson's Bay factor and was born in the McKenzie River district at Liard. Mr. Camsell has been with the Dominion geological service for sixteen years, fifteen of which have been spent in work in British Columbia. The retiring deputy minister, **R. C. Mc Connell**, has been granted superannuation at his own request.



# THE MINING NEWS

## LEADING EVENTS

### Almost a Million Involved in Transfer on Mesabi Range

Adams Security Co. Sells Iron Lands and Royalty Interests to David T. Adams of Chicago

Mineral lands on the Mesabi Range and interests in royalties valued at \$940,500 are transferred from the Adams Security Company to David T. Adams, of Chicago, in quit claim deeds presented for recording to the register of deeds for St. Louis County, Minn. The real estate and royalty rights are transferred in three separate deeds. One deed involves a prospect immediately west of Mohawk and Miller mines at Aurora, the second a prospect north of the Hartley-Burt and west of the old Croxton at Chisholm, and the third the Tener mine at Chisholm. The first deed transfers an undivided one-fourth interest in the northeast quarter of the southwest quarter and the northwest quarter of the southeast quarter of section 5, 58-15 and one-fourth of the royalties accruing under a lease running to R. M. Bennett and E. J. Longyear. The consideration is \$590,500. The second deed conveys an undivided one-fourth interest in the southeast quarter of the southeast quarter of section 14, 58-20 and a one-fourth interest in all royalties accruing from a lease running to the Weed Iron Co. The consideration is \$25,000. The third deed conveys an undivided one-fourth interest in the northwest quarter of the southeast quarter of section 28, 58-20 and royalties accruing from the lease. The consideration involved in this last transaction is \$325,000.

### Maine Court Will Try Arizona Commercial-Iron Cap Case

The Supreme Court in Equity of Maine has returned a verdict in the Arizona Commercial-Iron Cap litigation finding that the suit brought by the former for alleged illegal extraction of ore falls within the court's jurisdiction and that it will be tried before it. The second suit involving damages for the pumping of water which it was alleged should be borne by Iron Cap, was found not to be within that court's jurisdiction.

### Arizona Commission Grants Lower Freight Rates on Ore

Reduced railroad rates on ores and concentrates have been granted by the Arizona Corporation Commission between various points, including Ajo, Hayden, Douglas and Globe. These are now being reviewed by a representative of the Interstate Commerce Commission, with the idea of possible extension to El Paso.

#### WEEKLY RESUMÉ

*Contrary to expectation, the Federal Mining & Smelting Co. has been refused permission by Judge Deitrich to appraise from the Hecla workings by way of preparation for the pending apex suit. In Oklahoma, opposition on the part of certain operators has developed to the proposal to remove the restrictions from the Quapaw Indian lands. An important deal involving the transfer of iron lands on the Mesabi Range has been consummated. James MacNaughton, general manager of the Calumet & Hecla, has declared before the business men of Houghton that other industries must enter the copper country, if the mining companies are to continue. The Arizona Commercial-Iron Cap suit for the illegal extraction of ore from the former's workings will be tried before the Maine Supreme Court. At Ottawa, the Yukon Placer Mining Act has been amended by the House of Commons. Charles Camsell, of the Canadian Geological Survey, has been appointed deputy Minister of Mines.*

### Copper Country Needs New Industries, MacNaughton Says Many Miners Leaving for Busier Centers Because of Lack of Work for Their Children

BY HOMER A. GUCK

Talking to the Houghton Chamber of Commerce recently, James MacNaughton, general manager of the Calumet & Hecla company, plainly stated that his corporation and every other copper company operating in the district would suspend operation today, if it considered only the financial interest of the corporation; that a bettered copper market, which he believed to be in the immediate future, would find Michigan mines unable to profit from it in substantial measure because of the present shortage of labor; that the general business interests of the various towns in the Michigan copper district had too long taken it for granted that the copper mines were the best wage payers and the most certain profit producers; and that co-operation of the business interests with the mine management to the end that diversified interests of a general manufacturing nature should be brought to the district was an absolute essential to the continuance of the prosperity of the district.

The exodus of labor from this district, Mr. MacNaughton said, was not due to dissatisfaction of the men themselves but to the inability of the highest class labor to find employment for their sons and daughters. Boys cannot work in the mines excepting in rare instances; girls cannot work there at all. Other industries must be provided for them, to prevent the families from moving to other districts. The condition referred to has existed for some time.

### Federal Company Not Permitted To Raise from Hecla Workings

Court Holds Same Result Can Be Obtained by Sinking on Vein Apexing in Russell Claim

Judge Deitrich, of the United States Court for the district of Idaho, sitting at Coeur d'Alene, has denied the application of the Federal Mining & Smelting Co. to raise from the workings of the Hecla Mining Co. as a means of proving its contention that the apex of the east Hecla vein is in the Russell claim, owned by the Federal. The court first granted the petition of the Marsh Mines Consolidated, which has a lease on the Russell claim, to enter the case as an intervenor. Taking up the application of the Federal, Judge Deitrich said in part:

"The plaintiff urges, and the defendant does not deny, that the suggested exploration could be carried on more expeditiously and with less expense by raising from the tunnel, but admittedly the same result could be accomplished by going down upon the vein with its apex in the Russell. Unless, therefore, the expense of sinking is prohibitive or is out of the range of reason, or the delay will result in serious prejudice to the plaintiff, either in its substantial rights or the remedies now available to it, it cannot be properly held that the requisite necessity exists.

"It must be admitted that the right to use the tunnel would be highly beneficial to the plaintiff, and that in view of the fact that the use would be without loss or serious inconvenience to the defendant, denial of the privilege seems unnecessarily harsh, but as we have seen, the power invoked responds only to the call of necessity, and, after all, the considerations urged are of convenience rather than necessity. If it were shown that withholding the privilege would jeopardize any substantial rights of the plaintiff, a different view might be taken. In the absence of such showing, I am constrained to deny the application.

"Whether if, in view of the necessary delay and expense, the plaintiff should abandon its purpose of showing continuity by complete expose of the vein upon its dip and should rely upon less conclusive proofs, the court should construe such proofs more strongly against the defendant because of its refusal to permit the plaintiff to resort to facilities within its control for the production of more direct and satisfactory evidence, is a question which need not presently be discussed." The decision was contrary to that expected. A motion by the Federal to the same effect was denied early in April.

## Arizona Mossback Preparing To Erect Mill

Property Opened on Six Levels and Large Tonnage of Commercial ore Developed, It Is Claimed

By S. FORD EATON

The Mossback property on Silver Creek, four miles north of Oatman, Ariz., is in the preliminary stages of a rather extensive development campaign. The Arizona Mossback Mines Co., owner of the estate, has recently passed through a change in organization. Jesse W. Speidel, of Wheeling, Va., is president, W. A. Shirley is secretary and treasurer, and Etienne A. Ritter acts as consulting engineer and general manager. Charles Burlock, pioneer promoter of the project, is a director.

Definite plans of considerable scope have been worked out by Mr. Ritter. Electricity will be installed and the site for a large mill is being prepared. A survey has been completed for a new

drifts and crosscuts have proven the existence of a large tonnage of milling ore. The management claims to have between half a million and a million tons of ore in sight which will average about \$10 per ton. In places ore of a much better grade than this is found but no attempt at selective mining will be made.

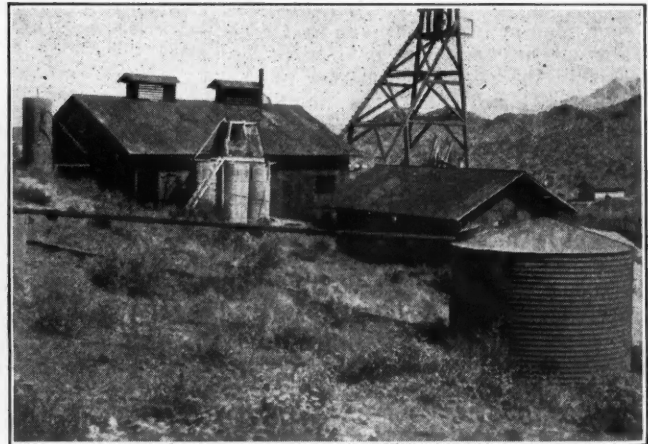
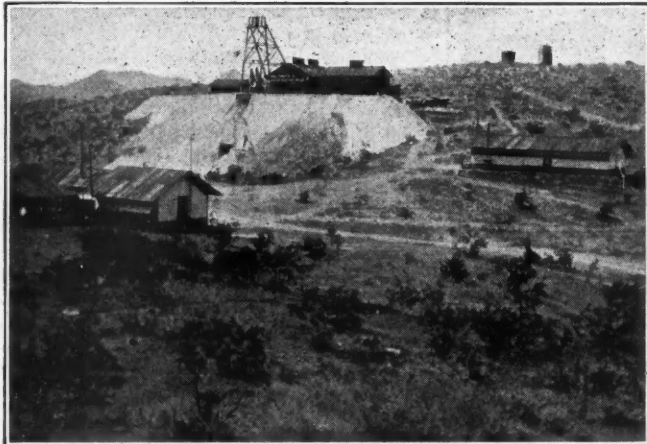
The property has a rather interesting history. The original discovery was made in 1863 by soldiers stationed near by for protection of early emigrants and settlers. At that time there must have been quite a town on Silver Creek as today there are many of the old stone houses standing. "Blanca Lode" was the name given the prospect, no doubt due to the conspicuous outcropping of white calcite. In time the troops were sent to other points and work ceased for several decades. In 1900, Charles Burlock, accompanied by his wife, came into the district. They found some rich ore on the surface and the Mossback came into being. For several years the couple were able to

## Germans Getting Hold on Potash in Spain

Spanish potash production will be placed in German hands, and German capital and labor will be prominently employed therein, according to a report published in Berlin newspapers on June 4. It is added that two German potash experts, Herr Gunte and Herr Ziervogel, have just returned from a trip to Spain to look over the situation, as a result of which they report that the Spanish government will probably grant to the German potash syndicate wide concessions for working the Spanish potash deposits.

## Bill for Ontario Mining Court Fails to Pass

There is much disappointment among mining men over the failure of the Ontario Legislature to pass the bill establishing the "Mining Court of Ontario." Harvey Mills, the Minister of Mines, desired to give further considera-



TWO VIEWS OF THE ARIZONA MOSSBACK MINES CO.'S PROPERTY NEAR OATMAN, MOHAVE COUNTY, ARIZ.

road better adapted for bringing in heavy machinery. An electric pump of large capacity will be installed on the 700-ft. level. Two 800-ft. drifts will be driven south on the 400 and 700 levels. From these, 100-ft. crosscuts will be driven at intervals. It is anticipated that by the time mill construction is completed the orebody will be opened up to permit the extraction of a large tonnage daily.

The company owns a number of claims on what is known as the Mossback ledge. This vein is similar to the producing veins of the Oatman district. The ledge is a wide sheared zone and includes heavy streaks of calcite from one to ten feet thick with altered andesite in between. In width, it will average between 50 and 60 ft. About 1,000 ft. south of the shaft this vein is joined by the famous old Moss vein. Near this junction some remarkable high grade was mined from a glory hole.

Considerable development work has been done to date. The shaft is now down 700 ft. and laterals have been driven on six levels. Rather extensive

work the vein on the returns from high-grade ore found in an adit near the outcrop. In spite of many difficulties development was carried to a depth of 300 ft.

In 1917, Mr. Burlock succeeded in interesting Will H. Holcomb and others. The Arizona Mossback company was incorporated Sept. 4 of that year. A gasoline driven hoist, air compressor, and other equipment were installed and the development work went forward rapidly to its present stage. An excellent camp site was laid out and a number of buildings constructed.

Arizona's compensation law has been sustained in the State Supreme Court with respect to its application to the case of a miner, Laurence Conwell, who met death through the derailment of an ore train on which he was riding in a drift of the Inspiration mine at Miami. It was contended that the derailment did not constitute an accident such as covered by the legislative act. The judgment of \$17,000 was assessed against the mining corporation.

tion to the bill so it was held over until the next session of the House. It is understood that he intends visiting the northern mining districts at an early date in order to hear the opinion of the various interests involved.

## Bush Fires Threaten Ontario Mining Camps

Several of the Northern Ontario mining camps were in danger of destruction from bush fires last week, but the actual damage occasioned was comparatively slight. The safety of Boston Creek was seriously imperilled, and the citizens waged a continuous battle with the flames for three days and nights before the danger was over, the town in the meantime having been cut off from communication. In the Gowganda area the Big Four mining plant was destroyed, the T. C. mine sustained some loss, and at last accounts some other properties were in danger. Fires raged all around Cobalt, but no losses were occasioned in the camp. There were no fires in the vicinity of Porcupine or Timmins.

## Opposition to Removing Quapaw Restrictions Develops

Some Operators Prefer Dealing With Indians Themselves Than With Agents Who Might Be Named

It has developed that all of the mining operators of the Oklahoma field are not favorable to the removal of restrictions on Indian mining lands next year, and it is probable that a bill to continue the restrictions, so far as the Quapaws are concerned, will be introduced in Congress with their consent and backing.

The position of these operators is that it will be much safer and more satisfactory for them to continue to deal with the Indian agents as at present than it would be for them to have to deal with the Indians themselves, or with special guardians appointed by the county commissioners of Ottawa County, Okla. Any such special guardians, they feel, would be imbued with the idea of making as fine a showing for their wards as possible, and in this spirit might be manifestly unfair toward the present operators of the lands.

The restrictions were established for 25 years at the time the Indians were given fee simple to the lands, and they will expire in 1921 unless a special act of Congress causes them to be continued. There promises to be considerable interest aroused in the matter, as those favoring removal argue that only the Indian agents seek their continuance, while the other side asserts that the county officials are interested primarily because they will be permitted to name the dozens of Indian guardians that will be required.

## Yukon Gold Dredge Sinks at Murray, Idaho

The big steel dredge of the Yukon Gold Co., at Murray, Idaho, sank in 25 ft. of water recently. The cause of the occurrence will not be known until an inspection is made by a diver, and possibly not until the boat is floated. The dredge had closed down the day before for annual repairs and overhauling. It had been leaking for some time in operation, as is common with most dredges, but heretofore when idle the leaking stopped. Two watchmen were on the dredge during the night before the accident. Early in the morning they were at work in the hopper, when attention was called to the noise of articles falling on the deck. Investigation showed that the dredge was listing heavily and they hardly had time to make the shore when she went down. As a precaution against an occurrence of this kind, D. H. Ferry, resident manager of the Yukon company, had an electric pump as well as a hand pump ready for instant use in such an emergency. He also had an electric device in the stern of the boat which would automatically give warning before the water reached the danger point. However, the water seems to have entered the bow and therefore did not affect the

device. The hull is divided into watertight compartments as a further precaution against inflowing water. The motors and pumps are all submerged, and by the time these are replaced a diver will be on the spot to make an inspection and close all openings preparatory to pumping the hull out and raising it. It is estimated that two weeks will be required to raise the dredge and three weeks more to make repairs.

## Old Dominion To Build Addition To Present Concentrator

Old Dominion's new mill at Globe, Ariz., is to be housed in an extension of the present 800-ton concentrator, according to W. G. McBride, manager, but is to be of very different type. Nominally its capacity will be of 1,200 tons. The design is that of H. Kenyon Burch, who planned the Miami and Inspiration mills and who is now doing the same work for the Copper Queen mill at Warren. The Old Dominion ore, after crushing, will go to rod mills and thence to tables, provision being made for re-grinding before delivery to flotation units of the Callow-Inspiration type. The new unit will be much simpler in operation than the present mill and will require less power and less labor. At least a year is expected to be consumed in construction.

## Dynamite Plant for Southwest Rumored

Near Land Station, Ariz., south of Benson in the San Pedro Valley, is being erected what is rumored to be the first dynamite factory in the Southwest. Charles E. Mills, who was in charge of Inspiration operations at Miami before he went into war work, appears to be at the head of the enterprise. He now is president of the Valley Bank at Phoenix, and has other large southwestern financial interests. His newest venture is understood to have strong backing. The necessary equipment, it is said, has been secured from a wartime plant in Virginia and is being delivered with notable speed. Little is being said about the project.

## Lake Ore Shipments Compare Favorably With Last Year's

Iron ore shipments from the head of the lakes, in spite of a slow start and interruptions because of the congestion on the lower lakes due to the railroad strike, have maintained a very fair comparison with those of the same period last year. Below are shipments for May:

| Deck                              | May, 1919 | May, 1920 |
|-----------------------------------|-----------|-----------|
| G. N., Superior . . .             | 1,052,747 | 1,739,129 |
| Soo, Superior . . . .             | 119,189   | 140,284   |
| N. P., Superior . . .             | 79,047    | 104,246   |
| D. & I. R., Two Harbors . . . . . | 1,002,608 | 1,145,690 |
| Soo, Ashland . . . .              | 75,188    | 125,430   |
| N. W., Ashland . . .              | 594,459   | 887,619   |
| D. M. & N., Duluth .              | 2,957,337 | 1,662,971 |
|                                   | 5,880,575 | 5,805,369 |

As of June 1 the entire Steel Corporation fleet was put into commission as compared with 40 per cent capacity in operation previous to that date.

## Yukon Placer Mining Act Amended

Measure Passed by House of Commons at Ottawa Permits Leasing of Larger Tracts

An amendment to the Yukon Placer Mining Act has passed the House of Commons providing for the establishment of prospector's leases principally for the purpose of prospecting worked-over ground, or ground previously staked but which has reverted to the government, and also for prospecting new territory.

The present placer lease comprises an area of 500 ft. along the channel and from rim to rim. The objection has been made that such an area is too small to make prospecting worth while in worked-over or low-pay ground, particularly as such prospecting is now done by means of drilling, which necessitates a considerable initial outlay.

By the amendment, leases will be granted five miles in length, for a period of one year, at a yearly rental of \$25 a mile, renewable for further periods of one year upon production of evidence to the satisfaction of the Gold Commissioner that the ground is being duly prospected. In the case of new territory, prospecting leases will be granted for only one mile of the channel upon the same terms as the others.

In the event of a discovery being made on a lease upon worked-over ground the prospector may stake the whole five miles. In regard to leases on virgin ground, the prospector may only stake the regular discovery claim, which is 1,500 ft. in length. After discovery claims are staked the provisions of the Placer Act govern as hitherto. This legislation was passed as a result of representations made to the government by the Yukon Development League.

## Boundary Near Portland Canal To Be Re-Surveyed

The Canadian-Alaskan boundary in the Portland Canal district will be re-defined this season. This work was done some sixteen years ago but in the interval the line has become overgrown and somewhat difficult to determine. Stone cairns on the mountains, bronze monuments, and the hewing of a 20-ft. lane through the forest will be undertaken this season by parties representing the United States and Canadian governments. J. D. Craig, who will head the Canadian party, left for the north a few days ago. He states that the wisdom of marking the boundary sixteen years ago is apparent now, as it happens that about 90 per cent of the silver recently discovered is within Canadian territory and, if the survey had been delayed, it might have made a settlement of the question of the line more difficult. A neutral strip of 60 ft. on either side of the boundary is to be reserved, as is the custom on the whole of the Alaskan and U. S. bound-

ary, except where titles to the strip already had passed out of the hands of the government. This will not mean, however, that the strip will be withheld from mineral development but only that, in the case of the location of mineral, special leases will have to be obtained from Ottawa or Washington.

