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## Stripping with Harbor Dredge

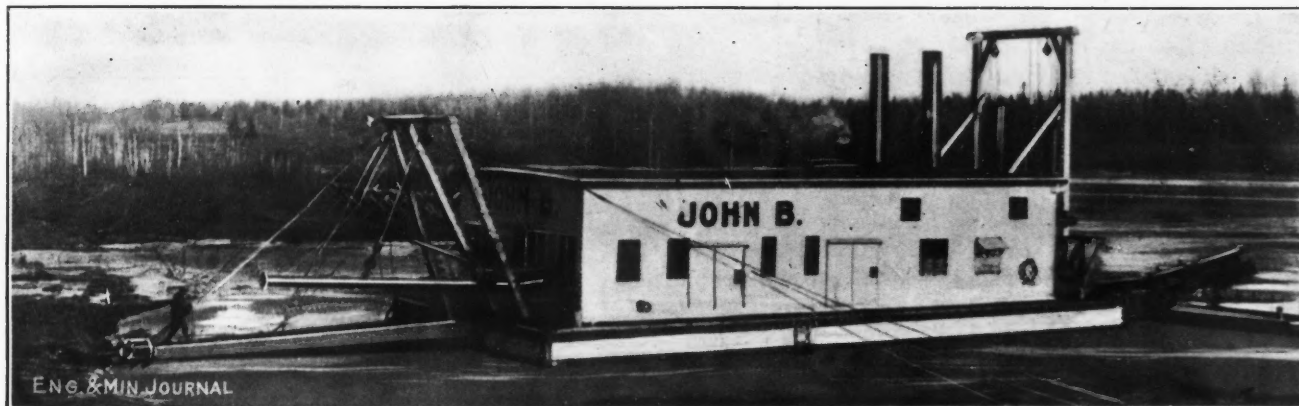
BY L. O. KELLOGG\*

*SYNOPSIS*—A harbor dredge is being tried by Jones & Laughlin as a means of stripping the overburden from ore lands held under option on the western Mesabi. Grade of ore too low to permit stripping with steam shovel, and it is desired to find cheaper method. Description of dredge and equipment. Nature of the work contemplated. Success seems probable; only difficulty will be that caused by bad overburden.

An interesting experiment in stripping off the overburden has been undertaken by the Interstate Iron Co., of Jones & Laughlin, at the extreme western end of the Mesabi. The company has an option on land between the Mississippi River and Pokegama Lake, about three

across the opening to the river, sufficiently strong and tight to protect the pit permanently against flooding. Sluice gates in this dam will allow the entrance to the pit of sufficient water for operating purposes.

The dredge now in use is a small one, built in general on the lines of an ordinary harbor dredge; with it the plan is to take out 100,000 to 150,000 cu.yd. of overburden as a test run. If it proves satisfactory and it is found that the method is sufficiently cheap, a more elaborate plant will be installed. As is usual in such undertakings, some difficulties are being encountered at the start, and since it is not expected that the dredge can operate in the coldest weather, it may be some time before results are known.



THE DREDGE AT THE BEGINNING OF OPERATIONS, ENTERING MARSHY LAND ON THE EDGE OF THE PROPERTY.

The pipe on pontoons at the rear is discharging into the Mississippi River. The discharge pipe supported along the dam site can be seen.

miles northwest of Grand Rapids, owned largely by local people. The property has been drilled and the average grade of the ore is known to be so low as to make underground mining impossible, the usual condition on the western Mesabi, and to render problematical even the commercial success of steam-shovel stripping. The experiment with the dredge is an attempt to find a stripping method enough cheaper than steam shoveling to render the ground available for exploitation under existing conditions.

The surface of the iron formation lies about 65 ft. below river level, and the surface of the overburden lies about 23 ft. above the water. The dredge is cutting a channel in from the river through a swampy depression and will discharge the debris so as to form a dam or dike

The hull of the dredge is 36 ft. long, 26 ft. wide and 6 ft. deep below the level of the main deck. When working it draws about 3 ft. of water. The stern is occupied by two marine boilers and the coal bunkers. In the center of the boat is the main pump, a Jennings 12-in. centrifugal, direct driven by a vertical, compound engine. This pumping unit is set in a cockpit and alongside it on the deck itself is a duplicate unit. Across the boat near the bow extends a countershaft, gear-driven by a small horizontal two-cylinder engine; this in turn is geared to drive three small drums separately clutched, which are used to raise and lower the digging boom and to swing the boat from side to side as it is desired. The lines for these purposes are 5/8-in. steel cable. In one corner of the bow a small 7-in. Jennings centrifugal-belt driven by a vertical, single-cylinder engine supplies a hydraulic giant,

\*Of editorial staff, "Engineering and Mining Journal."

which is mounted in the bow about 8 ft. above the deck.

The digging boom projects about 35 ft. measured to the end of the cutter and is built of 14-in. I-beams for its main members. It is hinged to permit vertical motion. The cutter consists of six manganese-steel blades and is rotated through gearing by a two-cylinder, horizontal engine, similar to that driving the drums, and mounted on the boom itself near the hull. A bow gantry of 12-in. timber carries the line that raises and lowers the boom. Two timber spuds, 14x14 in. by 35 ft., hold the stern when the dredge is operating. Lighting current is obtained from a self-contained Enberg set, consisting of a vertical engine and a 110-volt, 32-amp. direct-current generator. These are the principal items of equipment. The boilers and pumping engines were built by the Marine Iron Works, of Chicago, and the pumps by the Jennings Pump & Dredge Co., also of Chicago. The boat was constructed and equipped at Grand Rapids and came up the river under her own power, by pumping water in at the bow suction and out through the stern discharge.

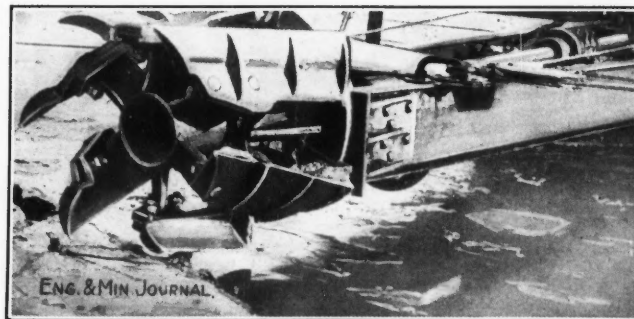
The pump in the center of the boat is the only one used at present. It has a 12-in. suction of welded pipe leading from a point under the cutter and a 14-in. discharge of spiral riveted pipe back, overhead and out through the stern. The duplicate set at the side is intended to work in parallel with the other as soon as a sufficient bank has been established to furnish a supply of loose material that needs no cutting. Each pump is supposed to be capable of lifting to a height of 40 ft. When higher lifts become necessary, the two pumps can be connected in series and make in effect a two-stage set, good for 80 ft. of head. The giant is provided for sluicing down the bank and furnishing loose material to the second pump.

It is thought that the dredge will dig 16 ft. under water. As the excavation recedes from the river after the dam is built, it will be dug continually lower and the boulders and other material which cannot be handled, will be left on the bottom behind it, out of water, where they will be accessible and can be removed. The main discharge lines over the land are of American 14-in., spiral-riveted pipe, with flexible joints. The discharge line near the dredge is carried on pontoons and flexible joints are provided by the use of rubber sleeves, 5 ft. long. The dredge has been discharging into the river immediately behind it, but at the time of visiting was about to begin discharging along the proposed line of the dam. The long discharge line to the actual dumping ground will extend a distance of about 1000 ft. at the start. The ultimate maximum lift will be about 100 ft. if the operation is continued and the whole property stripped. This will involve the removal of several million cubic yards of material.

It will be noted that certain points of similarity exist between this operation and that the Rowe mine on the Cuyuna, as described in the *JOURNAL* of Jan. 17, 1914, the principal differences being that here the main work of breaking down the overburden will be done with the cutter rather than the giant, that on the dredge the entire power plant is self-contained and portable and that the power applied to the operation is steam direct and not electrical. One long pipe line is saved with the dredging method, and it would seem as if the suction under the cutter could be made to carry a higher proportion of solids than the pump at the Rowe, which picks up its material after it has been washed down a sluiceway.

The saving in original investment over steam shoveling is considerable in either case, but on the other hand, if the work is done by the company, the steam-shovel equipment can usually be employed in subsequent operations, whereas the hydraulicking or dredging outfit must be discarded for the most part. The fact that water-using methods must be suspended in the dead of winter is a disadvantage and it would look, furthermore, as if a stripping job would have to be entirely completed before mining could be done. This means a great amount of capital tied up. The mining companies usually or frequently begin mining as soon as a portion of the orebody is accessible and continue stripping for many years, a great deal of this subsequent stripping being done in the winter, using equipment otherwise idle and keeping the organization together.

The two water-using operations are alike in being situated on the edge of bodies of water and in being below the level of such water. The Rowe mine, however, is protected with a natural clay dike, and the Interstate will have to build a dam. The Rowe furthermore can fill in its body of water, while the Interstate must dispose of its debris



THE CUTTER RAISED OUT OF WATER, SHOWING THE SIX BLADES, I-BEAM BOOM AND DRIVE SHAFT

on land, which involves a higher lift. The ultimate success of the dredging experiment probably depends on the nature of the material encountered. In such an ideal overburden as that on the Cuyuna, its success would seem assured. Boulders, hardpan and clay will all make trouble, however, and actual rock would be almost prohibitive. If it does prove successful, it should be applicable to a good many properties. The presence of a body of water in the immediate vicinity is not absolutely essential, as a pond could be artificially created. Dumping ground adjacent to the pit, however, would seem to be necessary, since pumping sand and water through a long pipe line would entail difficulties, and if water were not extremely abundant, it would have to be allowed to drain back into the pond.

### Explosive Production

The Bureau of Mines has compiled some figures on the production of explosives in this country in 1912. It appears that there were manufactured, 230,233,369 lb. of black powder; 24,630,270 lb. of permissible explosives; and 234,469,492 lb. of high explosives, such as dynamite, nitroglycerin, etc. Of the high explosives, 89,703,081 lb. were consumed in mining other than coal and 4,668,399 lb. of permissible explosives in the same industry.



on Crooked Creek, Mead Creek, Placer Creek, North Creek, South Creek and on Bench Claim No. 14, right limit of Crooked Creek. There is, however, a vast area unprospected which looks as favorable as any of the creeks named. It is a good country to prospect, which is all that can be said at this time, owing to the fact that not enough work could be done in the district last year to demonstrate it to a certainty. Men contemplating a visit to this camp should consider no route except by way of Chitina. Fifty-eight miles of this route is the Fairbanks wagon road, over which stages run every day. The remainder of the route is up the Tazlina River on the ice, and Discovery claim is but 69 miles from the Tazlina Road House.

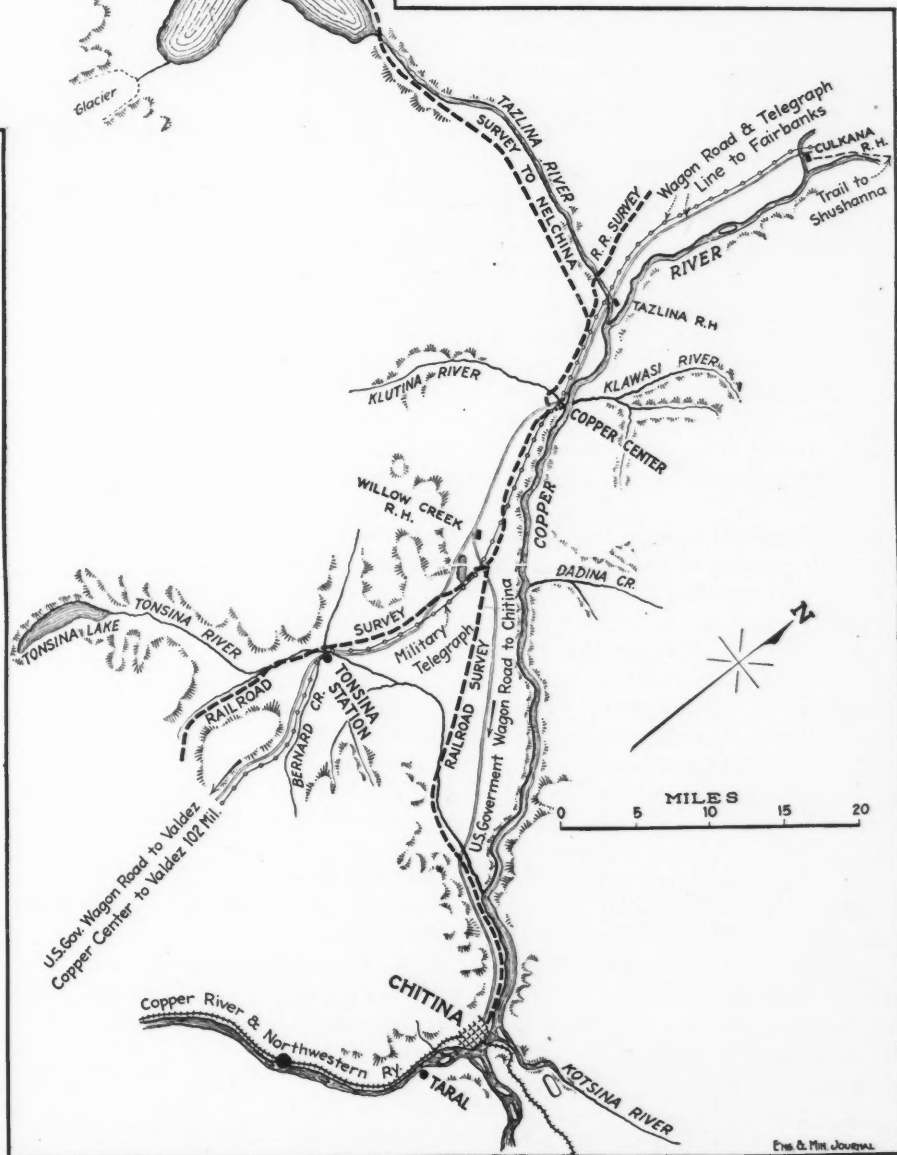
Outfits can be obtained at Cordova or Chitina, except horses and dogs, which must be shipped in from the states.

### The Nelchina Goldfields

The Nelchina district lies in the headwaters of the Tazlina River, which is a tributary of Copper River. The Tazlina River empties into the Copper River, 8 miles above Copper Center or 58 miles north from Chitina, the point where the Copper River Northwestern Ry. branches off to the copper fields. Discovery claim is 127 miles from the railroad and the route is a water grade all the way. The find was made by Getchell and Olson in the latter part of July, 1913, in a hole sunk by Jack Tansey, Slim Gray and Big Munson, in 1907. They whip-sawed lumber, made three sluice boxes and in a few days took out between \$1000 and \$1500, when they were forced to leave to procure more food. The discovery is on Albert Creek, a tributary of Crooked Creek, which, with the Nelchina, forms the Tazlina River. Gold has been found

#### CHITINA TO NELCHINA

	Miles
Cordova to Chitina by rail...	131
Chitina to Tonsina, R. H. ....	15
Chitina to Willow Creek, R. H. ....	39
Chitina to Copper Center, R. H. ....	50
Chitina to Tazlina, R. H. ....	58
Chitina to Tazlina Lake. ....	80
Chitina to Mouth of Nelchina. ....	103
Chitina to Discovery on Crooked Creek .....	127



MAP OF THE NELCHINA GOLD FIELDS IN ALASKA

## Rio Tinto Strikes and Their Causes

Strikes at the Rio Tinto mine, in Huelva, Spain, have been occurring at intervals of only a few months. Commenting upon the reasons for these strikes, the correspondent of the London *Mining Journal* says that the working community of Rio Tinto has been the last in industrial Spain to begin to organize and make use of the power of striking, and the situation of the district, geographically, partly explains why. When Socialism was overspreading Europe, Rio Tinto was isolated from the fight, but it would be unfair to say that the workmen did not get some benefit. As a matter of fact, the company could easily stand, and did stand, the aspirations of the workmen, without sacrificing the master's interests, until the time came when the workmen's demands would have eliminated profits altogether, and the company could give way no further.

Last April, the Huelva wharf loaders complained of reduction of their wages, which has been gradual over a few years, from 0.75 pesetas per ton of ingots down to 0.25 pesetas. As the number of loaders was only 8, the strike did not amount to anything serious. A short time later the company dismissed five workmen, and a strike of 3000 resulted. This was settled after the governor of Huelva was named as an arbitrator and proposed a plan in which the workmen's position was recognized, though punishments in proportion to the gravity of the fault committed were imposed, the strike having lasted only a few days.

Disregarding the immediate causes of the strike, it is evident that the organization of the miners tending toward higher wages and shorter working hours has been regarded with uneasiness by the company, and an antagonistic condition has resulted. Apparently the workmen do not understand the manoeuvres of the company in varying the force at work in different places at different times. Diminishing the force is considered as a form of reprisal, which provokes opposition on the part of the workmen.

Operations at Rio Tinto have been executed under three different systems; administration of the company, partnership and contract. The contract is about the only system in operation today, and on it the company pays so much per ton, or per unit in any case. The workmen do not like this system, as they believe it more advantageous to the company than to themselves. The great influence that the company possesses over the workman's life, by means of ownership of their dwellings and the general store, increases the bad feeling between the two. The general store is a splendid one, where workmen can get all that is necessary for the needs of their family. The quality of the goods is excellent and prices so reduced that competition is impossible. On the other hand, cash must be paid for everything, and if the workmen are strikers, there is no other place to procure their living. Medical assistance is ordered by the company, and the men are not free to choose their own doctors. The workmen, in short, is an automaton, well paid, but having his life controlled by the company.

The strike, which was settled in December, due to the unstable terms which have been mentioned, was not a permanent settlement and broke out again in January. Ten thousand men withdrew from work, and although the

strike is not so general and therefore not so serious as the previous one, it is feared that it may spread further and a settlement may prove more difficult. An explanation of this latest trouble states that in the agreement signed between the company and the miners, which ended the former strike, the company undertook to replace all the dismissed workmen before January 1st, and the workmen now say that this condition has not been filled. Workmen are holding meetings, and the foreign element is fomenting agitation. At the same time, most of the workmen remain pacifically inclined, and if the company admits their grievance, an arrangement will speedily follow.

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## Annual Meeting, A. I. M. E.

The following were the programs of the coal and iron and oil and gas sections of the Institute, which were omitted in our previous report of the meeting.

### WEDNESDAY, FEB. 18, 10 A.M.—PAPERS ON IRON AND STEEL

"Notes on the Plastic Deformation of Steel During Over-strain," by H. M. Howe and A. G. Levy.

"Notes on Some Heating and Cooling Curves of Prof. Carpenter's Electrolytic Iron," by Albert Sauveur.

"Influence on Quality of Cast Iron Exerted by Oxygen, Nitrogen, and Some Other Elements," by J. E. Johnson, Jr.

"Research with Regard to the Nonmagnetic and Magnetic Conditions of Manganese Steel," by B. Hopkinson and Sir Robert Hadfield.

"Manganese Steel with Special Reference to the Relation of Physical Properties to Micro-Structure and Critical Ranges," by W. S. Potter.

"The Heat Treatment of Steel Castings," by C. D. Young, O. D. A. Pease and C. H. Strand.

"Notes on an Iron Ore Deposit near Hong Kong, China," by C. M. Weld.

### 2 P.M.—PAPERS ON IRON AND STEEL

"American Steel Rail Situation," by R. W. Hunt.

"Manganese Steel Rails," by Sir Robert Hadfield.

"Notes on Blast Furnace Operation with a Turbo Blower," by S. G. Valentine.

"Data Pertaining to Gas Cleaning at the Duquesne Blast Furnace," by A. N. Diehl.

"Pig Steel from Ore in the Electric Furnace," by Robert M. Keeney.

"Notes on the Utilization of Blast Furnace and Coke Oven Gas for Power Purposes," by Heinrich J. Freyn.

"Notes on Conservation of Lake Superior Iron Ores," by Charles K. Leith.

"The Need of Uniform Methods of Sampling Lake Superior Iron Ore," by C. B. Murray.

"Sound Ingots," by Sir Robert Hadfield.

### PAPERS ON PETROLEUM AND GAS

"The Anticlinal Theory of Oil Accumulation," by H. A. Wheeler.

"Scientific Installation for the Economical Burning of all Gravities of Liquid Fuel," by W. N. Best.

"The Use of Petroleum in Dust Prevention and Road Preservation," by W. W. Page.

"The Killing of the Burning Gas Well in the Caddo Oil Field, Louisiana," by C. D. Keen.

"An Oil-Land Law," by George Otis Smith.

### 2 P.M.

"Cementing Oil and Gas Wells," by I. N. Knapp.

"The Age and Manner of Formation of Petroleum Deposits," by E. T. Dumble.

"Geology and Technology of the California Oil Fields," by Ralph Arnold and V. R. Garfias.

"Water Intrusion and Methods of Prevention in California Oil Fields," by F. W. Oatman.

"Chlorides in Oil Field Waters," by C. W. Washburn.

"Is it Feasible to Make Common Carriers of Natural Gas Transmission Lines?" by S. S. Wyer.

# Treatment of Cyanide Precipitate--I\*

BY HERBERT A. MEGRAW

*SYNOPSIS*—Melting precipitate was formerly an arduous process, but many improvements have been made lately. Acid treatment may or may not be resorted to, according to the object in view. The Homestake makes fine bullion by acid treatment. Taverner process used a reverberatory furnace for melting and a cupel for final refining. The U. S. Metals Refining Co., at Chrome, N. J., uses a reverberatory-furnace melting system on high-grade silver slimes; good results being obtained.

with gold ores, there is reason for resorting to acid treatment. An exceptionally high-grade bullion can be produced, which avoids some of the charges for outside refining. The question, then, resolves itself into a comparison of the cost of refining of the plant itself or at some regularly equipped refinery.

## THE HOMESTAKE ACID-TREATMENT SYSTEM

Smelting and refining the precipitate from cyanide plants is probably one of the simplest processes, in theory,

At the Homestake<sup>1</sup> mills, in South Dakota, acid treatment is followed, bullion averaging 980 fine in gold and silver, being produced. The cleanup is made once a month, the presses being blown with air for about two

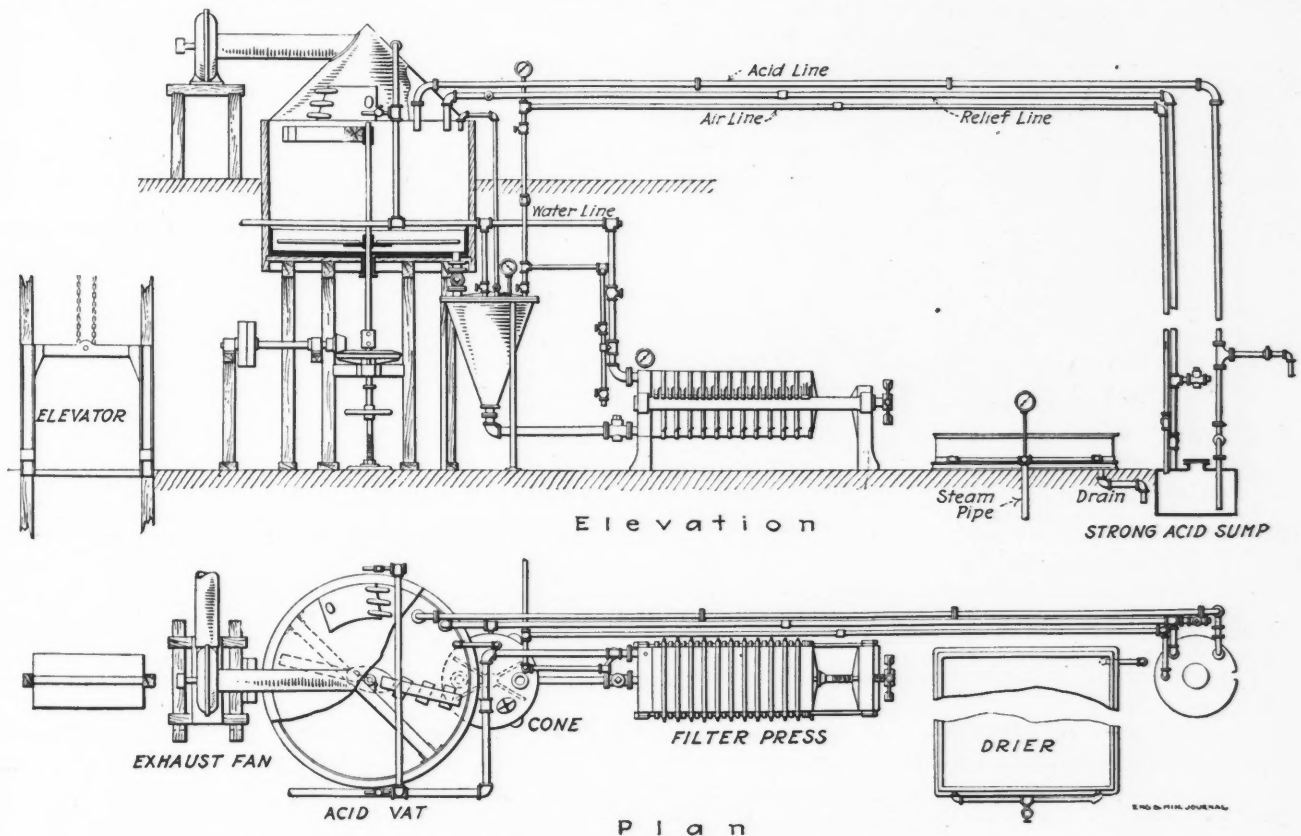


FIG. 1. ACID-TREATMENT PLANT AT HOMESTAKE MILL

in the whole range of cyanide work. In practice it has been, until recently, the most imperfectly developed detail of them all. Particularly is this true of the silver-producing mills, in which the large quantity of material to be handled at each cleanup is a factor of importance.

The question of whether or not acid treatment should be resorted to depends a great deal upon the ultimate requirements. Where a high-grade product is desired for sale directly to the U. S. Mint, especially when comparatively small quantities of material are to be handled, as

hours previous to their opening. Zinc dust is used as precipitant. The cake is dropped into a tray and carried to the acid-treatment department after being sampled and weighed. A lead-lined tank is used for the acid treatment, and it is provided with agitating mechanism for stirring and mixing the charge. A hood and exhaust fan are provided for carrying away the fumes. Commercial sulphuric acid of 66° Bé. is used for treating the precipitate.

Water is first run into the treatment tank, the precipitate added while the agitator is moving, and then acid run in slowly, keeping the action under control at all times. Treatment is continued until the action is practically complete, a point determined by testing with

\*This is the seventh of a second series of articles by Mr. Megraw. It deals with comparative details of cyanide practice, discussing points of possible improvement. Preceding articles of this series appeared in the issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, 1913, and Jan. 31, 1914. The next article will deal with "The Treatment of Cyanide Precipitate--II" and will appear in the issue of Mar. 21, 1914.

<sup>1</sup>Clark and Sharwood, "Metallurgy of the Homestake Ore," Bull. 93, I. M. M., November, 1912.

methyl orange, then the tank is left to settle, and the clean liquor decanted. Two or three water washes are applied and decanted, and then the whole mass is forced through a filter press, and washed again. The precipitate is then ready for melting. The treatment as described is, of course, efficient in leading up to a high-grade bullion. It represents a system of careful precipitate cleaning, the cost of which depends largely upon the mechanical arrangements for cheap and rapid handling of the material. The accompanying drawing, Fig. 1, shows the arrangement of this acid-treatment plant reproduced from the article already mentioned. It shows an exceedingly convenient arrangement for economical work.

#### DIRECT SMELTING OF PRECIPITATE

While it can be readily understood that acid treatment of precipitate has some definite advantages, it must also be evident that by avoiding the operation the actual cost of precipitate handling will be reduced, whatever the final result per dollar of product value may be. And in handling large quantities of precipitate, as in large silver-producing plants treating high-grade ore, it may be more advantageous to omit acid treatment, and reduce the entire precipitate at once to bullion, at the same time getting rid of the greatest possible amount of adulteration by slagging it off during the smelting process. This

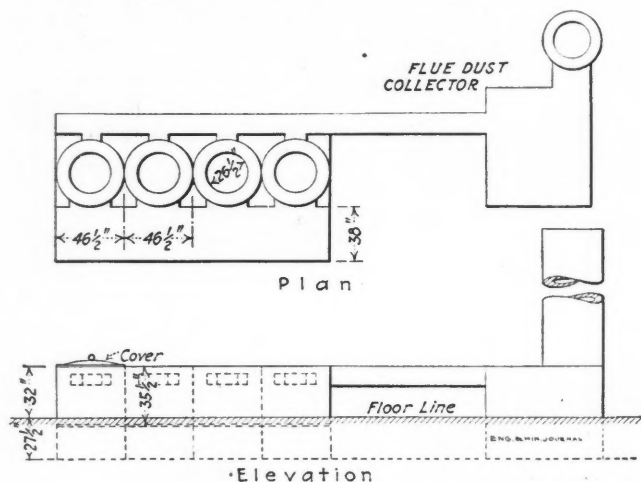


FIG. 2. BATTERY OF WIND FURNACES

system is widely followed at the present time, and acid treatment is not so popular as it once was. The process of roasting precipitate to volatilize the zinc, widely followed at one time, has now been almost universally discarded, as it was shown that an appreciable quantity of gold or silver was unavoidably volatilized along with the zinc in the operation.

The operation of melting precipitate into bullion, whether or not it has been acid treated, has been done in many ways, but the prevailing method, until recently, was to melt it, together with the required flux, in graphite crucibles in a coke-fired wind furnace. In a large plant, or even medium-sized one, there was usually a battery of these furnaces, varying in number, to insure prompt handling of the cleanup. Their serving has always been the most severely uncomfortable piece of work connected with the cyanide plant. Attending crucible wind furnaces makes an ordinary foundry molding job look easy, the reason having been that strength and awkwardness have been relied upon to produce results,

and little or no thought was spent upon finding the troubles and weaknesses of the process and searching for means to remedy them. The difficulties of the process, however, have made an impression on some operators, and during the last few years, several important improvements have been made which have not only resulted in notable economies, but have brought important relief for the actual workers who attend the process.

#### USE OF CRUCIBLE WIND FURNACES

In the old style of wind furnace, the fireplace was made just large enough to hold the crucible used, having

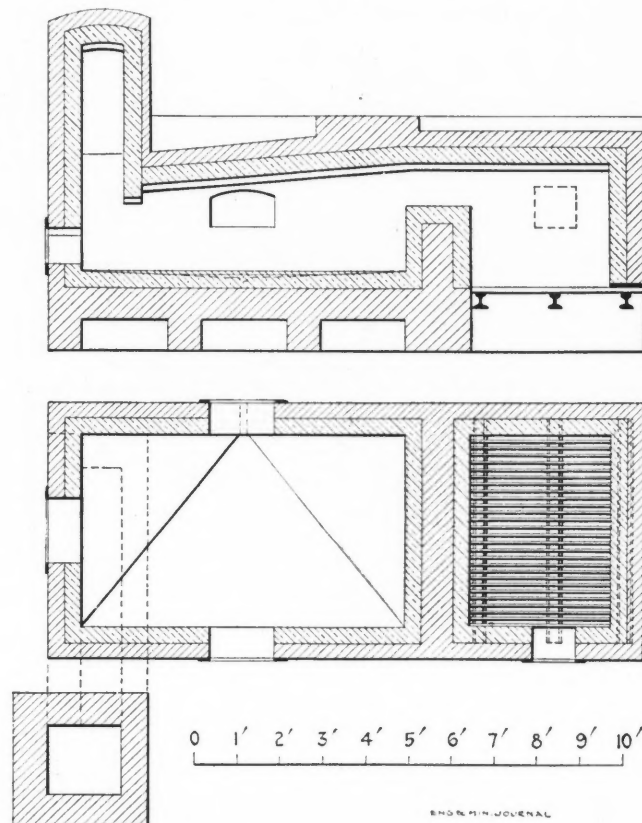


FIG. 3. REVERBERATORY FURNACE USED IN TAVERNER SYSTEM

about three inches all around for fire space. A sketch is appended, Fig. 2, showing a battery of such furnaces of a size appropriate for holding No. 300 graphite crucibles. They are operated by first starting a small fire on the grate bars, igniting a small amount of coke to serve as a basis for the melting fire. The crucible, after having been properly annealed, is then put in, coke added until the furnace is properly filled, and draft increased. The crucible is allowed to become as hot as possible and then the mixture to be melted is added. The crucible may be filled with the mixture before it is put in the furnace, if desired, and this is often done. As the charge melts, it occupies considerably less space, and as fast as room is made in a crucible additional amounts of the charge are added until the crucible is full of the molten mixture. It is then extracted with appropriate tongs and the contents poured into molds. When cold, the slag and metal are easily broken apart. The metal is melted again in the same or similar crucibles and cast into bars of approximately uniform weight.

The process described is theoretically all right and is, in fact, the basis for even the most improved processes. The mechanics of it is where the difficulty appears. Handling precipitate in small doses in this way is not economical, since spilling and wasting occur in charging the crucibles, especially when they are hot, and there is loss in dusting of the precipitate. In pouring the crucibles there is another good chance for loss. The whole process, too, is hard on the operator, for attending the fire is severe, so is charging the crucible, while drawing and pouring it taxes the endurance of the most hardy. At one of the plants in my experience, a battery of six furnaces was installed. The precipitate, result of electrical precipitation, was extremely difficult to melt, so that the furnaces were kept busy, night and day. The furnaces required opening for firing, replenishing the crucibles, or pouring, an average of once every five minutes. The strain and heat of the work, combined with the warm climate, wore out a man about every month. That was the most difficult example of old-style melting I ever saw, but there are numbers of others similar, and, in fact, most of the wind-furnace melting jobs were extremely uncomfortable.

THE TAVERNER REVERBERATORY-FURNACE SYSTEM

One of the first steps toward improvement was taken by P. S. Taverner,<sup>2</sup> who improved Rand practice in pre-

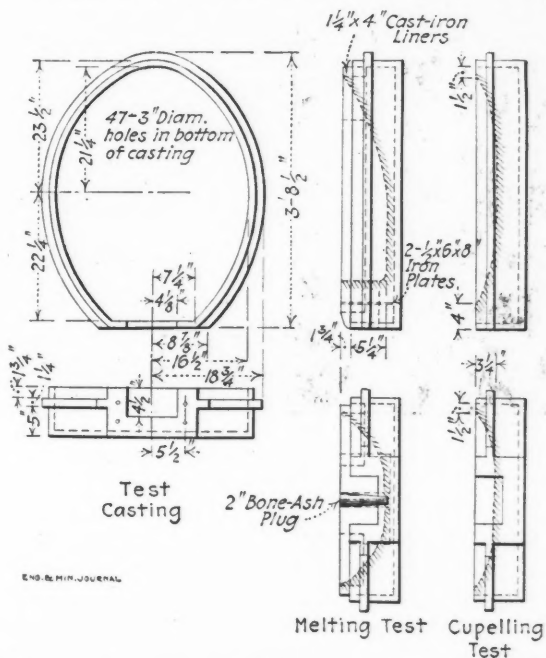


FIG. 4. CASTINGS FOR TESTS AT CERRO PRIETO

cipitate refining to such a great extent. Taverner's first change was to do away with acid treatment, but later it was taken up again as giving a cleaner bullion. The process uses lead smelting of the precipitate in a reverberatory furnace and cupellation of the lead bullion. This produced a fine doré bullion, which was subsequently remelted into bars of the required size.

The mixture used in smelting is as follows:

Precipitate	100 parts
Litharge	100 parts
Assay slag	55 parts
Carbon (coal dust)	10 parts
Silica	25 parts
Iron (any junk).	

<sup>2</sup>"Rand Metallurgical Practice," Vol. I, p. 274.

The partly dried charge is shoveled into the furnace and the temperature raised gradually until the moisture has been driven out. When the charge is fused, it is rabbled, and the temperature raised until the slag is fluid. Washes of litharge, carbon and iron are given to clean the slag, which is finally drawn off through the slag door. After the slag has been removed, the lead is drawn off through the tap hole and run into appropriate molds. The cupellation process follows. In Fig. 3 is given a drawing of

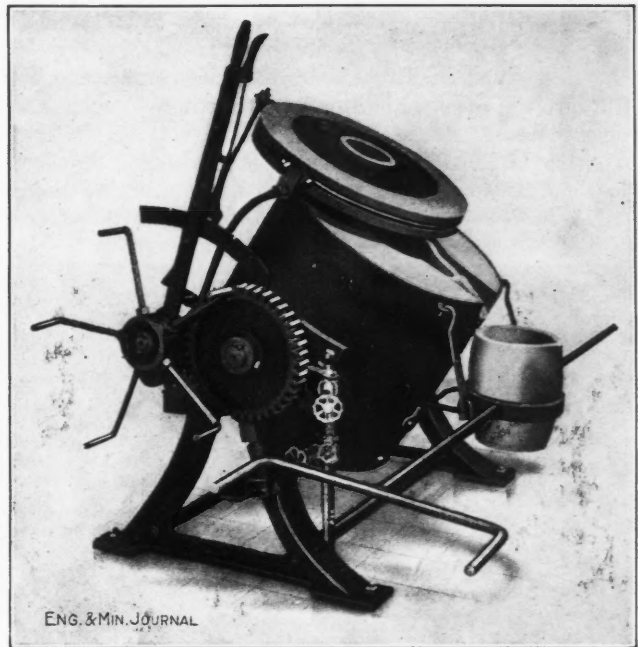


FIG. 5. MONARCH OIL-FIRED TILTING FURNACE

the reverberatory furnace used for smelting. The cupel furnace is of a type shown later in this article in connection with another plant.

REVERBERATORY SMELTING AT CHROME, N. J.

This reverberatory smelting of precipitate has proved to be immune from loss and is, when carefully carried out, a clean and convenient method to work. At the Chrome, N. J., plant of the U. S. Metals Refining Co., the system is applied to the smelting of anode slimes from an electrolytic separation process. The material contains about 10,000 to 13,000 oz. silver per ton and 300 to 400 oz. gold per ton, together with small quantities of copper, lead selenium, silica, and much arsenic. It contains about 45% precious metal, and in that respect compares about on equal terms with cyanide precipitate, although the latter is often somewhat richer.

The furnace used at Chrome measures 15x8ft. outside and has a 12x5-ft. hearth. In beginning a melt, niter slag from a previous operation is added and some silica slag, but usually no fresh flux. This, with the precious-metal slime, is melted down and the slime added in shovels as the melt progresses. When the whole mass is fluid, the slag is tapped off, and when it can be no longer tapped it is skimmed. The melt is then oxidized by blowing air through it. A flux of soda ash is introduced and finally the last traces of impurity are removed with niter flux. This last is saved and used with the next melt, as has been mentioned. The resulting bullion is 995 fine in gold and silver, and contains an ex-

tremely small amount of copper, possibly about 10 points. The furnace is heated with a Houck oil burner with the hood removed. The system is said to be economical on the large scale, and is certainly simple and easily handled. Heat is well confined within the furnace itself, and molding is reduced to a minimum. From the Chrome furnace, the bullion is cast in small slabs, ready for the parting process.

#### SMELTING AND CUPELING IN ONE FURNACE

An installation is described by H. S. Munroe,<sup>3</sup> which used a process closely resembling the Taverner system, the only difference being that the same furnace was used for forming the lead bullion and cupeling it, using a different bottom for each operation. The precipitate was first partly dried over a wood fire, reducing the moisture to about 10%. It was then fluxed, the mixture containing 1 to 100 parts of precipitate, 90 to 120 parts of li-

through 20-mesh. The cost per ounce of fine Au-Ag bullion, using oil as fuel for melting and cupeling, was as shown in the accompanying table.

REFINING COST AT CERRO PRIETO, MEXICO	
Fuel .....	\$0.006
Flux .....	0.017
Tests .....	0.003
Repairs .....	0.002
Labor .....	0.016
Power .....	0.003
Assaying .....	0.002
<b>Total .....</b>	<b>\$0.049</b>

#### ADVENT OF OIL FUEL AND TILTING FURNACES

The introduction of oil as a fuel in melting precipitate, made possible some important improvements in the process. While the application of oil burners directly to the old-style wind furnaces did not improve the condition of the operator materially, it opened the way toward the improvement of the furnace itself. The first essential advance was embodied in the Steele-Harvey or Monarch

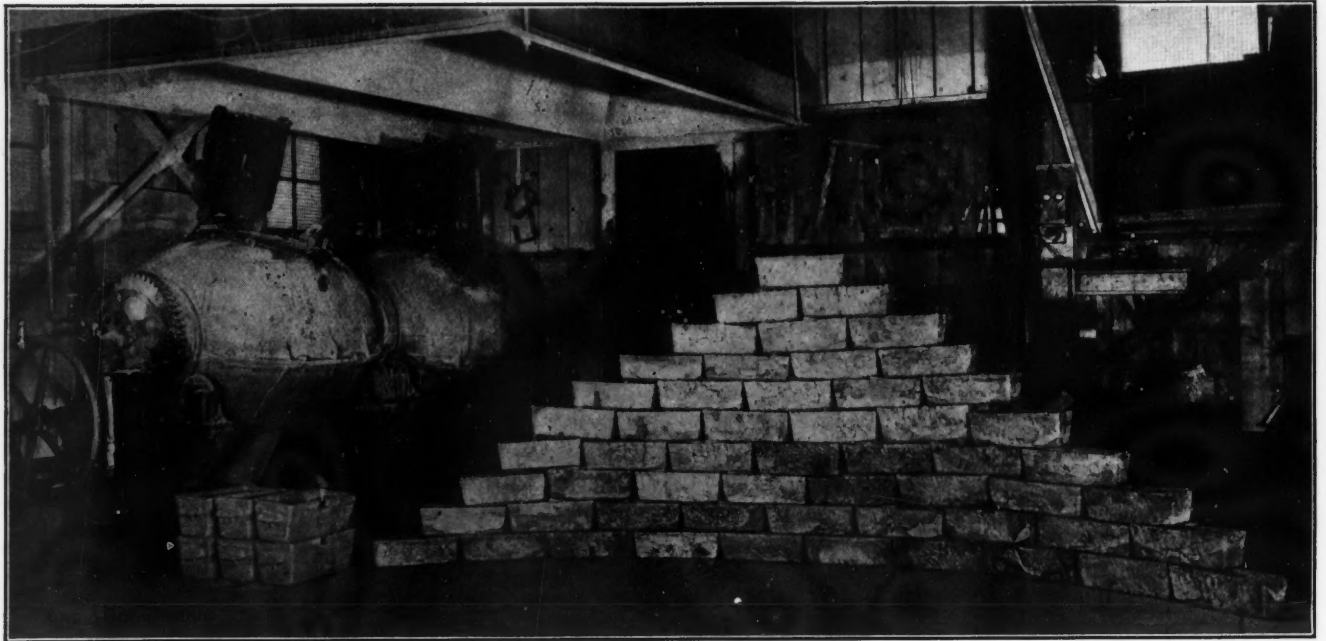


FIG. 6. MONARCH-ROCKWELL FURNACES AND THEIR PRODUCT AT TONOPAH-BELMONT MILL

tharge, 30 parts of old slag, 10 to 20 parts of borax glass, and 20 to 30 parts of old assay slag. Coke equal to 5 to 8 parts was sufficient to reduce the litharge, and 8 to 15 parts of silica were added, depending upon the zinc content of the precipitate, and also 5 parts of soda.

It was found in this practice that the cleanest slag and best cupeling conditions were obtained when the lead bars from the melting were kept under 225 fine. This condition was insured by using sufficient litharge and being sure that it was reduced.

Bottoms made in the ordinary test castings were used for each melting process, the accompanying drawing, Fig. 4, showing the essential details. The materials for the melting bottom are: 180 lb. limestone, ground through a 20-mesh screen; 180 lb. fireclay; 60 lb. portland cement, and 60 lb. of old test bottom ground through 20-mesh screen. For the cupel, the materials are: 156 lb. limestone, ground through 20-mesh; 156 lb. fireclay; 52 lb. portland cement, and 52 lb. old test bottom ground

furnace, now so well known. A cut of this furnace is shown in Fig. 5. In this device almost all of the heavy, severe work which formerly was required in melting, is avoided, and the process is made quicker and cheaper. A point in its favor is the fact that the crucible is not removed from the furnace during pouring, and therefore it avoids sudden and great changes of temperature, whereby the life of the crucible is much increased. This furnace may be used with air pressures varying from 1 oz. to 30 lb. per sq.in. The type is largely used and generally considered satisfactory for the work. A similar furnace is the Case, which is used under about the same conditions.

A later development of the oil-fired tilting furnace is the Monarch-Rockwell, illustrated in diagram in Fig. 7. Fig. 6 shows a halftone engraving of an installation of those furnaces at the Tonopah Belmont mill, together with some bars of its production. This example will be considered in detail in another part of this article. The Rockwell is a double-chamber furnace which uses no crucible, the principle being practically that of the re-

<sup>3</sup>"Smelting Precipitate at Cerro Prieto," "Eng. and Min. Journ.," June 7, 1913.



verberatory. The heating is done with an oil burner through a hollow trunnion, upon which it also turns for discharging the melted product. The operation of the

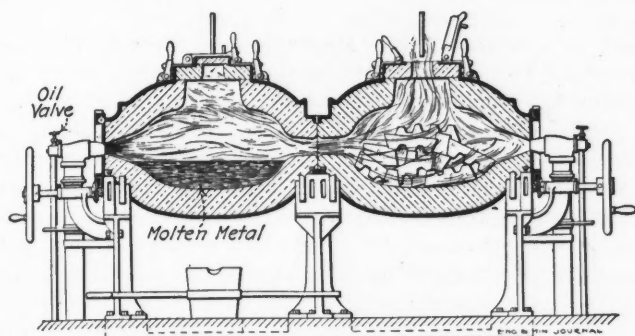


FIG. 7. MONARCH-ROCKWELL FURNACE

machine is convenient and economical. Low-pressure burners, gas or oil, are used, the pressure required being from 8 to 12 oz. per square inch.

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### Treatment of Ores in Place

In addressing the Mining and Metallurgical Society of America as newly elected president, James F. Kemp outlined in humorous vein some proposed methods for leaching and smelting ores in place. The address, curiously enough, called forth from other members numerous instances of variably successful actual attempts along similar lines; these are reported in *Bull.* No. 68.

Allen H. Rogers was reminded of a scheme tried in Arizona not long ago, where in a certain property, drilling developed a small tonnage of low-grade, disseminated copper ore. The company set up a small generator driven by a gasoline engine and, placing electrodes in two of the drill holes, passed current through them in the attempt to extract the copper by electrolysis. The details were never published, but it is understood they are not now operating, and probably the attempt was not successful.

The same man who suggested this method had an ingenious scheme for transporting copper metal, in connection with a mine in Peru, which was without railway connection. His suggestion was that, after the copper was reduced at the mine, it be drawn into wire, one end of the wire to be carried to the coast and attached to a powerful winding engine by which the copper, continuously drawn into wire at the mine, would be dragged over the country and delivered at the coast.

Sidney J. Jennings said that the recovery of metal from ores without mining was a possibility which had always possessed an interest for him. He referred to a statement, made by R. M. Catlin some years ago, concerning experiments of his on dissolving silver ore in place with a hyposulphite solution, in which, owing to the nature of the case, a fair measure of commercial success was attained. On the Rand, some experiments were made to dissolve the gold in the upper levels of the deposit. H. S. Stark, who was responsible for the successful treatment of tailing piles in place, conceived the idea that it would be possible to treat the upper level of the low-grade main reef by the same process which had proved successful on the tailings dump. The upper portion of the main reef was a porous banket, having a clayey streak

on the foot wall. Experiments on a small scale proved that the banket was permeable to cyanide solution and it seemed possible that, while undoubtedly a large amount of cyanide solution would be lost, a certain amount would be saved, and whatever was saved would be clear gain, as the gold contents in the main reef would not pay for mining and milling. Experiments were continued for a length of time sufficient to prove that not only was the cyanide solution lost, but the gold was not recovered. During the first years of the development of the deep levels on the Rand, many suggestions were made to obviate the necessity for sinking the deep shafts contemplated. One enthusiastic French engineer came out to see Mr. Jennings one day on the Crown Deep, and noticing the elaborate preparations being made for deep shafts and large mills, earnestly declaimed against the waste of capital when, according to him, all that was necessary was to sink a diamond-drill hole at the top of the property, and another one at the bottom, to pour cyanide solution in the top hole and pump it out, enriched with all the gold, from the bottom, precipitating this gold on zinc. His enthusiastic "Why not, Mr. Jennings?" still echoed, Mr. Jennings said, in his ears.

J. Parke Channing noted that extracting metal from ores without mining them was not altogether an iridescent dream. The late John Stanton told him that about 1858, when he was at Ducktown, Tenn., among the properties under his management was the Eureka mine. This is one of the largest pyritic deposits in the district, but is low in copper, running probably less than 1%. The result was that the black-copper zone under the gossan was so thin that it did not pay to drift it out. Mr. Stanton said that he permitted the mine to fill up with water each month, and then pumped it out, running the water through boxes containing scrap iron, and obtained commercially successful results. He is said to have been stopped in this work by the owners of the Isabella, an adjoining property, who claimed he was, probably unconsciously, extracting the copper from their mine.

Allen H. Rogers then called attention to the fact that at the Anaconda, the mine waters richest in copper are drawn from these sections where the mines are on fire. The condition, although inadvertent on the part of the management, is evidently the same as that sought by Mr. Stanton.

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### Detection of Lead in Bismuth

If 10 grams of bismuth subnitrate are boiled with 50 c.c. of a 1:20 solution of ammonium nitrate, the liquid allowed to become cold, filtered, and a few drops of strong neutral potassium chromate added to the filtrate, a precipitate of lead chromate will be obtained in the presence of even a trace of lead, says the *Chemical Trade Journal*. For the detection of lead in the subcarbonate, 10 grams are treated with 100 c.c. of the ammonium-nitrate solution, boiled down to about one-third of its volume, and then evaporated to dryness on a water bath. The dry residue is well stirred up with 100 c.c. of distilled water, and evaporated to 40 c.c. over a naked flame. When cold, this solution is filtered and treated as above. The more prolonged heating is essential in this case to ensure the complete elimination of the ammonium carbonate formed, the presence of which in the filtrate would prevent the precipitation of lead chromate.

# Top Slicing at Bingham--III

By D. W. JESSUP\*

*SYNOPSIS—Drilling and mucking in top slicing, controlling overburden movement, necessity of ventilation, spiling practice and advantages and disadvantages of top slicing.*

In the system of top slicing practiced in Bingham Cañon, Utah, drilling is done with  $2\frac{1}{4}$ -in. piston drills of Ingersoll-Rand or Sullivan manufacture. Ingersoll-Rand hammer drills, butterfly-valve type, are used in stoping and raising. In the soft ore and with a clean face, the machineman will set up, put in a round of holes and blast in one shift. In the harder ore two shifts may be required. The holes are 4 to  $4\frac{1}{2}$  ft. deep. For a lead or advance set, six to 12 holes are required to break the round. Two rounds may be necessary to make room for one set, depending on the nature of the ground. For a wing or side set the ore is taken out with a round of three to nine holes. The lead sets are always in advance of the wing sets and are sometimes run to the limits of the orebody before the wing sets are taken out. As two faces in the wing sets are exposed, it requires fewer holes and less powder to break the ore than in the lead sets. It is the policy to leave a clean setup for the machineman on the succeeding shift. When a round has been blasted the mucker on the following shift removes the ore while the machineman is drilling in a clean face. With two shifts a clean setup is possible. Blasting at lunch time may be necessary to obtain a supply of ore and to make room for timbers, but there is the disadvantage of powder smoke in the stope.

## HORSES ARE LEFT STANDING WHEN POSSIBLE

The drilling face may be a mixture of ore and waste, if possible each is blasted separately in order to obtain clean ore. If the first part of the slice is in waste, the waste is handled through the ore chutes and trammed outside, but after the slice has been opened up there is sufficient room in the stope in which to store the waste. Horses of waste and low-grade ore are usually left in place and when the succeeding slice enters underneath this point, care is taken to have the ground well caught up with timbers. Four sets of ground are always left between the drifts or crosscuts, thus making pillars about 20 ft. in width. These pillars act as supports for the overburden until they are withdrawn. They are lagged in at the side to hold the ore in place. If the space available for storing waste is limited, cribs are made of lagging in which the waste is placed. In each stope there is a miner who squares out corners and prepares the ground for the timberman. He also timbers, sorts ore, etc. As the ore is low-grade, little sorting is attempted, only the large pieces of waste are thrown aside.

The raising is done with hammer drills and the machineman puts in at least one round of holes per shift. Sometimes two rounds are drilled in the shift or one round drilled and a set of timbers put in place. The raising is mostly done by contract work.

In blasting two to four sticks of 1-in., 40% dynamite

\*Mining engineer, Salt Lake City, Utah.

are used in each hole. Harder ground may require six sticks. Two primers are used in wet holes. Electric firing has not given good results. Only sufficient powder is left in the powder thawer to last about two shifts to avoid danger of a serious explosion. The powder thawer consists of a cupboard with a series of latticed shelves on which the powder is placed. At the bottom of the thawer are a number of electric lights, which give out sufficient heat to keep the powder soft.

## MUCKING PRACTICE

The broken material in the stope is handled with a wheelbarrow and shovel through runways to the chute. The runways are kept open and as straight as possible to avoid rehandling. The mucker as a rule works from a round of ore blasted by the previous shift. The wheelbarrow holds about 350 lb. of ore. When the wheeling distance exceeds 75 ft. it is the best policy to make a new raise and shorten the wheeling distance. This is governed by the nature of the orebody as to its dimensions, the dip of the hanging wall, etc. A long wheel is ineffi-

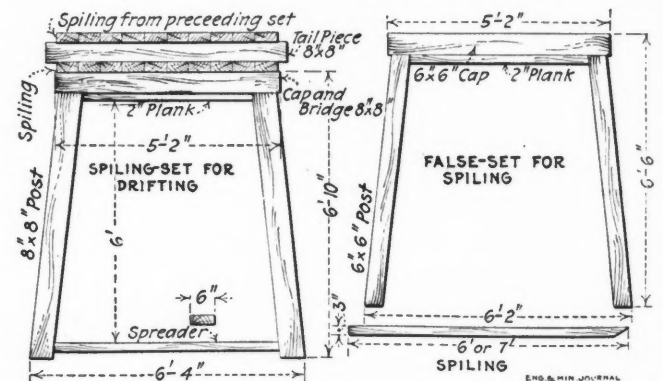


FIG. 10. SPILING SET USED IN A RUN OF OVERBURDEN

cient, it requires time and tires the mucker more than a short wheel. A mucker will handle from 10 to 30 tons of ore, depending upon conditions. Small cars of 1000 lb. capacity have been used in some of the stopes, but with poor results. They cannot make the sharp turns required, reach the far corners of the stope, and cannot be trammed through the narrow runways past the distorted timbers. The small cars have their place only in running from an inside chute in the stope.

## SPILING PRACTICE

A run of overburden will often occur when mining a slice and before it can be stopped mining operations may be seriously hindered. To prevent and stop these runs spilings are used. The spiling set consists of two posts, a tail piece, a bridge, eight or 10 spiles, and a false set or a tee piece, Fig. 10. The spilings are 3 in. by 6 in. by 6 ft. long with one end trimmed to a 30° cutting edge. In a stope the cap or girt of the timber set is used as a tail piece. The bridge is a 6x8-in. or an 8x8-in. piece placed about 3 in. below the tail piece and rests on lagging nailed to the sides of the posts. Small posts may be used instead of lagging. In this 3-in. space the

spiling is driven, each spile being put in place and driven a few inches in turn. When they have advanced two or three feet, the overburden which has fallen is removed and the spiling is supported by a tee piece or a false set. The driving of the spiling is continued and the overburden is removed until room is made for a set of timbers. The tee piece is then removed. If the run occurs in a part of the stope that has been timbered, the spilings are driven until they rest upon or butt against the further set and are then blocked in place. If the overburden is not heavy, 2x12-in. lagging is used instead of the 3x6-in. pieces. Side spiling is sometimes necessary, 2x12-in. lagging is used and is driven across the set from post to post. A vertical stull placed in between the posts will prevent the spiling from driving inward. The cutting edge is always driven either upward or outward.

A number of the old stopes which have been caved for many years are now reworked by the aid of spiling. Drifts are advanced through the caved workings and the ore removed as fast as it caves into the drift. A pillar of crushed ore and fine fillings may run for several days and when waste predominates the run is stopped and the drift continued. The spiling set consists of two posts 7 ft. long, a cap 5 ft. 10 in. long, a tail piece somewhat longer than the cap, and the necessary spiles. The timbers are 8x8 in. The posts are set at a batter of 1 in. per foot. A space of 6 ft. 6 in. is left between the cap and the bottom of the drift. The tail piece is blocked in place 3 in. above the cap and supports the spiling driven from the preceding set, as shown in Fig. 10. Through this 3-in. space spiling, 7 ft. long, are driven upward at a slight angle. When they have advanced three or four feet, the tee piece is used as a support. The spiling is continued until room is made for another set. The tee piece is then removed and serves its purpose for the following sets. If the ground is heavy or hard to handle, a false set is used in preference to the tee piece. This set is made up of 6x6-in. timbers and consists of two posts and one cap, it is removed and used again for the succeeding sets. The old timbers encountered in drifting are extremely troublesome, they are taken out with a saw and ax, also by blasting.

#### OVERBURDEN

The pressure upon the timbers is due mostly to the overburden of waste, low-grade ore and timbers, also a side pressure from the hanging wall. The overburden following the successive slices at times exerts an enormous pressure, due to the initial creep and adjustment of the mat and loose material. At times it is almost irresistible and necessitates a large amount of timbers and reinforcement. After the pressure has been acting for some time the overburden seems to adjust itself. It becomes partially self-supporting and does not exert much pressure upon the timbers unless more ground is taken out and the equilibrium is disturbed. Often the timber sets in a slice are crushed into matchwood or distorted into many shapes during the adjustments. The advantages that the top-slice method of mining has over the square-set method can then be realized. The large quantity of timber required to hold open the orebody for any length of time then becomes apparent.

But little ore is lost by the top-slice method. From 90 to 95% of the ore is extracted and may be called clean mining. The loss is mainly due to the mixing of the ore

with waste from the overburden and this mixture is too low grade to ship or to sort, or it may be too expensive to remove the waste in order to obtain the ore. In this case the ore may be tapped from the floor below. A neglect to lay flooring, flooring being out of place in the slice above, and heavy blasting may cause disastrous runs, especially if the overburden is fine. But with proper care and caution to lay all flooring and to keep the ground well caught up, the runs can be greatly reduced and may not occur until the slice is to be blasted. Runs are sometimes intentional, the slice above may have caved in prematurely or a pillar of ore may have been left for some purpose. The ore is allowed to run until the excess of waste is too great, the run is then stopped.

#### TRAMMING AND HAULAGE WAYS

The main haulage ways are tunnels and drifts to or underneath the orebodies. Various crosscuts make connections with the different parts of the orebody from which raises are made. The tunnels are about 7 ft. in height and 6 ft. wide; the drifts and crosscuts are slightly smaller. The ore from the chutes is dumped directly into ore cars and if the chute is in the main tunnel level the ore is trammed to the main chute and dumped, a one-ton car being used. If the stope is below the main tunnel level the cars are run outside to the bins. If the chute is in the upper level, the cars are trammed to a shaft and hoisted to the surface on a cage. The ore train running in the main tunnel level consists of five to seven cars each of two tons capacity. One horse pulls the train in and out of the tunnel. The last car is equipped with a brake. With a heavy tonnage horses are changed every half shift; otherwise the horses work alternate half shifts. Electric power has been installed at one of the mines and has made a material increase in the tonnage by hauling a larger number of cars in the train and increasing the number of trips. The train is emptied outside into bins and loaded directly into aerial tramway buckets or into railroad cars. The tracks are laid to 18 in. gage. A 12-lb. rail is laid for the small cars and 20-lb. rail for the larger cars. The track grade is 1 in. per 20 ft.; this affords an easy grade for both the ingoing and outgoing trains. The underground water is carried out by a ditch placed to one side of the track. No pumps are necessary as the workings at present are above the tunnel levels. The main drifts and tunnels are lighted by electricity, 8- and 16-cp. bulbs are used.