### Camsell Appointed Deputy Minister of Mines for Canada

Charles Camsell, for several years head of the Geological Survey of Canada in British Columbia, has been appointed Deputy Minister of Mines for the Dominion. He succeeds R. G. McConnell, who has held the office for years and who previously was prominently connected with the Geological Survey. Mr. Camsell was born at Fort Liard, Northwest Territory, and after being graduated from the University of Manitoba spent six years in the wilds of the far North. He then took post-graduate courses in geology at Queens and Harvard Universities. Exploration work for the Algoma Central Railway and geological work for the Canadian Northern in Manitoba occupied the two years lapsing before he became attached to the Canadian Geological Survey, with which he has been connected for sixteen years.

### Granby's Change in Managers Causes Speculation

Speculation is rife in British Columbia mining circles regarding the policy of the Granby Consolidated Mining & Smelting Co. as a result of the retirement of F. M. Sylvester, for years the company's managing director in the province. As far as is generally known the change in local control will mean nothing more than that the headquarters will be removed from Vancouver to the smelting centre at Anyox, where H. S. Munroe, the new general manager, has been established. The press and business men with whom he came in contact express regret that Mr. Sylvester is leaving British Columbia. It is pointed out that under him the Granby company did much for the Canadian West in the way of industrial development. It was under him that the large by-product coking plant was installed at Anyox and that the Cassidy Collieries, on Vancouver Island, the most modernly equipped on the Pacific Coast it is claimed, were constructed and began production. In this connection it is suggested that the coal from the island has not been giving unqualified satisfaction in coking and that a change is proposed appears to be indicated by the receipt at Anyox of trial shipments of coal from fields situated near the border of the provinces of British Columbia and Alberta. This fuel is said to have given better results.

In several Arizona towns, notably in Globe and Jerome, manual training for school boys is to be extended to include practical mining. At Globe and Miami the students are to be taken down into a Copper Hill mine and there instructed.

### Yampi Sound Iron Ore in West Australia at Seaboard Can Be Mined in Open Cut and Loaded Directly Into Deep Water Ships—Taken Under Option By State

The Queensland government has taken an option over a portion of the iron deposit at Yampi Sound, Western Australia, and the Commonwealth government is discussing the advisability of securing an option over the balance. This iron is found on the Cockatoo and Koolan Islands; there is in all about 97,300,000 tons of ore above water level and the greater portion of it can be mined by open cut and loaded straight into deep-water ships, there being ample draft for the largest vessels right to the foot of the hematite cliffs. Another proposal comes from Messrs. G. & C. Hoskins, iron and steel makers, of New South Wales, who state that they are prepared to build storage bins at Strahan, Tasmania, and ship large quantities of iron ore from Heemskirk (West Coast) to their works at Lithgow, N. S. W., if the government will provide a tramline about ten miles long for transport. This tram is already being agitated for by the tin miners in the district.

### Work Begins on Great Basin Power Survey

A topographical survey has been started by the U. S. Geological Survey, under the direction of K. W. Trimble, as the first step in determining the hydro-electric possibilities of the Great Salt Lake basin. Work is now being done on Mill Creek and on Big and Little Cottonwood. Data regarding the power available in this section will be collected.

### Court Will Review Conkling-Silver King Case

In the litigation between the Conkling Mining Co. and the Silver King Coalition, of Park City, Utah, which has lasted more than ten years, the Conkling claiming damages for ore alleged to have been illegally extracted by the Silver King, the writ of certiorari granted the Silver King by the U. S. Supreme Court less than a year ago has been allowed to stand against the motion of its repeal recently made by the Conkling company.

Suit was first brought against the Coalition in 1907, and the case heard before Judge John A. Marshall in the U. S. District Court, at Salt Lake City. The decision then was in favor of the Coalition, and the Conkling company appealed to the circuit court of appeals, which eventually reversed the decision of the Utah court, and rendered judgment against the Coalition for a sum somewhat exceeding \$500,000. After further legal steps by both litigants, and when a rehearing was refused by the court of appeals, the Silver King Coalition was granted a

writ of certiorari by the Supreme Court last October. A motion was then made by the Conkling company asking that the writ be dismissed, which was followed by the result noted.

### Civil Service Examinations

Those interested in the following examinations should apply to the Civil Service Commission, Wash., D. C., for form 1,312, stating the title of the examination desired.

Assistant explosives engineer, \$1,620-\$2,400, both sexes. An open competitive examination July 20. A vacancy in the Bureau of Mines, Pittsburgh, Pa., may be filled from results. Not required to report at any place for examination.

Computer, Coast and Geodetic Survey, \$1,400 plus \$20 temporary monthly increase, both sexes. An open competitive examination July 21-22. Ten or more appointments may be made from results. Examination will be held at various places in each state.

Research engineer, \$3,000-\$3,600, both sexes. An open competitive examination, July 20. A vacancy in Watertown Arsenal, Watertown, Mass., may be filled from results. Not required to report at any place for examination.

Assistant mechanical engineer, male and female, \$1,680. An open competitive examination on July 6. Vacancies in the U. S. Bureau of Mines, Pittsburgh, Pa., and elsewhere, may be filled from this examination. Not necessary to report for examination.

### Recent Production Reports

Calumet & Arizona produced 4,760,000 lb. in May, of which 3,840,000 lb. was available for the company, compared with 3,176,000 in April.

New Cornelia's copper production in May was 3,720,000 lb. against 3,560,000 in April. Of the May output 106,000 lb. was cement copper.

U. V. Extension produced 3,219,934 lb. copper in May, compared with 3,270,718 in April.

Cerro de Pasco's May output was 3,890,000 lb. copper against 3,942,000 lb. in April.

Butte & Superior in May produced 5,900,000 lb. zinc in concentrates and 103,000 oz. silver against 6,300,000 lb. zinc and 113,000 oz. silver in April.

Oriental Consolidated, Unsan, Chosen, obtained \$95,500 from its May clean-up, compared with \$101,610 in April.

The gold output on the Rand in May was 699,000 oz. against 686,000 in April.

Utah Copper produced 9,904,781 lb. copper in May against 9,313,227 in April.

Chino Copper produced 3,930,728 lb. copper in May against 3,543,471 in April.

Ray Consolidated's May output was 4,260,000 lb. copper against 4,500,000 in April.

Nevada Consolidated's May output was 4,350,000 lb. copper against 4,140,000 in April.

### Budget Bill Carried Over to Next Session

Washington Correspondence

The National Budget Bill, which passed both houses of Congress and was vetoed by the President, was amended by the House and again passed, but the Senate failed to act. This legislation, therefore, is ineffective until Congress meets again and acts on the measure. Anticipating that the budget system would be adopted, the House reorganized its appropriation committees, forming a single committee of thirty-five members to replace the eight committees formerly working. The House, also expecting the budget program to go through, defeated the resolution which provided for an investigation of the Federal executive departments with a view to complete reorganization. Failure of the budget bill leaves this matter without agency for its prosecution.

### Steel Companies Would Cease Reporting to Trade Commission

Washington Correspondence

Over twenty steel companies have joined in a suit against the Federal Trade Commission before the District of Columbia Supreme Court in an effort to compel the commission to cease requiring monthly cost reports. On preliminary hearing, a temporary injunction was granted restraining the commission from demanding these reports or prosecuting the companies for failure to make them. This matter has an important bearing upon the suits in which some of these companies had recently been engaged before the New Jersey courts, where mandamus proceedings had been instituted by the Department of Justice to compel reports to the commission. The commission is expected to make its reply in the District of Columbia cases on Monday June 21.

### Fund Provided for Making Power Investigation in East

Washington Correspondence

The appropriation for the super-power investigation covering the territory from Washington to Boston was granted to the U. S. Geological Survey in the Sundry Civil bill passed just before Congress adjourned. This provides a fund of \$125,000 and authorizes acceptance of additional sums from outside interests to be expended in the work. It is anticipated that the study will include the possibilities of water power, fuel power, byproduct coking and other combinations both in the coal fields and at seaboard. The technical, economic and conservation aspects of the whole situation will be considered.

Nearly 600 men for the mines have been supplied by the municipal employment bureau at Spokane, Wash., during the three months ended May 31.

## NEWS BY MINING DISTRICTS

### MEXICO

#### Butters Company Operating Mill at Copala, Sinaloa—Las Chispas in Sonora Again Running

##### Sinaloa

The general outlook for the early fall seems good, as there will be a number of exploration and development companies formed to develop promising prospects on the coast for which only capital and confidence in the country are needed to make some rich mines.

**Sinaloa**—The Cia Jesus Maria y Anexas, situated in the Sinaloa district, is making high-grade gold and silver flotation concentrates, which are being shipped to Selby, Cal., by express. Its capacity is about 100 tons daily of raw ore.

**Mocorito**—The Potrero Mining Co., in the Mocorito district, is milling about 50 tons daily of a gold ore running about \$12. It is installing a new power plant purchased from Roy & Titcomb, of Nogales, Ariz., and will sink a vertical shaft 1,000 ft. to intersect the vein at that depth. They have a modern cyanide plant and extraction is extremely satisfactory. Arthur Cortel-yo is manager.

The Palmarito Leasing Co., also in the Mocorito district, is crushing about 80 tons daily of a 12-oz. silver ore. The extraction by fine grinding and cyaniding all slimes is good, and regular shipments of precipitates are being made to Selby by express from Guamuchil. Miles S. Milward is general manager.

**Choix**—The Choix Consolidated Mining Co., Ltd., with mines near Choix, in the Fuerte district, are getting in machinery and constructing necessary roads for the erection of a 200-ton

copper matting furnace. A. M. McDermott, of Los Angeles, is general manager.

**San Dimas**—The mines in the San Dimas district are producing to their full capacity, shipments of silver bars going to the San Francisco mint through Mazatlan.

**Casala**—The Cia Minería Nuestra Señora in the Casala district is making flotation concentrates containing copper, lead, silver and gold. This is being shipped to Selby. Edward H. Hoag is general manager.

The Guadalupe de los Reyes Co., belonging to Francisco Echeguren y Cia., of Mazatlan, is making a flotation concentrate of silver and gold, also silver bars from the cyanide plant.

**Copala**—The Butters Company in Copala is operating the mill which was shut down for a number of years. It is crushing about 200 tons daily of a 12-oz. silver ore. Paul Crawford is manager.

**Rosario**—The Tajo mines in Rosario, belonging to the Bradbury estate, are running full on a silver ore averaging about 11 oz. silver. They are crushing about 200 tons daily. G. C. Jones is manager.

**Culiacan**—The Occidental Banking & Commercial Co., with headquarters in Mazatlan, has opened offices in Culiacan, with the view to opening other branches as opportunity seems to offer. Aside from a general banking and commercial business it will purchase all classes of mineral products, making ore shipments direct to the Phelps Dodge Corporation Copper Queen Branch, Douglas, Ariz.

Mines in the Topia district and all western Durango are working only on high-grade ores of shipping values. F.

A. Gowing and associates, of San Francisco, are developing a silver property in the Rodeo district of western Durango.

##### Sonora

**Arizpe**—Work has again been resumed at the Las Chispas mine of the Minas Pedrazzini Co. after a shutdown of three weeks caused by a strike of the miners. About the first of this year a very high-grade body of silver ore was opened up on the 800 level. To prevent the possibility of "high grading" the company put into effect certain regulations requiring the men to change their clothes in one change room and pass to another room where their underground clothes are kept. Upon leaving the mine the reverse must be done, making it almost impossible for them to carry off ore. This was the cause of the men going out on strike. Shipments are being made at the rate of about 70 tons of first-class ore per month. A recent carload shipment ran well over 700 oz. of silver per ton with about three-fourths of an ounce of gold for each 100 oz. of silver.

Louis Bragonier and associates are sinking a shaft on the north extension of the Las Chispas vein. At a depth of 40 ft. ore running 14 oz. of silver and one ounce of gold per ton was cut.

Work on the Babacnora property has been temporarily stopped. This is one of the oldest mines in Sonora. Bostwick and associates have developed some milling ore below the main tunnel level.

**Sierra Pinta District**—A small Gibson mill is to be operated which has been erected by Oliver Dahl, of Ajo, and D. Richards, of Tucson. The partners have eight pertenencias, on which a 4-ft. face shows workable values in gold and silver.

## ARIZONA

**Ray Con. Gets Arizona Hercules Men  
—Kay Copper Stops Sinking Tem-  
porarily—Flotation Plants in  
Yavapai County**

**Ray**—Most of the men thrown out of employment by the shut down of the Arizona Hercules properties have been taken on by Ray Consolidated to relieve labor shortage. The latter will hereafter send an extra trainload daily to the mill at Hayden.

**Kelvin**—The first diamond drill hole on the Ray Boston copper property is down 1,015 ft. There remain 335 ft. to be drilled to reach the east contact of diabase with quartz-porphry. The

pressor is installed. The old compressor is no longer adequate.

**Plomo King**—The recently acquired mining equipment has been installed and a headframe built. A two-compartment shaft is to be sunk at least 300 ft. The ore is lead and silver.

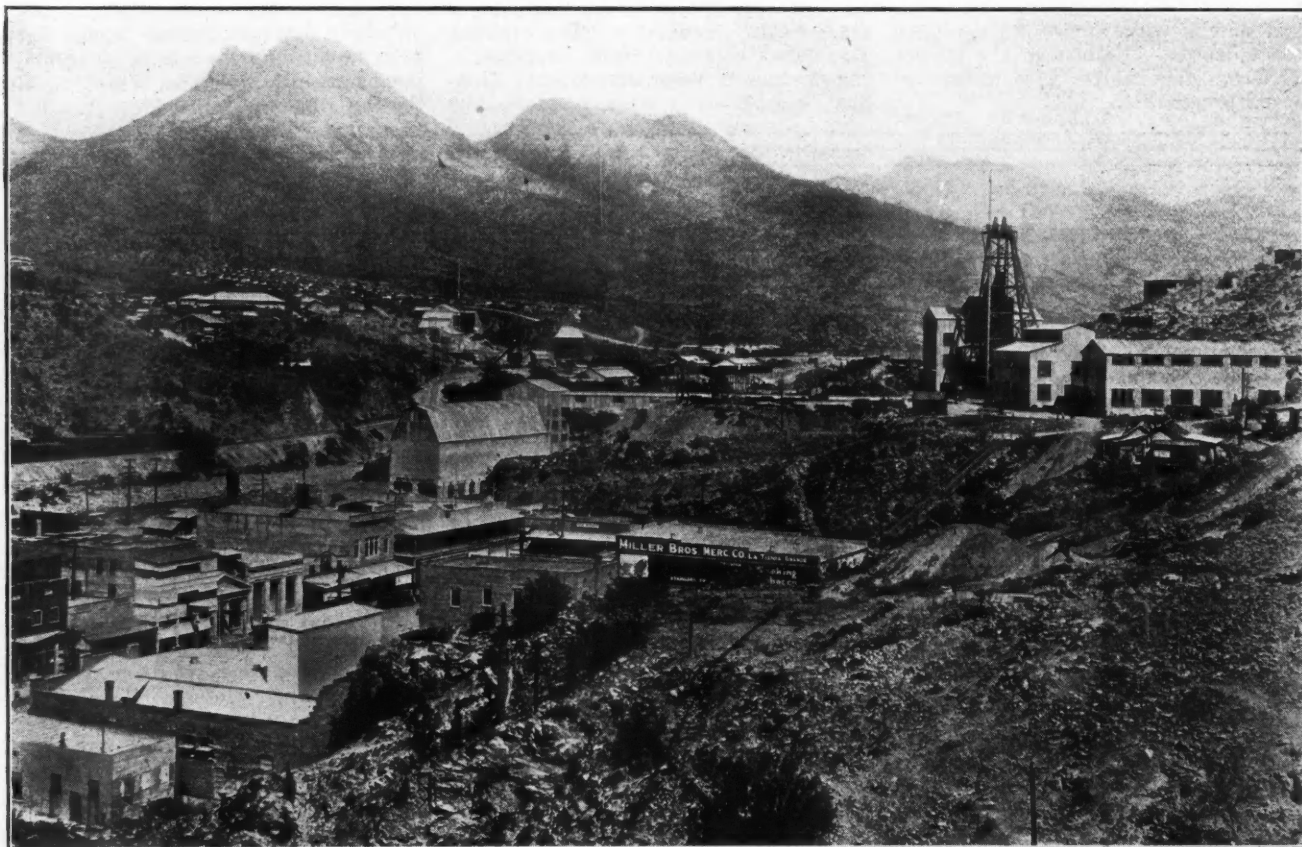
**Kirkland**—The Zonia and McMahan groups about 11 miles southeast of Kirkland have been taken over by the C. & A. Co. and are being prospected. These two groups cover large deposits of copper carbonate.

**Morristown**—The main crosscut tunnel of the United Grande is being driven further east to the contact. This is a large low-grade silver-gold property close to the railroad on the west

Near Dos Cabezas A. J. Welty is building a 300-ton concentrator on the Black Prince property.

**Superior**—It is reported that the Magma Copper Co. is to build a reverberatory in Superior to handle ores and concentrates from its mine and mill, thus avoiding the expensive haul by narrow-gage road to the Arizona Eastern and transfer at that point for Hayden. It is believed that all flux needed and incidentally some custom ore can be found in the immediate district.

**Tucson**—In the property of the Sherwood Copper Co., in the Comobabi district, six miles north of Indian Oasis, 3 ft. of ore is said to have been cut that samples above \$700 a ton. Much



RAY, ARIZ., SHOWING ARIZONA-HERCULES COPPER CO.'S PLANT AT RIGHT, THAT HAS RECENTLY SHUT DOWN

drill is expected to cut the extension of the rich shoot opened up in the 300-level east drift in 1916. This was not reached on the 500-ft. level.

**Winkelman**—The Continental Commission Co., operating the old "79" mine under lease, is building a 3-mile wagon road to the upper section of the property. High-grade lead ores are still being shipped at the rate of two cars a week. Shipment of copper ores is to start soon.

The Cuttler-Biwater property is producing about 1,000 lb. of concentrates per day. As soon as additional water supply is developed the mill will run two shifts. A new table has been added.

**Canyon**—Shaft sinking at Kay Copper will be stopped until the new com-

side of the Hassayampa River. The original crosscut went through 85 ft. of milling ore. A shaft is to be sunk on the contact.

**Dos Cabezas**—The property of the Mascot Copper Co. including 56 mining claims, the Mascot townsite and the Mascot & Western R.R. to Willcox, has been leased by the Central Copper Co., which has an adjoining group of 31 claims. An aerial tramway delivers the ore to the railway. A 50-ton experimental mill has been erected. Power is obtained from a 500-hp. gas-engine plant. The Central workings show commercial ores at shallow depth improving in quality as they go down. In the Mascot, commercial ore is being taken from 750 ft. depth. The Central has recently resumed work.

of it shows native and wire silver. It was cut in developing a much broader ledge, said to sample \$40 on the 145 level. The high-grade is being sacked for shipment and, it is said, a mill is being considered. Water is scarce, however, and not to be had near by. The main shaft will be deepened in the hope of striking a water flow, and some drilling will be done. The ore is in hard quartz porphyry. Y. Cavillo is in charge of the property, which is controlled by a Philadelphia brokerage firm.

**Duncan**—Utter Bros. are working the old Carlisle mine at Steeple Rock, N. M., and are milling about 60 tons daily. The ore is taken from the 3d and 4th levels. The concentrates average 35 per cent lead, 15 per cent zinc, 5 per cent cop-

per and about \$17.50 in gold and silver. Milling costs are \$1.50 and recoveries high considering the complex nature of the ores.

The New Year's Gift group, that was purchased about a year ago from George F. Utter by J. Hardy and others, is said to have 20,000 tons of \$20 free gold ore blocked out. This will be hauled 3 miles to the Duncan M. & M. Co.'s mill for treatment.

The Duncan company has opened free milling gold and silver ore, which will be treated in the 100-ton cyanide plant recently completed. F. Johnson is in charge.

**Globe**—On the 16th level of Arizona Commercial a raise has been driven 53 ft., the ore averaging over 10 per cent copper. This adds appreciably to the present reserves of 750,000 tons.

**Prescott**—At present there are five flotation plants in successful operation on gold-silver-lead ores in Yavapai County: the L. C. S. custom mill, four miles south of Turkey; the Black Diamond mill at Walker; the Pocahontas mill, two miles southeast of Mayer; the Anderson-Birch mill, two miles west of Humboldt; and the Monte Cristo mill, on Groom Creek, eight miles south of Prescott. There are also two flotation plants treating copper ore, one at the Arizona Binghamton mill, at Stoddard, and one at Humboldt, which is a part of the milling equipment of the Consolidated Arizona Smelting Co. One new flotation plant, the Abe Lincoln, north of Wickenburg, of 100 ton capacity, will soon be in commission. Plans are completed for an entirely new flotation plant at the Silver Belt mine, two miles west of Humboldt. The 100-ton flotation plant at Crown King, formerly operated by the Bradshaw Development Co., is being overhauled, and the Peak Silver Mining Co., a new organization, will start, in the next few days, to remodel the old Midnight Test and the Emporia mills, both located about ten miles south of Prescott.

**Chloride**—At the Molly Gibson-Chloride the shaft is now down 120 ft. It is being sunk on a well-defined vein striking east and west with a 75-deg. dip south. The vein matter is about 5 ft. wide. At about 90 ft. depth 30 in. of good ore has been found, which samples about 20 oz. silver and 20 per cent lead. Lenses of remarkable cube galena from 2 to 20 in. thick and running well in silver occur in this. In sinking on this streak much high-grade has been sorted out and a shipment is to be made soon. Present plans call for continuing the shaft to the 200-ft. point, where a station and sump will be cut and a 200-ft. crosscut driven to the main vein, which lies parallel to the first and dips 75 deg. north. At depth they should join with interesting results. A prospect shaft on the vein about 70 ft. deep uncovered 5 ft. of quartz carrying 18 oz. of silver. It is this vein which the management anticipates will make the mine. R. C. Ferguson is president.

## CALIFORNIA

### Midas Mine Shuts Down Temporarily—Engels Copper Hampered by Labor Shortage

**Adin**—The recent strike made on the 250-ft. level of the Juniper mine is attracting attention, the vein being approximately 5 ft. wide. Considerable high-grade ore is in sight, as well as small specimens containing much gold. Ore is being sacked for shipment and reserves already in sight are estimated to be worth \$300,000.

**Redding**—Work in the Midas has been temporarily discontinued because of the scarcity of fuel oil. The property is one of the two gold producers of Shasta County that are active at present, and is controlled by San Francisco and Sacramento Valley people, under the name of the Victor Power & Development Co.

**Lowell Hill**—Development of an extensive deposit of barite has been started by Levy, Gilman & Moore of Oakland. The product is to be sent to Alta for shipment to the refinery at Milrose.

**Grass Valley**—All work is being concentrated in an effort to develop the rich orebody recently found in the Alcalde mine. The mill is operating steadily on good ore, and the management is preparing to add ten-stamps to the present unit. Quartz carrying free gold is making its appearance on both of the main working levels.

The Normandie-Dulmaine group of claims at Deadman Flat has been acquired by a syndicate of Southern California people, among whom is Mack Sennett, the theatrical man. The property lies in the same district as the Alcalde and has been worked for some years, but intermittently. Equipment is being assembled and the development work will begin shortly, in an effort to reach or locate the extension of the famous Alta gravel deposit which is thought to run through the property.

**Portola**—W. J. Gruss, manager of the Gruss Mining Co., has completed all arrangements for diamond drilling. He plans to use a caving system. An effort is being made to determine the extent of high-grade orebodies recently uncovered.

Superintendent McKelvey, of the Copper King, has just completed arrangements for driving a new tunnel by contract. It will be at least 300 ft. long.

Construction of the aerial tramway to Spring Garden from the Walker mine is practically completed, and shipments of concentrates will start soon. Additions to the flotation mill are to be made during the summer if present plans are carried out. The new ore is said to carry considerable gold and silver.

**Engels**—Scarcity of skilled miners is hampering operations at the Engels property. Despite the labor shortage the company is making a good production and the flotation plant is running at capacity.

**Needles**—The Kalazona property, located about 20 miles north of Needles in San Bernardino County just west of the Nevada state line, has been developed by four shafts, 40, 50, 70, and 105 ft. deep. The deepest of these is a 2-compartment vertical shaft, well timbered and equipped with a gasoline hoist. It is sunk on the company's Hawkeye vein, and opens a small streak of high-grade gold quartz ore. The financing of further development is under advisement by officers of the recently organized Kalazona Mining Co.

**Big Pine**—The Montezuma mine is being developed under direction of John Mitchell. The lower crosscut tunnel is 900 ft. long and will be continued to cut the vein at a point about 500 ft. below the upper workings which have yielded considerable carbonate and sulphide ore of shipping grade. A vertical winze has been sunk 50 ft. below the bottom level of the upper workings, and a crosscut will be driven to intersect the vein, which dips about 45 deg. at this elevation.

**Yreka**—J. C. Hubbard and associates have acquired the Osgood, Spring Gulch, Wacker, Mono, Coburn, and other adjoining gold quartz properties in the Yreka district, and will operate them under one management. These adjoin the town of Yreka and aggregate 500 acres. The Osgood is equipped with a 5-stamp mill which is running on dump ore, of which there is said to be 30,000 tons running \$7. A 50-ton Lane crusher is to be installed.

## COLORADO

### Prospect Mountain Tunnel Co. Organized—Gold King Mill at Gladstone Running

**Leadville**—In connection with the great activity in exploration work to open up new territory in this district, may be noted a long contemplated project to develop the northern portion of the field, by a tunnel through Canterbury hill. The Prospect Mountain Tunnel Co. has been organized for this purpose and has secured holdings in the section amounting to over 400 acres. John Cortellini, an operator of Leadville and other parts of the state, is president.

**Silverton**—The Gold King mill at Gladstone which has been shut down since February, on account of blockaded roads, began dropping forty stamps early this month. Three shifts are employed and from one to two cars of concentrates are shipped daily.

**Cripple Creek**—The Golden Cycle Mining & Reduction Co. has announced that hereafter dividends will be paid quarterly instead of monthly, the rate to be determined by the earnings. On April 1, the company announced a reduction from three cents per share to two cents. This action President Carleton states, is due to the decrease in earnings caused by the decline in production in the Cripple Creek district, and the increased cost of operation with no compensating increase in price for gold.

## IDAHO

**Hailey**—The Golden Glow M. & M. Co., operating a group of claims on North Boulder Hill, 20 miles north of the old smelter town of Ketchum, is installing a 50-ton mill, which at the outset will handle dump ore. Later on a flotation unit will be considered. The ore is silver-lead. John D. Pope is president.

Work is to be resumed at the North Star mine, 7 miles northwest of Hailey. The 150-ton mill has been overhauled. About 60 men are employed at the mine. The Independence has been overhauled and is to be put in operation. It is employing about 40 men. The ore at both properties is silver and lead. A. O. Ring is in charge.

**Broadford**—The Lark mine is working three shifts per day, employing 16 men. The main working shaft has been sunk to a depth of 350 ft., cutting a 4-ft. vein of galena. A 55-ton shipment recently returned \$14,000. John Hennessy is in charge.

## JOPLIN-MIAMI DISTRICT

## Missouri-Kansas-Oklahoma

**Picher**—The Beck Mining Co. has temporarily abandoned operations at its mill and adjacent field shafts, but is getting dirt from a new shaft recently put down half a mile east, near the No. 4 property of the Underwriters' Land Co. A surface railroad has been built, but horse teams are being used on account of the delay in shipment of the dummy steam locomotive ordered some weeks ago. At present not enough dirt is being obtained to keep the mill running one shift, but when the engine arrives it is thought that this can be done.

The Huttig Lead & Zinc Co., which erected its second mill last winter on its 120-acre tract northeast of St. Louis, Okla., is now planning to sink four more shafts to be connected with the two mills by surface railroads. Two of these shafts are to be started at once about a quarter of a mile southeast of the No. 1 mill and an equal distance northeast from the No. 2 mill. Drilling has been carried on here for several weeks and shows an ore run coming in at 241 ft., which is 35 ft. deeper than the run being mined at the No. 2. The derrick and hopper at a worked-out mine half a mile to the west are being moved to this site. B. E. Brown, manager, expects to have the two shafts down, and possibly two more, before cold weather. The company will build no more mills on its tract but will handle all dirt by surface roads.

The Eagle-Picher Lead Co. has completed a tailings mill to handle the tailings from its Bingham mill, one of the first to be erected in the Picher camp.

The Cosmos company has put down a new shaft on its property near St. Louis, Okla., and in the same neighborhood the Aztec company has completed the moving and re-erection of the Medical mill on its lease. The Wills-Day Co. has installed a crusher and rolls and expects to erect a mill later on.

## MICHIGAN

## Price of Coal Prohibitive to Copper Companies—Newport and Palms-Anvil Mines on Gogebic Range Reduce Forces

## The Copper District

**Houghton**—Coal formerly cost the Michigan copper mines \$3 per ton laid down on the docks. All mines brought in large quantities by water in the summer to last them throughout the winter. The price now is \$9 at the coal mine, which means \$12 per ton on the docks. It is prohibitive. Calumet & Hecla and the associated companies use 2,000 tons a day. This company has enough to last 60 days because of unusually large purchases made last summer. None of Michigan mines have contracted for the \$12 coal, because they cannot operate at such a cost, which would total \$11,000,000 for the year. Winona, which closed down a month ago, sold her coal to the Copper Range, enough to keep the latter's mines going ten days. In the early days all steam power was obtained by burning cord wood.

Ore extracted by the Copper Range group in May follows: Champion 22,000 tons, Baltic 15,000, Trimountain 8,700. This is the lowest output in years for these mines and is about half of normal. Michigan produced 5,773 tons, Seneca 5,611, Mohawk 29,302, and Wolverine 18,879.

**Calumet**—Dismantling the Tamarack stamp mill has been completed. This removes a fire hazard. Calumet & Hecla interests plan to erect a duplicate of their Lake Linden regrinding plant for the purpose of handling all of the Tamarack conglomerate sands. It is estimated that \$35,000,000 will be paid in dividends from the Calumet & Hecla and Tamarack sands.

**Ontonagon**—White Pine, one of Calumet & Hecla's subsidiaries, is a copper proposition differing in its mining and metallurgical problems from every other copper mine in northern Michigan. But it has been possible to evolve a system of operation which makes it a successful producer under normal conditions. Its costs for mining and taxes were 16.3c. last year and are higher now. But its future is promising.

Recently there has been an increase in the silver output, which differs from that of any other mine. Quincy gets considerable silver, and likewise Isle Royale. But the silver in these mines is in small nodules. Some of it disappears before it leaves the mine and some before it leaves the stamp mill. But White Pine silver is very finely disseminated in the sandstone, like the White Pine copper, and is practically 60 mesh. It is recovered in the smelter. This silver was opened first in No. 4 shaft and the sandstone carrying it has been cut in three different levels. The stopping ground has been found remarkable in the regularity with which this metal occurs. The silver makes possible an actual reduction of 5c. a lb. in the cost of copper produced in this part.

The other important consideration regarding the future of the White Pine is the development work at No. 2 shaft, unwatering of which is almost finished. Sinking will be started at once. It is expected that the so-called "third" lode will be cut 1,900 ft. in this shaft. This lode runs the best in copper of any of the formations found in the Nonesuch sandstone.

Good ground has already been proved in shafts Nos. 3 and 4 and to the east of No. 3 shaft, where drilling already has shown ground for two more shafts. These shafts are not deep. The mine is the best for the workmen to be found in the Lake Superior district. The dip is now 7 deg. instead of 70 at Calumet or 55 at Quincy. Many of the stopes are level. The mine has a record of but one fatality since starting operations 12 years ago.

When the mill was started the loss was 18 lb. of copper per ton, this being fine copper found in sandstone and slate. Under the direction of C. H. Benedict, of Calumet & Hecla, this has been reduced to 6 lb.

## Gogebic Range

**Ironwood**—The Steel & Tube Co. of America, operating the Newport and Palms-Anvil mines, has reduced its operating forces by about 140 men because of the shipping situation. The Newport is shipping a considerable tonnage from its stockpiles but this is being done chiefly because the stockpile ground is caving.

At the Pabst mine several construction jobs are in progress. At "H" shaft, the piers are being set for the steel headframe and idler stands. At "G" power plant a large extension of the cooling pond is being built, and at the boiler house, ash handling equipment is being put in. The ashes will be run into cars in the basement of the building and then trammed to a shaft at the end of the building, where the cars will dump into a skip. The ashes will then be hoisted up into a small headframe and dumped into a storage bin. The mechanical stokers for the battery of four 400-hp. boilers in the new part of the boiler house have arrived. They are of the under-feed multiple retort type of Westinghouse manufacture.

## Marquette Range

**Negaunee**—An open pit is being worked in connection with the Rolling Mill mine. Operations are being pushed underground, and about 10 cars of ore of lower grade are being removed daily from the pit. The South Jackson pit, which is operated only during the summer months, is again working.

## Menominee Range

**Crystal Falls**—The McKinney Steel Co. is planning on moving all of the surface equipment at the Odgers mine to permit the mining of pillars close to the shaft. No. 1 shaft will be abandoned later in the summer and No. 3 shaft will then handle the entire output.

The Hollister Co. is exploring with a diamond drill to the north of the Monongahela property.



## MONTANA

**Anaconda's New Stewart Strike  
Sampling 40 Per Cent Copper—  
Tuolumne Makes New Find—  
One Company Resumes at  
Neihart**

**Butte**—The recent discovery of ore at 3,740 ft., while sinking the Stewart shaft, is believed by Anaconda officials to be one of the most important developments made in some time, the grade of the ore and the depth at which it was found being regarded as significant. The disclosure reveals a large area of new stoping ground apparently carrying high-grade copper ore. On the 2,800-ft. level, 200 ft. north of the shaft, the ore shoot showed a width of 6 ft. averaging 25 per cent copper and the deposit now opened in the shaft, the vein dipping south, is the same shoot on dip. Assays ranging up to 40 per cent copper have been obtained across approximately 6 ft. where the shaft cut the ore.

During the last week Anaconda sent forward a second trainload of refined zinc amounting to 1,250,000 lb., to the Ansonia Brass Works, in Connecticut, and within the course of a few days another train of 20 cars will be shipped.

Practically a full shift is at work at Butte & Superior's Black Rock mine and smelter.

A new orebody has been found by the Tuolumne Copper Co. above the 500 ft. level of the Main Range mine, which gives promise of showing a length of from 300 to 400 ft. with a back practically to the surface, as it was uncovered under one of the foothills fringing the Continental divide and situated to the west of the present shoots, which have a back of approximately 200 ft. of "wash" above. This shoot is running about 25 oz. of silver and more than 2 per cent copper, and is about 5 ft. wide. The winze on the 1,200-ft. level is down about 50 ft. and showing continuous ore. With this month's proceeds in hand Tuolumne expects to have about \$90,000 in its treasury.

An electric hoist has been installed by the Butte & Plutus at the Plutus shaft and sinking from the 200 to the 400 level will start at once. It is planned to crosscut a 3-ft. orebody found in the Norwich claim, which averages 17 oz. of silver. An airline has been run to the Mapleton shaft, 1,700 ft. east. This shaft will also be operated. An orebody showing a width of 6 ft. on the 110-ft. level is to be developed here at depth.

An orebody 2½ ft. in width carrying considerable native silver has been opened in the San Salvador at a vertical depth of more than 40 ft., apparently being the top of the ore shoot.

J. W. Nuekon, of Duluth, Minn., was in Butte recently completing arrangements for the Butte Silver Mines for operating the old Butte & Ballaklava property in the Butte district, together with property in the Corbin district.

**Neihart**—The Neihart Silver Mines has reached an agreement with the striking miners and work was resumed last week. Forty-five men are em-

ployed. This is the only property to resume thus far in this camp, which has been shut down for several weeks on account of labor trouble.

**Lump Gulch**.—Shipments of silver ore from the Liverpool have been increased to a carload daily. The east face on the 750-ft. level is reported improved and ore is being found to continue in the Manchester claim on the strike.

**Elliston**.—With roads now open it is expected that shipments of concentrates from the Monarch can begin. The mill is running upon good ore. Sinking of a winze from the main working tunnel is under way.

**Saltese**.—The date of the delinquent sale of Tarbox stock, in consequence of the last assessment of five mills per share, has been postponed to June 28.

**Libby**.—Construction of the Lukens-Hazel 250-ton mill is expected to be completed about the end of July. A hydraulic power plant of 600 hp. capacity has been built. A compressor plant has also been installed.

**Elkhorn**.—The orebody on the Blue Jay vein of the Boston & Montana continues 6 ft. wide. Raising for the Park orebody continues, and the striking of a heavy water flow is believed to indicate the proximity of an ore channel, which, when the water has been drained, will disclose the ore shoot in evidence at the surface of the Park vein.

**Copper Cliff**.—Two and a half feet of 17 per cent copper ore has been cut by the No. 4 tunnel of the Potomac Copper Co., which is being driven for the Copper Cliff property.

## NEVADA

**Mina**—The skip pocket at the Simon Silver Lead, 20 ft. below the 7th level, has been cut and timbered, the station timbered and the pumping station completed. Crosscutting has started to explore for the downward extension of ore developed on the 4th, 5th and 6th levels. Six additional dwellings have been completed for employees with families.

Fred Miller, R. J. Bonnemort, superintendent of the Olympic Mines Co., and J. P. Nelson have made the first payment to Stevens and Moore for the Clairmont and Gumbo groups and the Gold Coin claim, all of which adjoin Olympic ground. The framework for the new Olympic 65-ft. cyanide mill is completed. The company has bought two Fairbanks-Morse, type-Y, vertical cylinder semi-Diesel engines. Machinery is being hauled to property. The former mill was totally destroyed by fire last spring.

**Tule Canyon**—The Ingalls company has placed in operation its new 5-stamp mill. Five more stamps and a cyanide plant will be added.