#### VENTILATION

The top-slice system presents a serious drawback in the lack of ventilation. This problem deserves serious consideration before the system is adopted. If the circulation of air is retarded in a stope, the air soon becomes warm and contaminated with carbon dioxide generated from the slacking limestone. While this gas is not poisonous, it does not support life and the air must be kept in circulation to prevent the segregation of the gas. A wood gas from the decaying timbers is formed, but it does not have a deleterious effect unless in excess. In some of the older stopes sulphurous gas is generated which will prevent all working unless removed. The ventilation is more troublesome in summer than in winter, due to an approximate equalization of temperature of the air both inside and outside the mine. In winter this dif-

ference is greater and will cause a circulation of air through the mine without the assistance of a fan. In some of the stopes it is possible to maintain an open-air course from some upper level to the successive slices, using heavy timbers to prevent the crushing of the course. This is impractical as a rule and a fan is placed in the level below the stopes. Both suction and blower fans have been tried but the blower gives better results. A 12-in. galvanized-iron pipe connects the fan with the stopes, the joints are wrapped with cloth soaked in tar or black paint. If the various slices in the different stopes are kept connected with each other a good circulation of air is usually maintained without the aid of a fan. At least two raises should connect the slice to drifts or other open workings. Acetylene lamps have proved quite a success. They give light of much greater brilliancy than the candle, cost about the same and will burn better in poor air. Compressed air is constantly blowing in some of the stopes; the exhaust from the machines also aids in the circulation. After blasting the air valves are turned wide open to ventilate the stope thoroughly for the following shift.

By the time the ore has been mined from the slice a great many of the timbers have been crushed and a large portion of the overburden has settled to the floor. If the pressure of the overburden has been great but few timbers are standing. The remaining posts and stulls are bored with a 1 1/8-in. auger, making a hole 5 in. deep in the middle of the post. Half a stick of dynamite is placed in each hole and primed. The fuses from four primers are tied together to facilitate spitting. Several miners are employed to spit the fuse, using a short piece of fuse and extra candles, about three minutes are allowed. Heavy timbers are placed over the manway to prevent any overburden from falling through. The last man down the manway makes certain that the covering is intact. Before blasting the timbers all tools, pipe, etc., are removed from the stope.

Two shifts are employed: the day shift with hours from 8 a.m. to 5 p.m., one hour being allowed for lunch, and the night shift from 6 p.m. to 2:30 p.m., half hour being allowed for lunch. The machinemen and timbermen are mostly Finns, Cornishmen and Americans. The carmen and muckers are Greeks and Italians. The machinemen and timbermen receive \$3.25 per shift, the miners \$3, the carmen and muckers \$2.75, and the skinners \$3. Board and room costs 80c. to \$1.20 per day.

#### SLICING SYSTEM VERSUS SQUARE-SET SYSTEM

With the top-slice system of mining there is little danger to the men. The stope is but one set high and the distance that any material may fall is limited. There are no open sets or broken flooring for the miner to fall through and no danger of the stope caving without more than sufficient warning to the miners. The timbers take weight, crack and break for several hours before the mat and overburden finally settle down. The principal danger to the men lies in falling down a manway or chute. A run of overburden sometimes occurs and may partially bury a man before he can be rescued. As stated in the first part of the article, a number of Bingham's orebodies could not be worked by any other method. Considering the nature of the orebodies, the heavy hanging wall, the steep pitch, softness of the ores, the demand for excessive timbering, etc., the advantages over the square-set system are: Cheaper extraction of the ore; lower timber con-

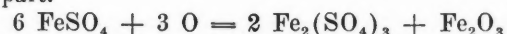
sumption; cheaper grade of timber can be used; less danger to the miners; less skilled labor in timbering; higher percentage of ore extraction under the conditions; can better stand an unequal loading or pressure from the overburden. The disadvantages are: Poor ventilation; does not allow following oreshoots and stringers; workings destroyed, may not be able to explore again; as practically all of the ore has to be taken out, it is not applicable where the nature of the ore changes and only a partial extraction is desired; caves to the surface, destroys the ground above. With irregular walls and a flat pitch this system of mining might prove inefficient.

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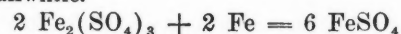
## Corrosion of Water Jackets and Rabble Arms

BY R. D. MACKECHNIE<sup>2</sup>

When managing a heavy-chemical plant in a smelting district, I was for a time at a loss to account for the chemical action in the water-cooled interior of the iron shafts and arms of the mechanical furnaces in use. The water in circulation showed no acidity when tested with blue litmus paper, but iron from the shafts and arms was dissolving, nevertheless. It was surmised that the SO<sub>3</sub> from the near-by smelting-plant chimneys and the escaping gases from the acid-works chimneys were being absorbed in the water-cooling tower of the circulating system. The water, too faintly acid to affect blue-litmus paper, dissolved the iron of the furnace shaft and arms, forming ferrous sulphate. This ferrous sulphate on passing down the water-cooling tower and on exposure formed ferric sulphate and hydrated oxide, probably thus, wholly or in part.



The ferric sulphate, on being circulated, would attack the iron and would be aided by the additional SO<sub>3</sub> absorbed meanwhile.



It will thus be seen that the soluble iron retains its place in the circulation, due to oxidation following reduction, and is aided in forming more iron salts by the SO<sub>3</sub> which is continually being absorbed. I have found that water with less than 0.001% free SO<sub>3</sub> would not distinctly affect blue-litmus paper, but the acid present in less quantity than this dissolved its equivalent weight of iron at 60° C. This, then, forms the basis of the trouble, and solution of iron in a smelting-furnace jacket or a roasting-furnace shaft or arms might well proceed until the circulation water has more than 0.02% ferric sulphate or 0.4% ferrous sulphate. These latter salts, when present in greater amount than stated, begin to show acidity to blue-litmus paper.

The obvious remedy is to use a more delicate indicator than litmus paper, which is the usual works indicator, and to keep the water alkaline. A small volume of water in circulation if kept slightly alkaline would be quickly affected and might escape notice when the SO<sub>3</sub> was temporarily abundant in the atmosphere; and if the water was strongly alkaline, SO<sub>3</sub> would be too easily absorbed and unnecessary alkali used. It would appear that a large volume of faintly alkaline water in the circulation system would meet the case.

<sup>2</sup>Chemical engineer, Glasgow, Scotland.

# Details of Practical Mining

## Automatic Light Switch Signal

By L. O. KELLOGG

It frequently happens in underground electric-haulage systems that the main drift branches a short distance from the shaft and that loaded trains are brought in over both branches. It then becomes necessary to signal to any incoming trains whether the track between the junction and the shaft is open or whether a train from the other branch drift is dumping at the pocket. This signaling is done automatically by colored lights in an exceedingly neat way at the Oliver mines near Ely, Minn. A switch is set in the back of the drift so as to be tripped by the trolley wheel of the incoming train and to flash a red light. The trolley wheel of the outgoing train usually flashes a green light. A train approaching on the other branch drift will stop if the motorman sees a red light and will proceed if he sees a green.

It is not entirely necessary to use the green light, but somewhat safer; for if two lights are used, the absence of

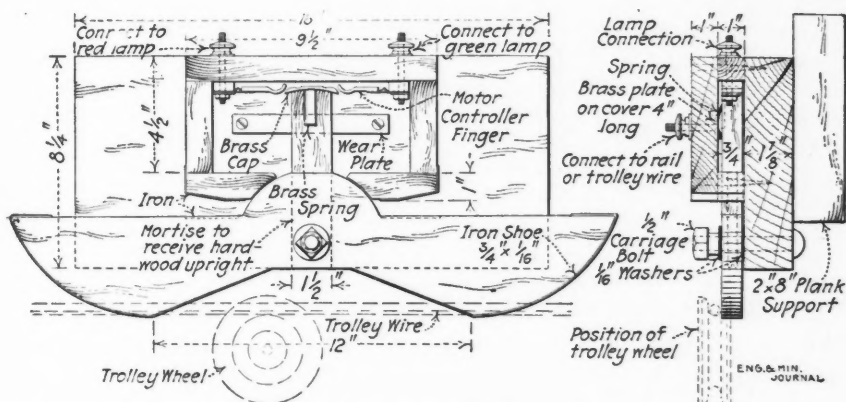
sists of a wooden back and a wooden front piece screwed together through filling blocks which form the box sides. The finger, by means of the brass spring shown, maintains a constant contact with a brass plate on the inside of the box front piece, which is connected to one side of both lamp circuits. The spring connects with a brass cap on the finger, and this makes contact with one of two fingers taken from a motor controller. One of these connects with the other side of the red-light circuit, the other with the other side of the green light. In the case shown, the trolley current is used for the lights; if a separate lighting circuit were in service, connections could be as easily made to this. The device is mounted on a board fastened parallel with the tracks between two caps.

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## The Breaking of Drill Steel

The inability of drill steel to stand up in a hammer machine was discussed at a recent meeting of the Mining and Metallurgical Society of America. (Bull. No. 68). Mr. Le Fevre stated that the chief difficulty thus far at Mineville in the use of hammer machines had been to procure steel which would stand up. Cruciform 1-in. steel did not seem to have enough metal, so that the company expected to try 1 1/4-in. octagon. The jackhammers using round hollow steel, break the shanks when the hole gets down 6 or 7 ft., and the borings do not come out freely.

Mr. Spilsbury stated that the peculiar fractures to which the hollow steel drill, under the impact of the hammer, seemed to be subjected, did not appear to be due simply to the



AUTOMATIC SWITCH TO INDICATE POSITION OF UNDERGROUND MOTOR

either a green or a red light indicates that something is wrong with the system, and the motorman will not proceed as he would if the mere absence of a red light was used to indicate a clear track. Only one switch is necessary, set where it will be operated by trains from both drifts. One or two sets of lights may be used, only one set being required, if a point can be had visible from a sufficient distance in both drifts; this is sometimes impossible on account of the curve arrangements.

The construction of the switch is shown in the drawing. It consists of a wooden box inclosing the contacts. A vertical pivoted finger is connected through the bottom of the box with two horizontal wings which the trolley wheel strikes; the finger, thrown laterally by the movement of the wings, completes a circuit through the lamp of the proper color. The wings of wood are shod with iron where struck by the wheel and where they strike the bottom of the box, in order to resist wear. The top of the wingpiece is shaped as an arc to fit the opening in the box, which is thus kept closed. The box itself con-

actual blow of the hammer, but to an interior condition of abnormal strain in the structure of the steel itself. He thought that possibly the trouble was due to the method under which these hollow drills are produced. The ingot is first punched and then forged down on a mandrel. Any defect, or ragged edge, on the punch originally used would cause striations along the interior surface of the hole and in the subsequent hammering down over the mandrel, these lines would never be entirely obliterated. The grooves might be closed but would probably include a slight film of oxide in their folds which would still remain in the finished drill, and under the jar of operation would naturally become a source of weakness. This trouble would also be increased by the unequal annealing of the material during the time of its reduction, owing to the fact that surfaces exposed to the mandrels would be cooled more rapidly than the rest of the material and shrinkage strains would probably be set up. He believed that this was the direction in which

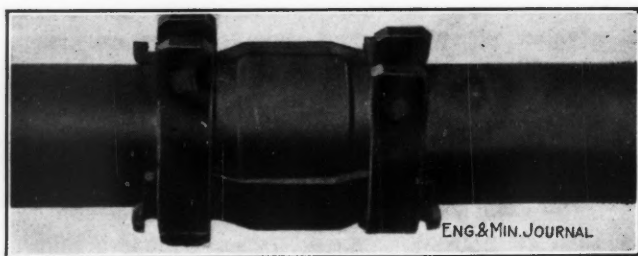
to look for the cause of the rapid failures rather than to the quality of the steel.

R. M. Catlin said he had an idea that the breaking of the drills was due to inequalities in the steel, although he had never seen a longitudinal fracture in a drill. The fractures with which he was familiar indicated a nucleus, and correlation indicated that the fracture had begun from this nucleus and spread outward. As is observed in a flaw in glass, these were concentric rings spreading out from a central point. It seemed as though there were in the nucleus some substance which had developed, under the strain of the vibrations or of heat, a tendency to expand more than the elasticity of the steel could accommodate. This nucleus seemed to run through the length of the steel, and if broken anywhere, one could expect to find it. There can be had steel of all kinds and prices from 5c. to over 30c. per lb. As a matter of fact, the higher-priced steel does not seem to be the more durable. A trial of hollow steel having an absolutely round hole, gave no better results, even though it was a drilled hole.

W. L. Saunders said his company had experimented a great deal on the subject of the round hole, and had to give it up. They thought that the mandrel might have a great deal to do with it, and went to great expense to bore a hole in a piece of the best quality of steel, but experienced the same trouble. The steel problem is being solved, he said, not by American, but by foreign metallurgists, and the steel with a hole in it that is now standing up best under the hammer blow is of foreign make. Referring again to the difference between a piston and a hammer drill, in the latter the bit is pressed against the bottom of the hole, and is then struck a thousand blows per minute. Probably 10% of the blows are struck when the bit does not touch the bottom of the hole, since one cannot press a piece of steel against the bottom of a hole and hammer it without the steel's bouncing back.

### Joint Reinforcement for Unsupported Steam Line

The Tully mine, near Iron River, Mich., is sinking by the drop-shaft method. As usual, in drop-shaft sinking, a large crater surrounds the shaft itself. The shaft re-



CLAMPS AND STRAPS TO STRENGTHEN SLEEVE COUPLING

quires a steam supply for the sinking pumps and the steam lines must be carried unsupported a considerable distance over the crater. To protect the sleeve joints as much as possible against stresses due to the weight of the pipe, the vibration and the movement of the shaft, the straps and clamps shown in the photograph are used. Two straps are shaped roughly to the sleeve and held in place, one below and one above the sleeve, by the clamps, each of which is in two parts.

### Cut and Fill Method in Wide Orebody

The manner of occurrence of the ore at the South Mine, at Broken Hill, is such as to render the open-stope and filling method of mining most available for ore extraction.

It is accepted as good practice, nowadays, in the case of wide lodes, to provide permanent drifts in the foot wall for tramming, the stopes being reached by crosscuts from these drifts. In this mine, the drifts are not put in originally, timbered gangways under the stopes being used for tramming until such gangways have to be picked up, when the drifts are run in the solid. The advantage is that at the later time the waste from such development can be conveniently deposited in lower stopes, while at the earlier period some trouble and expense would be incurred in handling the material in the shafts. Consequently, the stopes are opened out from the crosscuts or drifts leading from the shafts, and stoping commences as soon as the ore is struck.

The sill-floor stoping is done in two operations. The first is a cut 9 ft. high, where only side-shooting is allowed, and which is carried for the full area of the orebody before the second operation begins; this consists in taking a 7-ft. slice off the back, thus making the cavity 16 ft. high. The advantages claimed for this double procedure over the method of carrying the full height originally are: (1) A large orebody may occupy 6 to 12 months for the sill-floor cut, and during that time a 9-ft. back can be more easily examined and kept right than a 16-ft. back; (2) in the case of a 16-ft. back carried in one operation, no gangway timber can be stood until the stope is finished, while in the method adopted, timber and filling can closely follow the back-stoping miners; (3) in the double operation there is no cessation in mining, for as soon as men finish the 9-ft. stope they are put on the back, and as soon as they finish the 7-ft. slice they begin over the timber, while in the other case the miners, as soon as they have cut out 16 ft., must be withdrawn to allow the timber to be erected.

The arrangement of gangways, shoots and ladder-roads is decided mainly on the following considerations: (1) The gangways must serve conveniently for chutes from the stope above; (2) they must be in positions favorable to the sinking of winzes into the orebody beneath; (3) convenient connections must be made for tramming waste from the chutes to the winzes which will be subsequently sunk from the timber; (4) ladderways are always offsets from gangways, and never start from curves; (5) chutes are kept out of the main gangways as far as possible, and also off the curves; (6) two chutes are always arranged adjacent to a raise, and a ladderway is also placed nearby, the reason for this being that both in open stoping and also in the picking-up of bottoms the raise serves as the starting point for work, and a handy chute means a ready start, and a handy ladder road a good get-away.

When the timber work has been completed as high as 12 ft. above the sill, and the stope is ready for filling, bottoms are laid over the whole of the ground outside the gangway. The method of procedure consists in first running down some tailings from the raise, spreading it to a smooth surface 12 in. thick, and upon this laying 14-

Note—An excerpt from an article by Andrew Fairweather (Proc. Aust. I. M. E., No. 10, 1913).

ft. and 12-ft. 10x4-in. Oregon pine boards, close, level, and firmly bedded, with their joints broken. The direction of laying is parallel to the main run of the orebody. More filling is then run in, until the toe of the fill comes to the edge of the boards already laid. Further laying of boards and filling then proceed simultaneously, the material required for spreading under the bottoms being obtained from the advancing toe of the fill.

The advantages claimed for laying the bottoms on 12 in. of filling are: (1) The boards being level, well bedded, and buried, are under the best conditions for remaining sound; (2) in the subsequent picking up from the stope underneath, it will be possible to scrape out the 12-in. layer of "skimps," boom up the bottoms, and thus secure the back before shooting the ground away; (3) a reduction in working costs is effected, and the risk of runs is minimized.

The filling used is the rejected material from the minerals-separation process of the Central mine, and has been proved to set well under the wet conditions of the stopes

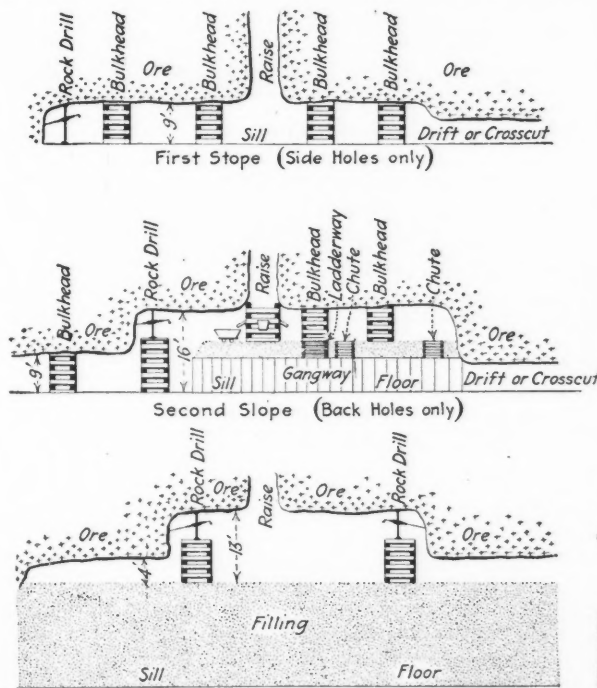


FIG. 1. PERMISSIBLE ARRANGEMENTS SHOWING TYPICAL DEVELOPMENT

that now obtain. The first layer goes in for a height of about 12 ft., thus covering the gangways with about 3 ft. of material, and leaving an opening of about 4 ft. under the back. Distribution from the raises is effected by side-tip cars running on trestles made of 10x2-in. timber. This timber is subsequently drawn out of the filling, and used over again.

The next stope taken off is 9 ft. thick, and starts from a raise, water holes being used in the lower portion of the breast and flat holes in the top portion. Boards of 10x4-in. material, 6 ft. long, are laid close on the filling previous to blasting to keep the ore clean of tailings and provide good shoveling for the men.

As stoping proceeds, bulkheads or cribs of 10x10-in. by 6-ft. Oregon pine are built behind the miners in places where there is any danger of falls of ground. The interval apart is about 12 ft., which allows of the catching up of ground between adjacent bulks by 10x10-in. or 10x

6-in. by 14-ft. stringers. Where the back gives no sign of weakness, the bulkheads are not omitted but the spacing is made 20 ft., no stringers being used. The bulkheads serve two purposes: (1) They prevent local small falls; (2) they give warning to men in the vicinity of the loosening of a larger mass. A special gang of men, controlled by a foreman, is engaged solely on the building of new bulkheads and the constant wedging and blocking of those already standing.

In the construction of each bulkhead, two 10x6-in. by 8-ft. stringers are used at a height of about 9 ft. above the sollar level, and, while the next layer of filling is being distributed, the ends of these are caught up on 10x6-in. props, so that the lower portion of the bulkhead may be removed. Naturally, this work proceeds just in advance of the toe of filling. Instead, therefore, of 9 ft. of bulkhead being buried, only four props are lost, and these only temporarily, as they are afterward drawn out of the filling by pole and chain. This method has the advantage that the bulkheads remain in their original position

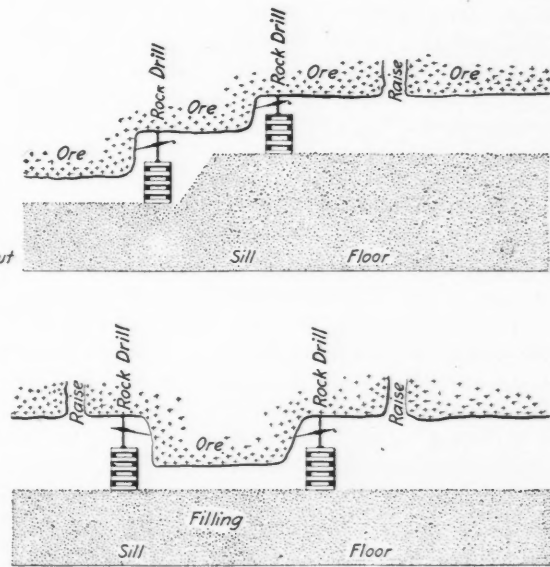


FIG. 2. ARRANGEMENTS NOT PERMISSIBLE

until the filling operation is completed. Wherever ground is bad over a bulkhead, and it is not convenient to take it down, the lower portion of the bulkhead is allowed to remain, and is buried.

The filling follows the stoping miners as closely as circumstances will allow, and the thickness of the layer corresponds to a depth of a stope, which is almost invariably 9 ft. As it is customary to carry the back 13 ft. high, this leaves an open space of 4 ft. above the fill.

To render this method of flat stoping as safe as possible, the following rules are laid down and enforced:

(1) Back stoping in an open working proceeds with one party usually, but if more than one is operating they always stope away from one another. It has been abundantly proved, both here and elsewhere, that ground attacked from two ends by parties approaching each other tends to become heavy. If it were possible to absolutely close the thoroughfare between two such parties, an in-

intermediate fall would be of no consequence. For many reasons, however, this is not convenient, and a wise precaution is to avoid such conditions. The adoption of this rule limits the output from a large stope. On any one side of the starting winze one breast only may be carried, and, as men dislike large parties, it is difficult to get an output from a large lode in any way commensurate with its size.

(2) The direction of work is always parallel to the strike of the orebody, the argument being that, since the holes are drilled in the direction of the stoping, they are parallel to the walls, not across them, and therefore decrease the risk of breaking away the wall and causing the adjacent ore to become heavy.

(3) Uppers, holes drilled above the horizontal, are absolutely prohibited; and strong holes, especially in the upper portion of the breast, are not shot until they have been relieved. As an upper carries more ground on its point than on its collar, it must be a strong hole; and strong holes are prohibited in the back, for the reason that the force of their explosions finds no ready release, and spends itself in trying to rend the ground that has to remain over the men, which may result in the opening up of "flaws."

(4) Work underneath the "belly," the low ground ahead of the breast, is never permitted, especially during drilling operations; this is the weakest part of the stope, and the portion most likely to fall. Sollars may be laid under the belly only when the machines are stopped, and then only if there be no doubt about its strength. All ladderways under bellies are blocked as thoroughfares, as is the 4-ft. open space under the rock. As it is an exceedingly difficult matter to prevent communication by the shortest route between parties in one stope, it is advisable, wherever possible, not to allow one party to follow another, carrying a higher stope, for thus the belly of one is the back of the other. With a long interval between, the arrangement is permissible, but should not be tolerated unless a ladder road is handy to the forward party. Where men have to travel under a belly to get to their ladder road, the gangway should be formed by two rows of bulkheads, 6 ft. between. The ladder near the raise, however, is good practice.

(5) As soon as it is known that a piece of ground is bad, work is concentrated on that piece with the object of bringing it down. A crack is shot, or a hole is drilled and shot. If the piece be comparatively small, and any blasting might tend to make the back worse, extra bulkheads are built under it. This is a matter about which supervision must be strict. It has often happened that a stone has been tried repeatedly, and then forgotten, only to fall when least expected. No miner should be allowed to leave things to chance in this way. If the stone will not bar, it should be blasted, and the blasting repeated until the piece is down.

(6) Ore-breaking contracts do not include the building of bulkheads, as the special gang does most of the work. Should the stoping contractors have to build one, they are compensated for such work by a special bonus to the party, arranged between themselves and the foreman. In this way financial considerations do not cause the men to neglect work intended for their own safety.

When a stoping party has squared up its end, either to a wall or an intrusion, it goes back to the original raise to beat off another slice, and the filling of the end is ac-

complished from a raise near-by. These raises are placed at intervals of about 100 ft., and therefore prevent the clashing of the two operations. Alternate stoping and filling proceed until the back remaining measures 30 ft. or thereabouts. A light stope is then taken off, and a flat floor of square sets of 7-ft. 2-in. posts, resting on bottoms, is stood throughout the working, the timber work following the miners. Close attention is paid to the blocking on the walls and over the posts, but not over the caps. When the ore has been cleaned up, all the sets are filled to the caps, except certain ones around the raises which connect to ladder road and chute. The remaining ground is removed by underhand square sets, worked across the lode.

The advantages claimed for the flat floor of sets previous to closing up are: (1) The standing of the sets leaves the back absolutely level, and therefore secures a uniform depth of underhand stope; (2) the sets form an excellent foundation for the timber of the underhand stope.

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## Safeguarding the Pay Roll

BY A. H. SAWYER\*

It is stated that an employee sometimes fails to receive his wages because someone else has previously given his name and obtained the money without question.

To guard against such practice, the Republic Iron & Steel Co. uses the Dixon patent wage statement and pay envelope; the envelope is shown herewith, the statement is a duplicate of the form on thin paper. The statement and envelope are made out in one operation by means of a sheet of carbon paper, thus avoiding any discrepancies in number, name, items or balance due.

The statement is handed to the employee previously to payday and is signed by him and presented to the paymaster on payday. The company is thus protected in

Dixon Wage Statement and Pay Envelope. Pat. Nov. 25, 1903.	
No. _____	
TOTAL WAGES .....	
Checks	
Brass Checks	
Rent	
Coal	
Physician	
Stores	
Commissary Account	
Insurance	
Garnishments	
Cash Advance	
TOTAL DEDUCTIONS.....	
CASH PAY DAY.....	
Month Ending, _____	
PAID BY	
REPUBLIC IRON AND STEEL COMPANY.	
SOUTHERN DISTRICT	
RAIMUND MINES	
Form 210B—SM-6-15—D. P. Co.	

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FORM OF ENVELOPE DUPLICATED ON PAPER SLIP

that it retains the original statement duly received by the employee. The employee is also safeguarded in that he receives the envelope which is the exact duplicate of the statement which he presents to the paymaster. This seems to be as simple and efficient a system as can be devised.

\*Mining engineer, 412 American Trust Bldg., Birmingham, Ala.



# Details of Metallurgical Practice

## Grade of Discharge Pipes

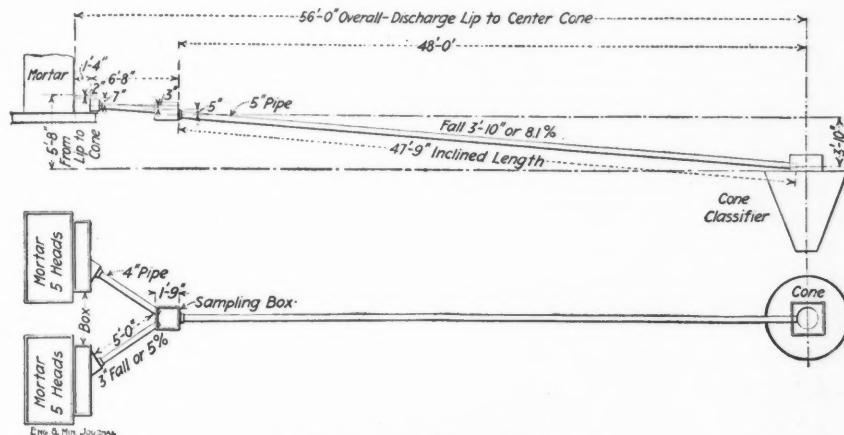
By H. E. WEST\*

Little authentic data is published respecting the grade of launders, or pipes, since the introduction of coarse-crushing as tube-mill feed. In the example in the accompanying illustration, the product from a screen with 9 holes per sq.in., quartz in schist, was as follows:

Mesh	+ 20	+ 40	+ 80	+ 100	- 100
%	35.5	17.0	12.1	5.4	30

This sizing shows roughly one-third each of coarse, middling and fine products. The water ratio in this instance was 6 to 1. The denser the pulp, the more readily is the coarse product kept in suspension, and in consequence the pulp flows more freely and requires less grade.

An ideal section for a coarse-pulp conveying pipe would



GRADE FOR PULP FLOW

be an oblong or flattened section, affording the rolling action of the coarse particles increased surface. A round pipe, however, is readily procurable and has the advantage of being capable of being turned twice through 120°, affording three surfaces to abrasion. It is important that the pipe be proportioned to the volume of the pulp, neither too large nor too small. A launder has the approved section, but necessitates additional grade, a most essential consideration at times.

The sketch shows, by repeated trial, the minimum grade of pipe that will successfully convey coarse ore particles. The specific gravity of the ore is 2.8 and the pulp half fills the pipe at the entrance.

It is important to maintain the pipe, on a uniform grade, and to guard against obstructions on the lower inside surface, such as a projecting gasket or coarse extraneous material.

A rod, 3/8 in. in diameter, connected by links, inserted into the pipe, assists, by occasional working, in keeping the the pipe clear of obstructions.

The sampling box is a commendable feature of this pipe arrangement, though it sacrifices some inches of elevation. The smaller 4-in. pipe works with a 5% grade.

\*Mining engineer, Nundydroog mine, Ooregum.

It is suggested, therefore, that for the conveying of coarse ore particles from the mortar, a gradient of not less than 10% be allowed, measured from the mortar lip to the classifier, with 2 ft. additional for contingencies.

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## Kennedy Tailings Wheel

By LEWIS H. EDDY\*

Two of the four wheels installed by the Kennedy Mining & Milling Co., in Amador County, Calif., for elevating and distributing stamp-mill tailings, are in operation. The other two have been satisfactorily tested and will be started when necessary, or when the total capacity shall be required for the disposal of the tailings. The present mill is equipped with 100 stamps, having an average duty of 4 tons each day. In the initial operation of the wheels the actual carrying capacity will be carefully studied and compared with the rated or theoretical capacity. Record of costs will be kept; the distribution of the tailings over the area selected, the question of building restraining dams, the disposal of the water, and other details combine in a problem that must be studied from an extended period of actual operation of the wheels. It is likely that early in the operation the necessity will arise for the construction of brush and earth walls and that later a stone dam may be essential in one part of the ground.

It is not improbable that the water may be so conserved by a system of tanks or reservoirs and carried by flume or pipe back to the mill for economic use. An interesting feature in the carrying out of this system of disposing of mill tailings will be the study of the material respecting its value for further metallurgical treatment and its quality for agricultural purposes.