The Silver Hills company is also building a mill and cyanide plant. The shaft is now down 110 ft.

**Montezuma**—The Silver Mines Co. has stopped shipments, put in power drills and is concentrating on developments. A mill is being installed.

## NEW MEXICO

**Work of Opening White Signal Radium  
Property Progressing—Octo to  
Resume—Co-Operative Strikes  
High Grade**

**Lordsburg**—The Octo Mining Co. will start operations at once. The main shaft will be sunk to the 300 ft. level, a station cut and exploratory crosscuts run. The management has changed. E. W. Smith, of Los Angeles, W. T. Bill, of El Centro, and H. S. Hubbell, of Redlands, Cal., being the leading stockholders. Operations will be in charge of Fred C. Sammek as mining engineer, who has but recently returned from India, where he was with the Burma Mines, Inc., for seven years at Bawdwin.

The Co-Operative Mines Co. have struck some very high grade metallic silver in the bottom of the shaft. The vein seems to be about 2 ft. wide and highly mineralized. E. H. Gould is in charge as engineer.

A meeting of the stockholders of the 85 Mining Co. was held on June 7, incidental to the turning over of the property to the Calumet & Arizona Mining Co.

Mill test reports upon the ores of the Bonney Consolidated recently received are most favorable. A new form of flotation box was used, the recovery being remarkably high. Arrangements are now being made for a 500-ton mill test to be carried out during July. These tests will be under the direction of James P. Porteus, general superintendent.

Some very fine specimens of copper sulphide ores have been brought in by L. W. Simpson from the Red Rock district, north of Lordsburg on the Gila River. The veins are strong and well mineralized fissures.

**Silver City**—Shipments of manganese ores from Boston Hill by Porterfield Bros. are tied up owing to a wash-out on the Santa Fe Ry. Mining will be continued and shipments of 300 tons a day will be made until they catch up on deliveries.

**White Signal**—Work is progressing upon the Foster and Grissom radium (torbernite and autunite) properties. A 20-hp. gas hoist has been installed at the Merry Widow shaft. A compressor and engine will follow at once. Six tent houses have been erected and a frame building suitable for a store and mine office has been completed. Hugh L. Foster is in charge.

**Hanover**—The Black Hawk Consolidated shipped 600 tons of ore in May, principally from the Lucky Bill and Denver claims. Extensive development is being carried on. Ira L. Wright is manager.

**Deming**—The Warren-Hoagland manganese property is shipping. A second tunnel is being run to block out ores on the north side of the gulch. The orebody on the south side shows an analysis of 78.73 MnO<sub>2</sub>, 5 per cent CaF<sub>2</sub>, 3 per cent CaCO<sub>3</sub>, and 1 per cent moisture.

## WASHINGTON

**Quilp To Deepen Shaft—Washington Water Power Co. Adding to Power Resources**

**Republic**—The Republic district, which is the major gold producing area of Washington, is showing a renewal of mining activity. The Quilp Mining Co. reports that it will sink its shaft 200 ft. below the 800-ft. level. These are the deepest workings in the district and the extension of mining operations is encouraged by the size and consistency of the pay shoot to the present depth. The quartz vein is of the typical banded type and is enclosed in latite-porphyr. The mining is on a segment of the Surprise vein, the principal vein of the district.

The Northport Mines Branch, which owns the adjoining Lone Fine-Surprise group, is drawing siliceous gold ore from the stopes for shipment to the Northport smelter, where it is used as a flux.

**Boundary**—The Electric Point mine is operating with a crew of 65 men and shipping crude lead ore regularly to the Northport and Trail smelters. Auto trucks are used to haul the ore to Boundary station. Spring freshets have put the roads in poor shape and considerably delayed shipments.

**Valley**—At present a crew of 75 men is employed at the Allen and Moss quarries of the American Mineral Production Co. and an average of 200 tons of crude magnesite shipped daily to the large calcining plant of the Northwest Magnesite Co.

**Chewelah**—The Washington Water Power Co. expects to complete within 15 days the transmission line being built from the Long Lake power plant to Chewelah. This line will meet the urgent power demands of the magnesite industry and the United Silver-Copper Mining Co. which have heretofore been seriously handicapped by the power shortages at the Myers Falls plant during the low water period.

## OREGON

**Holland**—A. C. Stewart and associates have acquired the Cowen gold quartz property near Holland in the Waldo district. The workings are not over 100 ft. deep and consist of 2,000 ft. of tunnels and drifts. The new owners have sunk a winze below this level.

## UTAH

**Bingham Canyon**—The plan of carrying on underground mining by contract is being tried out in a number of Bingham mines and is said to be meeting with success. The Utah Apex, for example, is working 285 men under this system. The men are paid for the actual amount of work done, it being left to them whether they work the straight eight-hour shift or nine or ten hours. Owing to the labor shortage the mining personnel is made up of a larger number of younger men than formerly, who are being trained into good miners.

## CANADA

## British Columbia

**Dolly Varden Again Shipping—Mining Corporation Developing Texas-Yankee Girl**

By ROBERT DUNN

**Victoria**—The statement that the railway up the Bear River Valley has been taken over by one or more of the development companies of the district seems to be well founded. Whether the road will be ready for operation this season is doubtful but it is evident that those responsible for the move are in earnest. Such transportation facilities would be a boon to the prospectors and operators in the Marmot River, Bitter Creek, and other areas along the upper waters of the Bear. Nothing has been heard lately of the suggested aerial service from Stewart into the Salmon River district but arrivals from the North declare that the project has not been abandoned.

There is some agitation for the construction of a bridge by the government across the Bear River and also for building a road from the Premier mine to the Mineral Hill Flats. George Clothier, government mining engineer for the district, reports that there will be quite a number of prospectors in the Unuk River country, north of Salmon River littoral, during the summer.

Two of the companies actively engaged in the development of properties of the Portland Canal mining division are the Pacific Coast Exploration Co. and the Algonic Development Co., Ltd. These are in addition, of course, to the Premier Mining Co. and the syndicate headed by Sir Donald Mann, which controls the Big Missouri.

The Patricia, Magee, and Montana groups of claims, situated on the Marmot River, are to be developed, preparations to that end already having been completed.

General R. G. Edwards Leckie, for four years with the Canadian Expeditionary Force in France, has returned to his practice as a mining engineer and is investigating the possibilities of the Hercules group on the Salmon River. This property has been Crown granted and so has been developed to some extent. The work is to be carried on and, if results warrant, the investment necessary to put it on a shipping basis will be undertaken.

**Kamloops**—The Donohoe Mines Corporation has ordered machinery for a 50-ton mill for the Stump Lake mine. The foundations are being constructed. The property was recently inspected by William J. Shedwick, Jr., of Kennecott Copper, and Lewis A. Levensaler and Francis N. Myers.

**Renata**—Development work carried on at the Mountain Chief copper mine, at Renata, Arrow Lakes, has demonstrated that the ore body has a depth of 68 ft. below the original shaft. The ore remains bornite and chalcocopyrite.

**Ymir**—The Texas-Yankee Girl mine at Ymir, recently taken over by the

Mining Corporation of Canada, is being systematically explored and developed. About forty men are engaged and it is expected it will take six months of this work to obtain the information necessary to determine the company's plans.

**Grand Forks**—It is announced that the diamond drilling to be undertaken by the provincial government in Franklin camp will be started on the Gloucester group of claims. Equipment has been installed and work will start soon under the supervision of P. B. Freeland, government mining engineer. It is likely that other properties near by will receive similar attention.

## Ontario

**Cobalt**—At the annual meeting of the Mining Corporation of Canada it was officially announced that the company had secured an interest in the option on the Flin Flon property in northern Manitoba. This has been known for some time. It was also stated that a deal was practically consummated for another Cobalt property having developed ore reserves.

**Gowganda**—Surveys have been completed for the Gowganda Light Railways and the first carload of steel has arrived for construction. The railway, which will be similar to the light railways used behind the front in France, will run between Elk Lake and Gowganda, and will serve the latter camp, which has always been greatly hampered by lack of transportation.

**Painkiller Lake**—A revival of activity is reported from this district about 10 miles from Matheson. The Hill Gold Mines has resumed work with a force of about 20 men. The Cartwright Gold Fields has built mining camps and is preparing to carry on an active exploration campaign.

**West Shining Tree**—President George B. Rogers, of the Wasapika, has issued a statement denying the stories as to the discovery of \$200 ore on the second level of the mine. The company, he says, wishes to advise shareholders and the public that results, though satisfactory, do not indicate the presence of any considerable body of ore of such high grade. Preliminary sampling indicates that the ore deposit carries enough gold to permit profitable mining, but the venture is still in the early speculative stage.

**Wolfe Lake**—Three brokerage houses in Toronto, New York and London, England, have between them underwritten 1,500,000 shares of the Murray-Mogridge Co. each taking 500,000.

**Matachewan**—The Robb-Clemens claims, which were under option to Novington and Smith, recently reverted to the Crown owing to work done on them in order to protect the title not being duly recorded and have since been re-staked by William Young, who owns an adjoining claim.

## Quebec

Samuel W. Cohen, of Montreal, has recently purchased the Poulin asbestos mine at East Broughton.

# THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

## Silver and Sterling Exchange

| June | Sterling Exchange               | Silver          |                                | June | Sterling Exchange | Silver          |                                |
|------|---------------------------------|-----------------|--------------------------------|------|-------------------|-----------------|--------------------------------|
|      |                                 | New York, Cents | London, Pence                  |      |                   | New York, Cents | London, Pence                  |
| 10   | 391                             | 87              | 48 <sup>3</sup> / <sub>8</sub> | 14   | 393               | 85              | 44 <sup>1</sup> / <sub>2</sub> |
| 11   | 394                             | 92              | 51 <sup>1</sup> / <sub>2</sub> | 15   | 393               | 82              | 44                             |
| 12   | 393 <sup>1</sup> / <sub>2</sub> | 90              | 50 <sup>3</sup> / <sub>8</sub> | 16   | 394               | 80              | 44 <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.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

## Daily Prices of Metals in New York

| June | Copper       |             | Tin     |       | Lead   |        | Zinc |
|------|--------------|-------------|---------|-------|--------|--------|------|
|      | Electrolytic | 99 Per Cent | Straits | N. Y. | St. L. | St. L. |      |
| 10   | 18.20        | 44.25       | 46.50   | 8.50  | 8.40   | 7.60   |      |
| 11   | 18.15        | 45.50       | 48.50   | 8.50  | 8.40   | 7.55   |      |
| 12   | 18.10        | 45.50       | 48.50   | 8.40  | 8.40   | 7.50   |      |
| 14   | 18.10        | 45.00       | 47.25   | 8.40  | 8.25   | 7.50   |      |
| 15   | 18.00        | 43.50       | 45.25   | 8.20  | 8.00   | 7.45   |      |
| 16   | 18.00        | 43.75       | 45.50   | 8.00  | 8.00   | 7.35   |      |

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 prompt and nearby deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

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

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

## London

| June | Copper                         |                                |              | Tin                             |                                 | Lead                           |                                | Zinc                           |                                |
|------|--------------------------------|--------------------------------|--------------|---------------------------------|---------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|      | Standard                       |                                | Electrolytic | Spot                            | 3 M                             | Spot                           | 3 M                            | Spot                           | 3 M                            |
|      | Spot                           | 3 M                            |              |                                 |                                 |                                |                                |                                |                                |
| 10   | 89 <sup>1</sup> / <sub>2</sub> | 92 <sup>1</sup> / <sub>2</sub> | 105          | 235 <sup>1</sup> / <sub>2</sub> | 241                             | 35 <sup>1</sup> / <sub>2</sub> | 37 <sup>1</sup> / <sub>2</sub> | 42                             | 44                             |
| 11   | 88 <sup>1</sup> / <sub>2</sub> | 92                             | 104          | 244                             | 247 <sup>1</sup> / <sub>2</sub> | 35 <sup>1</sup> / <sub>2</sub> | 37 <sup>1</sup> / <sub>2</sub> | 41 <sup>1</sup> / <sub>2</sub> | 43                             |
| 12   | .....                          | .....                          | .....        | .....                           | .....                           | .....                          | .....                          | .....                          | .....                          |
| 14   | 88                             | 90 <sup>1</sup> / <sub>2</sub> | 103          | 245 <sup>1</sup> / <sub>2</sub> | 249 <sup>1</sup> / <sub>2</sub> | 35 <sup>1</sup> / <sub>2</sub> | 37 <sup>1</sup> / <sub>2</sub> | 41 <sup>1</sup> / <sub>2</sub> | 43 <sup>1</sup> / <sub>2</sub> |
| 15   | 86 <sup>1</sup> / <sub>2</sub> | 88 <sup>1</sup> / <sub>2</sub> | 102          | 235                             | 239                             | 34 <sup>1</sup> / <sub>2</sub> | 36 <sup>1</sup> / <sub>2</sub> | 41 <sup>1</sup> / <sub>2</sub> | 43 <sup>1</sup> / <sub>2</sub> |
| 16   | 85 <sup>1</sup> / <sub>2</sub> | 88                             | 100          | 239                             | 242                             | 32                             | 33 <sup>1</sup> / <sub>2</sub> | 40 <sup>1</sup> / <sub>2</sub> | 42 <sup>1</sup> / <sub>2</sub> |

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

## Metal Markets

### New York, June 16, 1920

Weakness throughout characterized the major-metal markets during the last week. Further declines in London, caused to a large degree by forced liquidation on the part of the speculative element, compelled a general lowering of prices here; otherwise, actual shipments of metal from Europe would have become profitable. No immediate relief is in sight, though the statistical position of most metals continues good. Consumers are not buying, and are willing to let their stocks dwindle far below normal levels. With

much of their finished product on their hands, owing to cancellation of orders and to transportation difficulties, and with labor conditions unsettled, they are not willing to carry their usual stocks of raw materials, especially in the face of decreasing prices and tight money. Lots of metal bought during the first four months of the year remains undelivered.

### Copper

Leading producers are trying to be optimistic and refusing to sell at present prices. Large consumers are beginning to feel that their third-quarter requirements can be filled at nearer 18c.

than 19c., and consider that a waiting policy is conducive to their interests. The smaller producers are selling copper around 18c. f.o.b. refinery, and odd lots can be had through dealers down to 17<sup>1</sup>/<sub>2</sub>c. for shapes which are not in the greatest demand.

Export demand is also light—approximately half what it was a month ago. Spot electrolytic can be obtained in London today at £100 per 2,240 lb., which is equivalent to 17.60c.

### Lead

A reduction of <sup>1</sup>/<sub>2</sub>c. by the A. S. & R. yesterday, and another reduction of <sup>1</sup>/<sub>2</sub>c. today has brought their "official" price to 8c., New York. This was in line with the trend of the market. Inquiries for July delivery have been poor, and the depressed London market also influenced the decision. In the general market small amounts are still in demand for immediate shipment, but large orders are a rarity. Metal for August and September delivery can still be obtained at a discount of <sup>1</sup>/<sub>2</sub> to <sup>3</sup>/<sub>4</sub>c. from the prices which we quote. Paint makers and manufacturers of batteries are the most active consumers.

### Zinc

Last week's slight advance has been upset by further declines abroad, and practically the only business has been done by international traders. The London price today is equivalent to about 6<sup>3</sup>/<sub>4</sub>c. St. Louis basis—below domestic cost of production. Electrolytic zinc, however, continues in good demand and one of the large producers reports that the price is being held firmly around 9<sup>1</sup>/<sub>2</sub>c., New York, with little or none for sale this side of August. The propaganda of the American Zinc Institute is having its effect, and many inquiries are being received for various forms of sheet zinc from architects. Rollers of this metal require the high-grade article, as cadmium is a most undesirable impurity.

### Tin

Inquiries have been few. Consumers loaded up when the metal was between 50 and 60c., as they thought they were getting a bargain at that time. Considerable Banca tin has been looking for a market at almost any price, for the last two weeks. Producers of electrolytic have found no market, and have been compelled to cut <sup>1</sup>/<sub>2</sub> to <sup>3</sup>/<sub>4</sub>c. under the price of Straits to make sales. The price differential between Straits and 99 per cent continues greater than usual.

Straits tin for future delivery: June 10, 46@46<sup>1</sup>/<sub>2</sub>c.; June 11, 47<sup>1</sup>/<sub>2</sub>@48c.; June 12, 47<sup>1</sup>/<sub>2</sub>@48c.; June 14, 46@46<sup>1</sup>/<sub>2</sub>c.; June 15, 44<sup>1</sup>/<sub>2</sub>@45<sup>1</sup>/<sub>2</sub>c.; June 16, 45@45<sup>1</sup>/<sub>2</sub>c.

Arrivals of tin in long tons: June 11, Liverpool, 110; Singapore, 15; Hongkong, 65; June 12, China, 55; Penang, 250; June 14, London, 185; Liverpool, 50; June 15, Liverpool, 70; London, 125.

### Silver

Silver continues to show a substantial decline in London. The occasion of the fall can be attributed to two causes chiefly, first, the stagnation in Eastern exports to Western countries, thus checking the purchases of silver for China and India to settle balances, and the arrival in substantial quantities of silver coin in London from the Continent. Before the war, France and Germany were buyers in considerable amounts, but those countries are now sellers to an appreciable extent.

A critical analysis of the silver market is presented on p. 1388.

**Mexican Dollars:** June 10, 64½; 11, 69½; 12, 66½; 14, 62½; 15, 61½; 16, 60½.

### Gold

Gold in London on June 10, 105s. 3d.; June 11, 104s. 2d.; June 14, 104s. 4d.; June 15, 104s. 4d.; June 16, 104s. 2d.

### Foreign Exchange

Only narrow fluctuations have occurred in foreign exchange during the last week, with the exception of Canadian money, which continues to weaken, and Indian rupees, which dropped from 41.00c. a week ago to 39.25c. yesterday. In units to the dollar francs and lire on Tuesday were 13.04 and 17.65 respectively. German marks 2.43c., and New York funds in Montreal, 15½ per cent premium.

### Other Metals

**Aluminum**—Ingot is quoted at 33@34c. per lb., with 32@33c. open market for 98@99 per cent virgin.

**Antimony**—Market quiet. Spot, 8½@8¾c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 8@8¼c. W. C. C. brand, 9c.

**Antimony, Needle**—The market for Chinese needle antimony in lump form is firm at 9½c. per lb., although demand continues quiet. Standard powdered needle antimony (200 mesh) is quoted at from 12 to 15c. per lb. according to quantity. Unchanged.

**Bismuth**—Unchanged at \$2.70@\$3 per lb. for 500-lb. lots.

**Cadmium**—Quoted nominally at \$1.40@\$1.50 per lb. Unchanged.

**Cerium Metal**—There has been no change from the price of \$8@\$9 per lb. in ingot form.

**Cobalt**—Metal remains at \$2.50 to \$3. per lb. Black Oxide, \$2 per lb.

**Iridium**—Purely nominal quotation of \$300 per oz. No business.

**Magnesium**—Metallic, 99 per cent or over pure, \$1.60@\$1.85 per lb. Unchanged.

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

**Nickel**—Ingot, 43c.; shot, 43c.; electrolytic, 45c; Monel metal, shot, 35c; blocks, 35c., and ingots, 38c. per lb.

**Osmium**—Open market prices, \$50@\$75 per troy oz.

**Palladium**—Quoted at \$70@\$80 per oz.

**Platinum**—Market weaker at \$75@\$95 per oz. Little business transacted.

**Quicksilver**—Market quieter. Quotation \$90@\$92 per 75-lb. flask. San Francisco wires \$85; steady.

**Ruthenium**—Market value, \$200@\$220 per troy oz. Unchanged.

**Selenium**, black, powdered, amorphous, 99.5 per cent pure, continues to be quoted at \$1.75@\$2 per lb., depending on quantity.