The wheels are 56 ft. diameter, set tandem. From the first to the second wheel the distance is 100 ft., from the second to the third wheel 820 ft., from the third to the fourth wheel 200 ft., making the total distance from the first to the fourth wheel 1120 ft. The distance from the mill to the first wheel is approximately 1500 ft. The tailings are fed to the first wheel by wooden flumes, and the wheels are likewise connected by flumes. These flumes are set on a 2 1/2% grade between wheels and about the same grade from the mill to the first wheel. The intake to and the delivery from each wheel are so designed in relation to the grade of the flumes as to provide for an elevation of the tailing at each station to a height of

\*Associate editor, "Engineering and Mining Journal," San Francisco, Calif.

35 ft., making a total lift from the plane of the intake at the first wheel to the plane of delivery from the last wheel of approximately 105 feet.

The wheels are well housed and provided with stairways, platforms, repair benches, and equipped with electric motors and telephone connection between the wheels and to the mill. The mechanical operation has been sufficiently tested to prove the accuracy of the design and the cost is shown to be reasonably economical, but the actual cost per ton cannot be set down until the wheels have handled an amount and variety of tailings equal to the demands of economic demonstration. The wheels were designed by and constructed under the supervision of James Spiers, of San Francisco. They are operated under the supervision of Webb Smith, general superintendent of the Kennedy mine and mill.

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### Relieving Converter Cranes

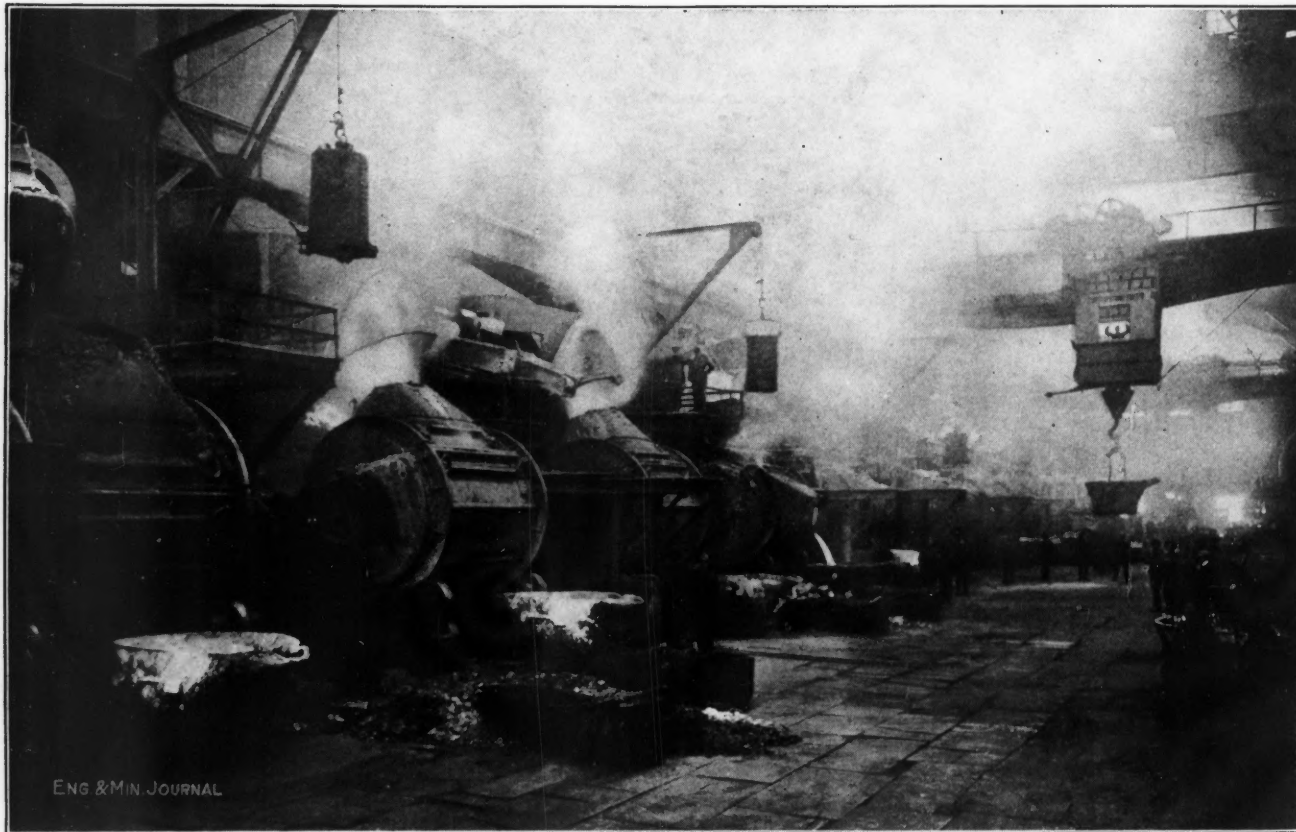
Many of the older converter plants have been handicapped by the increased crane service required in feeding

to obtain promptly any silica or "dope" needed for the converters. After the third electric crane was installed, it was found that the converters could be served with sufficient promptness by the traveling cranes and the dope buckets were no longer used, as it was easier to load the material into the long boats shown on the converter floor.

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### Fleeting Rolls

In a discussion of the applicability of rolls to gold-ore crushing in *M. M. S. A. Bull.* No. 68, Mr. Channing described the experience of Miami with fleeting rolls. The first rolls put in at Miami, by H. Kenyon Burch, were provided with a fleeting motion designed by him. The ore was so hard, however, that the mechanism was soon shaken to pieces. The next rolls were a modification of the Burch roll, made by the Traylor Engineering Co. While this fleeting device was an improvement, it also racked itself to pieces and failed to prevent corrugating. The speed of the mechanism was such that the movable roll was moved backward and forward once a minute.



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CONVERTER AISLE AT ANACONDA, SHOWING "DOPE BUCKETS" USED WHEN CRANE SERVICE WAS INADEQUATE

siliceous flux to basic-lined converters, and have been unable to produce the maximum output on this account. When the two electric traveling cranes at Anaconda became overcrowded, it was decided to install the "dope buckets" shown in the accompanying view of the converter aisle at the Washoe works. These buckets were suspended from swinging jib cranes installed between each two converters. The buckets open at the bottom and are discharged from the platform by striking the latch with a rod. This arrangement enabled the converter men

Within the last few months Mr. Traylor has invented a new device in which the movement is made by pawls working on a ratchet wheel, and the movement of the roll has been so reduced that a cycle is now completed in 30 min. instead of one minute. This seems to have entirely solved the problem, and this mechanism is now being installed on the 42x16-in. rolls for fine crushing in the mill proper. Here the rolls run face to face, and the friction in attempting to make the movement in one minute was altogether too great.

# Company Reports

## Utah Copper Co.

The report of the Utah Copper Co. for the fourth quarter of 1913, shows a gross production of 31,982,442 lb., the monthly average being 10,660,814 lb. Total ore treated was 2,113,080 tons, at both Garfield mills, as compared with 2,035,391 tons for the previous quarter. The average grade of the ore was 1.2165% copper, as compared with 1.2459% for the previous quarter. After making allowance for smelting deductions and without crediting miscellaneous income, the cost of producing copper was 9.978c. per lb. After crediting the net miscellaneous earnings, including those from the Bingham & Garfield Ry., the net cost per pound for the quarter was 8.932 cents.

The financial results of the quarter's operations were as follows:

Net profit from milling operations.....	\$1,479,787
Other income, rents, etc., in Utah.....	27,365
Income from Bingham & Garfield Ry. ....	175,000
Income from Nevada Consolidated Copper Co. ....	875,433
<b>Total net profit .....</b>	<b>\$2,557,590</b>
Dividends paid .....	1,187,760
<b>Net surplus for the quarter.....</b>	<b>\$1,369,830</b>

The earnings for the quarter are computed on a 14.857c. basis. Both mills were in continuous operation and operations were considered satisfactory except for the low grade of the ore and reduction of tonnages during the latter half of December. The low grade of the ore was caused by the necessity of mining a low-grade area near the northern limit of the deposit and the reduced tonnage in December was due to weather conditions. Stripping operations resulted in the removal of 1,365,606 cu.yd. The Bingham & Garfield Ry. handled the largest tonnage of ore and commercial freight in its history; an average of 16,711 tons of ore per day having been transported and 2942 tons per day of other freight handled. Quarterly reports give a gross production of 119,939,809 lb. of copper for 1913.

## Shattuck Arizona

The following is an abstract of the report of the Shattuck Arizona Copper Co., Bisbee, Ariz., covering a 17-month period, ended Dec. 31, 1913:

Total receipts from ore and interest.....	\$2,562,668
Operating expenditure .....	1,411,788
<b>Operating profit.....</b>	<b>\$1,150,880</b>
Depreciation charged off.....	35,376
<b>Net profit.....</b>	<b>\$1,115,504</b>
Dividends paid.....	525,000
<b>Net surplus for period.....</b>	<b>\$590,504</b>

	PRODUCTION	
	5 Mo., 1912	12 Months, 1913
	Copper Ore	Copper Ore    Lead Ore
Ore mined (dry tons).....	6,821	89,857    5,010
Ore from stock pile.....	4,602	.....
Ore shipped.....	11,432	89,317    4,874
Ore smelted.....	10,913	89,343    4,874
Lb. recovered per ton.....	160.5	147.9    304.5
Per cent. recovered.....	8.026	7.398    15.22
Total lb. of copper.....	1,746,493	13,219,756
Total oz. of silver.....	15,165	236,000
Total oz. of gold.....	16	2,033
Total lb. of lead.....	.....	1,483,956

During the period covered by the report, 20,147 ft. of development work were performed, making a total of 60,525 ft. to date. Improvements and construction expenditures amounted to \$32,138, of this amount \$15,035 was charged to current expense and the remainder to capital accounts.

A body of lead-carbonate ore was discovered on the 600-ft. level. It is stated that the company expects to be able to produce upward of 100,000 tons from this level of ore assaying \$2 gold, 2 oz. silver and 18% lead per ton. Recommendations have been made for a lead smeltery of 100 tons daily capacity. The company has its copper ore smelted by the Calumet & Arizona Mining Co. and sells its copper through Adolph Lewisohn & Sons.

## Stratton's Independence, Ltd.

The fifth ordinary general meeting of the shareholders of Stratton's Independence, Limited, was held on Monday, Dec. 8, 1913, according to a report in *Mining Journal*, Dec. 13, 1913. The chairman said that, regarding the mill operation, the sales of ore for the year amounted to £25,912, against £22,867 in the previous year. Bullion sales were £36,793, as against £22,621 2s. 10d. The charges were up by £7260, leaving a profit of £23,735, as against £13,778. The sales of ore from the mine realized £13,831, as against £17,970, and the percentage of royalties and charges on profits amounted to £11,103, against £22,423, the lessees' production having fallen from £80,165 for 1912 to £47,325 in 1913. Maintenance and property expenses had slightly increased, being £16,199, against £14,122, and they had spent £4755 on development. There was a net balance to profit and loss account of £25,260, against £33,461 in the previous year, and after meeting London expenses and sums paid in settlement of claims by the Portland company and the Moore Filter Co., there was a balance to carry to the balance sheet of £17,777, as against £27,465, so that the total amount at credit of profit and loss account, including this £17,777, was £29,680. From this two dividends, at the rate of 3d. per share, had been paid, free of income tax, leaving a balance to carry forward of £4680, as against £11,902. Two items on the profit and loss account had reduced the profit—namely, the settlement with the Portland company and the payment to the Moore Filter Co., but the outstanding feature was the great reduction in the profits from the mine proper, whereas they had largely increased the profits from the mill. Mr. Argall's estimate of the cost of working the mill had been very satisfactorily carried out in practice; his original estimate was \$1.52, and he had worked at 8c. less. He had also secured a recovery of 78.48% on ore averaging only \$3.076, against an estimate of 70% on \$3.60 ore, which, from the estimate made as to the value of the dump, was what they hoped to obtain in practice. The mill had thoroughly justified itself, and it was clearly to the mill

that they must look for their principal profit in future. Without the mill they could not touch less than \$10 ore at a profit; with it \$5 ore gave a decent profit, and they were mining \$4 ore and breaking even. Mr. Argall said that on the A level, where the ground was soft and no hoisting, \$2.50 ore would pay. With reference to the mill, Mr. Argall for some time past had been conducting negotiations to treat some of the many dumps of ore which exist in the Cripple Creek district. The point on which the whole question really turned was that of railway freight; naturally, the low-grade ores which were thrown on the dumps were not capable of bearing a high freight and still return a profit. However, Mr. Argall might eventually succeed in this direction. Mr. Argall had suggested that it might be advantageous to endeavor to secure another property. Having Mr. Argall they had a much better chance of procuring a property of a good character than most people would have in that part of the world; but to carry out this suggestion required funds. Up to now their policy had been to divide the profits among the shareholders as dividends as fully as possible. To secure the necessary funds, however, to enable them to support Mr. Argall in finding a new property it would be necessary to accumulate the profits for the future until they had built up a reserve of £10,000 to £20,000 in cash. Mr. Argall estimates that in the dumps and upper levels they had ore to keep the mill going for two years, with a profit of £30,000, which might be doubled.

### Cape Copper Co.

The Cape Copper Co. is about to raise approximately \$1,000,000 by issuing 60,000 ordinary shares of a par value of £2 each. No specific explanation is made in the company's circular as to the purpose to which this new capital is to be applied, but it is presumed that it will be largely used in the Rakha Hills copper development. The company has a 36-year lease on this property in Central India, and according to Skinner's, 1913, had developed 190,000 tons of 4% ore. The company has also been prospecting some ancient mines in Asia Minor. At the last general meeting, an increase of 100,000 ordinary shares was authorized; the present issue is a part of this allotment, and is offered to shareholders at £3 10s., a premium of £1 10s. over the par value. The ordinary shares, sold on the London exchange at £4 $\frac{1}{4}$ @4 $\frac{1}{2}$  on Feb. 4. The company's issued capital is £690,000, which will be increased to £810,000, by the additional shares now to be issued. Besides the above mentioned properties, the company owns the O'okiep, NababEEP, and other mines in Namaqualand, Cape Colony, a share interest in a mine in Spain, an option on a Newfoundland property, and an interest in the Briton Ferry Chemical & Manure Co., Ltd. The 99-year lease on the Tilt Cove copper mines in Newfoundland was relinquished last year.

### Mt. Morgan Gold Mining Co.

The Mount Morgan Gold Mining Co., Queensland, Australia, in its report for half-year ended Nov. 30, 1913, states that 2.5 tons of ore were broken per miner and shoveler per shift, against 2.72 for the previous year. The decrease is accounted for by the fact that 21,680 tons of waste were mined against 6860 tons for the previous six months and also that one sill set was cut for

every 7.2 swinging sets as compared with one to 15.2 during the previous period. Ore handled per underground employee equaled 1.32 tons per shift. The average earnings of miners on contract was \$4.22 and shovelers \$3.32 per shift. The cost of miners, shovelers and explosives was \$1.37 per ton of ore. In the smeltery it costs about 13c. per unit of silica to flux it, due to the high cost of fluxing material, the slag produced assayed about 45% silica. After the completion of the concentrating plant it is not intended to smelt ores containing over 52% silica except where the gold content is high. The Mineral Separation Co. has been making some tests on these ores. The experimental concentrating plant has cost about \$17,500 and the testing and other expenses about \$38,000 to date.

### Chief Consolidated

The 1913 annual report of the Chief Consolidated Mining Co., Eureka, Utah, shows that 51,173 tons of ore having a gross value of \$16.29 per ton were shipped to the smelters. The profit on this ore amounted to \$2.20 per ton after deducting \$5.17 for all charges at the mine and \$8.92 for smelting, freights, sampling, etc. Assays of the ore gave the following content per ton: gold, 0.928 oz.; silver, 19.88 oz.; lead, 2.525% and copper, 0.111%. Development work consisting of 5306 ft. of drifts, 818 ft. of raises, 71 ft. of winzes, 132 ft. of shaft widening, 56 ft. of shaft sinking, total, 6383 ft. was performed; this is the largest amount of development work ever performed by the company in one year.

Though the production of ore exceeds that of former years, the contents averaged much lower, causing a reduction in the dividend rate. There is a larger tonnage of ore in reserve than at any previous time. The management states that it is difficult to estimate the value of the future production, but that it seems reasonable to assume that what has already been accomplished can be repeated. But a small part of the property has been developed.

### Portland Gold Mining Co.

The annual report of the Portland Gold Mining Co., Cripple Creek, Colo., for 1913, shows that 231,407 tons of ore were treated; of this tonnage, 53,245 tons averaging \$25.93 per ton were treated in the Colorado Springs mill and 178,162 tons averaging \$2.95 per ton were treated in the Victor mill. Of the ore treated at Victor mill, 51,108 came from dumps. The total net earnings from mine and mills were \$604,443. A regular dividend of \$240,000 and an extra dividend of \$60,000 were paid, leaving a surplus of \$304,443 from earnings. Cash on hand at the end of the year amounted to \$341,088.19 after all expenses and improvements were paid for, in addition to this ore stocks and supplies bring the total of quick assets to \$565,664.78. Development work consisted of 6876 ft. of drifts, 3597 ft. of crosscuts, 1546 ft. of raises, 91 ft. of winzes, 333 ft. of sinking, total 12,443 ft. Total development work to date at the Portland amounts to 257,186 ft. From this work the company has secured 1,767,592 tons of ore, having a gross value of \$36,268,796 out of which \$9,457,080 have been paid in dividends.

# Change House with Novel Features

**SYNOPSIS**—A high-grade, economical change house worked out on original lines. Underground clothes hoisted on guided hooks to a drying chamber. Street clothes in revolving circular lockers. Wash room, showers, urinals, water-closets provided. Space for office and emergency hospital. Structural-steel frame and concrete walls with air spaces. Cost, \$10,000.

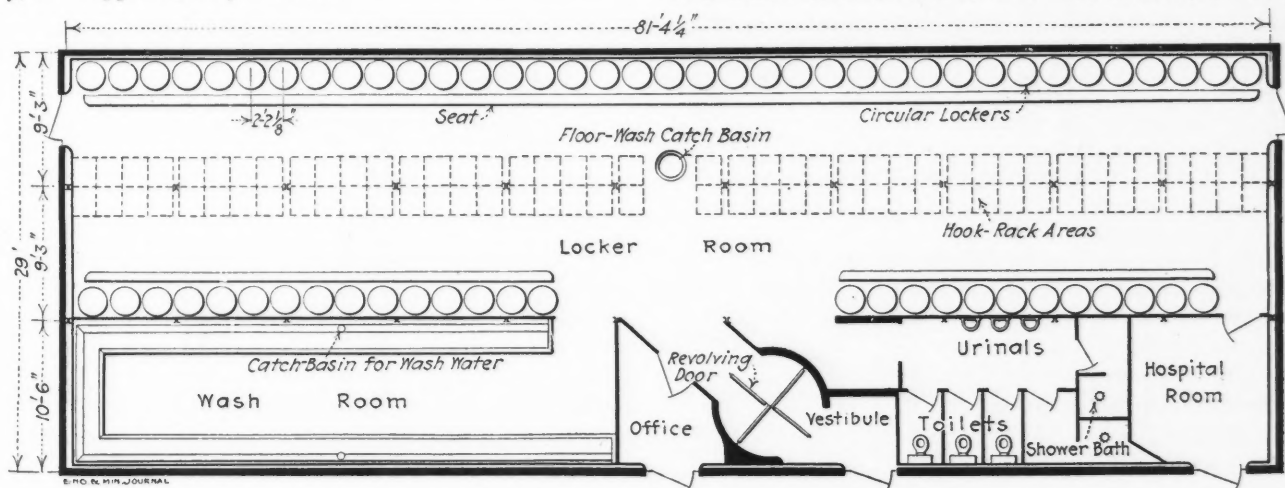
A change house was recently built at the East Vulcan mine of the Penn Iron Mining Co., on the Menominee range, involving original features of design, the result of a large amount of study and thought. The principal requirements of an ideal change house, named in the order of their relative importance, seem to be: Perfect facilities for drying, warming and otherwise caring for digging clothes; suitable provision for washing off the dirt accumulated underground; a comfortable and convenient place for changing clothes; safe and convenient storage of street clothing; emergency-hospital facilities; and toilet arrangements, comprising sanitary closets, urinals and shower baths. Good lighting, heating, ventilating, plumbing, fire resistance, and good construction generally, are supplementary features.

multi-pronged hook attached to a simple chain, not confined against swinging, and hoisted to a more or less high ceiling. The chains or hoists have been arranged in blocks comprising at least five rows between aisles. Their use has not been confined to mine clothes; the street clothes are also hung up, and one man's street clothes are often in contact with another man's underground clothing.

In this case a cupola or monitor, extending the full length of the locker room, was built and into this as a drying chamber the clothes are hoisted. Near the base of this monitor are coils of steam pipes from which quantities of dry, warm air rise through and about the clothing. The monitor is surmounted at its center by a large ventilator, which provides for the escape of the moist air and bad odors. The monitor is about 4 ft. wide inside and provides for only two rows of hoists, which places each row adjacent to an aisle. No street clothing is hung on these hooks.

### HOOK RACKS OF STANDARD STOCK

The support for the mine clothes, or hook rack, consists of a hollow central stem to which are attached 12 or 16



PLAN OF THE CHANGE HOUSE, SHOWING ARRANGEMENT OF THE ROOMS AND EQUIPMENT

The matters of permanence and economy of operation and maintenance have to do both with general policies of management and with local conditions, such as the value, size and permanence of the mine for which the equipment is planned. Of course, there must always be in the mind of the designer a continuous conflict between the awful ogre, cost, and the beautiful goddess, perfection. It was decided to build a permanent, substantial, convenient, sanitary change house of fire-resistant construction at minimum cost without much attention to architectural beauty. Minimum cost implied minimum size of building. It was necessary to provide for at least 150 men with the possibility of taking care of 250.

### HOISTED HOOKS FOR UNDERGROUND CLOTHES

The hoisted-hook system for handling the underground clothes was adopted. In all such previous installations, so far as known, one man's clothes are hung upon a single

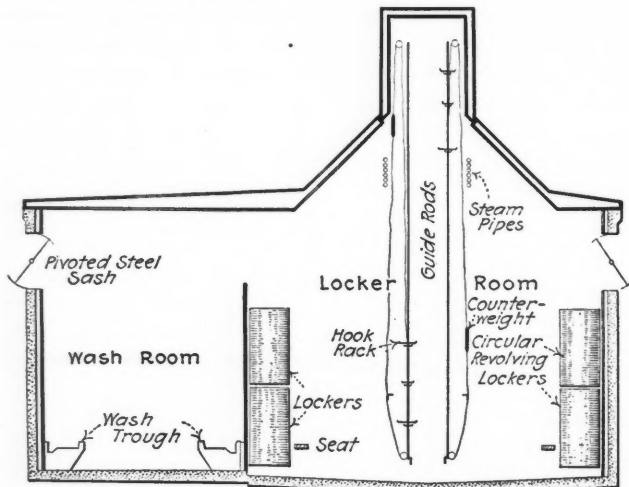
large hooks. This central stem is made up of two channels placed flange to flange and held in that position by the pressure of the hooks which are bolted together in pairs, inclosing the stem. This hollow stem surrounds a round steel guide rod, on which the rack travels as desired. This guide rod is about 22 ft. long and extends from an attachment at a point about a foot above the floor up to a point about a foot below the ceiling of the monitor. The hooks can turn about the guide rod but are confined by it against swinging. The arrangement prevents adjacent hook racks and their hoisting chains from becoming entangled. For the sake of economy each rack is assigned to two or three men and to neutralize the excessive hoisting load a counterweight is attached to the chain. Suitable hooks are provided for holding the chain at any desired point in its travel and there are padlocks to secure it. These devices are attached to a horizontal 3x3/4-in. steel angle about 4 ft. above the floor. The horizontal area contiguous to each hook rack is a rectan-

Note—An abstract of an article by Floyd L. Burr in the Proceedings of the Lake Superior Mining Institute, Vol. XVIII.

gle 21x24 in. and the one double row includes a total of 84 racks.

#### CIRCULAR LOCKERS FOR STREET CLOTHES

For the street clothes lockers are provided. To economize in floor and wall space, it was decided to use double-tier lockers and in order to have them of proper height and yet be able to reach into the upper tier of lockers successfully, it was necessary to have a seat run along the front of the lockers, 19 in. above the floor, to be used as a step. The lockers consist of galvanized-iron cylinders 24 in. in diameter and 46 in. high, revolving about a central spindle. Each locker is provided with six 3-pronged hooks, but has no shelf, on account of limited



CROSS-SECTION THROUGH THE LOCKER AND WASH ROOMS

vertical dimensions due to the double-tier arrangement. They are doorless and are closed by revolving them until the openings come adjacent to the wall along which they are arranged, in which position they are locked. This idea is to be patented.

The available wall space gives room for 64 lockers in each tier or a total of 128 lockers. There is ample room in each locker for two men's street clothes at one time while three men would not be badly crowded. The lockers are strong; upon several occasions a large man has been enticed into one of them and given a free merry-go-round ride therein.

The lockers and hook-racks occupy a rectangular room 17 ft. 8 in. wide and 80 ft. 4 in. long. Pivoted-ventilator steel-sash windows about 9 ft. above the floor are arranged along one side and at both ends of this room. At each end of the room is an emergency-exit door opening outward.

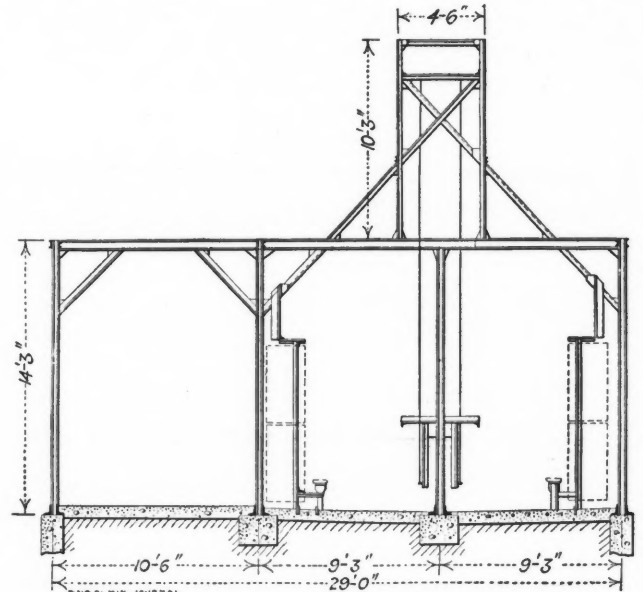
#### WASH, FIRST-AID, OFFICE AND TOILET ROOMS

Connected by an open doorway with the locker room and separated from it by a partition reaching only to within about 4 ft. of the ceiling is the wash room. This is 9 ft. 8 in. wide and 36 ft. 6 in. long, and contains 70 linear feet of wash-trough, arranged on the two sides and one end of the room. The men use this trough only as a sink or support for pails, each man providing himself with a pail to be used as a wash basin. This is standard practice at all the Penn change houses. The trough is of concrete so shaped as to form at the back a gutter which slopes to catch basins discharging into the sewer, into

this gutter each man dumps his pail after washing. The bottom of the main portion of the trough slopes slightly toward the gutter, so that water dumped upon it discharges immediately and one man's wash water does not inconvenience his neighbor. Hot and cold water is on tap at 3-ft. intervals along the length of the trough. A coil of steam pipes attached to the wall just above the water pipes gives heat to the room.

In working out the floor plat only a small space seemed to be available for first-aid purposes. This room is 9 ft. 3 in. wide by 9 ft. 11 in. long and may prove to be rather cramped when equipped with the hospital apparatus needed for such a place. There is, however, a high ceiling, and by a proper use of the space overhead, the floor area may be conserved and found sufficient when the equipment is in. In order to give the room sanitary qualities, a heavy coating of enamel was applied to the floor, walls and ceiling.

The irregular-shaped office room is also something in the nature of a left-over, the floor area being only about 45 sq.ft. In use, however, it seems large enough for its



CROSS-SECTION SHOWING STEEL FRAME

purpose. The shift bosses use it for writing their daily reports and the dry-man uses it to dispense carbide as well as for an office where he stands in taking the numbers of the men going on shift.

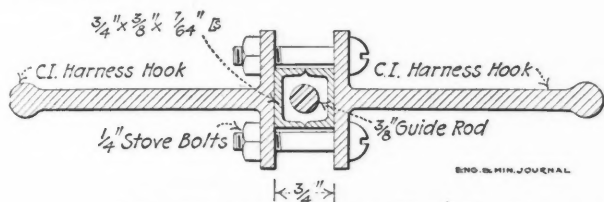
The toilet room is of ample size and contains two shower baths, three urinals and three closets. Each shower room has a vestibule where the bather may disrobe and hang up his clothes. The fixtures are of the ordinary type without mixing chambers. The urinals are high grade and arranged for ample flushing. The closets are of good quality and are equipped with white-enamel iron tanks. They have proven to be extremely satisfactory in use, and no difficulty has been experienced in keeping them perfectly clean. They flush automatically, on the removal of the occupant's weight from the seat. They are far superior to the closed or air-pressure-tank type of automatic closet.

To provide against a current of cold winter air blowing in through open doors upon men half naked during changing and washing, it was decided to have a revolving

door, built of steel and asbestos, made at the company shops.

CLEANING, HEATING AND ILLUMINATION

Perfect cleanliness is most essential in a modern change house and in this design it was arranged that the dry-man could thoroughly clean up each morning with a minimum expenditure of time and labor. The concrete floor of the building slopes from every point to a large central catch-basin in the center of the locker room, except that the floor in each of the shower-bath rooms slopes locally to a small catch basin. The large catch basin is so provided with trap, screen, and flushing arrangements that the dry-man may with impunity wash all dirt and litter down to it. Sticks, matches, tobacco bags, discarded hats, all land at the catch basin, and large quantities of ore and jasper go the same way. The building is so piped that at five different points a 1-in. hose may be readily attached for this floor washing. Thus, one 25-ft. length of hose is sufficient to reach every part of the building. Compressed air is piped into the building and is on tap at several points where a small hose may be attached for blowing dust from the tops of lockers or other points of lodgment.



SECTION THROUGH THE HOOK RACK

The building is heated by steam, piped in from the boiler house. The coils in the various rooms are each provided with valves so that the temperature of the different rooms may be regulated separately. The steam pipe in the monitor is in four coils, allowing regulation to suit the season, or other changing conditions. All water of condensation is discharged through a steam trap to a concrete tank over the revolving doorway, and hot water is drawn from this tank for the wash room and shower baths.

The illumination of the building, due to the high windows and to white-washed walls and ceiling, is extremely satisfactory. Electric incandescent lamps are provided in plentiful number for night use. A few in the entrance way and main aisle stay on all night, but most of them are switched on only when the men are in the building. The lights are arranged on several subcircuits for the sake of economical control. The main switches and sub-switches are in the office, except one located in the hospital room.

CONSTRUCTION AND FINISH

The building is of fire-resistant construction throughout, although not fireproof in the strict sense, since many steel members are exposed; considering the contents of the building, however, there is practically no risk of any fire sufficient to injure the structure. The structural steel frame is of somewhat unusual design. The outer columns are merged into a 6-in. concrete wall and the roof beams support a concrete roof. Inside of the 6-in. concrete wall is a 2-in. air space, a layer of No. 1 tarred felt, a 1/2-in. air space, and last of all a 1-in. slab of

cement plaster. The roof consists of a 1 1/2-in. slab of concrete, below that an air space, a layer of asphalt mastic wall board, another air space, and at the bottom, a 2-in. slab of concrete. The partitions consist of cement plaster walls 2 in. thick. Some of these partitions reach to the ceiling, while others of them reach only part way. All the concrete and plaster work is reinforced with "Trussit" and "Self-Centering," furnished by the General Fire-Proofing Co. The steel window sashes came from the Trussed Concrete Steel Co. Wooden storm sashes for winter are applied inside the regular sashes. The roof, including sides and top of monitor, is waterproofed by the application of Carey's flexible cement roofing, with a surfacing of asphalt. The exterior of the walls is made uniform and is slightly tinted by the application of "Trus-Con Stonetex." The interior walls and ceiling, except in the hospital room, are treated with whitewash. For the lower 5 ft. of the walls the whitewash was stained red by the use of powdered hematite. All the exposed steel work is painted black.

CAPACITY AND COST

The 84 hook racks will each hold the underground clothing of three men, giving a total hook-rack capacity for 252 men. The 128 circular lockers will each normally be issued to two men, one man on day shift and one man on night shift, accommodating a total of 256 men. However, these lockers will easily hold the clothes of two men at one time and on a pinch, of three men. Therefore it would be practicable to assign each locker to two men on each shift and thus only 63 of the 128 would be needed to equal the capacity of the hook racks, leaving 65 lockers empty. A good many miners who work in dry places could get along with the circular lockers for both street and mine clothes. Two men could easily occupy a locker together in this way and the 65 lockers could thus be made to accommodate at least 130 men. By this arrangement the capacity of the dry house would be 382 men. In computing the cost per man, however, a capacity of 252 men is considered.

The work of construction was all done by the regular mine force. Estimating the cost of a few items yet to be furnished, the total cost was \$10,325. This includes excavation, grading, building and construction, piping, sewerage work inside and outside of building, wiring, experimental work, and equipment. For a capacity of 252 men, this amounts to a cost of about \$41 per man.

Some Common Sense Respecting the Railway Situation

W. H. Coolidge, who is a leading interest in the affairs of the United States Smelting, Mining & Refining Co., is also general counsel of the Boston & Maine Ry., whose affairs are in a bad condition. Notwithstanding this, the Massachusetts legislature is considering bills reducing the hours of station agents and crossing tenders to eight a day. Arguing against these before the legislature, Mr. Coolidge made the following remarks, which manifest a common sense that is refreshing:

You can steal the railroads, you can confiscate them, but you ought not to do it. You may make hours of labor as few as you see fit, and pay as large as you like, assuming you have power at all, but at the same time you tax yourselves in fares and freight to pay for it. If you make expenses greater, without giving us opportunity to get additional

revenue, just so long you are destroying, crippling, the railroads. If the state has the power to fix rate of wage or time on railroads, and desires to exercise that power, don't think that there is any fund to pay the wages. The only fund is the receipts from people that travel and ship goods, and if there is not money to do it, we have got to go to smash. Within the last few years railroads have been run all over the United States under public regulation and legislation, where apparently those that had the power did not have the courage to recognize that they have got to pay for it.

You are taxing the railroads to pay for the parcel post. Today the railroads are being compelled under the guise of law to carry express packages for nothing. The government is stealing that from the railroads, and they have not the courage to come out and admit that they are stealing it.

It would be a fine thing to have a five-hour day, but you cannot get it without paying for it. In 1910, at one fell swoop, we raised the pay of our employees, and not of the high officials, \$3,000,000 per year for doing the same work, and that \$3,000,000 was \$1,000,000 more than the entire dividend of the Boston & Maine. We went before the interstate commerce commission to tax the people to raise enough money to pay for these salary increases. "No! No! We want to think it over," they replied. In the meantime three or four years have gone by. The stock has gone down from \$150 to \$50, because there is no indication that the public officials will let the railroad get in taxes on the public the extra \$3,000,000 we paid our men. In addition, for use of freight cars we are now paying \$1,500,000 more per annum than three or four years ago, a total of \$4,500,000. The financial trouble with Boston & Maine is not with leased lines or purchase of securities, but solely due to the wage increase and car hire.

### Mr. Bayliss on Copper

The views of R. T. Bayliss, chairman of the Exploration Co., Ltd., on any subject related to mining, are always of interest. At the last annual meeting of that company he announced the intention of its management to become interested in copper mining and made the following remarks:

I have dealt at some length with this subject, for it leads me up to a definition of our policy with regard to investments in copper mines and in the snares and bonds of copper-mining companies generally. On almost every occasion on which I have addressed the shareholders of this company I have expressed my favorable opinion of the opportunities presented by the copper industry for the lucrative investment of our funds. Acting on this belief, we have made substantial investments in the past, which on balance have proved very profitable, and have only been deterred from engaging ourselves more heavily by a promise I once made to you that we would limit the employment of the company's funds as far as possible in any individual undertaking. When the Exploration Co. was formed gold mining was in the ascendant. We were in the initial period of the development of the greatest gold field the world has known, followed quickly by remarkable discoveries of the precious metal in Western Australia. In the United States new and important gold mines were exposed in many localities, and one's opportunities for exploration and investment were practically unlimited. Today the outlook is completely changed. As I informed you last year, there is a lack of activity in the development of new mining districts; and, so far as my information goes, there is no indication today, except perhaps in Rhodesia, of the development of any new or important gold field. If we cannot find gold mines we must employ our energies in some other direction, and look for some other channel for the profitable employment of our funds, and I am irresistibly driven to the conclusion that this medium is to be found in the copper industry. I think a careful study of the position supports that opinion. In reviewing the copper-mining industry today one is forcibly struck by the fact that it is more skilfully and economically conducted, and under more capable control, than in any period of its history. The old haphazard principles which obtained 30 years ago in the production and marketing of the metal have gone forever, to the great advantage, be it said, of producer and consumer alike.

Moreover, there can be no doubt with regard to the increasing demand for the metal. In 1889—i.e., 25 years ago—the world's production of copper was 265,400 tons. Last year it was 1,000,716 tons, being an average annual increase of 29,412 tons throughout that period, and, for the purpose of my argument, production may be taken to represent con-

sumption. Last year the position was somewhat abnormal. The world's production, for the first time in many years, showed a decrease of roundly 20,000 tons compared with the year preceding. Visible stocks during that period, however, were depleted by 20,000 tons; there was, therefore, no corresponding setback in the world's consumption. Furthermore, since the month of March, 1911, visible supplies have decreased by 106,976 tons. In other words, consumption has since that date been drawing largely on its reserves. In the face of these figures, I ask you if one can have any doubt with regard to the favorable outlook for the copper-mining industry. What reason have we to suppose there will be any abatement in the world's increasing demand for the metal? There is, I submit, no ground for such belief. If consumption, therefore, maintains the relative increase of the past 25 years—and with the electrification of railways, construction of armaments, and the generation and transmission of electric power, it is in my judgment bound to do so—we shall require several Chuquicamata mines to meet its demands. Copper mines are wasting properties, and in due course some of the main sources of supply on which we rely today will in whole, or in part, be withdrawn. Gentlemen, I am not expressing these opinions at random. The economic position of the industry has been an engaging study to me for many years; and my recommendations to you today that our interests in copper shares be enlarged are prompted by the conviction which those investigations have carried to my mind. I think the chances of making profits, and continuous profits, at a smaller cost for exploration are better in the copper-mining industry today than they are in any other direction.

### Smelting of Ores and Metals

With the view of developing more efficient methods in the smelting of ores, the Bureau of Mines began, at Pittsburgh, experiments as to the practicability of using the electric furnace as a substitute for or adjunct of the blast furnace, according to its third annual report.

The possibility of using crude oil as a reducing agent was also studied. Another problem under investigation, is the possibility of using the electric furnace in the smelting of copper-sulphide ores.

The use of the electric furnace in the smelting of non-ferrous ores was investigated, and also its use as an aid to the ordinary blast furnace. The purpose of the work has not been to show that the electric furnace should replace reverberatory or the blast furnaces, but that in some places it may be substituted for them. So far, only the possibility of treating copper sulphide ores has been studied.

New investigations proposed for the coming year include: The electric smelting of zinc ores; the smelting of titaniferous iron ores; the production of "natural alloys;" the use of an electric process for removing moisture from the blast supplied to blast furnaces; the removal of sulphur from producer gas for metallurgical purposes.

Reports have been or are being prepared for publication on "The Use of the Electric Furnace in the Manufacture of Iron and Steel," by D. A. Lyon and R. M. Keeney; "The Use of Crude Oil as a Reducing Agent in the Reduction of Iron Ores," by D. A. Lyon and J. F. Cullen; "Smelting of Fine Michigan Copper Concentrated in the Electric Furnace," by R. M. Keeney; "The Use of the Electric Furnace in Metallurgy," by D. A. Lyon, R. M. Keeney and J. F. Cullen; "The Possibility of Smelting Copper Ores in the Electric Furnace," by D. A. Lyon and R. M. Keeney.

**Brazil Exported in 1912**, the following mineral products, according to a recent bulletin of the Pan-American Union: Monazite sand, 3398 tons; manganese ore, 154,870 tons; scrap metals, 2749 tons; gold in bars, 4027 kg., and diamonds and other precious stones to the value of 647,793 milreis (1 milreis = 54.6c.).



### Constitutionalist Orders on Mining Denouncements

The confused situation in northern Mexico has worked a hardship on those who have applied for title on mining claims. Applications forwarded to Mexico City have, of course, been held up and the applicants meanwhile neither know where they stand, nor can they work the properties which they desire to take up. To clear up some points, the constitutionalist secretary of mines in Hermosillo has issued certain notices, which have been translated by the *Douglas Daily Dispatch*.

One notice, dated Dec. 16, 1913, states that all applicants for title whose papers have been forwarded to Mexico City and not returned shall, within one month, start procedure to make new copies and forward them to the secretary's office, in Hermosillo, and that failure to do so shall be considered an inexcusable delay in asserting a right.

Another notice provides that applicants whose papers have been held up and who desire to work the properties sought, shall have their cases adjudged in each instance by the secretary's office in Hermosillo and that if permission to work be granted, that probably the applicants will be required to pay in advance the mining tax for the first four months during which the property is worked, as well as other taxes specified by the laws.

### Coal-Dust Firing in Zinc Smelting

The Collinsville Zinc Co. in 1912 leased its plant at Collinsville, Ill., to the General Smelting Co. of Philadelphia, which organized an operating company under the name of the Collinsville Zinc Smelting Co. The latter operated the plant during the first half of 1913. In June, 1913, the Collinsville Zinc Smelting Co. surrendered its lease and the plant came again into the possession of the Connellsville Zinc Co. The latter is at present under the supervision of the Fuller Engineering Co., of Allentown, Penn., which is installing a pulverized-coal equipment and expects to have the plant in operation with this new equipment some time in June, 1914. This will be a very interesting experiment in zinc smelting, inasmuch as it will be the first extensive trial of coal-dust firing of distillation furnaces with modern equipment. The management anticipates that this system of firing will be more economical than gas firing.

### Braden Copper Co.

The report that a plan for refinancing the Braden Copper Co. was under consideration at this time is denied at the offices of the company. Consulting Engineer Pope Yeatman has been on the property for several months and on his return from Chile, it is probable that he will recommend an increase in reduction works to correspond with the greatly augmented ore reserve, now estimated at 78,000,000 tons.

In the event of such recommendations, the matter of further financing will probably be taken up when Mr. Yeatman reports to the board in April. In January, the company's mills treated over 98,000 tons of ore, making a recovery of 72.7%. The Braden company has an authorized capital of \$14,000,000, of which \$6,000,000

is outstanding and the balance is held in the treasury against the conversion of \$8,000,000 of authorized outstanding bonds, of which \$7,000,000 are issued, as follows: \$4,000,000, 6% first-mortgage collateral trust bonds; \$1,000,000, 7% second collateral trusts (\$2,000,000 authorized); \$2,000,000, 7% 3-year convertible debentures.

### February Mining Dividends

Dividends paid in February, 1914, by 21 United States mining companies, totaled \$2,004,300, as compared with payments by 27 companies of \$2,787,470 reported for February, 1913. Industrial companies allied to mining paid \$9,309,427, unchanged from last year, and Canadian and Mexican companies paid \$909,050, as compared with \$1,126,220 reported a year ago.

United States Mining Companies		Situation	Per Share	Total
Arizona, c. com.	Ariz.		0.36	\$526,761
Alaska Mexican, g.	Alas.		0.20	36,000
Alaska Treadwell, g.	Alas.		1.00	200,000
Alaska United, g.	Alas.		0.30	54,060
Bunker Hill Con, g.	Calif.		0.05	10,000
Bunker Hill & Sull. l.s.	Ida.		0.25	81,750
Chief Consol., s.l.	Utah		0.05	43,823
Elkton, g.	Colo.		0.02	50,000
El Paso Con., g.	Colo.		0.10	49,000
Fremont, g.	Calif.		0.02	4,000
Golden Cycle, g.	Colo.		0.03	45,000
Hecla, l.s.g.	Ida.		0.02	20,000
Homestake, g.	S.D.		0.65	163,254
Miami, c.	Ariz.		0.50	372,202
Navaho, g.	*		-0.04	8,000
Parrot, c.	Mont.		0.15	34,477
Tom Reed, g.	Ariz.		0.06	54,573
United Verde, c.	Ariz.		0.75	225,000
Yellow Aster, g.	Calif.		0.05	5,000
Yellow Pine, l.z.s.	Nev.		0.02	20,000
Yosemite, g.	Calif.		0.01	2,400
Canadian, Mexican and Central American Companies		Situation	Per Share	Total
Amparo, g.	Mex.		1.00	100,000
Buffalo, s.	Ont.		0.03	30,000
Chontalpan, g.s.l.z.	Mex.		0.75	5,250
Cobalt Lake, s.	Ont.		0.02½	75,000
Cobalt Lake (holding)			0.24	72,900
Cobalt Townsite, s.	Ont.		0.48	240,000
Crown Reserve, s.	Ont.		0.02	35,376
Dominion Steel, pfd.	Can.		1.50	105,000
Encino, g.s.	Mex.		1.00	3,000
Hollinger, g.	Ont.		0.15	90,000
Lucky Tiger, g.	Mex.		0.06	42,920
Seneca Superior, s.	Ont.		0.12½	59,604
Standard, s.l.	B.C.		0.02½	50,000
Iron, Industrial and Holding Companies		Situation	Per Share	Total
Amalgamated, c.	Mont.		1.50	2,308,319
Cambria Steel	Penn.		0.62½	562,500
International Nickel, pfd.	U. S.		1.50	133,689
U. S. Steel, pfd.	U. S.		1.75	6,304,919

\* Liquidation dividend (final).

No important dividend changes are to be noted. Mexican companies continued to pay in spite of disturbed political conditions.

### Katanga Copper Mines

#### RHODESIA CORRESPONDENCE

The progress made in opening up these deposits is shown in the following table:

Year	Days Furnace Ran	Ore Treated, Tons	Copper %	Tons Ingots	Cu		Cu	
					%	Matte %	%	%
1911	88	10,300	12.1	786	90	..	..	..
1912	171	20,900	13.1	2404	95	88	..	65
1913	No. 1—208	48,500	15.1	6240	96	130	65	
	No. 2—90							

Copper now costs 1000 francs per ton landed in Antwerp.

**Diamond Production in German South-West Africa.** according to the "Tropenpflanzer," through "Min. Journ.," during the first half of 1913 amounted to 760,000 carats, valued at 35,000,000 marks. To this total the Pomona company contributed 316,423 carats, the Koloniale Bergbau-Gesellschaft 178,233 carats, and the Diamantenpachtgesellschaft 79,197 carats. For the full financial year 1912 the official sales office disposed of 902,000 carats for 26,500,000 marks. The total amount realized by the sales office from 1909 to 1912, inclusive, was 85,500,000 marks for 3,078,000 carats.

## New Officers A. I. M. E. and M. M. S. A.

### Benjamin B. Thayer

Benjamin Bowditch Thayer was born in San Francisco, Calif., in the year 1862. He was prepared for Harvard University at Quincy, Mass., and was graduated from the Lawrence Scientific School in 1885. On leaving college the call of the West drew him into mining in the Rocky Mountains of the United States and the Sierra Madre in Mexico. After years of experience in underground work and in administrative relations in a number of mining districts, he became especially identified with copper mining in Butte and has been in later years President of the Anaconda Copper Mining Co. Thoroughly familiar with both the workings under ground and the operations on the surface, and with all phases of the mining profession, and further provided with a knowledge of what good team work means in an organization, Mr. Thayer has infused into his great company a loyalty and an efficiency that are exceptional. Mr. Thayer is one of the advisory committee upon the conduct and development of mining education at Harvard, and has served as President of the New York Society of Harvard Engineers.

### Sidney J. Jennings

Sidney J. Jennings was born at Hawkesville, Hancock County, Ky., Aug. 13, 1863. His early education was obtained in France and Germany, and he was graduated from the Lawrence Scientific School, Harvard University, in 1885, with the degree of C. E. In 1889 he went to South Africa as manager of the Willows Copper Argentiferous Syndicate. He resigned and shortly afterward was appointed assistant manager of the De Beers Consolidated Mines.

Mr. Jennings left Kimberley in 1893 to accept the position of manager of the Crown Deep, Ltd., one of the subsidiary "Deep Level" companies of the Rand mines at Johannesburg. In 1896 he was appointed general manager of the Crown Reef Gold Mining Co., a position which he held for three years.

In 1899 Mr. Jennings was appointed consulting engineer to the Robinson Gold Mining Co., and also assistant consulting engineer to Messrs. H. Eckstein & Co. Owing to the death of Louis Seymour, the position of consulting engineer to Messrs. H. Eckstein & Co. became vacant, and Mr. Jennings was appointed to fill it.

In 1907, Mr. Jennings left South Africa and came to America, where he established himself as a consulting engineer in New York. He was for almost two years consulting engineer of the Boston Consolidated, up to its absorption by the Utah Copper Co. He is now vice-president of the United States Smelting, Refining & Mining Co., and has charge of the exploration department.

Mr. Jennings was president of the South African Association of Engineers, vice-president of the South African Association for the Advancement of Science, and he is a member of the Chemical, Metallurgical and Mining Society of South Africa, corresponding member of the Council of the Institution of Mining and Metallurgy, of the Mining and Metallurgical Society of America, and a life member of the American Institute of Mining Engineers.

### James F. Kemp

James Furman Kemp was born in the city of New York, Aug. 14, 1859. Soon after his first birthday his parents moved to Brooklyn. In time he was placed in the Adelphi Academy of that city and practically remained in it until his graduation in 1876. A year later, in the fall of 1877, he entered Amherst College, and was graduated in 1881. Geological instruction was maintained in Amherst College, and when the subject of this sketch came under the instruction of Prof. B. K. Emerson, he determined to follow the science as a profession.

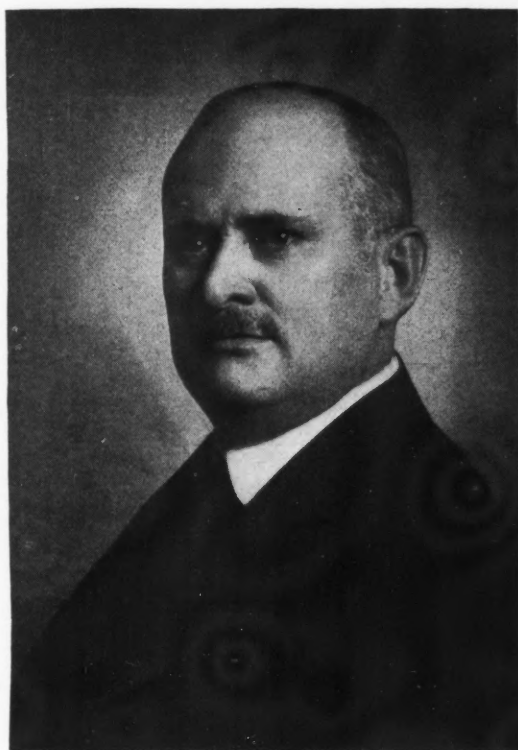
On leaving Amherst, Kemp entered the Columbia School of Mines, and, while taking the full course in mining engineering, spent such spare hours as he could command in the collection of ores and in special work under Prof. J. S. Newberry. In 1885, a year after Kemp had taken his degree of Engineer of Mines, he went to Europe for the International Geological Congress in Berlin, and remained for work in geology and petrography, settling at Munich as a pupil of von Groth, von Zittel, and their younger colleagues.

An instructorship opening at Cornell the following year, Kemp received the call and became assistant in the department with Prof. H. S. Williams. After five years' service at Cornell, the illness of Professor Newberry made a younger man necessary at Columbia, and Assistant-Professor Kemp was called to the position. The next year he became full professor and has remained in this capacity for the past 20 years. In his early instruction, finding no text book available for his students, he prepared "Ore Deposits of the United States."

Professor Kemp was President of the A. I. M. E. in 1912. He was elected to the National Academy of Sciences last year. He is a corresponding member of the Christiania Academy of Sciences, of Norway.

### James R. Finlay

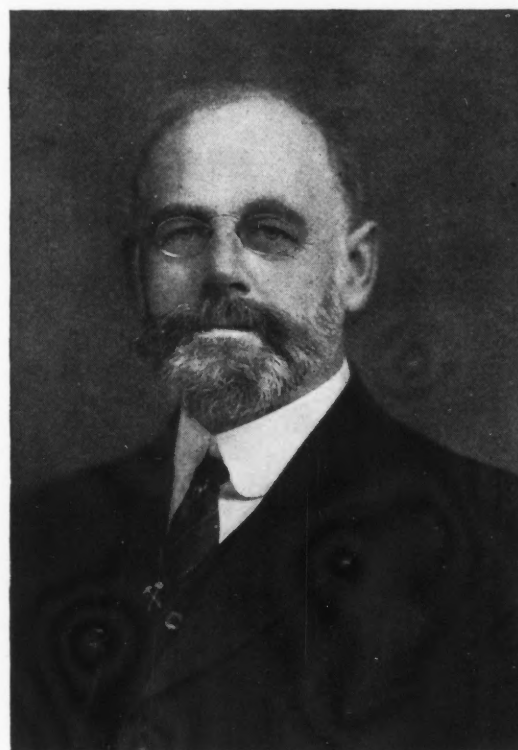
Mr. Finlay was born at Blenheim, Ontario, Canada, on Sept. 30, 1869. He was graduated from Harvard University in 1891, shortly afterward becoming geologist for the Michigan Land & Iron Co., in northern Michigan, this connection existing until 1893. The following year he acted as mining engineer and superintendent for the Minnesota Iron Co., after which he spent a year in Colorado and three in Ecuador. He served with the Cleveland-Cliffs Iron Co. in Michigan, the Standard & Hecla and the Bunker Hill & Sullivan, in Idaho. Mr. Finlay managed the Portland Gold Mining Co. in 1902-03, and in 1904 was at Flat River, Mo., reorganizing the local operations of the Federal Lead Co. Since 1904 he has been employed as an independent mining engineer, except for one year, 1910, when he was manager for the Goldfield Consolidated Mines Co. In 1911 he made the notable appraisal of all mining properties in Michigan for the state government, and in 1913 an appraisal of the St. Joseph and Doe Run Lead companies. Since 1908 he has been lecturer on economics of mining at Harvard and since 1913 at Columbia also.



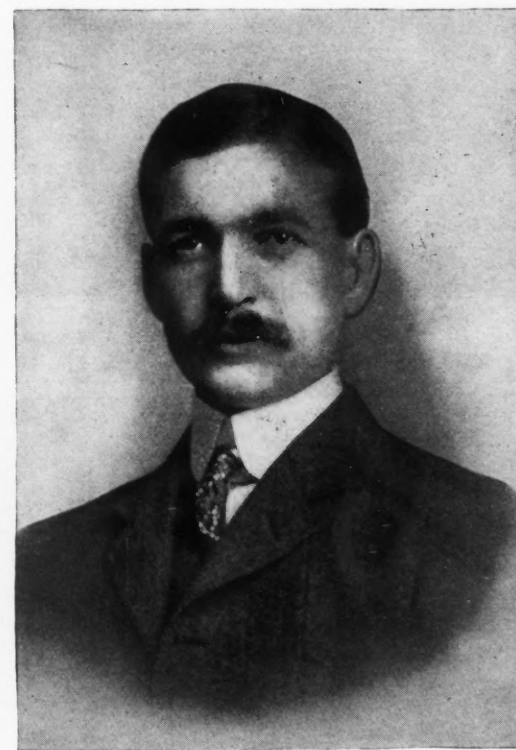
**Benjamin B. Thayer,**  
Pres., American Institute of Min. Engrs.



**Sidney J. Jennings,**  
Vice-Pres., American Institute of Min. Engrs.



**James Furman Kemp,**  
Pres., Min. and Met. Society of America.



**James R. Finlay,**  
Vice-Pres., Min. and Met. Society of America.

## Photographs from the Field



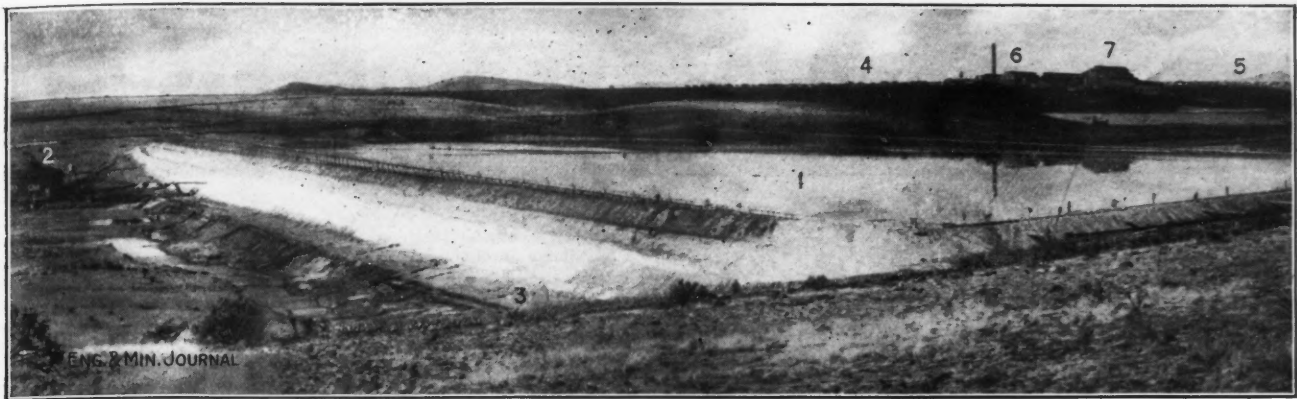
**BULLION TRAIN FROM ALVARADO MINING & MILLING CO.'S PROPERTY AT PARRAL, CHIHUAHUA, MEXICO**  
Ten such teams carried 1,000,000 pesos worth of silver bullion 330 miles to Marfa, Texas.



**LAST CHANCE MINE AND MILL IN THE MOGOLLON DISTRICT, NEW MEXICO**  
The Mogollon District has several producing gold-silver properties despite difficult accessibility.

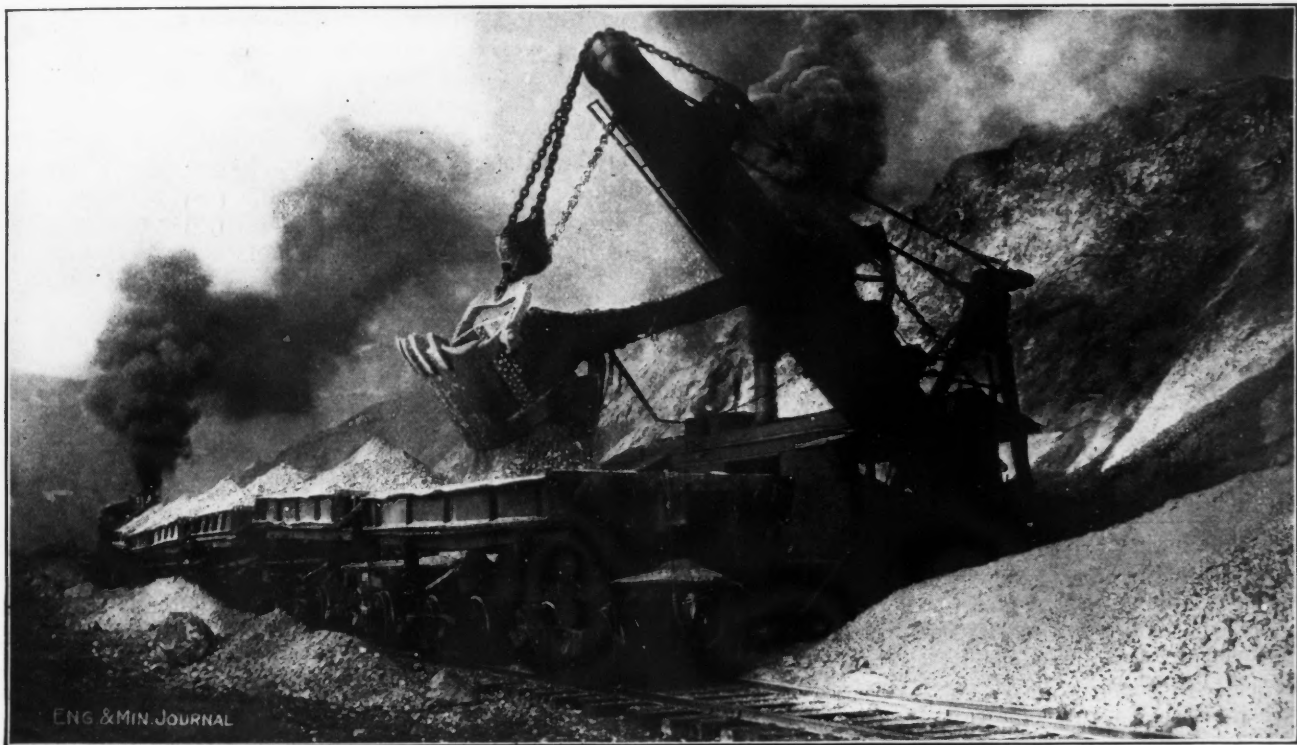


**MINNESOTA STEEL CO.'S MODEL TOWN, NEAR DULUTH, MINN., WHERE 170 CONCRETE**  
The town is several miles above Duluth, on Spirit Lake, an embayment of the St. Louis River. It has street-car connections



CHINO COPPER Co.'s MILL AT HURLEY, N. M., FROM SOUTHEAST CORNER OF DAM

1, Dam proper and tailing settling pond; 2, water recovery pumping station; 3, spillway; 4, town of Hurley; 5, Mexican section of town; 6, power plant; 7, concentrator.