**Thallium Metal**—Selling at \$18@\$20 per lb., ingot, 99 per cent pure, depending on quantity.

### Metallic Ores

**Bauxite**—Bauxite for alum manufacture, containing about 52 per cent alumina, less than 2 per cent iron oxide and up to 20 per cent silica, and artificially dried to contain not more than 4 per cent free moisture, sells for \$10 per gross ton at mine. Bauxite containing 54 per cent alumina and about 15 per cent silica sells for \$11 per gross ton. Bauxite averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, \$13 per gross ton on the basis of 8 per cent free moisture. Ores of very low silica content suitable for manufacture of aluminum oxide and hydrate of alumina command a fancy price.

**Chrome Ore**—Current price of chrome ore on the basis of Cr<sub>2</sub>O<sub>3</sub> varies with the sesquioxide contained. The guaranteed 50 per cent foreign ore with a minimum of 6 per cent silica ranges from 72c. to 80c. per unit, New York. California concentrates, 50 per cent Cr<sub>2</sub>O<sub>3</sub> and upward, 60@65c. per unit, f.o.b. mines. Unchanged.

**Iron Ores**—Lake Superior ores, per ton delivered at Lower Lake ports: Old Range bessemer, \$7.45; Old Range non-bessemer, \$6.70; Mesabi bessemer, \$7.20; Mesabi non-bessemer, \$6.55. Ore shipments ample to cover requirements of furnaces, which are curtailed due to coal shortage.

**Manganese Ore**—High-grade ore is quoted at 80@85c. per unit. Chemical ore (Mn O<sub>2</sub>) \$75@\$85 per gross ton.

**Molybdenum**—Few transactions. Quoted nominally at 85c. per lb. of contained sulphide for 85 per cent MoS<sub>2</sub>.

**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, is still selling at 65@70c. per lb. in ton lots.

**Titanium Ores**.—Ilmenite 52 per cent TiO<sub>2</sub>, 2c. per lb. for ore. Rutile, 95 per cent TiO<sub>2</sub>, 20@25c. per lb. for ore, with concessions on large lots or running contracts.

**Tungsten Ore**—Scheelite, 60 per cent WO<sub>3</sub> and over, per unit of WO<sub>3</sub>, \$7 f.o.b. mines; wolframite, 60 per cent WO<sub>3</sub> and over, per unit of WO<sub>3</sub>, \$6.50@\$7.50 f.o.b. mines.

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

**Uranium Ore (Carnotite)**—\$2.75@\$3 per lb. for 96 per cent of the contained oxide (U<sub>3</sub>O<sub>8</sub>). Ores must contain a minimum of 2 per cent U<sub>3</sub>O<sub>8</sub>.

**Vanadium Ore**—Prices are usually based on vanadium content, and at present range from \$1 to \$3 per lb. of contained vanadium. Variation also depends on presence of lead, copper, arsenic, molybdenum, uranium, etc.

**Zircon**—Washed, iron free, continues to be quoted at 10c. per lb. Zirkite—In carload lots, \$90@\$100 per ton is quoted. Pure white oxide, 99 per cent, is quoted at \$1.15 per lb. in ton lots.

### Zinc and Lead Ore Markets

**Joplin, Mo., June 12**—Zinc blende, per ton, high, \$47.50; basis 60 per cent zinc, premium, \$45; Prime Western, \$45 @\$43.50; fines and slimes, \$42@\$40; calamine, 40 per cent zinc, \$36. Average settling prices: Blende, \$44.40, calamine, \$37.30; all zinc ores, \$44.22.

Lead, high, \$104; basis 80 per cent lead, \$100; average settling price, all grades of lead, \$102.76 per ton.

**Platteville, Wis., June 12**—Blende, basis 60 per cent zinc, \$48.50 for high-grade blende. Lead ore, basis 80 per cent lead, \$100 per ton. Shipments for the week: Blende, 1,092; calamine, 80; sulphur ore, 124 tons. Shipments for the year: blende, 32,636; calamine, 2,060; lead, 2,991; sulphur ore, 804 tons. Shipped during the week to separating plants, 2,417 tons blende.

### Non-Metallic Minerals

**Asbestos**—Quoted per short ton f.o.b. Thetford, Broughton and Black Lake mines, Quebec, Canada. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots. Crude No. 1, \$1,800@\$2,500; crude No. 2, \$1,100@\$1,500; spinning fibres, \$400@\$700; magnesia and compressed sheet fibres, \$300@\$400; shingle stock, \$100@\$150; paper stock, \$60@\$80; cement stock, \$17.50@\$30; floats, \$8.50@\$15 per short ton. Crude No. 1, f.o.b. Thetford Mines, freight to New York \$8.45 per ton in carload lots. Five per cent Canadian royalty export sales tax must be added to these prices.

**Barytes**—Crude, 88 to 94 per cent barium content, \$8@\$10 per net ton; ground, (white) \$22@\$25 in bags, carload lots; (off-color) \$18@\$20 in bags, carload lots; all prices f.o.b. Kings Creek, S. C. Prices f.o.b. Cartersville, Ga., are \$23@\$25 per net ton for ground, (white); \$16@\$19 for ground (off-color); \$12 per gross ton for crude, 88@94 per cent. Quotations f.o.b. New York in less than carload lots are \$40.50 per net ton for ground (white); \$27 net ton for ground (off color); \$23 per net ton for crude 88 to 94 per cent barium content.

**Chalk**—English, extra light, 5@7c. per lb.; light, 5@6c. per lb.; dense, 4@5c. per lb., f.o.b. New York. Unchanged.

**China Clay (Kaolin)**—Imported lump, \$25@\$35; imported powdered, \$30@\$60;

domestic lump, \$10@20; domestic powdered, \$25@30, all per net ton, f.o.b. New York. Crude, \$8@12 net ton f.o.b. Virginia points; ground, \$15 @ \$40 net ton, f.o.b. Virginia points.

**Feldspar**—Crude, \$7.50@8 per gross ton, f.o.b. Maryland and North Carolina points; ground, \$22@25 car lots, f.o.b. Baltimore; ground, \$16@20, f.o.b. North Carolina points; up to \$16 to \$19 per ton, No. 1 ground, f.o.b. New York State.

**Fluorspar**—Gravel, f.o.b. mines, \$22.50@25.

**Fuller's Earth**—Remains firm at \$25 @ \$30 per ton for domestic and \$35 @ \$40 for foreign, with little material available.

**Graphite**—Present quotations for crucible flake are: 80 per cent carbon content, 5c. per lb.; 90 per cent, 10c.; 30 per cent (dust polish grade) 1c.; 50 per cent (dust facing grade) 2c., f.o.b. Ashland, Ala.

Market conditions in the Alabama district show a better demand and higher prices during the past week. One 60,000-lb. car of 85 per cent guaranteed carbon was shipped at 11c. per lb. delivered. The continuing good demand for 90 per cent crucible at from 8½ to 9c. f.o.b. Ashland, with the increased demand for the lubricating grades, is gradually cleaning up the accumulated stocks, with the result that if the domestic material is continued to be used it must receive an increase above the past six months' prevailing price. Quotations f.o.b. New York for crucible flake are: 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c. per lb.; 90 per cent, 10½c. per lb.

**Gypsum**—Wholesale price, plaster of paris in carload lots, is \$3.75 per 250-lb. bbl., alongside dock New York.

**Kaolin**—See China Clay.

**Magnesite**—Dead burned, for refractory (see Refractories).

**Magnesite, Calcined**—High-grade caustic calcined, in lump form, is selling at \$35@40 per ton in carload lots f.o.b. California points. The price of freshly ground calcined, suitable for the flooring trade, is \$65@75 per ton f.o.b. Eastern points.

**Mica**—No change in prices per lb. for block mica slightly stained according to grade: No. 6, 50c.; No. 5, \$1.20@1.40; No. 4, \$2@3; No. 3, \$4.25@5; No. 2, \$5.50@7; No. 1, \$8; all prices f.o.b. New York. Prices quoted per lb., f.o.b. New York, for clear block mica according to grade are: No. 6, 55c.; No. 5, \$2; No. 4, \$4; No. 3, \$5.75; No. 2, \$7; No. 1, \$9; A1, \$14; extra large, \$25.

**Monazite**—Product carrying a minimum of 6 per cent thorium oxide, \$42 per unit is quoted, duty paid.

**Phosphate Rock**—Prices quoted per long ton at Florida ports are: 68 per cent tricalcium phosphate, \$6.85; 70 per cent, \$7.35; 74 to 75 per cent, \$10; 75 per cent minimum, \$10.50; 77 per cent cent minimum, \$12.50. Situation unchanged.

**Pumice Stone**—Imported, 3@6c. per lb.; domestic, 2½c. per lb. Unchanged.

**Pyrites**—Placing of additional tax in Spain is holding down imports of this mineral. Spanish furnace size ore has sold at 16½c. per unit. Freight rates range from 15s. to 17s. No change in domestic situation.

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

**Sulphur**—Market remains unchanged, with a quiet domestic and heavy foreign demand. Prices average \$18 per ton for domestic, and \$20 for export, f.o.b. Texas and Louisiana mines.

**Talc**—Prices f.o.b. Vermont are \$9.50 @ \$14 per ton, paper making; roofing grades, \$8@9; rubber grades, \$9@15. California talc sells for \$20@35, talcum powder grade. Quotations for southern talc are: powdered, carload lots, \$12 per ton; less than carload, \$15, f.o.b. cars. Freight to New York, \$5.25 per ton, carload lots; less than carload lots, \$9.25.

#### Mineral Products

**Arsenic**—White arsenic, 14@15c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works.

**Nitrate**—Soda quoted at \$3.85@3.90 per cwt., ex vessel, Atlantic ports. Market quiet.

**Potassium Sulphate**—Domestic, \$2.25 to \$2.50 per net ton, basis 90 per cent, f.o.b. New York, depending on quantity.

#### Ferro Alloys

**Ferrocobalt**—For 15-18 per cent material, \$206@250 per ton f.o.b. Niagara Falls, N. Y. Unchanged.

**Ferrocobalt**—Conditions abroad continue to cause a reduction in price of the American goods, and this alloy is now selling at \$12@15 per lb.

**Ferrochrome**—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 18@19c.

**Ferromanganese**—For 70 to 80 per cent Mn, \$200@250 per gross ton, f.o.b. works. Spiegeleisen, 16 to 20 per cent Mn, \$72.50@75 per gross ton.

**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, are quoted at \$2.25 @ \$2.75 per lb. of contained metal.

**Ferrosilicon**—For 10 to 15 per cent, per gross ton, f.o.b. works, \$60@65; 50 per cent, \$80@90; 75 per cent, \$150@160.

**Ferrotungsten**—Unchanged at 85c @ \$1.15 per lb. contained tungsten.

**Ferro-uranium**—35-50 per cent U, \$7 per lb. of U contained. Unchanged.

**Ferrovanadium**—Basis 30-40 per cent, \$6.50@7 per lb. of V contained.

#### Metal Products

**Copper Sheets**—No change in Jan. 7 price of 29½c. per lb.; wire, quoted 22½ @ 22½c.; market still strong.

**Lead Sheets**—Full lead sheets, 12½c.;

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

cut lead sheets, 12½c. in quantity prices, mill lots. Unchanged.

**Nickel Silver**—Unchanged at 39½c. per lb. for 18 per cent nickel.

**Yellow Metal**—Dimension sheets, 26½c.; sheathing, 25½c.; rods, ½ to 3 in., 23½c. Unchanged.

**Zinc Sheets**—\$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb. Unchanged.

#### Refractories

**Chrome Brick**—Present quotation for 9 inch straights and sizes, f.o.b. Baltimore, is \$80@90 per net ton. Unchanged at \$70@75 per net ton, f.o.b. Chester, Pa.

**Chrome Cements**—Unchanged at \$45 @ \$50 per net ton, f.o.b. Chester, Pa.

**Clay Brick**—First-quality fire clay, \$45@50 per 1,000, f.o.b. Clearfield, Pa.; second quality, \$40@45 per 1,000, f.o.b. Clearfield, Pa. Fire clay, \$5 to \$7 net ton, f.o.b. Baltimore. A correspondent informs us that first-quality fire clay brick sells at plants in New Jersey at \$75 per 1,000 and in St. Louis at \$45.

**Magnesite**—Dead-burned, \$48@55 per net ton, f.o.b. Chester, Pa.; brick, 9 x 4½ x 2½ in., \$90@95 per net ton, f.o.b. Chester, Pa. Nine-inch straights, f.o.b. Baltimore, \$90 per net ton; 9-inch sizes and shapes larger than 9-inch, regular extras. Dolomite is selling at \$12.50 per ton, f.o.b. Ohio.

**Silica Brick**—Prices for 9-inch straights and sizes, f.o.b. Baltimore, are \$80@90 per net ton; \$50@55 per 1,000, f.o.b. Mount Union, Pa.

#### Iron Trade Review

Pittsburgh, June 15, 1920

The steel market as a whole is even quieter than it was in May. Prices for prompt shipment continue to decline, and prices for three or four months' delivery are maintained, the mills filled up for such a period being under no pressure to reduce prices.

**Pig Iron**—Market transactions are confined to prompt shipments, for which prices are firm, \$43 for bessemer, \$43.50 for basic, and \$45 for foundry, f.o.b. Valley furnaces, freight to Pittsburgh being \$1.40. There is a waiting game as to whether buyers or sellers will first be forced to move in the matter of second-half business.

**Steel**—Billets are practically nominal at the old range of \$60@65, and there is occasional business in sheet bars at \$75@80.

#### Charcoal and Coke

**Charcoal**—Large quantities sell as follows: Willow 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls.

**Buffalo**—For 72-hour Connellsville foundry, \$15; for 48-hour furnace, \$13.50 per ton.

**Connellsville**—Market stiffer. Prompt furnace, \$14.50@15; prompt foundry, \$16@16.50; contract foundry, \$12 per net ton at ovens. Nominal.

**New River**—Furnace, \$12@14, and foundry, \$14 per ton.

**Pocahontas**—Furnace, \$14@15 per ton.

**Wise County**—Furnace, \$14@15 per ton; foundry, \$15@15.50 per ton.

## The Dollar Silver Quotation

Telegrams From Secretary of the Treasury and Senator Pittman Clarify Government's Attitude

THE decline in the silver market has been so startling and sudden that many points still require explanation regarding the attitude of the United States Government toward its repurchase of silver, under the Pittman Act, at \$1 per oz., and the significance of the *Engineering and Mining Journal* quotations below \$1. Immediately after the recent sharp drop in silver, the *Engineering and Mining Journal* took steps to ascertain the attitude of the Government, bullion dealers, smelters and consumers. The results of some of these inquiries were partly set forth in these columns last week, but important events since then have given greater light on the situation. Under date of June 11 a telegram was dispatched to the Secretary of the Treasury embodying the following questions:

Is the Treasury now purchasing American silver at \$1 per oz.? How long has it been doing this and has there been any period since it started when it did not buy or was not ready to buy if offered? Will Treasury take all American silver offered? *Engineering and Mining Journal* quotations are used as basis for most contracts between producer and smelter; therefore, it is important to mining industry of the country that we should quote correctly. New York price of silver is considerably below \$1, but if Treasury is taking all American silver at \$1 we will quote two official prices, which we have not yet done.

J. E. SPURR, *Engineering and Mining Journal*.

Under date of June 14 the following reply was received from Secretary Houston:

J. E. SPURR, Editor, *Engineering and Mining Journal*.

Your telegram as to silver purchases received. As publicly announced by Director of the Mint on May 17, the Secretary of the Treasury has given standing orders to Director of the Mint to buy silver at \$1 per oz., 1,000 fine, delivered at option of Director of the Mint at Assay Office in New York or Mints in Philadelphia, Denver, and San Francisco, up to aggregate amount of 207,000,000 oz. Pittman Act requires, however, that silver so purchased must be product both of mines situated in United States and of reduction works so located, and clear and unequivocal proof to that effect is required, forms for which may be obtained from said Assay Office and Mints. Treasury feels that under provisions of Pittman Act when world price is below \$1 it is inevitable that there will be two prices for silver, one the world price and the other the dollar price for silver produced and reduced in United States. There has been no time since provisions of Pittman Act became operative when Director of the Mint has not been ready to buy American silver which conforms to provisions of the act within the limitations prescribed by the statute. He has purchased all silver so offered.

D. F. HOUSTON, Secretary of the Treasury.

In accordance with the information contained in Secretary Houston's wire to the *Engineering and Mining Journal*, we now quote two prices for silver: one a world price, and the other the dollar price for silver produced and reduced in the United States.

A recent telegram sent by Senator Pittman to the Nevada Mine Association discussing these points follows:

Mints are not declining to take American silver from smelters or anyone else at \$1 per oz. About 40 per cent of smelters' refinery is foreign silver and is intermingled with domestic silver. Smelters contend that they cannot segregate American silver and want Government to accept amount of silver that they can prove is equal to American silver purchased by them. Treasury willing to do this if legal officer of Comptroller advises that it is legal. In my opinion it is possible for refineries to keep separate American silver and foreign silver. If this is done smelters will have no trouble and Government will accept such silver under Pittman Act and pay \$1 therefor. It may cost refineries something to segregate silver, but they will not hesitate to do it if they can get \$1 per oz. from Government by such act instead of 84c. per oz. or possibly less if they don't segregate it. I have been discussing matter with Treasury Department today. Treasury Department will insist, however, that smelters settle with miners on basis of \$1 per oz. for silver that is sold to Government, namely, American silver. The necessity for Government being assured that silver presented to it under Pittman Act is American silver is accentuated by present conditions. Owing to condition of exchange in European and Oriental countries, and great depreciation in purchasing power of their money, such countries as France, China, and Japan have been compelled and are now melting up their silver coin into bullion and using it as a purchasing medium in foreign coun-

tries. Germany has already melted up and thrown on market practically all of her silver coin. It is the only thing these countries have that is worth anything near par except gold, and they have an insufficient quantity of that to secure their paper money. India for first time in history for same reasons is now melting up its silver coin and using bullion with which to purchase in foreign countries. This supply will eventually be absorbed, but before that takes place it may drive silver down to an even lower price in general market. American silver and American mines alone are safe from effects of this destructive condition. In the United States there are two markets and two prices for silver. Foreign silver is being sold to the trade today at 84c. American silver at same time is being sold to Government under Pittman Act for \$1. This is perfectly fair to Government because Government sold same amount of silver for \$1 per oz. plus all costs of transaction. The Government loses nothing by purchasing American silver under Pittman Act. Market price for American silver is \$1, and smelters will be compelled to settle upon such basis for all American silver purchased by them and resold to Government under Pittman Act. Treasury will insist upon this.