CHINO COPPER Co.'s STEAM SHOVEL No. 8  
Loading waste on 6350 bench of southeast orebody.



HOUSES FOR EMPLOYEES AT THE NEARBY STEEL WORKS ARE READY FOR OCCUPANCY  
with Duluth, and is one of three new towns which have been platted for employees of the Steel Corporation's new plant.

## Correspondence and Discussion

### Wheeler and Krejci Converting Patent

I would like to call attention to a few things in the comments on the Wheeler and Krejci converting patent, in the JOURNAL of Jan. 24, 1914. You state:

The formation of a protective coating of magnetite is the factor that has permitted the production of great tonnages of copper from basic-lined converters, and is the almost universal practice where basic-lined converters are used.

The first part of the above statement is, I believe, true, and have so stated in our paper on "Monolithic Magnetite Linings for Basic Copper Converters."<sup>1</sup> As to the latter part of the statement, though it may be true today, it was not the case 1½ to two years ago. . . . Some time ago Mr. Thill, our master mechanic, and myself, made a 13,000-mile trip, visiting smelters in this country, Canada and Mexico. At that time our converters had made as high as 12,000 tons of copper on one lining, and were still in operation. About 4400 tons of copper was the highest tonnage per lining encountered in our trip, and this was in a cylindrical converter about 37 ft. long, having many times our initial charging capacity. Some of the plants visited had basic converters which had a life of only five to 20 days.

Doctor Ricketts, of Cananea, visited Great Falls in February, 1912, and was so pleased with the performance of our converters that he has installed them in five or six smelting works in the Southwest and Mexico. The *Mining and Scientific Press*, in its issue of May 18, 1912, noted the large tonnage per converter at our plant. During the last 1½ years the new converter installations have been almost entirely of the Great Falls type.

Following our visits to various smelters, we have been in turn visited by eminent metallurgists and superintendents, to whom we have given data freely, and shown everything we had without reserve.

The only person claiming to have "stumbled" on to the magnetite lining is L. O. Howard, Globe, Ariz., in a communication<sup>2</sup> to the secretary of the Institute, discussing E. P. Mathewson's paper, on the "Development of Basic Lined Converters." Mr. Howard started his converter (Great Falls type), on Jan. 6, 1913, and says he did not use the magnetite until the converter had turned out 2,000,000 lb. of copper.

During the summer of 1912, Dr. H. O. Hofman, of the Massachusetts Institute of Technology, visited the various smelters of this country, Canada and Mexico, gathering data preparatory to writing his treatises on metallurgy. During his entire trip he heard no mention of lining converters with magnetite. We, at Great Falls, did not call his attention to the matter at the time of his visit, as we were preparing the filing of our process for patent. Doctor Hofman, in a letter to Mr. Wheeler, under date of Nov. 10, 1913, tells of the experience he had with magnetite in his little converter:

Your idea of lining your basic converter with monolithic magnetite, made to order in the furnace itself and regulated at will by pushing one button or the other, is delightful. It is so simple, when one has once conceived the idea and found the way of carrying it into effect, that it seems queer that nobody has done it before. In our own little barrel converter the lining is made up of very hard siliceous firebrick. In running the converter as a thesis subject, last term, we found that the silica was not eaten into sufficiently quickly to form a decent slag. We therefore obtained beautiful concentrated matte and mushy residue, which we had to rake out to a considerable extent. There is your magnetite. We had to rake it out, while you can plaster it in.

Doctor Hofman's experience is similar to that met with at the converting plants which I visited. The control of magnetite in basic converters was not known. We have shown how magnetite could be made useful, and evolved the laws governing its use.

As to what our policy will be relative to the disposal of the patent, I must await word from Mr. Wheeler. I am not writing this for the purpose of publication, but merely to answer your letter, and keep the record straight as to the magnetite linings originating with us.

MILO W. KREJCI.

Great Falls, Mont., Feb. 13, 1914.

✽

I have your letter of the 18th inst., relative to the subject of magnetite linings. . . . Although my letter of the 13th inst. was not written for publication, you are at liberty to use it in any way you wish, as there is nothing in it that we care to conceal.

You mention that you saw a Peirce-Smith converter last summer that produced 7700 tons of copper; 50,000 tons is what should be expected comparing it with the output of our small (12-ft. Great Falls type) converters. Just two years ago today, our Bottom "B," 12-ft. type, had produced 9658 tons of copper.

I have also read John W. James' comments in the JOURNAL of Feb. 21, 1914. Does it not seem strange that if our process was known as stated by Mr. James, that no real longevity of converter linings came until after we had spread the "glad tidings?"

MILO W. KREJCI.

Great Falls, Mont., Feb. 26, 1914.

✽

### The Globe Drop Shaft

In the article by William J. Smitham, in the JOURNAL of Jan. 24, there is one item to which especial attention should be directed in the interest of the mining business. It is stated that an experiment had to be tried against a man's will, and that the experiment failed. And how could it otherwise? Who ever knew an experiment in mining to succeed if it had to be tried by a man against his will? And let it be understood that these questions are asked as bearing not on this particular case, but on a broad, fundamental, psychological basis.

F. W. SPERR.

Houghton, Mich., Feb. 2, 1914.

<sup>1</sup>Bull., A. I. M. E., Aug., 1913.

<sup>2</sup>Bull., A. I. M. E., Nov., 1913, pp 2673-75.

## Editorials

### The International Zinc Convention

The International Zinc Convention, which has been running now for a series of years, has proved to be the most successful attempt of this kind in the history of the industry. On Dec. 18, 1913, the convention was renewed for a period running to April 30, 1916. The new terms are about the same as the old ones, but restriction of production is made a little more prompt in beginning, when such restriction is necessary. Under the old terms, curtailment began after the price had ruled below £22 for four consecutive months, the unsold stocks being in excess of 50,000 tons. The new terms require that the price run below £22 for only two months.

The syndicates comprise all of the German smelters, the most important of the Austrian and nearly all of the French and Belgian, besides a considerable proportion of the British. The International Convention is made up of groups of syndicates, the most important being the German syndicate, which is known as Group A. The French smelters are embraced for the most part in Group B, while the British are allied in Group C. The German syndicate, Group A, comprises all of the German smelters, although the adherence of Giesche's Erben, a very important Silesian company, is only partial, i. e., that company reserves a certain independence.

The position of these groups is different. The British and French are committed only to the joint regulation of production. The German, on the other hand, is a tightly bound syndicate, with agreements respecting production and price, for the common sale of its product through certain agencies and a joint accounting bureau.

In 1911 the European production of spelter was 633,000 metric tons; of members of the International convention, 550,000; of the German syndicate, 325,000. In 1912, the respective figures were 661,000, 580,000 and 360,000. It appears, therefore, that only a little more than 50% of the European production is absolutely controlled as to marketing. The British and French groups are free to sell as they please and do so, but in certain circumstances are bound to restrict their production. This apparently throws the chief burden of carrying unsold accumulations upon the German syndicate.

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### Non-English Speaking Miners

According to press dispatches, the Western Federation of Miners is now trying to secure the enactment of legislation in Arizona to prevent the employment in the mines of any persons who do not speak the English language, this being aimed, of course, against those companies which employ a good many Mexicans. The advocacy of such a measure by the W. F. M. is obviously a combination of clever advertising and pure mischief-making, the latter because it may bother the companies, the former because it will interest theorists who will say, "Should

men unacquainted with the English language be exposed to the dangers of underground? Of course not!"

Now, there is indeed something to be said in favor of such a restriction. The man who does not understand English is exposed to danger that he would be better able to avoid if he surely understood instructions and warnings. The more enlightened managers are aiming to guard against this by posting danger notices in several languages and by conventional, well known signs. However, the sweeping exclusion of non-English-speaking persons from work underground has been decided to be wholly inexpedient by the experts who have carefully considered this subject.

The W. F. M., in its advocacy of such a measure in Arizona, is, of course, quite insincere. It does not mind the employment of the Croats, Huns and Finns in the mines of Lake Superior, so long as they pay their dues to the union, but objects to the Mexicans in Arizona and New Mexico. Those Mexicans are, to a large extent, skilled miners and have a mining ancestry, while the Finns and Slavs come to our mines without any previous mining experience.

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### Mine-Accident Statistics

It would not be far wrong to designate Technical Paper No. 61 as the best publication the Bureau of Mines has issued. Whatever views one may hold on the propriety and desirability of the Bureau entering the metallurgical field, no right-minded citizen can object to its efforts to promote safety and health underground. To collect statistics of accidents, to formulate rules and regulations, to distribute information and urge the adoption of safety methods, is emphatically the business of the government and the most legitimate function of its mining department.

This technical paper, by Albert H. Fay, is similar to the corresponding publication covering 1911, but is better. The method of treatment and certain typographic features mark an improvement. The most gratifying change is the presentation of accident rates calculated to the 300-day basis. This is a distinct step in advance. The old method of calculating rates penalized the constant-running mines at the expense of those worked intermittently. Suppose a mine reported 1000 employees and had one accident, but closed down in June after 150 days of work. On the old basis, this would appear as an accident rate of 1. Another property with the same number of employees worked all year, 300 days, and had two deaths. The accident rate would appear as 2, yet the second property had the same number of men exposed to risk for twice the time. On the 300-day basis, the number of employees of the first property is reduced to 500 so that its death rate appears as 2. Obviously, this is as it should be. The accident rate thus calculated is in effect based on 300,000 shifts of work. Many of the tables in this paper, however, are still calculated on the

old basis; we suggest that, once the new method becomes well understood, the old system might be wholly discarded with a considerable gain in clearness of conception and value of figures.

The accuracy of accident and death figures is still far from what it should be. Not only must the 300,000 man-shift basis be adopted, but greater uniformity is necessary in ascertaining the number of men employed. This number should be the daily average at work, not the payroll average. If the operator could be induced to report the number of individual days wages paid, the exact number of man-shifts would then be had at once.

Furthermore, a better criterion of the risk existing and the degree of safety obtained should be had. It is usual now to use the death rates in comparing year with year, or district with district, and this is the best criterion available. It is far from ideal, however. Certain injuries are more serious than a death. A man losing two members, or both eyes, not only usually leaves his family without support, but becomes himself a drain on the community. A better criterion would be had by combining all deaths and other injuries into one figure, each weighted according to its seriousness. Thus, if a death were assumed as having an importance of 1, the loss of both legs would be weighted, say at 1.5; the loss of one leg might be 0.5; of a hand, might be 0.4. With these weighted figures added, and their sum divided by the total number of man-shifts worked, and multiplied by 300,000, the result would be a rate susceptible of much closer comparison than the rough and ready figures now available. The exact weighting of each class of accident would require working out. A general, but excellent guide, would be the amount of compensation provided for various accidents by the many state compensation laws.

Other questions require clarification. What constitutes a death in the statistical classification? Suppose a man dies from an injury after a year or more, is it to be classed as a death or an injury, and if a death, to what year it is to be assigned? Suppose a man dies from blood poisoning following a cut of minor importance? The division of accidents into slight and serious has always been everywhere both arbitrary and vague. Division on the basis of incapacity lasting more than a week, or two or three, is far from satisfactory. More detailed classification is desirable. The most serious accidents, as stated, are more serious than deaths. The Bureau of Mines is more competent than anybody else to introduce these reforms into the handling of mine accident statistics and could do no more useful work.

It is a pleasure to record on the basis of this report that the "safety-first" campaign is at last bearing fruit. The death rate for 1911 in the metal mines of this country was 4.45, reduced to the 300-day basis; in 1912 it was 4.09. Figured on the same basis the, coal-mine rate for 1911 was 5.09 and for 1912, 4.36. Substantial gains like these are gratifying, but how far we have yet to go before attaining the figure of 1.5 to 2, which prevails in Australasia!

### Surprising Cobalt

The ability of Cobalt to confute the prophet and the geologist has been well instanced. The veins refuse to be limited by any of the wall rocks to which they have been repeatedly assigned. Now comes news that another little vein has broken out of bounds and appears in the granite.

The strike was made by the Beaver Consolidated which reports a width of 4 to 6 in. with a silver content from 4000 to 12,000 oz. per ton. Extent in depth and along the strike is not yet known, only 13 ft. of work having been done at latest reports. We join with our Canadian friends in bidding the new vein welcome and in hoping that the granite may prove the home of many more of the same.

### Patented Processes

Contemporary technical literature leads us to the conclusion that the average engineer of the present day needs education of a kind that no school can furnish. When he finds something needed in his mining or metallurgical program, he invents it and goes ahead calmly, not bothering to find out whether or not anyone else had previously used the idea. When the inventive engineer considers his idea worth patenting, he usually learns much about the previous state of the art, and then strains his intelligence and that of his attorney in imagining reasons why he ought to have a patent on something that has evidently been thought of before. If he persists long enough, he usually gets his patent, a document which serves principally as a license to litigate.

Many an engineer needs more historical education. If he feels the need for a device to do certain work, he ought to investigate the technical literature of his subject and also the files of the patent office. In this way, he could learn many things of value to him, avoid going over ground that has already been explored, and possibly be better able to judge whether an invention is needed. Most engineers are only superficially acquainted with technical literature. Patents, they consider a nuisance, which may be true, but a lot may be learned from them. Incidentally, the engineer may save himself a lot of money in useless patent fees and expenses.

We understand that a change is being made in the shrinkage-stope system, as used by a number of the "porphyry-copper" companies in Arizona. Smaller rooms and pillars are being adopted, and instead of 100-ft. or even 50-ft. units, it is probable that the area will be divided up into 25-ft. units, with 15-ft. rooms and 10-ft. pillars, or even 17-ft. rooms and 8-ft. pillars. It was found in the case of the 100-ft. units that while the 50-ft. pillars stood satisfactorily, the rooms were too wide for safety. In the case of the 50-ft. unit with a 25-ft. pillar and 25-ft. room, the pillar would crack, but would not crush fine enough to be drawn through the chute, and at the same time enough cracks developed to make it dangerous for men to attempt to cut them up for blasting. The 10-ft. pillars now being tried crush satisfactorily and it is possible that these 10-ft. pillars may even be reduced to eight feet.

The investigation of the Committee of the House of Representatives, which has been studying the foreign and domestic shipping of the United States, the so called "Shipping Trust Investigation," has come to a rather remarkable *denouement*. In substance, this committee finds that the foreign and domestic shipping of the United States is so combined by agreement, pools, and conference arrangements that an attempt to dissolve the combination would cripple trade. Consequently, the committee does not propose dissolution, but recommends



regulation by the Interstate Commerce Commission in the same way that the railways are regulated. This is quite different from the attitude of the Administration when the suit against the Steel Corporation was brought, and the battle cry was "Smash," no matter whether it was something good or bad that was to be smashed.

### BY THE WAY

The flotation patent case was argued before the U. S. Circuit Court of Appeals, at San Francisco, on Feb. 19. Decision is expected to be rendered in May next.

However be criticized the administration policy of watching and waiting in respect to Mexico, it must be recognized that away from the border states there is no public sentiment in favor of intervention.

The General Development Co. has secured an option on the famous Reforma mine, in Guerrero, Mexico, the option to run for 15 months after the pacification of Mexico, or the recognition of a government there by the United States. This is the big mine, controlled by the Ortiz family, which has been the subject of numerous negotiations among the big mining houses during recent years, the crux of which has been the price and terms.

According to the *Marine Review*, of Cleveland, the records of the Pittsburgh Steamship Co., the largest operator on the Great Lakes, show that in the season of 1913 the average stay of its boats in upper Lake ports was 13 hr. 52 min.; in lower ports, 21 hr. 19 min.; total time receiving and discharging cargoes, 35 hr. 11 min. This average was increased by some delays resulting from labor trouble on the docks. The average cargo carried was 7283 long tons; the largest cargo, 12,373 tons. The best loading time made was 5897 tons in 75 minutes.

An old millman, says the *Pahasapa Quarterly*, who seldom got out of the hills, spent some time last summer in eastern South Dakota, and saw for the first time, a threshing machine in operation. He watched with wonderment the bundles of wheat being swallowed up by the hungry cylinder, the straw shot out from the wind stacker in an unbroken stream, and the wheat neatly sacked up by a mechanical device, and, finally, his curiosity prompted him to inquire of the machine man: "Say partner, do you lose any values in the tailings?"

Reports of the importation of large quantities of iron and steel products from foreign countries should be taken with extreme caution, says the *Iron Trade Review*. Recently a report has been going the rounds that 27,000 tons of structural steel were to be shipped to Seattle from Europe within four or five months on vessels of the Hamburg-American line. Our correspondent at Seattle was instructed to investigate as to the truth of this report. He finds that a shipment of 500 tons of beams has been made to a jobber and that there will be another shipment of angles, plates and channels, bringing the aggregate up to between 1000 and 2000 tons. This steel is being put into stock to be jobbed and the whole proceeding is an experimental matter. The first shipment came from

Antwerp. If the steel can be sold at a reasonable margin, more will be brought in, but, if not, there will be no further importations. Our correspondent reports that the shipment of 27,000 tons of structural steel, so far as he has been able to learn, is purely "a figment of some overly zealous newspaper man's imagination."

Besides being a good metallurgist, R. C. Canby should also bear the reputation of being the "Bertillon of the smelting industry." When the Kansas City Consolidated Smelting Co. began operations at El Paso, Texas, the labor chiefly available was Mexicans of the peon class, few of whom could read or write. On pay day, about 90% of these men signed the payroll by merely making a cross after their names. Occasionally pay checks were cashed by other persons than the workmen to whom they belonged, and it became something of a problem to obtain a satisfactory receipt from the men. R. C. Canby, then superintendent of the company, had just been reading Mark Twain's "Pudd'nhead Wilson," and the idea of adopting the finger-print system of signing the payroll was suggested and, after some discussion, adopted. The workman, as he received his check, put his finger on a rubber-stamp pad and then made an impression after his name on the payroll, this constituting the evidence that the smelting company had paid to him the check. This was in 1895. We understand that this system is still in use at the El Paso Smelting Works, and is also used by several mining companies.

Some touching testimony has been elicited in the Congressional investigation of the Michigan strike. We used to think that Calumet was the Arcady of mining districts and the Calumet & Hecla management benevolent and even paternal toward its people, but we have lately heard grim tales of peonage and brutality, or rather the Congressional Committee has heard them. Liberty has been throttled, patriotic sentiment has been garroted, and "Old Glory" has been dragged in the mud. One Sullivan testified that he had seen a National Guardsman under the influence of liquor in Hancock one Saturday night in September. "A veteran of the Civil War took hold of the soldier's arm, and told him not to disgrace the uniform," said Sullivan. Real pathos! The same Sullivan denied on cross-examination that strikers on parade ever interfered with nonunion men going to work, or yelled "scab" at them. One gathers that the strikers amused themselves quietly at pink teas. The story of the deportation of Moyer is interesting as told by Charles H. Tanner, auditor of the Western Federation of Miners. "Moyer was standing at the telephone in his room," Tanner said, "when there was a rap on the door. I was standing by the bed, and Moyer opened the door. A crowd of 20 or 30 rushed in, shouting, 'Where is Moyer? Where is Moyer?' At the same time three men covered me with revolvers. Then Moyer, by the telephone, replied, 'I am Moyer.' Several men made a rush for him and bent him over almost double. Another man rushed in from the hallway and struck Moyer on the head with a revolver. The gun exploded, and Moyer was wounded in the back." Tanner said Moyer and he were then rushed out of the room, down the stairs, and out of the hotel. They were hustled across the bridge to Houghton, where they were placed on a train for Chicago and warned if they ever came back they would be hanged.

## PERSONALS

David J. Kelly is now in Cuba on business.

Henry C. Carr is going to Brazil to make some important mining examinations.

H. C. Hoover arrived in New York on March 4, and intends to sail for England on March 11.

James R. Finlay has returned to New York, having completed his work in southeastern Missouri.

Arthur L. Walker is home from the South and is well again, but will have to take things easily for some time to come.

W. F. White, president of Aguacate Mines, sailed from New York on Feb. 28 for a month's visit at this company's property in Costa Rica.

A. Van Zwaluwenburg, formerly metallurgist for the Fresnillo Co., has taken charge of the mill of the Cia. Minera Natividad & Anexas in Oaxaca.

Howland Bancroft will leave Denver for New York City the end of February and expects to sail for Peru March 7. He will return to Denver about June.

A. R. Gordon, general manager of the New York & Honduras Rosario Mining Co. at San Juancito, Honduras, is expected to arrive in New York this week for a short visit.

A. A. Hassan has concluded a preliminary study and examination of gold placer deposits on the Colorado River for a distance of 25 miles, starting from the mouth of Grand Cañon and going west.

Charles Butters left for California on March 2 after spending several weeks in New York on his return from an inspection of the Butters' properties in Salvador. Mr. Butters will return to New York, shortly.

Dr. F. H. Hatch, of London, a director of the Kirkland Lake Proprietary Mines, Ltd., has arrived in the Kirkland Lake district, Ontario and is inspecting the Tough-Oakes and other holdings of the company.

U. H. Broughton, son-in-law of the late H. H. Rogers and formerly at the head of the United Metals Selling Co., is campaigning for Parliament as Unionist candidate in York, Eng., advocating tariff reform as based on his American business experience.

James M. Swank, Philadelphia, recently vice-president and general manager of the American Iron & Steel Association, has given to the Cambria Library, Johnstown, Penn., his large collection of books in which are many volumes of great historical value. The gift was accepted at a recent meeting of the trustees of the library.

A. O. Backett, editor of the "Foundry," Cleveland, has accepted the appointment as secretary-treasurer of the American Foundrymen's Association, succeeding Dr. Richard Moldenke who recently resigned. The change will take effect when Dr. Moldenke completes his work on the current volume of the "Transactions" of the association.

William D. Mainwaring, who for the past eleven years was connected with the Detroit Plant of the Railway Steel Spring Co. as chemist and metallurgical engineer, has opened a consulting business at 866-868-870 Rockefeller Bldg., Cleveland, Ohio, as a production engineer. Mr. Mainwaring was formerly connected with the openhearth department of the Pencoyd Plant of the American Bridge Co., during the installation of the continuous process of the manufacture of steel. All the furnace records of his father, Isaac Mainwaring, who worked out the practical details as to furnaces and processes at Chattanooga, Pencoyd and later in England, have recently come into his possession.

W. G. Swart, chairman of the mining committee of the Denver Chamber of Commerce, at the recent meeting of that organization urged strong support by Denver for the bill now before congress which carries an appropriation of \$150,000 a year for three years to the U. S. Bureau of Mines for the erection of a plant for the extraction of radium. Mr. Swart warned the meeting that Salt Lake City was after the government plan and that it behooved Denver to get busy and stay busy. Denver, he said, was entitled to the plant: First, because 75% of the world's radium was produced in Colorado, and second, because the plant could be operated more economically there than at Salt Lake City. Better freight and facilities in the chemicals needed were two advantages held by Denver.

Professor Henry Tschetschott, of the St. Petersburg Mining Institute, has registered at the Massachusetts Institute of

Technology for special work. His coming to the Institute is part of a general plan of the Government to educate Russians in the best places possible for positions as teachers in the home schools. Already there are at Technology two other Russians, Messrs. Penn and Ortin, who have likewise been sent by the Government. Mr. Tschetschott is a native of St. Petersburg though of Polish extraction. He graduated in 1900 from the Mining Institute in that city, and since that time has been mining expert and is now full professor of mining engineering in the Institute. Professor Tschetschott on finishing his present course will make a trip through the Northwest, visiting Michigan, Canada and Alaska, getting to St. Petersburg in time to take up his three months of lectures in the autumn, after which he is to return for a second special course, following which there will be a visit to mining works in other parts of the country, including Colorado and New Mexico.

## OBITUARY

Dispatches state that John Harmon, an agent of the Mines Co. of America, was killed in Mexico this week by the Federals. The properties of the Mines Co. of America are in the territory held by the Constitutionalists and inquiry at the company's New York office develops the fact that E. M. Harmon was formerly a forwarding agent for the company at Madera, on the Mexico-Northwestern R.R. Mr. Harmon has not been in the employ of the company for some months.

## SOCIETIES

**Engineers' Society of Western Pennsylvania**—This society has elected A. R. Raymer president; A. Stucki, Samuel E. Duff, vice-presidents; E. K. Hiles, secretary; A. E. Frost, treasurer; George H. Nielson, F. Crabtree, directors.

**Texas School of Mines**—Efforts are being made to secure the placing of this school at El Paso. The Chamber of Commerce of El Paso has taken steps to secure the old El Paso Military Institute, consisting of a dormitory, administration and academic building and to deed the property to the state of Texas. El Paso, it is claimed, is accessible to extensive mining and milling operations in New Mexico, Arizona and Mexico.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

**CEMENT**—Tube-Mill Cement Feeder. Arthur Ernest Sparrow, Chicago, Ill. (U. S. No. 1,085,305; Jan. 27, 1914.)

**CRUSHING**—Improvements in Crushing, Pulverizing and Disintegrating Machines. Patent Lighter Crusher Co., Ltd., London, Eng. (Brit. No. 264 of 1913.)

**CRUSHING**—Roll Crusher. Ray C. Newhouse, Milwaukee, Wis., assignor, by mesne assignments, to Allis-Chalmers Manufacturing Co. (U. S. No. 1,086,842; Feb. 10, 1914.)

**CRUSHING**—Tube-Mill Feeder. Thomas W. Capen, Milwaukee, Wis., assignor, by mesne assignments, to Allis-Chalmers Manufacturing Co. (U. S. No. 1,086,024; Feb. 3, 1914.)

**CYANIDING**—Filtering Machine. James Drage, Boulder, Western Australia. (U. S. No. 1,087,647; Feb. 17, 1914.)

**DERRICK for Mines**. Job E. Jones, Carneyville, Wyo. (U. S. No. 1,085,208; Jan. 27, 1914.)

**DRILL**—Pneumatic Rock Drill. Clark J. Smith, Ottumwa, Iowa. (U. S. No. 1,086,625; Feb. 10, 1914.)

**DRILLS**—Coupling for Drills. Preslay C. Wills, Monticello, Utah, assignor of one-third to Lee W. Galloway, Montrose, Colo. (U. S. No. 1,085,515; Jan. 27, 1914.)

**DUST COLLECTOR**. Utley Wedge, Ardmore, Penn., assignor to the Furnace Patent Co., Philadelphia, Penn. (U. S. No. 1,086,961; Feb. 10, 1914.)

**ELECTRIC FUSION of Metals**. Arthur Percy Strohmenger, Westminster, London, England, assignor to Ester & Co., Ltd., London, England. (U. S. No. 1,085,951; Feb. 3, 1914.)

**FLOTATION PROCESS**—Improvements in or Relating to the Treatment of Ores. Minerals Separation, Ltd., London, Eng. (Brit. No. 27,323 of 1912.)

**ZINC**—Process for Precipitation of Zinc. Frank Lake Wilson and S. E. Bretherton, Berkeley, Calif. (U. S. No. 1,083,785; Jan. 6, 1914.)

## Editorial Correspondence

### SAN FRANCISCO—Feb. 26

**The Hall Process for Desulphurizing Copper Ores** is reported to have been satisfactorily tested at the Balaklala smelting works, in Shasta County. There remain to be solved the problems of saving the elementary sulphur and reducing the sulphur contents of the calcines to the requirements of economic and profitable smelting. H. F. Wierum, who installed and tested the plant at the Balaklala, returned to San Francisco on his way to Coram this week, and expressed satisfaction with the progress of the demonstration there, both in the technical and commercial features of the process. The sulphur dioxide is under complete control and the fuel consumption reduced below the amount anticipated. Strictly speaking, the principles on which the process is based have been proved, and as the items of saving the elementary sulphur and reducing the sulphur in the calcines are largely mechanical problems the ultimate outcome is not feared, though the progress may be slow.

### DENVER—Feb. 27

**The Recent Mining Men's Convention** in Denver has given prominence to the metal-mining industry of Colorado. Pursuant to invitation extended by State Commissioner of Mines T. R. Henahan, to the leading commercial organizations or clubs in the various metal-mining counties, local meetings of mining men were held in each county, during January, to vote upon holding a state convention. Local organizations were created for permanent existence, and each of these selected five delegates to attend the convention. Some counties exercised the prerogative of sending 10 delegates each with half a vote. The convention, representing 23 counties, was called to order in the House Chamber of the capitol, Feb. 19, by Mr. Henahan. Judge E. A. Colburn, owner of the Ajax mine, in the Cripple Creek district, was made temporary chairman, and J. M. O'Connell, of Denver, was made temporary secretary. Prominent mining men of the state were present and the meetings were interesting. Nearly two days were spent in effecting the permanent organization of the Colorado Metal Mining Association. During the time required by the various committees on credentials, constitution and bylaws, resolutions, etc., to pass upon their several allotments, numerous able addresses were made. Governor E. M. Ammons spoke first by way of welcome, but followed with pertinent remarks on such topics as taxation of mining property; interference of the Federal Government in the matter of locations; the reduction of low-grade and complex ores; the offering of inducements to prospectors; comparison of Federal aids to agriculture and to mining; the prevention of fraud in mine promotions; and the wide field for technical investigations in metallurgy. Charles E. von Barneveld, of the Panama-Pacific Exposition, addressed the convention on the advisability of sending a strong exhibition. B. F. Laney, of the U. S. Bureau of Mines, with headquarters in the local branch, spoke on the progress of the bureau in investigating the profitable treatment of mixed, low-grade sulphides, and assured the mining men that the bureau would at all times be ready to give any information it could that would better the industry. R. D. George, state geologist, was emphatic in his denunciations of the meager appropriations provided for carrying on the duties of his office, explaining that more than half the time, for years, he has not had a cent in sight. Refuting a common remark that Colorado cannot reveal any more high-grade camps, he declared that there are numerous portions of the state that have not been properly prospected because of adverse conditions, such as heavy timber, great altitude and snow, or heavy covering of soil or "wash." He, too, believed that the Federal Government should render more aid to mining. He exhibited the new topographic and geological maps that have been prepared in his department and distributed copies to the members of the convention. The officers elected to serve the first year are as follows: Bulkley Wells, of Telluride, president; George O. Argall, of Leadville, first vice-president; Nelson Franklin, of Cripple Creek, second vice-president; H. C. Bolsinger, of Central City, third vice-president; J. M. O'Connell, secretary; A. M. Collins, of Creede, treasurer. The executive committee consists of R. M. Henderson, Breckenridge; T. R. Henahan, Denver; James Doyle, Durango; C. H. Hanington, Red Cliff, and E. M. Moscript, Idaho Springs.