KEY PITTMAN.

The American Smelting & Refining Co. today issued the following statement, as a result of a conference at Washington between Government officials and representatives of the smelters and refiners:

"The Mint officials in Washington yesterday concluded with representatives of the smelters and refiners the methods under which silver produced and reduced in the United States from ores sold to smelters will be received by the Mint under the Pittman Act, at \$1 per oz., which amount, less an adjustment on account of Mint requirements of 1,000 fine, as against the commercial 999 fine, and the cost of transportation to the Mint, the two approximately  $\frac{2}{3}$  of 1c., will be paid to the miner.

"The American miner will, therefore, at once get for his silver 99 $\frac{2}{3}$ c. per oz.

"It is understood that under this arrangement the smelting and refining companies will be enabled to offer to the Government within a few days several million ounces of silver purchased by them during the last four months. Four months has been agreed upon as being the average time it takes between the receipt by the smelter of the ore and the time when the silver is finally refined and ready for the market.

"The result of this arrangement will mean that all silver produced from American mines since the price fell below \$1 will be relinquished to the mine on the basis of \$1, with the above deductions, and that from this time on all American silver as fast as it is produced by the mines will be settled for at 99 $\frac{2}{3}$ c.

"All the advantages of the Pittman Act are thus made to inure to the benefit of the American mine and the American miner and become at once available."

The new interpretation of the Pittman Act by the Treasury Department permits American smelters to sell mixed silver, that is, silver of domestic and foreign origin, at one dollar per ounce to a certain extent. Under this ruling, a smelter may offer the Treasury Department such proportion of its total output as is equivalent to the domestic ore which it has smelted.

Telegraphic advices to the Mints at Philadelphia, San Francisco, and Denver, and the Assay Office of New York City, dated June 15, provide a new form of affidavit for silver offered under these rulings. These affidavits provide for submitting mixed silver smelted from ores received at the reduction works since Jan. 17. This date is chosen to allow a four months' period between the receipt of ore and the date at which silver dropped below one dollar in the market in order that the smelter can compute the proportion of his output which is of domestic origin in accordance with the strict interpretation of the law.

## COMPANY REPORTS

### Natomas Company of California Gold; California

The annual report for the year ended Dec. 31, 1919, of the Natomas Company of California, one of the most important gold-dredging companies operating in California, affords an interesting insight into the effect of changing economic conditions upon a relatively stable industry such as this one is reputed to be. The company operates eleven gold dredges, nine in the American River field and two in the Feather River district. During 1919, there was dredged 20,485,530 cu.yd. of gravel. The gross recovery was \$1,775,124, at a cost, including taxes and insurance, of \$1,313,640. The net return was \$461,483. The annual final net return from all of the company's activities for the year was \$167,547. The significant figures of gross return, cost, and net return per cubic yard of gravel follow:

| Year      | Gross Recovery<br>Cents | Cost<br>Cents | Net Return<br>Cents |
|-----------|-------------------------|---------------|---------------------|
| 1914-1917 | 9.16                    | 4.57          | 4.59                |
| 1918      | 8.31                    | 5.46          | 2.85                |
| 1919      | 8.66                    | 6.41          | 2.25                |

According to the company's report, the remaining proved dredging ground owned amounts to 160,000,000 cu.yd., or at a dredging rate of 20,000,000 cu.yd. per year, an amount equivalent to eight years' operations. A reduction in cost of operation due either to a fall in prices or to relief by the Government would permit the dredging of 40,000,000 cu.yd. additional ground. The company operates two rock-crushing plants and is engaged in reclaiming its dredged-over lands for agricultural purposes. The two rock-crushing plants, one at Fair Oaks and the other at Oroville, have been leased to the Coast Rock & Gravel Co.

### Plymouth Consolidated Gold Mines Gold; California

The director's report of the Plymouth Consolidated Gold Mines Co. (a British corporation operating in California) for the year 1919 states that 119,200 tons of ore was milled, valued at £148,666 5s 6d, an average of 24s 11d per ton. Total yield was 34,526.99 oz. gold and 7,940 oz. silver. After allowing for depreciation, the net profit realized from the year's working amounted to £24,425 12s 6d, which, added to the "appropriation account" for 1918, brought it to £41,593 11s 3d. Out of this sum, two dividends were paid, each of 1s per share, leaving a balance of £13,156 13s. 8d. Capitalization consists of 240,000 shares of £1.

Costs per ton milled were as follows: Development, 3s 2.32d; mining, 10s 1.82d; milling, 2s 5.46d; realization of bullion and concentrate, 1s 2.44d; maintenance and general expenses, 1s 8.70d; a total of 18s 8.74d per ton, which is an increase of 2s 9.44d per ton over the record of 1918.

Although a British corporation, this company was unable to take advantage of the "gold premium" enjoyed by other British operators, as operations were conducted in the United States, where no "gold premium" exists.

### Chief Consolidated Mining Co. Silver-Lead; Arizona

The quarterly report of the Chief Consolidated Mining Co. for the first quarter of 1920 indicates that 22,996 dry tons of ore was shipped, which yielded \$678,071.87, after deducting smelting, transportation, and sampling charges. Production amounted to 1,517,555 oz. gold, 651,453.05 oz. silver, 2,911,174 lb. lead; 1,252 lb. copper, and 40,216 lb. zinc. The net profit after payment of all charges was \$188,522.08, from which a dividend amounting to \$88,423.20 (10c. per share on 884,232 shares of \$1 par value) was paid. Surplus account on Mar. 31, 1920, was \$1,738,789.99.

### Alaska Treadwell Gold Mining Co. Gold; Alaska

The operations of the Alaska Treadwell Gold Mining Co. for 1919 are summarized as follows: Receipts from interest and commercial profits, \$141,181.39; expenditures, Douglas Island, \$22,089.17; general utility improvements, \$26,312.71; Shakan prospect, \$18,995.21; Omilak venture, \$10,982.99; and other expenditures bring total to \$123,714.97. The net receipts over expenditures amounted to \$17,466.42. The company's assets are \$2,112,230.69, and liabilities are \$117,282.92, leaving a surplus of assets over liabilities, excluding property and plant, of \$1,994,947.77.

This company plans the manufacture of ferro-alloys at its plant, and has installed a new electric furnace for that purpose.

### Alaska Mexican Gold Mining Co. Gold; Alaska

The Alaska Mexican Gold Mining Co. carried on no operations during 1919 other than its 20 per cent interest in the joint utilities and in the outside properties and general prospecting. Expenditures totaled \$43,596.35 and receipts \$22,345.10, leaving a balance of expenditures over receipts of \$21,251.25. The company's assets total \$185,604.58 and liabilities were \$7,703.82, leaving a net surplus of assets over liabilities, excluding property and plant, of \$177,900.76.

### Alaska United Gold Mining Co. Gold; Alaska

The operations of the Alaska United Gold Mining Co. for 1919 are summarized as follows: Ready bullion expenditure over receipts, \$58,798.67. With prospecting, additions to property, and other items the net expenditure over income was \$78,917.81. The company's assets totaled \$104,768.83, and liabilities were \$465,232.96, leaving a net excess of liabilities over assets of \$360,464.13. It is planned to discontinue the effort of holding the Ready Bullion mine open.

### Simon Silver Lead Mines Co. Silver-Lead; Nevada

The first annual report of the Simon Silver Lead Mines Co. for 1919 states that receipts, (including sales of treasury stock), amounted to \$319,624.71. Disbursements totaled \$217,871.75. The property is not yet in a producing stage.

### Latest Rand Gold Production

During May, the gold production of the Rand, in South Africa, amounted to 699,041 oz., an increase in output over the April figure, 686,979 oz. A table summarizing production since 1917 follows:

|           | RAND GOLD OUTPUT 1917-1920<br>(Fine Ounces) |         |         |         |
|-----------|---|---------|---------|---------|
|           | 1920  | 1919    | 1918    | 1917    |
| January   | 670,503                                     | 676,059 | 714,182 | 782,634 |
| February  | 625,330                                     | 636,728 | 659,759 | 721,321 |
| March     | 707,036                                     | 712,379 | 696,281 | 787,094 |
| April     | 686,979                                     | 694,944 | 717,099 | 742,778 |
| May       | 699,041                                     | 724,995 | 741,217 | 729,385 |
| June      | .....                                       | 702,379 | 727,696 | 759,724 |
| July      | .....                                       | 725,497 | 736,199 | 757,890 |
| August    | .....                                       | 706,669 | 740,210 | 756,658 |
| September | .....                                       | 698,553 | 708,206 | 738,231 |
| October   | .....                                       | 723,722 | 679,764 | 751,290 |
| November  | .....                                       | 677,970 | 658,701 | 722,839 |
| December  | .....                                       | 650,191 | 641,245 | 722,419 |

Current rate of production is below the war rate, despite the effect of the "gold premium."

# MINING STOCKS

Week Ended June 12, 1920

| Stock              | Exch.       | High   | Low    | Last   | Last Div.     | Stock                                | Exch.        | High    | Low     | Last    | Last Div.    |
|--------------------|-------------|--------|--------|--------|---------------|--------------------------------------|--------------|---------|---------|---------|--------------|
| <b>COPPER</b>      |             |        |        |        |               | <b>GOLD</b>                          |              |         |         |         |              |
| Adventure          | Boston      |        |        | *80    |               | Alaska Gold                          | N. Y.        | 1 1/2   | 1 1/2   | 1 1/2   |              |
| Ahmeek             | Boston      | 62 1/2 | 61 1/2 | 62 1/2 | Mar. '20, Q   | Alaska Juneau                        | N. Y.        | 2 1/2   | 2 1/2   | 2 1/2   |              |
| Alaska-B.C.        | N. Y. Curb. | 1 1/2  | 1 1/2  | 1 1/2  |               | Carson Hill                          | N. Y. Curb.  | 27 1/2  | 27 1/2  | 27 1/2  |              |
| Allouez            | Boston      |        |        | 30     | Mar. '19      | Cresson Gold                         | N. Y. Curb.  |         |         |         | Mar. '20     |
| Anaconda           | N. Y.       | 57 1/2 | 55 1/2 | 57 1/2 | Feb. '20, Q   | Dome Ex.                             | Toronto      | *20 1/2 | *20     | *20 1/2 |              |
| Ariz. Com'l.       | Boston      | 10 1/2 | 10     | 10 1/2 | Oct. '18      | Dome Lake                            | Toronto      | *5 1/2  | *5 1/2  | *5 1/2  |              |
| Big Ledge          | N. Y. Curb. |        |        |        |               | Dome Mines                           | N. Y.        | 9 1/2   | 9 1/2   | 9 1/2   | Apr. '20, Q  |
| Bingham Mines      | Boston      | 9 1/2  | 9 1/2  | 9 1/2  | Sept. '19, Q  | Golden Cycle                         | Colo. Sprgs. | *92     | *75     | *75     | May '20, Q   |
| Calumet & Ariz.    | Boston      | 60     | 59 1/2 | 59 1/2 | Mar. '20, Q   | Goldfield Con.                       | N. Y. Curb.  | *10     | *9 1/2  | *10     | Dec. '19     |
| Calumet & Hecla    | Boston      | 323    | 318    | 320    | Dec. '19, Q   | Hedley                               | Boston       |         |         | 4 1/2   | June '19     |
| Can. Copper        | N. Y. Curb. | 1 1/2  | 1      | 1 1/2  |               | Hollinger Con.                       | Toronto      | 5.75    | 5.40    | 5.50    | Apr. '20     |
| Centennial         | Boston      | 12 1/2 | 11 1/2 | 11 1/2 | Dec. '18, SA  | Homestake                            | N. Y.        | 53 1/2  | 53 1/2  | 53 1/2  | Sept. '19    |
| Cerro de Pasco     | N. Y.       | 44 1/2 | 43     | 43 1/2 | Mar. '20, Q   | Kewanas                              | N. Y. Curb.  | 2       | 1       | 1 1/2   |              |
| Chief Consol.      | Boston Curb | 3 1/2  | 3 1/2  | 3 1/2  | Feb. '20      | Kirkland Lake                        | Toronto      | *48     | *45     | *45     |              |
| Chile Cop.         | N. Y.       | 16 1/2 | 15 1/2 | 16     |               | Lake Shore                           | Toronto      | 1.00    | 1.00    | 1.00    | Oct. '19     |
| Chino              | N. Y.       | 32     | 30     | 31     | Mar. '20, Q   | McIntyre-Porcupine                   | Toronto      | 1.94    | 1.87    | 1.87    | May '20      |
| Con. Ariz.         | N. Y. Curb. |        |        |        | Dec. '18, Q   | Porcupine Crown                      | Toronto      | *26 1/2 | *26     | *26 1/2 | July '17     |
| Con. Copper M.     | N. Y. Curb. | 3 1/2  | 3 1/2  | 3 1/2  |               | Portland                             | Colo. Sprgs. | *60     | *56     | *59     | Apr. '20, Q  |
| Cop. Range         | Boston      | 40     | 38     | 39     | Mar. '20, Q   | Reorgan. Booth                       | N. Y. Curb.  | *6      | *4 1/2  | *4      | May '19      |
| Crystal Cop. (new) | Boston Curb | *30    | *28    | *29    |               | Silver Pick                          | N. Y. Curb.  | *9      | *7      | *8      |              |
| Davis-Daly         | Boston      | 9 1/2  | 9 1/2  | 9 1/2  | Mar. '20, Q   | Teck Hughes                          | Toronto      | *12 1/2 | *11     | *12     |              |
| East Butte         | Boston      | 12 1/2 | 12 1/2 | 12 1/2 | Dec. '19, A   | Tom Reed                             | Los Angeles  | 1.63    | 1.60    | 1.61    | Dec. '19     |
| First Nat'l.       | Boston Curb | *100   | *93    | *93    | Feb. '19, SA  | United Eastern                       | N. Y. Curb.  | 3 3/8   | 3 3/8   | 3 3/8   | Apr. '20, Q  |
| Franklin           | Boston      | 2 1/2  | 2      | 2      |               | Vindicator Consol.                   | Colo. Sprgs. | *20     | *17     | *18     | Jan. '20, Q  |
| Gadsden Copper     | N. Y. Curb. | *74    | *62    | *73    |               | West Dome                            | Toronto      | *6 1/2  | *6      | *6 1/2  |              |
| Granby Consol.     | N. Y.       |        |        | 38     | May '19, Q    | White Caps Min.                      | N. Y. Curb.  | *12     | *6 1/2  | *11     |              |
| Greene-Can.        | N. Y.       | 29 1/2 | 28     | 28 1/2 | Feb. '19, Q   | Yukon Gold                           | Boston Curb  | 1       | 1       | 1       | June '18     |
| Hancock            | Boston      | 4 1/2  | 4 1/2  | 4 1/2  |               | <b>SILVER</b>                        |              |         |         |         |              |
| Houghton           | Boston Curb |        |        | *50    |               | Arizona Silver                       | Boston Curb  | *65     | *37     | *45     | Apr. '20, M  |
| Howe Sound         | N. Y. Curb. | 3 1/2  | 3 1/2  | 3 1/2  | Apr. '20, Q   | Bailey                               | Toronto      | *6      | *5      | *5      | Apr. '16     |
| Inspiration Con.   | N. Y.       | 53 1/2 | 52     | 52 1/2 | Apr. '20, Q   | Beaver Con.                          | Toronto      | *42     | *37     | *39 1/2 | May '20      |
| Iron Cap           | Boston Curb | 9 1/2  | 9      | 9      | Feb. '19, M   | Coniagas                             | Toronto      |         | 12.90   |         | May '20, Q   |
| Isle Royale        | Boston      |        |        | 29     | Sept. '19, SA | Crown Reserve                        | Toronto      | *24     | *22     | *22     | Jan. '17     |
| Jerome Verde       | N. Y. Curb. |        |        | 1 1/2  |               | Kerr Lake                            | Boston       | 3 1/2   | 3 1/2   | 3 1/2   | Sept. '19    |
| Kennecott          | N. Y.       | 27 1/2 | 27     | 27 1/2 | Mar. '20, Q   | La Rose                              | Toronto      | *35     | *35     | *34 1/2 | Apr. '18     |
| Keweenaw           | Boston      | 1 1/2  | 1 1/2  | 1 1/2  |               | McKinley-Dar                         | N. Y. Curb.  | *52     | *48     | *48     | Apr. '20, Q  |
| Lake Copper        | Boston      | 3 1/2  | 3 1/2  | 3 1/2  |               | Mining Corp.                         | Toronto      | 1.90    | 1.85    | 1.90    | Sept. '19    |
| La Salle           | Boston      | 2 1/2  | 2 1/2  | 2 1/2  |               | Nipissing                            | N. Y. Curb.  | 9 1/2   | 8 1/2   | 9       | Apr. '20, Q  |
| Magma Chief        | N. Y. Curb. | *24    | *20    | *22    |               | Ontario Silver                       | N. Y.        | 7 1/2   | 6 1/2   | 7       | Jan. '19, Q  |
| Magma Copper       | N. Y. Curb. | 32     | 29     | 29     | Jan. '19, Q   | Ophir Silver                         | N. Y. Curb.  |         |         |         | Jan. '12     |
| Majestic           | Boston Curb | *21    | *21    | *21    |               | Peterson Lake                        | Toronto      | *14 1/2 | *12 1/2 | *13 1/2 | Jan. '17     |
| Mason Valley       | N. Y. Curb. | 2      | 2      | 2      |               | Sil. King Ariz. (new)                | N. Y. Curb.  | *66     | *52     | *58     |              |
| Mass. Con.         | Boston      | 3 1/2  | 3 1/2  | 3 1/2  | Nov. '17, Q   | Temiskaming                          | Toronto      | *34     | *32     | *33     | Jan. '20     |
| Mayflower-O.C.     | Boston      | 6 1/2  | 5 1/2  | 6      |               | Trethewey                            | Toronto      | *32 1/2 | *27     | *28 1/2 | Jan. '19     |
| Miami              | N. Y.       | 20 1/2 | 20 1/2 | 20 1/2 | May '20, Q    | <b>GOLD AND SILVER</b>               |              |         |         |         |              |
| Michigan           | Boston      | 4 1/2  | 4 1/2  | 4 1/2  |               | Atlanta                              | N. Y. Curb.  | *21     | *1      | *1 1/2  |              |
| Mohawk             | Boston      | 62 1/2 | 61     | 61 1/2 | Feb. '20, Q   | Barnes-King                          | Butte        | 1.28    | 1.22    | 1.22    | Nov. '19, Q  |
| Mother Lode (new)  | N. Y. Curb. | 6      | 5 1/2  | 5 1/2  |               | Bost. & Mont.                        | N. Y. Curb.  | *71     | *70     | *70     |              |
| Nev. Con.          | N. Y.       | 13 1/2 | 12 1/2 | 12 1/2 | Mar. '20, Q   | Cashboy                              | N. Y. Curb.  | *7      | *5      | *6      |              |
| Nev. Douglas       | Boston Curb | *15    | *8     | *15    |               | El Salvador                          | N. Y. Curb.  | 2 1/2   | 2 1/2   | 2 1/2   |              |
| New Arcadian       | Boston      |        |        | 3      |               | Goldfield Merger                     | N. Y. Curb.  | *2      | *1 1/2  | *1 1/2  |              |
| New Baltic         | Boston Curb |        |        | 3      |               | Jim Butler                           | N. Y. Curb.  | *17     | *14     | *16     | Aug. '18, SA |
| New Cornelia       | Boston      | 17     | 16 1/2 | 16 1/2 | May '20       | Jumbo Extension                      | N. Y. Curb.  | *6 1/2  | *5      | *6      | June '16     |
| Nixon Nev.         | N. Y. Curb. |        |        | *9     |               | Louisiana Con.                       | N. Y. Curb.  |         |         | 1 1/2   |              |
| North Butte        | Boston      | 17 1/2 | 17     | 17 1/2 | Oct. '18, Q   | MacNamara M.                         | N. Y. Curb.  |         |         | 1 1/2   | May '10      |
| North Lake         | Boston      |        |        | *75    |               | N.Y. Bond. Rosar                     | Open Mar.    | 114     | 113     | 113     | Apr. '20     |
| Ohio Copper        | N. Y. Curb. |        |        | 1 1/2  |               | Tonopah-Belmont                      | N. Y. Curb.  | 1 1/2   | 1 1/2   | 1 1/2   | Jan. '20, Q  |
| Ojibway            | Boston      |        |        | 1 1/2  |               | Tonopah-Divide                       | N. Y. Curb.  | 1 1/2   | 1 1/2   | 1 1/2   |              |
| Old Dominion       | Boston      | 26 1/2 | 26     | 26     | Dec. '18, Q   | Tonopah Ex.                          | N. Y. Curb.  | 1 1/2   | 1 1/2   | 1 1/2   | Apr. '20, Q  |
| Osceola            | Boston      | 41     | 40     | 40     | Mar. '20, Q   | Tonopah Mining                       | N. Y. Curb.  | 1 1/2   | 1 1/2   | 1 1/2   | Oct. '19, SA |
| Phelps Dodge       | Open Mar.   | 195    | 180    |        | Apr. '20, Q   | West End Con.                        | N. Y. Curb.  | 1 1/2   | 1 1/2   | 1 1/2   | Dec. '19, SA |
| Quincy             | Boston      | 50 1/2 | 50     | 50     | Mar. '20, Q   | <b>SILVER-LEAD</b>                   |              |         |         |         |              |
| Ray Con.           | N. Y.       | 17 1/2 | 16 1/2 | 17     | Mar. '20, Q   | Caledonia                            | N. Y. Curb.  | *28     | *25     | *27     | June, '20, M |
| Ray Hercules       | Boston Curb |        |        | *75    |               | Consol. M. & S.                      | Montreal     | 26 1/2  | 25 1/2  | 25 1/2  | Apr. '20, Q  |
| St. Mary's M. L.   | Boston      | 40     | 40     | 40     | Dec. '19      | Daly-West                            | Boston       | 4 1/2   | 4 1/2   | 4 1/2   | Apr. '20, Q  |
| Seneca             | Boston      | 13 1/2 | 13 1/2 | 13 1/2 |               | Eagle & Blue Bell                    | Boston Curb  |         |         | 2 1/2   | Apr. '20, Q  |
| Shannon            | Boston      | 1 1/2  | 1 1/2  | 1 1/2  | Nov. '17, Q   | Electric Point                       | Spokane      | *41 1/2 | *38     | *38     | May '20, SA  |
| Shattuck, Ariz.    | N. Y.       | 21     | 21     | 21     | Jan. '20, Q   | Fed. M. & S.                         | N. Y.        | 13 1/2  | 10 1/2  | 13 1/2  | Jan. '09     |
| South Lake         | Boston      | *15    | *14    | *14    |               | Fed. M. & S. pf.                     | N. Y.        | 35 1/2  | 35 1/2  | 35 1/2  | Mar. '20, Q  |
| South Utah         | Boston      | 4 1/2  | 4 1/2  | 4 1/2  | Apr. '17      | Florence Silver                      | Spokane      |         |         | *45     | Apr. '19     |
| Superior           | Boston      | 4 1/2  | 4 1/2  | 4 1/2  |               | Iron Blossom                         | N. Y. Curb.  | 1 1/2   | 1 1/2   | 1 1/2   | Apr. '20, Q  |
| Superior & Boston  | Boston      | 4      | 3 1/2  | 3 1/2  |               | Marsh Mines                          | N. Y. Curb.  | *17     | *14     | *14     |              |
| Tenn. C. & C.      | N. Y.       | 10 1/2 | 9 1/2  | 10 1/2 | May '18, I    | Prince Consol.                       | N. Y. Curb.  | *8      | *7 1/2  | *8      | Nov. '17     |
| Tuolumne           | Boston      | *100   | *60    | *60    | May '13       | Rambler-Cariboo                      | Spokane      | *8      | *7 1/2  | *8      | Feb. '19     |
| United Verde Ex.   | Boston Curb | 32     | 30 1/2 | 31 1/2 | May '20, Q    | Rex Con.                             | N. Y. Curb.  | *14     | *13     | *13     |              |
| Utah Con.          | Boston      | 7      | 6 1/2  | 6 1/2  | Sept. '18     | Stand. S. L.                         | N. Y. Curb.  | 1       | 1       | 1       | Oct. '17     |
| Utah Copper        | N. Y.       | 70 1/2 | 69     | 70 1/2 | Mar. '20, Q   | Tamarack-Custer                      | Spokane      | 2.50    | 2.35    | 2.45    | Dec. '19     |
| Utah M. & T.       | Boston      | 1 1/2  | 1 1/2  | 1 1/2  | Dec. '17      | Wilbert                              | N. Y. Curb.  | *5      | *4      | *4 1/2  | Nov. '17     |
| Victoria           | Boston      | 2 1/2  | 2 1/2  | 2 1/2  |               | <b>NICKEL-COPPER</b>                 |              |         |         |         |              |
| Winona             | Boston      | *50    | *40    | *50    |               | Internat'l Nickel                    | N. Y.        | 18      | 17 1/2  | 17 1/2  | Mar. '19     |
| Wolvaine           | Boston      | 18     | 15     | 18     | Jan. '20, Q   | Internat'l Nick. pf.                 | N. Y.        | 80 1/2  | 80      | 80 1/2  | May '20, Q   |
| <b>LEAD</b>        |             |        |        |        |               | <b>QUICKSILVER</b>                   |              |         |         |         |              |
| Hecla              | N. Y. Curb. | 4 1/2  | 4 1/2  | 4 1/2  | June '20, Q   | New Idria                            | Boston       |         |         | 7       | Jan. '19     |
| St. Joseph Lead    | N. Y. Curb. | 16     | 16     | 16     | Mar. '20, QX  | <b>TUNGSTEN</b>                      |              |         |         |         |              |
| Stewart            | Boston Curb | 1 1/2  | 1 1/2  | 1 1/2  | Dec. '15      | Mojave Tungsten                      | Boston Curb  | *6      | *7      | *5      |              |
| Utah Apex          | Boston      | 1 1/2  | 1 1/2  | 1 1/2  | Nov. '18      | <b>VANADIUM</b>                      |              |         |         |         |              |
| <b>ZINC</b>        |             |        |        |        |               | Vanadium Corp.                       | N. Y.        | 83 1/2  | 73 1/2  | 81 1/2  | Apr. '20, I  |
| Am. Z. L. & S.     | N. Y.       | 14     | 14     | 14     | May '17       | <b>ASBESTOS</b>                      |              |         |         |         |              |
| Am. Z. L. & S. pf. | N. Y.       | 45     | 45     | 45     | May '20, Q    | Asbestos Corp.                       | Montreal     | 84      | 74      | 84      | Apr. '20, Q  |
| Butte C. & Z.      | N. Y.       | 8 1/2  | 8 1/2  | 8 1/2  | July, '18, I  | Asbestos Corp. pf.                   | Montreal     | 90      | 85      | 90      | Apr. '20, Q  |
| Butte & Superior   | N. Y.       | 24 1/2 | 22 1/2 | 24 1/2 | Sept. '17     | <b>MINING, SMELTING AND REFINING</b> |              |         |         |         |              |
| Con. Interst. 'al. | N. Y.       | 14 1/2 | 14     | 14 1/2 | June '20, Q   | Am. S. & R.                          | N. Y.        | 61 1/2  | 59 1/2  | 60 1/2  | June '20, Q  |
| New Jersey Z.      | N. Y. Curb. | 205    | 201    | 203    | May '20, SA   | Am. S. & R. pf.                      | N. Y.        | 90 1/2  | 89 1/2  | 90 1/2  | June '20, Q  |
| Success            | N. Y. Curb. | *5     | *4     | *4 1/2 | July '16      | Am. Sm. pf. A.                       | N. Y.        | 76 1/2  | 75 1/2  | 76 1/2  | Apr. '20, Q  |
| Yellow Pine        | Los Angeles | 1.10   | 1.05   | 1.08   | Mar. '20, Q   | U. S. Sm. R. & M.                    | N. Y.        | 59      | 57 1/2  | 58 1/2  | Apr. '20, Q  |
|                    |             |        |        |        |               | U.S.S.R. & M. pf.                    | Boston       | 44 1/2  | 43      | 43 1/2  | Apr. '20, Q  |