One resolution passed declared that the taxation of mines should be based on the net returns from shipments instead of on the gross or assay values. Another resolution criticized the proposed Federal bill requiring radium claims to be worked four full months each year and the sale of radioactive ores or products to the Government at prices to be fixed by the Secretary of the Interior. It was also resolved that railroad freight rates are exorbitant and should be lowered. One resolution recommended that the Federal Government establish sampling plants in mining districts for the purchase of radium ores. A resolution declaring that the so called smelting trust was responsible for the decline in metal mining was defeated, after much discussion, it being concluded that the most effective manner of getting relief from this company would be through the personal appeals of the directors of the association. These are the most important of 11 resolutions that were considered. The convention adjourned Feb. 21, sine die.

### SALT LAKE CITY—Feb. 26

**Utah Copper Co. Has Filed Suit** in the United States district court against the treasurer of Salt Lake County to recover \$31,092 paid the county in taxes. According to the complaint, the net proceeds of Utah Copper were assessed by the state board of equalization at \$5,147,305, while the net proceeds actually amounted to \$4,117,747. The company on Nov. 14, 1913, paid under protest \$155,448 as taxes for 1912, and now asks for a refund to the amount above stated. Last year a similar suit was filed, and the Utah Copper was awarded judgment for a refund of \$29,000, the amount asked. The case was appealed, and is now pending before the United States circuit court of appeals.

### CALUMET—Feb. 28

**The Western Federation Has Concluded Its Case** before the Congressional investigating committee and the operators were to present their side of the controversy in rebuttal starting Mar. 2. The committee spent three days inspecting the surface equipment of the mines and the underground workings of the Calumet & Hecla. They saw the operation of the one-man drill which has been such a bone of contention. They also filled tram cars and visited the various places in the mine where, according to the Federation testimony, the conditions were bad. The party consisted of the members of the committee, with the exception of Taylor, of Arkansas, Thomas James, mine inspector for Houghton County, and Hubert Laux, a striking miner representing the Federation, accompanied by General Superintendent Knox, of the Calumet & Hecla. The party went underground at No. 15 shaft and inspected the workings on the Amygdaloid lode and then went down on the Conglomerate, into the sub-shaft and came to surface from the 72nd level of the Red Jacket shaft, the company's vertical shaft. The Federation presented a mass of testimony tending to show bad conditions in the various mines, but the majority of the witnesses simply testified to personal grievances and little testimony bore upon the working conditions as a whole. Under the peonage charges, eviction notices were read into the records as evidence. The deportation of Moyer was taken up and the Michigan National Guard was harangued and abused. The committee also granted a day to take testimony on the National Guard at Chicago on their way back to Washington. This will allow Moyer and a few others to get into the records without coming into Michigan where they are under indictment.

### HIBBING—Feb. 28

**The Steel Corporation on the Mesabi**, now that there is only another season in which to produce ore from the so called Hill lands, the remaining leases to which will be canceled on Jan. 1 next, it is understood, is planning extensive development work. Part of these operations will center in the Canisteo district, at the western end of the range. Among other properties, it is understood the Arcturus tract will be developed. This mine will be an open pit, ranking with the largest producers on the range. It is in 56-24, two miles west of Marble and three miles from Taconite. The Arcturus deposit was one of the first big bodies of ore found in the Mesabi country. It was acquired by the Steel Corporation several years ago and has since been held in reserve. The

tract was thoroughly drilled last season. The corporation is in possession of full data relating to overburden and ore-body and when once started the development work will proceed without loss of time. Another prospective open-pit mine on the Mesabi, the development of which will, it is expected, be started this year, is the Jones & Laughlin company's Columbia property.

**The Draining of Carson Lake**, on the Mesabi Range, to permit extraction of the underlying iron ore is reported to have been authorized and the necessary appropriation made. Such draining of a lake will not be unique in the Lake Superior country. On the Marquette range, in Michigan, mining has long been in progress in the basin of what was once an even larger lake. This is at Ishpeming. Lake Angeline, in that city, was drained a score of years ago. Three mining companies have workings in the former basin, and one of these is a Steel Corporation subsidiary, the Lake Superior Iron Co. Carson Lake is estimated to contain 250,000,000 gal. of water. Preliminary to its drainage, a ditch more than two miles long will be excavated, an undertaking which will necessitate the removal of 25,000 cu.yd. of earth. A contract for this has been awarded and it is expected the work will be completed two months hence. The ditch will carry the water to a creek emptying into Kelly Lake. Centrifugal pumps of large capacity will be employed in draining the basin, and with the bed exposed preparations for mining will be started. The mine will be an underground property, worked through shafts, extensive drilling by the Steel Corporation having shown the overburden to be too heavy to make feasible the development of an open-pit producer. The project means increased income for the state of Minnesota. The land is owned by the state and the property will be operated under lease on a royalty basis. It is expected that mining will be in progress early in the fall. At Ishpeming, the waters of what once was Lake Angeline spread over what are now the Lake mine of the Cleveland-Cliffs Iron Co., the Lake Shafts mine of the Lake Superior company and part of the Lake Angeline mine of the Jones & Laughlin Steel Co. The orebodies were proved by diamond drills set on the ice in winter and mining was begun in 1885. As depth was attained it was found that the existence of a lake containing 1,000,000,000 gal. of water directly overhead was too great a menace to safety, and in 1892 the three corporations interested jointly undertook the task of draining the basin. For years thereafter, although the water was gone, there remained an unpleasant reminder in the way of a tenacious deposit of mud, too thin to shovel and too thick to pump. The mud ran freely when not restrained and from time to time it caused much annoyance by entering the workings in large quantities. The danger of miners drowning in mud has not, however, existed for a long time past. Palmer Lake, in the Cascade district of the Marquette range, has been partly drained by the Volunteer Ore Co., of Duluth, and it is only a question of time when the Cleveland-Cliffs company will unwater North Lake, west of Ishpeming, in close proximity to which lake this independent corporation is developing two mines. It is believed that eventually Lake Michigamme, also in the Marquette region, will be drained in part. Ore is known to dip beneath its basin.

#### JOPLIN—Feb. 28

**The Picher Lead Co.** annual meeting of the directors took place in Joplin last week, the officials announcing the determination of adding largely to equipment and capacity of the already rapidly growing plant. Before the year is ended, the company will have nearly doubled its capacity for litharge and sublimed white lead. This concern is the heaviest consumer of Joplin lead ores and is the largest manufacturing plant in the district.

**Recent Developments at Georgia City** about nine miles north of Joplin lead to expectations of another zinc mining camp within the year. Extensive drilling operations have been in progress and excellent strikes have been reported upon the Guinn land. More than 30 drill holes have been completed. Of these a large number have shown strikes of as much as 30 ft. of ore-bearing ground at the 130-ft. level. The prospecting has been done by J. W. Weaver, of Webb City, and his associates. It has created such a sensation that other mine operators are now seeking leases on adjoining lands.

**The Prevalence of Miners Phthisis** among the district's workers in the last two years has aroused the operators and plans have been formulated to combat this affliction. First a survey of some portions of the sheet-ground camps was taken to ascertain just how many men were affected, also the general type of workmen, and manner of home life. These facts were necessary before going further. This survey is not yet completed but its initiation has provided sufficient

data to indicate several plans of action. The first is the need of intelligent care of those afflicted. To secure this a visiting nurse has been provided who undertakes to visit all the miners afflicted and instruct them in the rudiments of care of themselves and to take such action as will help prevent further inoculation of the members of their families. Some surprising facts have been developed. From the evidence now in it appears that the greater number of victims come from the sheet-ground mines in the Webb City and Cartersville districts. Machine men seem to suffer most. This appears to be due to the fact that in drilling they breathe fine rock dust resulting sooner or later in silicosis and other pulmonary afflictions and become easy victims of pneumonia. Pneumonia, however, comes from infection after physical resistance has been impaired by exposure and lack of care on the part of the miners themselves. The visiting nurse and the educational campaign being waged by the anti-tuberculosis association it is believed will help correct this appreciably within another year. The rock-dust problem is not so easy of solution by the operators. Some have been willing to try out sprinkling systems to lay the dust and to insist on frequent watering of the holes, but men grow negligent and the added equipment to take care of and delay occasioned prevent the miners from carrying out this work. Some attention is now being paid to the introduction of water drills but here, too, the keeping up of water lines as well as air lines provokes discontent on the part of the men. The state mine inspectors as well as the anti-tuberculosis society believe that it will take some time to get the men to take proper steps to safeguard themselves. Yet the victims in the sheet-ground camps are reaching an appalling number, and the problem has gone beyond mere workmen's efficiency and has entered the social field, endangering the community health.

#### SILVER CITY, N. M.—Feb. 23

**Mining Activities in the Pinos Altos District**, nine miles north of Silver City, have taken on a sudden, and what appears to be a healthy, general activity. Several new companies have entered the field and large purchases of claims have been made. Companies already owning property in the district have a quantity of pay ore blocked out. Property that has been idle for a great many years is now either under lease or negotiations under way. Several mills are under construction and will treat custom ore with the output of their own mines. The ores are complex. More experimental mill work is greatly needed.

#### CALGARY, ALTA.—Feb. 26

**In Connection With Oil Leases** in the field southwest of Calgary, a remarkable situation has arisen which threatens to lead to much litigation and which may invalidate the securities of those who have invested either in oil leases or in the stock of oil companies. While it has been generally understood that land filed on for homestead purposes prior to 1889, carried with it the mineral rights, and all homestead lands taken up since that date were without such mineral rights, these rights were supposed to be reserved by the government under an order-in-council passed in 1889 which provided that under patents of that character issued by the Crown, all minerals should be reserved. This condition prevailed until 1908, when a new act was passed which expressly provided that mineral rights should be excluded from homestead entries. It is on this understanding that leases have been applied for and during the recent oil excitement, about 50% of the leases applied for in this district are for oil and gas rights under lands that were homesteaded between 1886 and 1908. It is now stated on high legal authority that during all these years, the government had no right under the law to make these reservations of mineral rights from the homesteaders, and that the oil and gas rights under all those lands belong to the owners of the surface rights or to anyone to whom the owner of the surface rights may have assigned them. This condition, if correct, would mean that probably half of the leases recently applied for are valueless. Should this condition be upheld, it would follow that the homesteaders affected could probably resist the rights of oil and gas lease holders and that this position would apply in thousands of cases in the Calgary field. The homesteader could go to the government and ask that the reservation be struck out. The question has been raised in a serious manner and indorsed by excellent legal opinion and until it is settled one way or the other, the title to oil and gas rights on an important area of the Calgary oil fields will remain in doubt. One contention that will be raised against this point will be that homesteaders having entered on their lands and ultimately having accepted patent with the knowledge of the regulations supposed to be in force, will now have no grounds for complaint.

# The Mining News

## ALABAMA

### Cullman County

**CULLMAN COAL & COKE CO.** (Cullman)—Receiver appointed to take over entire property and adjust claims after property is sold. It is understood that preferred stockholders will buy in and develop lands. Barker Bank & Trust Co. was appointed receiver. It is said that a railroad will be built and present line extended 26 miles to connect with Illinois Central.

### Jefferson County

**DRILLERS EXPECT TO STRIKE OIL** near Bryan station within next 300 ft. This work is being done on what is known as Sequatchie anticline of Trenton limestone.

**ALABAMA FUEL & IRON CO.** (Birmingham)—A tract of ore land, about 240 acres, in the Russellville district, owned jointly by Alabama Fuel & Iron Co. and Sheffield Coal & Iron Co., has recently been sold for \$10,000. It was purchased by E. P. Qulgley as agent for Alabama Fuel & Iron Co.

**WOODWARD IRON CO.** (Woodward)—General Machinery Co. of Chicago, agent for Link-Belt Co., has closed a contract for a new washer at Woodward. Price is said to be \$100,000. Washer will be of steel and concrete throughout and have a capacity of 3000 tons per day. Contract calls for completion of work in six months; 200 tons of steel will be required.

### Tuscaloosa County

**CENTRAL COAL & IRON CO.** (Holt)—Blast furnace, which has been down for repairs since middle of January, will be blown in shortly after March 1.

## ALASKA

A LETTER FROM CHISANA, dated Jan. 26, states: The mining camp is beginning to assume proportions of a town. There are 60 cabins under construction. Several of these are buildings of some size, meant for business purposes. There are several restaurants, about a dozen grocery stores, a clothing store, drug store, real estate office, watchmaker's shop, tobacco, cigar and confectionery shops and saloons. Mail is being brought in regularly twice a month. Second-class mail and parcel post is also coming into camp. Provisions are down to 35 to 50c. per lb. It is expected that each trip will bring them lower. Quite a variety of food is now obtainable. Potatoes, apples, oranges and lemons were brought in last trip with one sack of cabbages. Potatoes retail at 65c. per lb.; apples at 25c. each; lemons and oranges same; cabbages same as potatoes. Canned goods, such as corn, tomatoes, peaches and other fruits, are obtainable, but at price of luxuries, from 75c. to \$1.60 per can. Bacon is 75c. per pound. Record breaker in line of mail came with new year. Mail brought in from McCarthy was exactly 12 days from Seattle. Up to that time three weeks had been least possible time. There has been practically no cold weather as the Alaskan knows it; 44 deg. below has been the coldest at any time. Days have been sunny for an hour or so, and always clear, but for rare exceptions. These have meant only a little flurry of snow. There have been no cold winds to be noticed. Social life of the camp is not to be scoffed at. Dances occur once or twice each week. First wedding of the camp was solemnized just before Christmas. Christmas was celebrated by a Christmas tree, though there are no children in camp.

**ALASKA MEXICAN** (Douglas)—January production from 19,656 tons of ore crushed, \$1.99 per ton or \$38,836; \$8288 net profit.

**ALASKA TREADWELL** (Douglas)—January production from 69,930 tons of ore crushed, \$2.88 per ton or \$194,398; \$114,544 net profit.

**McCONNELL** (Fairbanks)—E. McCConnell did not take option on this property, as reported. No work has been done on it so far this winter.

## ARIZONA

### Gila County

**INTERNATIONAL SMELTING & REFINING CO.** (Miami)—Kansas City Structural Steel Co. has practically completed machine shop at smelter site. Riveting is in progress and corrugated sheathing will follow promptly. Forms for concrete foundations for warehouse are being built and within a short time concrete work should be well under way. Electrical engineers are busy with power-house plans and it is expected that work will soon be started on this structure. American Bridge Co. was compelled to suspend operations a few days ago on account of heavy rains.

**INSPIRATION CONSOLIDATED** (Miami)—Milling department has been experiencing trouble and has been forced to suspend a portion of the time week before last, due to a break in tailings dam. Mill closed down for day shift and dam was repaired in time to resume operation on night shift. Four cars of copper concentrates were shipped to Cananea that week, and as the small flotation machine has now been put into service it is expected concentrate shipments will be increased from now on. Considerable steel is now in place at main shafts, but erection of headframes has been suspended until rest of steel has been received. Headframes now stand 90 ft. high, while there remains practically as much more to be added. A large portion of steel for shaft bin is now in place. Bin will occupy entire space between main east and main west shafts and will have a capacity of 10,000 tons, which will afford ample storage room in case a breakdown should occur in crushing plant. Concrete pouring con-

tinues for retaining walls at concentrator as well as for other foundations about and it is hoped that some erection of steel will be done on this structure soon, as American Bridge Co. is gradually moving its equipment to this site. Brownhoist is being used daily at this place and is found useful in removing forms for retaining walls, as forms are made in one piece. United States reclamation service has copper wire for transmission of power strung up to tower at mill-site. However, this wire has yet to be tightened and insulators placed before it can be considered ready for service.

### Maricopa County

**DAN AINSWORTH** (Morristown)—Preparations are being made to install an Elspass mill within 60 days.

**RED ROVER** (Phoenix)—Mine has been sold to W. B. Twitchell and associates, of Phoenix. Development will be started at once. A new hoist has been ordered.

**BLACK BUTTE GOLD & COPPER MINING CO.** (Arlington)—High-grade copper and gold ore has been encountered in sinking and it is probable that working force will be increased.

**MARICOPA QUICKSILVER MINING CO.** (Phoenix)—High-grade ore has been cut in a tunnel which is 137 ft. in. It is not at present possible to reach this property on account of floods in all mountain streams.

## CALIFORNIA

### Eldorado County

**DINGMAN** (Placerville)—Reported sale by Nichola Fos-sati to F. H. Putt, of San Diego for \$30,000. Development will begin immediately.

### Humboldt County

**RED CAP** (Eureka)—About \$1400 has recently been taken from three cleanups. Development is encouraging for making a fair producer.

### Inyo County

**CERRO GORDO** (Cerro Gordo)—High-grade silver ore carrying a little gold and 10% lead is being mined and shipped at rate of 25 tons per day.

**CASA DIABLO** (Bishop)—An attempt was made Feb. 8 to reach mine, but 3 ft. of snow four miles below mine showed fallacy of continuing expedition. H. Livingstone and John Duffy have been at property all winter, but no fears are entertained as to their safety. As soon as snow clears plant and pipe line will be overhauled.

**NATURAL SODA PRODUCTS CO.** (Bishop)—Appellate court has remanded case back to Judge Dehey of superior court for trial. Defendant, City of Los Angeles, took case up on ground that judge was financially interested in lands and riparian rights affecting suit. Appellate court held that absence of such interest is admitted in stipulations. Company sues to prevent diversion of Owen River to detriment of company's holdings.

### Kern County

**WINDY** (Randsburg)—Large body of low-grade ore averaging probably \$10 per ton is being developed at 150 ft. depth.

**EXPOSED TREASURE** (Mojave)—Good ore reported on 900-ft. level, said to be same vein disclosed before mine was closed down. Mining was resumed last May by Mojave Consolidated Mines Co.

**CONSOLIDATED MINES CO.** (Randsburg)—Cleanup for January totaled \$4000. About 200 tons, averaging \$20 per ton was milled from Good Hope mine. Pumping plant will be installed on Wedge, which has been closed down for some time owing to water. This water will be pumped for use in mill.

**BLACK HAWK** (Randsburg)—C. A. Wilson, one of the owners, was caught by a cave-in Jan. 22, and died before help could arrive. Accident resulted from ignorance of necessity of dumping waste a sufficient distance from mouth of prospect shaft. Wilson, formerly a cattle man and C. Adkins, an attorney, had undertaken development of a prospect. Neither was a practical miner.

### Plumas County

**NORTH CALIFORNIA MINING CO.**—Relinquishment of 19 placer claims, aggregating 2000 acres, has been filed with county recorder at Quincy, abandoning holding to U. S. Government. During past year company has relinquished over 100,000 acres of lands filed on as mineral.

### Shasta County

**SILVER KING** (Redding)—It is reported that a 2-ft. vein has been disclosed carrying ore of high grade. Mine is in Centerville district, and being worked under bond by E. J. Barnes, of Seattle; 20 men are employed.

### Sierra County

**OCCIDENTAL** (Alleghany)—At this gravel mine 600 ft. of new tunnel has been completed at creek level, and promising prospects are shown.

**"ELEGANT"**—Main tunnel has been retimbered, and compressor and hoisting machinery have been overhauled and put in shape to begin sinking on vein at once.

**SIXTEEN-TO-ONE** (Downieville)—Much rich ore has been extracted here since New Year. Sinking upon payshoot is underway and indications are good for continued rich development.

**COLORADO****Eagle County**

**LADY BELLE (Eagle)**—A new shoot of silver ore has been opened.

**IRON MASK (Red Cliff)**—Mill is running and treating 120 tons per day.

**NORTH DAKOTA AND BEST CHANCE (Eagle)**—Continued development in these properties shows existence of carnotite in commercial quantities.

**Fremont County**

**FROM A NEW STRIKE NEAR CUSTER COUNTY LINE.** E. C. Metz, of Cañon City, shipped a wagon load of ore. It contains gold, silver, lead, copper, uranium and vanadium, according to report, and has started a small excitement.

**Gilpin County**

**WAR DANCE (Black Hawk)**—An electric hoist has just been installed and shaft is being sunk another 100 ft. Development will be pushed in effort to discover more bonanza ore. In 1908, ore worth over \$60,000 per ton was shipped in

**CASTLE ROCK (Black Hawk)**—A new compressor and a new shaft house have been erected. Drifting and raising are in progress on 400-ft. level, where vein ranges from 18 to 36 in. thick; 15 cords gave a cleanup of 41.3 oz. retort. Four tons of smelting ore sent as a trial lot carried 3.14 oz. gold, 16.1 oz. silver per ton and 22% lead.

**PITTSBURG (Russell Gulch)**—Cashier Gold Mining Co. has completed raise for ventilation from 900- to 800-ft. level. The 1000-ft. level has also been put in shape for stoping. Shipments week before last gave returns ranging between 2.16 and 10.54 oz. gold per ton and 3.84 and 10.20 oz. silver per ton, with from 4.8 to 19% copper.

**BATES (Central City)**—Old shaft is being unwatered and cleaned out to 400-ft. level, preparatory to new development both east and west. This is being done entirely by lessees, who have recently made satisfactory shipments to mills of district, where old-fashioned unit of a cord is still used. One lot of 10 cords gave a retort weighing 14 oz. gold, while concentrates ran 0.83 oz. per ton. Another 10-cord lot returned just as good results. Smelting ore has returned 1.73 oz. gold and 11.8 oz. silver per ton, while mine screenings contain 0.73 oz. gold per ton.

**SQUARE DEAL (Central City)**—Notaway shaft that has been sinking for some months is now close to 900 ft. deep and showings of ore are gratifying. There is quite a demand for leases. Levels are to be driven east and west each 100 ft. from shaft. Property is under management of H. J. Wolf. All shipments are now made by lessees, but it is proposed, after new ground is developed, to restrict leases to old territory, while company will work virgin areas. Recent shipments run 2½ to 3 oz. gold and 6 to 7% copper, with a small amount of silver.

**Lake County**

**DOME (Leadville)**—Zinc carbonate avoided by early operators is being shipped.

**HENRIETTA (Leadville)**—A new policy of shipping a larger tonnage of lower-grade iron ore is being tried. Some galena and sphalerite are also shipped.

**DINERO (Leadville)**—This tunnel, in Sugar Loaf district, is being worked steadily and about two carloads per week are being shipped to local smelters.

**GARBUTT (Leadville)**—John Cortillini, lessee, believes he has opened extension of Little Jonny vein and is doing exploration work in new ground. Ore contains gold.

**PENROSE (Leadville)**—Jesse McDonald is obtaining many endorsements of his project for consolidating and unwatering a large group of mines in the downtown district.

**ADELAIDE (Leadville)**—Peck & Sehart, lessees, have cleaned out caved ground along main shaft and are shipping ore to Leadville district mill for concentration before smelting.

**IRON-SILVER (Leadville)**—All shafts are again in commission, retimbering of South Moyer being complete. Lessees are shipping from North Moyer shaft, while company is hoisting large amounts of heavy sulphide ore through Tucson shaft.

**La Plata County**

**IN THE CAVE BASIN DISTRICT** prospectors and miners are doing assessment work on claims already located. Following the purchase of 200 acres in that district last month, by an eastern syndicate, interest here has grown. The copper and silver discoveries made last summer caused hundreds of claims to be staked. Now it is predicted that a thousand men will be in Cave Basin within two months. Men are now traveling 15 miles on snowshoes to get to the district. A new hotel and outfitting store is being built near the new camp, the materials being hauled over trails covered with 10 to 12 ft. of snow. Engineers are going out to survey claims, and 25 miners from the May Day mine, which lately closed down indefinitely, plan to leave for the new camp.

**MAY DAY (Durango)**—A. E. Reynolds, of Denver, has ordered mine closed. Reason for closing down has not been announced.

**BROOKLYN NO. 1 (Needleton)**—A ton of high-grade ore has been brought down in sacks on sleds to smelter. The ore is from a new vein and is thought to be of better grade than a recent shipment which ran heavy in wire gold and silver.

**San Juan County**

**GREEN MOUNTAIN (Silverton)**—Was under examination for last two months by H. B. Darling, of New York.

**IOWA-TIGER (Silverton)**—Snowslides went through mill and carried transformer house down mountain. Most of machinery is in good shape, but requires resetting. Aerial tramway was also injured. Men are making repairs and hope to get mill running within a month.

**Summit County**

**DUNKIN (Breckenridge)**—Lessees shipped carload of lead carbonate carrying free gold.

**IDAHO****Coeur d'Alene District**

**NATIONAL (Mullan)**—New 500-ton mill is ready for operation. Two-mile electric haulage line is working perfectly and ore is being dumped into mill bins.

**MAY DAY (Pritchard)**—High-grade copper ore has been cut in tunnel, the only tunnel which has been driven on property. It is 135 ft. below outcrop, which is one of the best showings on north side, being 3½ ft. wide and of shipping grade. Oreshoot discovered in tunnel will not be concentrated, but will be shipped down river on barges.

**RAY JEFFERSON (Nine Mile)**—Contract for new tunnel has been let and work has started. Tunnel will have to be driven 900 ft. to get directly under oreshoot discovered in upper tunnel two months ago. Strike made at that time was 2½ ft. of shipping galena. Object of new tunnel is to open this ore at depth. If ore is found in lower tunnel a mill will be built to treat low-grade ore. A compressor plant is being built in order to hasten work in tunnel.

**MINNESOTA****Cuyuna Range**

**SALES OF LARGE ACREAGES OF MINERAL LANDS** on the Cuyuna Range have recently been made. Duluth and Superior men recently purchased 1100 acres in Township 47-28, paying therefor \$44,000. The Kennedy mine is in this township. The tract will be diamond and churn drilled next summer. Cuyuna Ore Land Co., controlled by Superior, Wis., men, has acquired 7550 acres in Cass, Crow Wing, Hubbard and Beltrami Counties, favorably located for mineral, and will begin explorations when weather permits. John A. Savage and other Duluth and Eastern men, under name of John A. Savage Co., have acquired 11,000 acres from Robert E. Whiteside, at a cost of about \$200,000. A considerable proportion of this acreage is in northeastern part of Crow Wing County, near Emily. This district is about 15 miles north of present Cuyuna range developments, on north side of the Mississippi River, but recent drilling by Minneapolis men has shown some good ore and much iron formation in region.

**CUYUNA-MILLE LACS (Crosby)**—Mine is unwatered.

**CUYUNA-DULUTH (Ironton)**—Shaft completed to a depth of 310 ft. Large permanent station is being cut at 230 ft. Mining will be done on two levels during coming season.

**BRAINERD-CUYUNA (Brainerd)**—A large flow of water has flooded shaft in course of sinking. Heavier pumping equipment has been ordered. Flow was encountered at depth of 80 ft.

**HILL-CUYUNA MINING CO. (Duluth)**—Company has just been organized to explore properties near Barrows mine, on south range. Capitalization \$150,000, par \$1. Col. L. H. Hill, President; P. C. Oullette, Vice-President; Jesse Norton, Secretary-Treasurer.

**CUYUNA IRON & MANGANESE ORE CO. (Crosby)**—Drilling still continues to show up substantial additions to orebody. Holes 40 and 41, now drilling, are in ore assaying from 56 to 61% in iron. Deposit, which adjoins Pennington mine on north, will be stripped when drilling has outlined orebody. This will be first public stock company to secure a pit operation on range.

**Mesabi Range**

**OLIVER IRON MINING CO. (Hibbing)**—As soon as weather will permit, company plans to begin draining Carson Lake, appropriation for this purpose having been made some time ago. It is planned to operate three centrifugal pumps of large capacity, placing them on a barge. It is estimated that removal of this water, estimated at 200,000,000 gal., will take 60 days. Water will be conveyed to Kelly Lake, some distance away, by streams and ditches, work on the latter being in progress. Shaft sinking will be started after lake is drained. The body of ore beneath lake bed is exceptionally large. Contrary to expectations, deposit will not be stripped, overburden being too heavy. Land is owned by State of Minnesota, Oliver company holding a lease. Company now has nearly 150 drilling rigs at work exploring on Mesabi Range, being twice as many rigs as ever before used by company at any one time.

**Vermilion Range**

**VERMILION & MESABA IRON CO. (Duluth)**—Shaft now down 288 ft. and in iron formation, but no iron ore. At 300 ft. it is planned to crosscut to ore, shaft going down in south wall.

**MISSOURI-KANSAS-OKLAHOMA****Joplin District**

**COBLE LAND (Joplin, Mo.)**—Joselyn and associates are working 30-ft. face of zinc ore. Two shafts, operating from 155 to 185 feet.

**ANNA LEE (Spring City, Mo.)**—One of most modern plants in district completed by J. M. Short, of Joplin. Several shafts reported in ore at 80 to 150 ft.

**PENNICK (Seneca, Mo.)**—At this old mine a silicate strike was made last week. Former operations ceased years ago. Granby Mining & Smelting Co. now in charge.

**WHITELY & KILGORE (Ponca City, Ark.)**—More than ton of lead ore reported being removed daily from mine on this land with hand apparatus. Vein found at 15-ft. level.

**POWERS (Klondike, Kan.)**—Mine has been taken charge of by W. S. Watson, who will operate it. Concentrator on lease has been operated by various companies in past.

**LAMANTE MINING CO. (Cartersville, Mo.)**—This property, formerly Arkansas, now producing ore. Both zinc and lead found. Company is composed of W. S. Watson and C. R. Poyntz. Sheet ore at 200-ft. level is being worked.

**OAK ORCHARD CO. (Joplin, Mo.)**—Pumps are draining land and many companies operating. Miller, Warren & Co., Walker & Co., Lee, Westerman & Co., Scott & Co., Carmichael & Co., Lanyon Coal Co., are among concerns working leases.