\*Cents per share. †Bid and asked.



# CURRENT PRICES OF MATERIALS AND SUPPLIES

## IRON AND STEEL

**SHEETS**—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

|                | Large       |            | St. Louis | Chicago | San Francisco | New York    |              |
|----------------|-------------|------------|-----------|---------|---------------|-------------|--------------|
|                | Mill        | Pittsburgh |           |         |               | Current     | One Year Ago |
| Blue Annealed  |             |            |           |         |               |             |              |
| No. 10         | \$3.55-6.00 |            | 7.09      | 7.02    | 8.25          | \$6.62-8.00 | 4.57         |
| No. 12         | 3.60-6.05   |            | 7.09      | 7.07    | 8.30          | 6.67-8.05   | 4.62         |
| No. 14         | 3.65-6.10   |            | 7.09      | 7.12    | 8.35          | 6.72-8.10   | 4.67         |
| Black:         |             |            |           |         |               |             |              |
| Nos. 18 and 20 | 4.15-6.30   |            | 8.10      | 7.80    | 9.35          | 7.80-8.80   | 5.17         |
| Nos. 22 and 24 | 4.20-6.35   |            | 8.10      | 7.85    | 9.46          | 7.85-8.85   | 5.22         |
| No. 26         | 4.25-6.40   |            | 8.10      | 7.90    | 9.45          | 7.90-8.90   | 5.27         |
| No. 28         | 4.35-6.50   |            | 8.10      | 8.00    | 9.55          | 8.00-9.00   | 5.37         |
| Galvanized:    |             |            |           |         |               |             |              |
| No. 10         | 5.80-7.50   |            | 9.60      | 8.50    |               | 8.25-10.00  | 5.50         |
| No. 12         | 4.80-7.60   |            | 9.60      | 8.60    | 10.10         | 8.35-10.10  | 5.55         |
| No. 14         | 4.80-7.60   |            | 9.60      | 8.60    | 10.10         | 8.35-10.10  | 5.60         |
| Nos. 18 and 20 | 5.10-7.90   |            | 9.60      | 8.90    | 10.40         | 8.65-10.40  | 5.90         |
| Nos. 22 and 24 | 5.25-8.05   |            | 9.60      | 9.05    | 10.55         | 8.80-10.55  | 6.05         |
| No. 26         | 5.40-8.20   |            | 9.60      | 9.20    | 10.70         | 8.95-10.70  | 6.20         |
| No. 28         | 5.70-8.50   |            | 9.60      | 9.50    | 11.00         | 9.25-11.00  | 6.50         |

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enamelled. Automobile sheets are unavailable, except in fugitive instances, when prices range to 15c. per lb.

**STEEL RAILS**—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

|                           | Pittsburgh    |          | Chicago       |          |
|---------------------------|---------------|----------|---------------|----------|
|                           | Current       | Year Ago | Current       | Year Ago |
| Standard bessemer rails   | \$45.00@60.00 | \$45.00  | \$45.00@60.00 | \$45.00  |
| Standard openhearth rails | 47.00@60.00   | 47.00    | 47.00@60.00   | 47.00    |
| Light rails, 8 to 10 lb.  | 2.58@3.75     | 2.585*   | 2.585@3.75    | 2.835*   |
| Light rails, 12 to 14 lb. | 2.54@3.75     | 2.54*    | 2.54@3.75     | 2.79*    |
| Light rails, 25 to 45 lb. | 2.45@3.75     | 2.45*    | 2.45@3.75     | 2.70*    |

\* Per 100 lb.  
NOTE—The lower price is that of the U. S. Steel Corp., but the market is mostly speculative and higher prices prevail.

**TRACK SUPPLIES**—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

|  | Pittsburgh |          | Chicago | St. Louis | San Francisco |
|--|------------|----------|---------|-----------|---------------|
|  | Current    | Year Ago |         |           |               |
| Standard railroad spikes, 1/2 in. and larger | \$4.00     | \$3.25   | \$3.62  | \$5.34    | \$5.65        |
| Track bolts, 6.00-6.50                       | 4.90       |          | 4.62    | Premium   | 6.65          |
| Standard section angle bars, 3.00-4.00       | 3.00       | 3.00     | 3.02    | Premium   | 4.90          |

**STRUCTURAL MATERIAL**—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the \$2.55 places named:

|                                   | Mill Pittsburgh |          | New York |          | St. Louis | Chicago |
|-----------------------------------|-----------------|----------|----------|----------|-----------|---------|
|                                   | Current         | Year Ago | Current  | Year Ago |           |         |
| Beams, 3 to 15 in.                | \$2.45@4        | \$4.47   | \$3.47   | \$4.04   | \$3.97    | \$3.97  |
| Channels, 3 to 15 in.             | 2.45@4          | 4.47     | 3.47     | 4.04     | 3.97      | 3.97    |
| Angles, 3 to 6 in., 1/2 in. thick | 2.45@4          | 4.47     | 3.47     | 4.04     | 3.97      | 3.97    |
| Tees, 3 in. and larger            | 2.45@4          | 4.52     | 3.52     | 4.09     | 4.02      | 4.02    |
| Plates                            | 2.65@4          | 4.67     | 3.67     | 4.24     | 4.17      | 4.17    |

**STEEL SHEET PILING**—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

|  | Current     | One Month Ago | One Year Ago |
|--|-------------|---------------|--------------|
|  | \$2.35@3.65 | \$2.55@3.65   | \$2.55       |

**RIVETS**—The following quotations are per 100 lb.:

|                    | Warehouse       |         | San Francisco | Dallas |
|--------------------|-----------------|---------|---------------|--------|
|                    | Mill Pittsburgh | Chicago |               |        |
| 1/2 in. and larger | \$4.50          | \$5.37  | \$5.44        | \$7.50 |

### CONE HEAD BOILER

|                         | Chicago | St. Louis | Chicago | St. Louis |
|-------------------------|---------|-----------|---------|-----------|
| 1/2 in. and larger      | 4.60    | 5.15      | 5.47    | 6.75      |
| 3/4 in. and 1 in.       | 4.75    | 5.30      | 5.54    | 7.00      |
| 1 1/4 in. and 1 1/2 in. | 5.00    | 5.55      | 5.97    | 7.25      |

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

**WIRE ROPE**—Discounts from list price on regular grades of bright and galvanized are as follows:

|  | New York and St. Louis |
|--|------------------------|
| Hercules red strand, all constructions         | 20%                    |
| Patent flattened strand special and cast steel | 20%                    |
| Patent flattened strand iron rope              | 5%                     |
| Plow steel round strand rope                   | 30%                    |
| Special steel round strand rope                | 30%                    |
| Cast steel round strand rope                   | 22 1/2%                |
| Iron strand and iron tiller                    | 5%                     |
| Galvanized iron rigging and guy rope           | +12%                   |

San Francisco: Galvanized, iron rigging and guy ropes, +17 1/2%; bright plow, 25% off.  
Chicago, + 12 1/2 on galvanized, 30 off on bright.

**HORSE AND MULE SHOES**—Warehouse prices per 100 lb. in cities named:

|          | Mill Pittsburgh | Cincinnati | Chicago | St. Louis | Birmingham |
|----------|-----------------|------------|---------|-----------|------------|
| Straight | \$5.75          | \$7.50     | \$7.00  | \$7.00    | \$7.00     |
| Assorted | 5.85            | 7.50       | 7.15    | 7.15      | 7.25       |

**BAR IRON AND STEEL**—Per 100 lb. to large buyers at mill, Pittsburgh:  
Iron bars, \$2.35@4.00 Steel bars, \$4.27@4.50

**COAL BIT STEEL**—Warehouse price per pound is as follows:

|  | New York | Cincinnati | Birmingham | St. Louis | Chicago |
|--|----------|------------|------------|-----------|---------|
|  | \$0.10   | \$0.16 1/2 | \$0.18     | \$0.11    | \$0.15  |

**DRILL STEEL**—Warehouse price per pound:

|        | New York | St. Louis | Birmingham |
|--------|----------|-----------|------------|
| Solid  | 14c.     | 13c.      | 15c.       |
| Hollow | 16c.     |           |            |

**STEEL AND IRON PIPE**—The following discounts are for carload lots on the Pittsburgh, basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920.

### BUTT WELD

| Inches   | Steel Black |           | Galvanized |           | Iron Black |           | Galvanized |  |
|----------|-------------|-----------|------------|-----------|------------|-----------|------------|--|
|          | Per Cent.   | Per Cent. | Per Cent.  | Per Cent. | Per Cent.  | Per Cent. | Per Cent.  |  |
| 1/2 to 3 | 54          | 41 1/2    |            |           | 34 1/2     | 18 1/2    |            |  |

### LAP WELD

|                 |        |        |            |        |        |
|-----------------|--------|--------|------------|--------|--------|
| 2               | 47     | 34 1/2 | 1 1/2      | 24 1/2 | 9 1/2  |
| 2 1/2 to 6      | 50     | 37 1/2 | 1 1/2      | 31 1/2 | 17 1/2 |
| 7 to 12         | 47     | 33 1/2 | 2          | 28 1/2 | 14 1/2 |
| 1 1/2 and 1 3/4 | 37 1/2 |        | 2 1/2 to 6 | 30 1/2 | 17 1/2 |
| 15              | 35     |        | 7 to 12    | 27 1/2 | 14 1/2 |

### BUTT WELD, EXTRA STRONG, PLAIN ENDS

|                |    |        |                |        |        |
|----------------|----|--------|----------------|--------|--------|
| 1/2 and 1      | 43 | 25 1/2 | 1 1/2          | +7     | +40    |
| 1 1/2 to 1 3/4 | 48 | 35 1/2 | 1 1/2          | 23 1/2 | 6 1/2  |
| 2 to 3         | 52 | 39 1/2 | 2 1/2          | 28 1/2 | 15 1/2 |
| 3 1/2 to 4     | 53 | 40 1/2 | 3 1/2 to 4 1/2 | 34 1/2 | 19 1/2 |

### LAP WELD, EXTRA STRONG, PLAIN ENDS

|            |    |        |            |        |        |
|------------|----|--------|------------|--------|--------|
| 2          | 45 | 33 1/2 | 1 1/2      | 21 1/2 | 6 1/2  |
| 2 1/2 to 4 | 48 | 36 1/2 | 1 1/2      | 27 1/2 | 13 1/2 |
| 4 1/2 to 6 | 47 | 35 1/2 | 2          | 29 1/2 | 16 1/2 |
| 7 to 8     | 43 | 29 1/2 | 2 1/2 to 4 | 31 1/2 | 19 1/2 |
| 9 to 12    | 38 | 24 1/2 | 4 1/2 to 6 | 30 1/2 | 18 1/2 |
|            |    |        | 7 to 8     | 22 1/2 | 10 1/2 |
|            |    |        | 9 to 12    | 17 1/2 | 5 1/2  |

From warehouses at the places named the following discounts hold for steel pipe:

|                           | New York | Black Cleveland | Chicago |
|---------------------------|----------|-----------------|---------|
| 1/2 to 3 in. butt welded  | 40%      | 40%             | 40@54%  |
| 3 1/2 to 6 in. lap welded | 35%      | 42%             | 40@50%  |

|                           | New York | Black Cleveland | Chicago          |
|---------------------------|----------|-----------------|------------------|
| 1/2 to 3 in. butt welded  | 24%      | 31%             | 30 @ 40 1/2%     |
| 3 1/2 to 6 in. lap welded | 20%      | 27%             | 27 1/2 @ 37 1/2% |

Malleable fittings, Class B and C, from New York stock sell at list plus 22 1/2%. Cast iron, standard sizes, net.

**NUTS**—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

|                      | New York | Cleveland    | Chicago |
|----------------------|----------|--------------|---------|
|                      | Current  | One Year Ago | Current |
| Hot pressed square   | +\$4.00  | \$3.25       | \$0.75  |
| Hot pressed hexagon  | +4.00    | 2.70         | .75     |
| Cold punched square  | +4.00    | 3.25         | .75     |
| Cold punched hexagon | +4.00    | 2.70         | .75     |

Semi-finished nuts sell at the following discounts from list price:

|           | Current | One Year Ago |
|-----------|---------|--------------|
| New York  | 30%     | 50-10%       |
| Chicago   | 50%     | 50%          |
| Cleveland | 50%     | 60-10-10%    |

**MACHINE BOLTS**—Warehouse discounts in the following cities:

|   | New York | Cleveland | Chicago |
|---|----------|-----------|---------|
| 1/2 by 4 in. and smaller                | list     | 40%       | 30%     |
| Larger and longer up to 1 in. by 30 in. | +20%     | 20-10%    | 20%     |

**WASHERS**—From warehouses at the places named the following amount is deducted from list price:

|   | New York | Cleveland | Chicago |
|---|----------|-----------|---------|
| For wrought-iron washers:                                       |          |           |         |
| New York  | List     | \$3.00    | \$3.00  |
| For cast-iron washers the base price per 100 lb. is as follows: |          |           |         |
| New York  | \$7.00   | \$4.50    | \$4.25  |

## CONSTRUCTION MATERIALS

**PREPARED ROOFINGS**—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

|             | 1-Ply c.l. | 2-Ply l.c.l. | 3-Ply c.l. |
|-------------|------------|--------------|------------|
| No. 1 grade | \$2.40     | \$2.90       | \$3.45     |
| No. 2 grade | 2.15       | 2.00         | 3.10       |

Slate-surfaced roofing (red and green) in rolls of 108 sq. ft. costs \$3.50 per roll in carload lots and \$3.75 for smaller quantities.

Shingles, red and green slate finish, cost \$7.75 per square in carloads; \$8.00 in smaller quantities, in Philadelphia.

**ROOFING MATERIALS**—Prices per ton f. o. b. New York and Chicago:

|  |        |
|--|--------|
| Tar felt (14 lb. per square of 100 sq. ft.) per roll | \$3.50 |
| Tar pitch (in 400-lb. bbl.) per 100 lb.              | 1.85   |
| Asphalt pitch (in barrels) per ton                   | 46.50  |
| Asphalt felt (light) per ton                         | 118.00 |
| Asphalt felt (heavy) per ton                         | 119.50 |

**HOLLOW TILE—**

|                  | 4 x 12 x 12 | 8 x 12 x 12 | 12 x 12 x 12 |
|------------------|-------------|-------------|--------------|
| Minneapolis..... | \$0.087     | \$0.158     | \$0.248      |
| Seattle.....     | .09         | .175        | .30          |
| Los Angeles..... | .10         | .175        |              |
| New Orleans..... | .198        | .264        | .38          |
| Cincinnati.....  | .125        | .2186       | .3286        |

**LUMBER—Price per M in carload lots:**

|                   | 8 x 8-In. x 20-Ft. and Under |         |         |          | 12 x 12-In. |       |
|-------------------|------------------------------|---------|---------|----------|-------------|-------|
|                   | P.                           | Fir     | Hemlock | Spruce   | P.          | Fir   |
| Boston.....       | \$100.00                     | \$85.00 | \$80.00 | \$111.00 | \$105.00    |       |
| Kansas City.....  | 54.00                        | 51.25   | 51.25   | 65.00    | 51.25       |       |
| Seattle.....      |                              | 34.00   |         |          | 35.00       |       |
| New Orleans.....  | 53.00                        |         |         | 59.00    |             |       |
| St. Paul.....     | 62.00                        | 61.00   | 61.00   | 47.50    | 43.00       | 58.00 |
| Atlanta.....      | 62.50                        | 64.50   | 66.00   | 76.00    | 79.50       | 82.00 |
| Baltimore.....    | 75.00                        |         |         | 87.50    |             |       |
| Cincinnati.....   | 48.00                        | 55.00   | 55.00   | 55.00    |             |       |
| Montreal.....     | 80.00                        | 80.00   | 65.00   | 60.00    | 73.00*      | 73.00 |
| Los Angeles†..... |                              | 57.00   |         |          |             | 59.00 |
| Denver.....       |                              | 65.00   | 65.00   |          |             | 66.00 |

|                      | 1-In. Rough, 10-In. x 16-Ft. and under |                 |         | 2-In. T. and Gr. 10 In. x 16 Ft. |         |
|----------------------|--|-----------------|---------|----------------------------------|---------|
|                      | P.                                     | Fir             | Hemlock | P.                               | Fir     |
| Boston.....          | \$115.00                               | \$85.00         | \$65.00 | \$100.00                         | \$85.00 |
| Kansas City.....     | 115.50                                 | 106.50          | 106.50  | 124.00                           | 112.75  |
| Seattle.....         |  | 37.50           |         |                                  | 38.50   |
| New Orleans.....     | 61.00                                  |                 |         | 67.50                            |         |
| St. Paul.....        | 54.00                                  | 54.00           | 53.00   | 64.50                            | 58.50   |
| Atlanta.....         | 85.00                                  | 90.00           |         | 77.50                            | 87.50   |
| Baltimore (box)..... | 65@67.50                               |                 |         | 60-65.00                         |         |
| Cincinnati.....      | 55.00                                  | 55.00           | 50.00   | 48.00                            | 50.00   |
| Montreal.....        | 75.00                                  | 75.00           | 66.00   |                                  |         |
| Los Angeles.....     |  | 58.00           |         |                                  |         |
| Detroit.....         |  | (no quotations) |         |                                  |         |
| Denver.....          |  | 62.00           | 140.00  | 127.50                           |         |

\*Montreal—Up to 32 ft.; over which, \$3.00 per M. increase up to 30 ft.  
 †Base price, 2 x 3's and 2 x 4's, 8 to 14 ft., is \$54.00  
 Detroit—Dimension stuff ranges from \$60 to \$68.

**NAILS—The following quotations are per keg from warehouse:**

|           | Mill     | St. Louis | Dallas | Chicago | San Francisco |
|-----------|----------|-----------|--------|---------|---------------|
| Wire..... | \$3.25@4 | \$4.50    | \$6.90 | \$4.15  | \$5.50        |
| Cut.....  |          | 5.40      | 7.40   | 6.45    | 6.90          |

**PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.**

|                              | Current | One Month Ago | One Year Ago |
|------------------------------|---------|---------------|--------------|
| New York (delivered).....    | \$3.30  | \$3.20        | \$2.30       |
| Jersey City (delivered)..... | 2.47    | 2.47          | 2.27         |
| Boston.....                  | 2.60    | 2.60          | 2.42         |
| Chicago.....                 | 2.15    | 2.00          | 2.00         |
| Pittsburgh.....              | 2.20    | 2.05          | 2.05         |
| Cleveland.....               | 2.42    | 2.32          | 2.32         |

NOTE—Charge for bags is generally 15c. each, 60c. per bbl.

**LIME—Warehouse prices:**

|                    | Hydrated per Ton |         | Lump per 200-lb. Barrel |         |
|--------------------|------------------|---------|-------------------------|---------|
|                    | Finished         | Common  | Finished                | Common  |
| New York.....      | \$19.50          | \$18.50 | \$3.50* at plant        | \$3.30* |
| Kansas City.....   | 27.20            | 26.20   | 2.50                    | 2.40    |
| Chicago.....       |                  |         | 2.40                    | 1.75    |
| St. Louis.....     | 25.00            | 21.00   |                         | 2.25    |
| Boston.....        | 26.25            | 24.25   | 3.40†                   | 3.25†   |
| San Francisco..... | 20.00            | 16.00   |                         | 2.25    |
| Minneapolis.....   | 24.00            | 19.00   | 1.80†                   | 1.60    |
| New Orleans.....   |                  | 2.25†   |                         | 2.45    |

NOTE—Refund of \$0.10 per barrel.  
 \* 300-lb. barrels. † 180-lb. barrels.

**LINSEED OIL—These prices are per gallon:**

|                                   | New York |          | Chicago |          |
|-----------------------------------|----------|----------|---------|----------|
|                                   | Current  | Year Ago | Current | Year Ago |
| Raw per barrel (5 bbl. lots)..... | \$1.73   | \$1.76   | \$2.05  | \$1.78   |
| 5-gal. cans.....                  | 1.75*    | 1.89     | 2.30    | 1.98     |

\* To this oil price must be added the cost of the cans (returnable), which is \$2.25 for a case of six.

**WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:**

|                          | Red     |        |              |        | White   |           |
|--------------------------|---------|--------|--------------|--------|---------|-----------|
|                          | Current | In Oil | One Year Ago | In Oil | Current | 1 Yr. Ago |
| 100-lb. keg.....         | 15.50   | 17.00  | 13.00        | 14.50  | 15.50   | 13.00     |
| 25- and 50-lb. kegs..... | 15.75   | 17.25  | 13.25        | 14.75  | 15.75   | 13.25     |
| 12½-lb. keg.....         | 16.00   | 17.50  | 13.50        | 15.00  | 16.00   | 13.50     |
| 5-lb. cans.....          | 18.50   | 20.00  | 15.00        | 16.50  | 18.50   | 15.00     |
| 1-lb. cans.....          | 20.50   | 22.00  | 16.00        | 17.50  | 20.50   | 16.00     |

**MINING AND MILLING SUPPLIES**

| HOSE—                    | FIRE | 50-Ft. Lengths |
|--------------------------|------|----------------|
| Underwriters' 2½ in..... |      | \$0.85 per ft. |
| Common, 2½-in.....       |      | 30%            |

| STEAM—DISCOUNTS FROM LIST | First Grade | Second Grade | Third Grade |
|---------------------------|-------------|--------------|-------------|
| 1½-in. per ft.....        | \$0.60      | \$0.40       | \$0.30      |
| First grade.....          | 20%         | 30%          | 35%         |

**LEATHER BELTING—Present discounts from fair quantities (¼ doz. rolls):**

|                 | Light Grade | Medium Grade | Heavy Grade |
|-----------------|-------------|--------------|-------------|
| St. Louis.....  | 30%         | 25%          | 20%         |
| Chicago.....    | 30%         | 25%          | 20%         |
| Birmingham..... | 30%         | 25%          | 20%         |
| Cincinnati..... | 30%         | 25%          | 20%         |

**RAWHIDE LACING—**For cut, best grade, 25%, 2nd grade, 30%. For laces in sides, 79c. per sq. ft.; 2nd, 75c. For semi-tanned: cut, 20%; sides, 83c. per sq. ft.

**MANILA ROPE—**For rope smaller than ½-in. the price is ¼ to \$0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of \$0.01. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft.; ¾-in., 6; 1-in., 4½; 1½-in., 2 ft. 10 in.; 2-in., 1½ in.; 2½-in., 2 ft. 4 in. Following is price per pound for ½ in. and larger, in 1200-ft. coils:

|                    |        |                  |       |
|--------------------|--------|------------------|-------|
| Boston.....        | \$0.30 | Kansas City..... | 0.305 |
| New York.....      | .29    | New Orleans..... | .29   |
| Cincinnati.....    | .27    | Seattle.....     | .28   |
| Chicago.....       | .275   | St. Louis.....   | .265  |
| St. Paul.....      | .275   | Atlanta.....     | .295  |
| San Francisco..... | .27    |                  |       |

**PACKING—Prices per pound:**

|   |        |
|---|--------|
| Rubber and duck for low-pressure steam.....   | \$1.00 |
| Asbestos for high-pressure steam.....   | 1.70   |
| Duck and rubber for piston packing.....   | 1.00   |
| Flax, regular.....  | 1.20   |
| Flax, waterproofed.....   | 1.70   |
| Compressed asbestos sheet.....  | .90    |
| Wire insertion asbestos sheet.....  | 1.50   |
| Rubber sheet.....   | .50    |
| Rubber sheet, wire insertion.....   | .70    |
| Rubber sheet, duck insertion.....   | .50    |
| Rubber sheet, cloth insertion.....  | .30    |
| Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes..... | 1.30   |
| Asbestos wick, ½- and 1-lb. balls.....  | .85    |

**RAILWAY TIES—For fair size orders, the following prices per tie hold:**

| Material                                  | 7 In. x 9 In. by 8 Ft. 6 In. | 6 In. x 8 In. by 8 Ft. |
|---|------------------------------|------------------------|
| Chicago—Plain.....                        | \$1.48                       | \$1.33                 |
| San Francisco—Douglas fir, green.....     | 1.74                         | 1.24                   |
| San Francisco—Douglas fir, creosoted..... | 3.36                         | 2.38                   |

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:  
 Untreated A Grade White Oak 6x8x8      Untreated A Grade Red Oak 6x8x8

|                           |        |            |        |
|---------------------------|--------|------------|--------|
| No. 1.....                | \$0.70 | No. 1..... | \$0.55 |
| No. 2.....                | .80    | No. 2..... | .65    |
| No. 3.....                | .90    | No. 3..... | .75    |
| No. 4.....                | .98    | No. 5..... | .87    |
| 7x9x8 white oak.....      | 1.05   |            |        |
| 7x9x8 red oak, No. 4..... | .80    |            |        |

**FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:**

|  | New York | In Bbl. | Chicago Carloads |
|--|----------|---------|------------------|
| Pure steam-distilled pine oil, sp.gr. 0.93-0.94..... | \$1.75   | \$1.80  | \$1.74           |
| Pure destructively distilled pine oil.....           | 1.60     | 1.70    | 1.65             |
| Pine tar oil, sp.gr. 1.025-1.035.....                | .48      |         | .42              |
| Crude turpentine, sp.gr. 0.900-0.970.....            | 1.75     | 2.25    | 2.08             |
| Hardwood creosote, sp.gr. 0.96-0.99*.....            | .35      |         |                  |

\*F. o. b. Cadillac, Mich.

**COTTON WASTE—The following prices are in cents per pound:**

|                    | Current     | New York One Year Ago | Cleveland | Chicago     |
|--------------------|-------------|-----------------------|-----------|-------------|
| White.....         | 11.00-15.50 | 13.00                 | 16.00     | 11.00-14.00 |
| Colored mixed..... | 7.00-10.50  | 9.00-12.00            | 12.00     | 9.50-12.00  |

**WIPING CLOTHS—Jobbers' price per 1000 is as follows:**

|                |         |         |         |         |
|----------------|---------|---------|---------|---------|
| Cleveland..... | 13½x13½ | \$55.00 | 13½x13½ | \$65.00 |
| Chicago.....   |         | 41.00   |         | 45.50   |

**EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:**

|                  | Low Freezing |          | Gelatin  |     | Black Powder |
|------------------|--------------|----------|----------|-----|--------------|
|                  | 20%          | 40%      | 60%      | 80% |              |
| New York.....    | \$0.3425     | \$0.3425 | \$0.3425 |     | \$2.30       |
| Boston.....      | \$0.225-24   | .245-28  | .25-31   |     | 2.40         |
| Kansas City..... | 2475         | 27       | 30       |     | 3425         |
| New Orleans..... | 2425*        | 2825     | 2825     |     | 38           |
| Seattle.....     | 18           | 2175     | 2475     |     | 29           |
| Chicago.....     | 2175         | 2525     | 2975     |     | 34           |
| St. Paul.....    | 185          | 2275     | 2525     |     | 2950         |
| St. Louis.....   | 2175         | 26       | 285      |     | 295          |
| Denver.....      | 205          | 2475     | 2725     |     | 315          |
| Dallas.....      | 265          | 275      | 3025     |     | 2.60         |
| Los Angeles..... | 22           | 27       | 31       |     | 2.95         |
| Atlanta.....     | 22           | 245      | 265      |     | 2.55         |
| Baltimore.....   | 225          | 2675     | 3075     |     | 325          |
| Cincinnati.....  | 2275         | 2525     | 2725     |     | 2.30         |
| Montreal.....    | .28          | .31      | .34      |     | .38          |

\* For 50%.

**CHEMICALS**

**SODIUM CYANIDE—**New York price is 24@25c. per lb.; Chicago, 31½c.; St. Louis, 31c.; Birmingham, 45c.

**SODIUM SULPHIDE—**New York price per pound is 9c.@10c. for concentrated, Chicago, 6c. for concentrated, 3c. for crystals. Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

**ZINC DUST—**For 350 mesh the New York price is 12½-13½c. per lb.; Chicago, 13c.; St. Louis, 12c.

**ALUMINUM DUST—**Chicago price is \$1.10 per lb.; Birmingham, \$1.52.

**MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:**

|  | Union 100-Lb. Drums Per Ton | Cameo 100-Lb. Drums Per Ton | Union Single 25-Lb. Drums | Union 25-Lb. Ton Lots |
|--|-----------------------------|-----------------------------|---------------------------|-----------------------|
| East of the Mississippi, North of Chattanooga..... | \$106.00                    | \$101.00                    | \$1.52                    | \$1.49                |
| Southeastern portion U. S. A.....                  | 115.50                      | 110.50                      | 1.63                      | 1.60                  |
| Texas (except E. Paso).....                        | 124.00                      | 119.00                      | 1.74                      | 1.71                  |
| El Paso, Texas.....                                | 126.00                      | 121.00                      | 1.77                      | 1.73                  |
| Denver, Colo.....                                  | 124.00                      | 119.00                      | 1.74                      | 1.71                  |
| West Coast.....                                    | 129.00                      | 124.00                      | 1.81                      | 1.77                  |