**MONTANA****Beaverhead County**

**RABBIT FOOT**—E. W. Benner, of New York, has secured a lease on this property, in the upper Bloody Dick Valley, from Albert Fritchard and Frank Smith, owners, and will begin operations this spring. By terms of contract a 10-stamp mill must be placed in operation by June 1, and a 500-hp. electric generator will be installed for operation of mine and mill.

**SAGINAW**—This old copper mine between Jackson and Brenner on Oregon Short Line, is being reopened by Bruin & Peterson and seven carloads of ore running 10½% in copper have been shipped to Garfield smelter, Utah. Vein being opened is from 4 to 6 ft. wide. It is said that operators are planning to build a leaching plant this summer to treat ore of which there are already from 700 to 800 tons on dump.

**BOSTON & MONTANA DEVELOPMENT CO.** (Dewey)—Machinery for Elkhorn mines on Wise River, which have been held up for weeks waiting for snow to pack, is now being hauled from railroad at Dewey to mines. It is expected that steam and compressor plant will be ready for operation within a month. With use of air drills it is estimated that driving of proposed 1800-ft. tunnel will proceed at a rate of 150 ft. per month. The tunnel has been planned to tap vein at a low level, thus doing away with hoisting and pumping.

**Granite County**

**COPPER CLIFF AND ANGEL MINE NEAR BONITA** on the Northern Pacific R.R. are to be reopened, supposedly by Guggenheim interests, and ore shipped to Tacoma smelter. These mines have been owned and worked off and on since 1912 by various men and several shipments have been made of ore that contained from 14 to 23% copper. A 12-mile haul from mines to railroad has been a great handicap to profitable operation. This, it is reported, will be offset by more favorable rates for transportation and smelting in future. There is an abundance of water and timber at hand for development purposes.

**Silver Bow County**

**HARPER, McDONALD CO. VS. PETERSON & COHAN**—The engineering firm of Harper, McDonald Co., of Butte, has started a suit in equity in federal court against Peterson & Cohan, also of Butte. Complaint alleges infringement of copyright by defendant company in printing a large number of maps of mining claims of Butte and vicinity containing, with but few exceptions, matter copied from plaintiffs. Complaint asks damages in sum of \$11,200.

**BUTTE-DULUTH COPPER CO.** (Butte)—Building for new 1000-ton crushing plant was completed Feb. 20 and is now ready to receive machinery which is to consist of gyratory breakers and Symons rotary grinders. Superintendent Sherwood expects to have them installed by Apr. 1 and also to have new Dorr agitators, ordered last December, in place when crushing plant is ready for operation. This will bring capacity of plant to nearly twice what it is at present.

**LEONARD** (Butte)—An explosion took place, Feb. 4, in one cylinder of the new compressed-air hoisting engine. This was attributed to ignition of gas formed by lubricating oil. Explosion blew out throttle valve and put hoist temporarily out of commission. Part of engine room was wrecked and engineer and oiler were stunned by shock but fortunately no one was injured. Leonard is one of largest producing mines of Anaconda company and about 1500 tons of ore are hoisted through shaft each day.

**NEVADA****Clark County**

**REX PLASTER CO.** (Logan)—Gypsum is now being shipped from Etna deposit, five miles west of Logan. Road to Moapa, on San Pedro, Los Angeles & Salt Lake R.R., has been finished and ore bins have been built. Large tonnage of good-grade gypsum has been developed. Shipments are to company's mill at Fillmore, Calif.

**Esmeralda County**

**SANDSTORM-KENDALL** (Goldfield)—New pump with daily capacity of 200,000 gal. and compressor have been put into commission recently. Satisfactory progress is being made in development work.

**DIAMONDFIELD MINING & MILLING CO.** (Goldfield)—New 5-stamp mill has started operations. Ore assaying \$5 to \$20 is being stoped on 100-ft. level. Water-supply is obtained from Great Bend property.

**ATLANTA** (Goldfield)—New and larger pump is being installed in Merger shaft. When water is under control, development will be hastened. Crew driving long crosscut on 1750-ft. level has been temporarily reduced on account of increased flow of water.

**JUMBO EXTENSION** (Goldfield)—Terms of purchase of Velvet claim from Goldfield Merger Mines Co. were: Jumbo Extension increased its capitalization and Merger company took stock in payment. Ore from claim is to be treated by Goldfield Consolidated company at not to exceed \$3 per ton. Old apex contract with Goldfield Consolidated has been rescinded and new side line agreement entered into.

**Eureka County**

**EUREKA NEVADA RAILWAY CO.** succeeded in reestablishing train service between Palisade and Eureka Feb. 18, no trains having run through since Jan. 23.

**Humboldt County**

**SEVEN TROUGHS MINING CO.** (Seven Troughs)—Lessees are working down to 600-ft. level.

**FLOWER BOY AND ROMOLA** (Barrett Springs)—Lessees on these claims have made first shipment to Western Ore Purchasing Co.'s plant at Hazen.

**SIGNAL PEAK** (Seven Troughs)—Small mill will be built in spring. Oreshoot has been cut on 500-ft. level, 3 ft. wide, assaying \$15 in gold. Raise 70 ft. high, all in ore, has been driven from 500-ft. level.

**ANTELOPE SPRINGS MINING CO.** (Imley)—Tunnel has been driven 1000 ft. to vein and a 60-ft. drift has been driven.

Shoot, 12 ft. wide, of good-grade lead-silver ore has been opened. Further development will be done, and erection of treatment plant is contemplated.

**WINNEMUCCA MILLING & ORE PURCHASING CO.** (Winnemucca)—Plans for 35-ton mill and sampler are being completed. Plant is to be built one mile from Winnemucca, near railroad, and on Humboldt River to insure water-supply. At mine, 15,000 tons of \$15 ores, it is stated, have been developed. Bond and lease has been taken on property of Bonanza Mining Co. This mine is developed by 200-ft. shaft and levels at 90 and 200 ft. It is stated that 3000 tons of \$17 ore are developed. Company will engage in mining, custom milling, sampling and ore buying.

**Lander County**

**NEW DISCOVERIES OF PLACER GOLD** have been made in El Dorado cañon, which is parallel to Copper cañon, and in Snow gulch, eight miles from Battle Mountain. More work is being done in Alder cañon where a pump is being installed in order that shafts can be sunk to bedrock. Area being worked in Copper cañon is constantly increasing.

**Nye County**

**SILVER-LEAD PROPERTIES IN TWIN RIVER DISTRICT** are being developed.

**COMMERCIAL MINES & MILLING CO.** (Manhattan)—Tube mill and 10-stamp addition to War Eagle mill has been completed and 20 stamps are now dropping. Ore comes from Mustang glory hole.

**CLIFFORD MINES** (Clifford, or Helena, P. O.)—A 2-stamp Tetrault mill will be installed. Water has been piped from Mustang Springs, 3½ miles distant. A fair tonnage of ore assaying \$50 in gold and silver has been developed.

**White Pine County**

**WILLOW CREEK GOLD MINING CO.**—Contract to drive main tunnel another 100 ft. has been let.

**CARBONATE-ELY** (Lund)—Crosscut from shaft at depth of 47 ft. has cut two shoots of good-grade copper ore, each 8 ft. wide.

**CONSOLIDATED COPPERMINES CO.** (Ely)—Two new churn drills of 1400 ft. capacity have been installed. Five drills are now in operation.

**HAMILTON POWER, MINING & TRANSPORTATION CO.** (Hamilton)—Shipments are being made. Ore is hauled down Cathedral cañon and across head of Railroad Valley to Eureka.

**MCDONALD ELY** (Ely)—Shoot of good-grade copper ore has been cut in tunnel at point 600 ft. from portal. Drifting on this shoot is being done, and shipments have been made. Drifting from Golden Gate shaft is also being done and mine force is being increased.

**NEW JERSEY****Morris County**

**THOMAS IRON CO.** (Wharton)—A new shoot of iron ore has been opened in No. 5 slope of the Richard mine. Another shoot of ore has been found in No. 6 slope. Although mine is not of great area, it contains one of the richest shoots of magnetite in northern New Jersey; it is not necessary to concentrate the mineral. Thomas Iron Co. is using in its furnaces a mixture of magnetite iron ores from New Jersey and lower New York, and hematite from eastern Pennsylvania. About 15% of hematite from a mine that was believed to have been worked out a generation ago, but now is producing about 1200 tons per month is being used. There are several such deposits in Lehigh County, and operations now are being carried on in a small way at five mines, while preparations are being made to develop other properties.

**NEW MEXICO****Eddy County**

**PECOS VALLEY OIL & GAS CO.** (Carlsbad)—Jacob Rumpass has been appointed receiver of company and operations suspended. Consolidation may be effected with other company operating in this field.

**Sierra County**

**GREAT SOUTHWEST MINING CO.** (Chloride)—Charter has been filed with state corporation commission and P. R. Whitman appointed statutory agent. Company has silver-lead-zinc properties which it will develop and work.

**Socorro County**

**DEADWOOD** (Mogollon)—Drift on third level recently entered south orebody which has been exposed by surface prospecting. Indications are that shoot may be continuous to the upper workings, which would in that case give over 500 ft. of backs.

**PACIFIC MINES CO.** (Mogollon)—Shaft in which sinking was recently resumed has reached a depth of 70 ft. below third level with a 7-ft. vein assaying about \$14. High-grade stope 10 ft. wide under 250-ft. level continues to yield some of the best ore ever mined in district. Other development work on property is highly satisfactory. About 35 tons daily are shipped to custom mill.

**NORTH CAROLINA****Gaston County**

**LONG CREEK** (Gastonia)—This pyrite mine which was for many years operated by Virginia-Carolina Chemical Co. has recently been taken over by a Scranton, Penn., company and operations have been resumed.

**OREGON****Baker County**

**COLUMBIA**—About 30 tons of ore are being shipped from this property each week to Tacoma smelter.

**MAID OF OREGON**—This company has let a contract for driving a 100-ft. tunnel at this mine on Clear Creek.

**POWDER RIVER GOLD DREDGING CO.** (Sumpter)—Company has purchased 80 acres of land west of city, and will build a new dredge for it.

**QUARTZBURG**—This mine which was recently sold at sheriff's sale was bid in by Miss Ernestine Renz, of St. Louis. Mine is being steadily operated.

**SOUTH DAKOTA****Lawrence County**

**ORO HONDO (Lead)**—Purchase of this property by J. T. Milliken, president of the Golden Cycle Mining Co., has been announced, after several months had been spent in securing options on several hundred segregated interests, examination of titles, etc. Preparatory work is already under way, and probably by time this article appears in print, dewatering shaft will have been commenced. Property adjoins Homestake on south, and is believed to contain southerly extension of latter mine's ore lenses. In a search for them some years ago a shaft was sunk 1050 ft. and at 1000-ft. level about 1500 ft. of crosscutting was done, but no commercial bodies of ore found at that depth. Milliken has a theory, in common with many other miners, that ore will be found at greater depth, and states that he will sink shaft to 2000-ft. level. Oro Hondo shaft is about one-half mile from Ellison shaft of Homestake, and is on strike of Homestake orebodies. Equipment includes double-drum hoist having a capacity of 2760 ft. of round cable, two 100-hp. boilers, air compressor, pumps, etc. With a few minor repairs this plant will be utilized in work at present contemplated, and it is believed that with it water can be removed before end of March. Water stands about 30 ft. below collar of shaft, and timbering to that point will have to be renewed, as well as probably some below that point. Boilers, piping, etc., need small repairs, and a new smokestack will be necessary. Just as soon as preliminaries are completed and water removed actual work of sinking will be started. In this work "Jackhammer" drills will be used. Work at property will be under management of E. J. Carr, of Cripple Creek.

**Pennington County**

**DAKOTA CONTINENTAL (Hill City)**—Water has been removed, with aid of Rumsey pump installed on 700-ft. level, and sinking from bottom, 823 ft., has commenced. It is proposed to sink shaft to 1000-ft. level. Diamond-drill work indicates that 300 ft. of lateral work will be necessary to reach ore from this level.

**UTAH****Beaver County**

**LAST CHANCE (Milford)**—Buildings have been erected, and development is being done on these claims in Star district.

**COMBINATION (Milford)**—Some equipment has been purchased, and will be installed soon. Property is near Moscow and Red Warrior.

**Juab County**

**TINTIC SHIPMENTS** for week ended Feb. 13 amounted to 148 cars as compared to 153 cars for week preceding; and those for week ended Feb. 20, to 154 cars.

**SCRANTON (Eureka)**—Development is being done on lower levels about 700 ft. from surface.

**VICTORIA (Eureka)**—An accident to boiler caused a reduction in output for week ended Feb. 13. Repairs have been made, and normal production resumed.

**VICTOR CONSOLIDATED (Robinson)**—Ore has recently been opened by lessees in Boss Tweed section of this property. Stopping of copper ore is being done south of shaft.

**OPOHONGO (Mammoth)**—Several sets of lessees are working between 300- and 700-ft. levels, and are making shipments of copper ore. Development by company is being done on tunnel level.

**TINTIC ZINC (Eureka)**—A tunnel is being driven on this property in North Tintic, and is in 365 ft. Ground shows quartz and some iron, which is thought to be on Scranton vein. Stock has recently been listed on Salt Lake exchange.

**MAY DAY (Eureka)**—Strike made recently by lessees in upper workings is considered important by management. Sixty tons of ore carrying lead, silver and gold have been shipped. Ore has been followed for 15 ft. Lessees have recently made a strike on 700, though of lower-grade ore than that in upper workings.

**Salt Lake County**

**UTAH COPPER (Bingham)**—Preliminary estimate for January output is 10,649,000 lb., as compared to 10,624,000 lb. in December; and as compared to 7,560,000 lb. for January, 1913; 8,156,000 lb. for the same month in 1912; 6,707,000 lb. in 1911, and 4,745,000 lb. in 1910. The regular quarterly dividend of 75c. per share has been declared, payable Mar. 1.

**Tooele County**

**OPHIR HILL (Ophir)**—Remodeled mill operated successfully during 1913, a greater recovery being made with new equipment. Mining costs were reduced by operation of new transportation tunnel. One to two cars of concentrates are being shipped daily.

**WASHINGTON****Stevens County**

**COPPER QUEEN (Chewelah)**—A strong vein of silver-copper ore has been uncovered in an abandoned tunnel on this property.

**SILVER QUEEN (Turk)**—This mine which has been idle for past 10 years is to be reopened, and shipping to Tacoma, smelter will be started about Apr. 15.

**REATA MINING & MILLING CO. (Springdale)**—This company has been incorporated with a capital of \$1,500,000, for purpose of developing five claims. Silver ore predominates on all claims.

**McMILLIAN (Colville)**—Returns from first car of ore shipped from this mine show some high assays. H. E. Paulmier and associates have control of property, and plan some

**WYOMING****Crook County**

**WHILE DRILLING FOR WATER GOLD ORE WAS** found by George Brown, at Eothen. A shaft has been started.

**CANADA****Ontario**

**SHIPMENTS FROM COBALT IN JANUARY** were as follows: Alladin, 24 tons; Bailey, 20.50; Cobalt Lake, 95.86; Cobalt Townsite, 235.95; Coniagas, 80.49; Crown Reserve, 32.08; Dominion Reduction Co., 71.50, 103.58; Foster, 4.50; Hudson Bay, 128.11; Kerr Lake, 75.16; Dominion Reduction Co., 53.95, 129.11; La Rosa, 176.48; McKinley-Darragh, 179.89; Nipissing, 157.55; Peterson Lake (Seneca Superior), 31.54; Penn Canadian, 51.76; O'Brien, 32.07; Trethewey, 46.29; total, 1498.22 tons.

**NIPISSING (Cobalt)**—On Feb. 25, practically 15 tons of silver bullion valued at \$271,395 was shipped.

**FOLEY-O'BRIEN (South Porcupine)**—Contract has been let for sinking an additional 150 ft. at No. 3 shaft. Shaft is at present down 100 ft.

**DOME MINES (South Porcupine)**—This company has started to sink main shaft from 425- to the 575-ft. level. This work will be carried on as rapidly as possible in order to permit development of ore encountered on 425-ft. level.

**MEXICO**

**A PLAN FOR NATIONALIZATION OF OIL LANDS** in Mexico is to be forced through next Mexican congress, which convenes Apr. 1, according to Moheo, Minister of Commerce and Industry. Report is current that it is intention of government to transfer oil lands to Lord Cowdray for \$50,000,000 gold after they have been nationalized.

**COSTA RICA**

**AGUACATE MINES (San Mateo)**—Development work has been continued with favorable results since draining by seventh-level adit, driven from west side of mountain. This adit encountered vein sooner than expected, owing to a fault. Exploration of ore south of fault is to be continued at tenth level by a new adit, to be driven from east side of mountain. In January, 10-stamp mill crushed 1300 tons; heads assaying \$14, from which a recovery of about 50% was made by amalgamation. Slime plant was placed in operation early in February. New electric power line has been completed, and power therefrom will be available Mar. 15, when a 5-ft. Huntington mill will supplement stamps. There are also 10 additional 1350-lb. stamps at property; these will be erected as mine production is increased. Slime plant has a rated capacity of 500 tons. Later company will develop its own water power.

**HONDURAS**

**LAS ANIMAS**—A little development work is being done on this property. It is an old mine which, in former years produced a large quantity of silver. Lead-silver-zinc ore is in the contact of a heavy limestone with a thick and persistent conglomerate.

**SOCORRO MINING CO** carried on development work for more than a year, and is reported to have located a considerable body of ore. During last few months, however, development work was stopped, and a 100-ton stamp mill is now being built. Some prospecting and development work is also being carried on in a somewhat remote part of the property. Some excellent silver ore has been located. This property is in El Valle de Angeles.

**NICARAGUA**

**LA LUZ Y LOS ANGELES (Pittsburgh, Penn.)**—Recent fire at Prinzapolka entirely destroyed \$17,000 worth of stock and warehouse of company, in which was stored entire commissary supplies at that point, the main shipping station to the mine, some 200 miles inland. On areogram advice of loss new plans were prepared and within five days orders were placed for all materials for rebuilding store and completely replenishing stock. Loss was covered by \$10,000 insurance. Entire new installment will be completed by Apr. 1. Commissary at mine was fully stocked, and was able to tide over loss of warehouse at Prinzapolka. There was no interruption of regular mine work. January production was 1012½ oz. gold bullion. Mine has produced \$1,000,000 in the last four years. Company declared 15% dividend in 1913. Development for year amounted to 1758 ft., and increased ore reserve value by \$759,500; or at the rate of \$432 per foot advanced. Milling operations for 1913 are as follows: Tons of ore milled, 43,223; value per ton, \$9.07; recovered by amalgamation, 68%; (tailings stored for cyanidation), total ounces gold exported, 15,059; operating cost, including depreciation, \$3.45; total year's profit, \$140,600.69.

**GERMANY**

**OIL LANDS IN GERMAN NEW GUINEA** will be withdrawn from private exploitation pending investigation of their nature and extent, is the promise of Dr. Wilhelm Solf, Minister for the Colonies, at the instigation of the budget committee of the Reichstag. An appropriation of \$125,000 was passed by the committee for purposes of survey. Doctor Solf said companies bidding for concession had demanded exclusive rights of exploitation. Government was opposed to granting this, as a plan for the operation of oil fields by government was under consideration. It was pointed out in the lobbies that the discovery of oil in German New Guinea might lead the government to enter into the business of producing oil in order to facilitate the establishment of the proposed oil monopoly in opposition to the Standard Oil Co. The main obstacle to this has hitherto been the difficulty of guaranteeing an adequate supply of oil from independent sources.

**AUSTRALIA**

**GOLD MINING RETURNS** for January from the reporting states of the Australian Commonwealth are: Western Australia, 112,023 oz.; Victoria, 25,100; Queensland, 14,900; New South Wales, 18,333; total, 270,356 oz. fine gold, or \$5,588,259. The New Zealand production was 31,807 oz., making a total of 302,163 oz., or \$6,245,709, for the month.

**TRANSVAAL**

**GOLD PRODUCTION IN THE TRANSVAAL** in January was: Witwatersrand, 621,902 oz.; outside districts, 29,851 oz.; total, 651,753 oz., or \$13,471,735. This compares with 672,815 oz. in December, and 789,390 oz. in January, 1913. At the close of January there were 175,652 negro laborers at work, an increase of 4313 during the month.



# The Market Report

## METAL MARKETS

NEW YORK—Feb. 25

The markets have been dull and in general reactionary, especially as to copper and spelter, but in copper there were interesting and promising developments. Lead has exhibited a stronger tone than either of the other metals, perhaps because its reaction was experienced earlier.

### Copper, Tin, Lead and Zinc

**Copper**—During the early part of the week the market was dull and flat. Buyers were conspicuous by their absence, and sellers were feeling to find the price at which they would be interested. On Saturday, there was some evidence that large producers who had previously been standing out of the market had made up their minds to try to sell some copper and there were reports of a reduction in their asking price to 14½c., delivered, usual terms, but that reduction was not openly made until Mar. 2, and the price named was then shaded to effect business. One after another the large producers thus met the situation and reduced their prices to what had previously been established in the open market. Some considerable transactions—half-million and million pound lots—were consummated on Mar. 2 at prices averaging about 14.25c., New York basis, cash. There were intimations that some larger transactions might be done at a little lower basis. Later on the largest producers reduced their asking price to 14¾c., delivered in Europe, which was shaded a little on the business done. There were sellers for domestic deliveries at the same prices.

The business of the last week was done with domestic consumers to a larger extent than for export. They are now saying that business with them is not so bad as it has been pictured, that copper looks cheap and that they may be tempted by bargains. The producers, all around, have been trying to meet them in this. The feeling now prevails that we are not far away from the point at which a large buying movement will develop.

The average of electrolytic quotations for the week is 14.238 cents.

The market for Lake copper continues to be only nominal. There is nothing available that is worth mentioning except the Copper Range product, and the fancy brands—Quincy and Calumet & Hecla. As to the latter there has been no change in the price asked, viz., 15¾c. Some carload business in good, ordinary brands is reported about half a cent lower. Broadly speaking, however, quotations for lake copper are merely nominal.

The London standard market, after declining about 10 shillings, fluctuated within narrow limits. The close is cabled at £64½ for spot and £64¼ for three months.

Exports of copper from New York for the week were 4040 long tons. Our special correspondent reports exports from Baltimore for the week at 3753 tons.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 15½ @ 15¾c., carload lots at mill.

**Visible Stocks of Copper** in Europe on March 2 are reported as follows: Great Britain, 10,400; France, 1580; Rotterdam, 3300; Hamburg, 3990; Bremen, 1130; other European ports, 750; total, 21,150 long tons, or 47,376,000 lb. This is a decrease of 230 tons from Feb. 15. In addition to the stocks above 2750 tons are reported afloat from Chile and 3800 from Australia; making a total of 27,700 tons.

**Tin**—The market did not develop any special feature. American consumers, who recently had been buying rather heavily, were out of the market, and the London bull party supplied tin freely on the London Metal Exchange, so that a good part of the bear position ought to have been squared. The statistics which were published at the beginning of the month were rather unfavorable, as they showed, on the one hand, smaller deliveries into consumption and, on the other, larger shipments from the Straits, thereby increasing the visible supply to the extent of about 1200 tons. The market closes quiet at £173¾ for spot and £175½ for three months, and about 38c. for March tin.

Receipts of tin at Pacific ports of the United States for the year were 1923 long tons in 1912, and 1660 in 1913; decrease, 263 tons.

**Lead**—In the early part of the week, some tonnage of Missouri lead was sold for export. Thereafter, the market stiffened a little, and on February 28, sales were made as high as \$3.90. During the remainder of the week the market held steady.

The doubtful outlook in Mexico has had the effect of advancing the London quotation to £19¾ for Spanish lead; English lead 12s. 6d. higher.

During the week there were 163,584 lb. of lead exported through Baltimore to Liverpool.

**Spelter**—In the early part of the week some business was

### DAILY PRICES OF METALS

#### NEW YORK

Feb.-Mar.	Sterling Exchange	Silver	Copper		Tin Cts. per lb.	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.		New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
26	4.8585	57½	14½ @15*	14.25 @14.35	38½	4.00	3.85 @3.90	5.30 @5.32½	5.15 @5.17½
27	4.8580	57½	14½ @15*	14.20 @14.30	38	4.00	3.85 @3.90	5.30 @5.32½	5.15 @5.17½
28	4.8565	57½	14½ @15*	14.20 @14.30	38	4.00	3.87½ @3.90	5.27½ @5.32½	5.15 @5.17½
2	4.8575	57½	14½ @15*	14.20 @14.30	38	4.00	3.85 @3.90	5.27½ @5.32½	5.12 @5.17½
3	4.8580	57½	14½ @15*	14.15 @14.25	38	4.00	3.85 @3.90	5.27½ @5.32½	5.12 @5.17½
4	4.8590	58½	14½ @15*	14.15 @14.20	38	4.00	3.85 @3.90	5.25 @5.30	5.10 @5.15

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. The quotations for lead represent wholesale transactions in the open market for good ordinary brands; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c.

#### LONDON

Feb.-Mar.	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per lb.	£ per Ton	Cts. per lb.
		£ per Ton	Cts. per lb.								
26	26 1/8	64 1/2	13.93	64 1/4	69 1/2	174 1/2	176 1/2	19 1/2	4.29	21 1/2	4.67
27	26 1/8	64 1/2	13.96	64 1/2	69 1/2	173 1/2	175 1/2	19 1/2	4.32	21 1/2	4.64
28	26 1/8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	26 1/8	64 1/2	13.96	64 1/2	69 1/2	173 1/2	175 1/2	19 1/2	4.32	21 1/2	4.64
3	26 1/8	64 1/2	13.93	64 1/2	69	173 1/2	175 1/2	20	4.35	21 1/2	4.64
4	26 1/8	64 1/2	13.93	64 1/2	70	173 1/2	175 1/2	19 1/2	4.32	21 1/2	4.64

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21½c.

done at \$5.17½, and a trifle under. Reports as to bids and offers were, however, rather contradictory. One thing certain was that there were no eager buyers, and on the other hand there were suspicions as to some pressure from certain sellers. In the latter part of the week the pressure became more evident. This is not unnatural, stocks in smelters' hands having increased further, it is believed.

The London market is somewhat lower, good ordinaries being quoted at £21½ and specials £22½.

Base price of zinc sheets is unchanged at \$7.25 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

### Other Metals

**Aluminum**—Business is extremely dull. Prices remain unchanged at 18½@19c. for No. 1 ingots, New York.

**Antimony**—Business is quiet, but prices are up to 7.20@7½c. on Cookson's, 7@7½c. for Halletts, and 6@6½c. for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business in good. New York quotations remain unchanged at \$39 per flask of 75 lb. for large lots, and 54c. per lb. on small orders; San Francisco at \$38.50 per flask for domestic orders. London price is £7 10s. per flask, with £7 quoted from second hands.

**Bismuth**—Quotations at New York are \$1.80 per lb. for imported metal and \$1.72 per lb. for metal from domestic ores. The London price is 7s. 6d. per lb. The price is controlled by the European Syndicate.

### Gold, Silver and Platinum

**Gold**—The open-market rate for gold in London receded to normal on Monday, Mar. 2, 77s. 9d. for bars, 76s. 4d. for American coin, as against 77s. 9½d. the week previous. The Continent took all the gold offered, £600,000, and Paris engaged \$2,000,000 more in New York, beside \$2,000,000 shipped during the week, which had been engaged previously.

Imports of gold into Germany in January were 15,954,400 marks; exports, 2,038,400 marks; net imports 13,916,000 marks, against 2,352,000 marks in January of last year.

**Iridium**—Business remains about as usual, with prices quoted at \$75@78 per oz. New York, for pure metal.

**Platinum**—American prices remain at \$43@44 per oz. for refined platinum and \$46@49 for hard metal. Foreign prices are understood to have advanced 25c. per ounce.

Our Russian correspondent reports under date of Feb. 18 that the market is quiet, but firm. The demand for small lots is good, and all that are offered are readily taken. Stocks are not large, though some dealers are holding back, expecting an advance. Prices at Ekaterinburg are 9.65 rubles per zolotnik for crude metal, 83% platinum; at St. Petersburg 33,100 rubles per pood for the same grade. These are equal to \$36.28 and \$36.36 per oz., respectively.

**Silver**—Latest advices from India show a decrease of 55 lacs in the Note issue; of 25 lacs under the denomination of silver rupees; the silver rupees in the Standard Reserve now total 600 lacs. Owing to the material decrease in syndicates' holdings, rather higher prices are not unlikely.

Shipments of silver from London to the East Jan. 1 to Feb. 12, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£ 1,097,000	£ 568,500	D. £ 528,500
China.....	65,000	10,000	D. 55,000
Total.....	£1,162,000	£ 578,500	D. £ 583,500

Exports to India continue light, and there is no business doing with China.

**Gold Movement in France** for the full year is reported as below, in francs:

	1912	1913	Changes
Imports.....	Fr. 255,151,000	Fr. 664,748,000	I. Fr. 409,597,000
Exports.....	35,500,000	74,888,000	I. 39,388,000
Excess, imports.....	Fr. 219,651,000	Fr. 589,860,000	I. Fr. 370,209,000

These figures point to a considerable accumulation of gold in France last year.

### Zinc and Lead Ore Markets

#### JOPLIN, MO.—Feb. 28

Blende sold at \$46 for choice lots, the assay base ranging from \$41@43, the metal base \$38@41.50 per ton of 60% zinc, the calamine base price is \$21@23 per ton of 40% zinc, and the average of all grades is \$40.36 per ton.

One 3-ton lot of extra-choice lead sold at \$54, but \$52.50 was the high price of carlots, on a base price of \$50 per ton of 80% metal content. The average of all grades is \$50.70 per ton.

Alternate freezing and thawing has deterred loading to some extent, but a decreased interest was created by light buying orders this week, and this, with the offering for sale of two reserve bins, resulted in a week-end slump in prices.

#### SHIPMENTS WEEK ENDED FEB. 28

	Blende	Calamine	Lead	Value
Total this week ....	10,406,670	668,860	1,304,770	\$256,605
Two months .....	88,550,430	5,154,990	15,691,670	\$2,261,715
Blende value, the week, \$261,190; two months, \$1,810,850.				
Calamine value, the week, \$7380; two months, \$56,990.				
Lead value, the week, \$33,035; two months, \$393,875.				

#### PLATTEVILLE, WIS.—Feb. 28

The base price paid for 60% zinc ore this past week was \$43 per ton. A premium price of \$44.50 per ton was paid. No sales of lead ore were reported.

#### SHIPMENTS WEEK ENDED FEB. 28

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week .....	2,552,050	.....	958,100
Year .....	24,707,610	867,860	8,765,370

Shipped during week to separating plants, 2,658,280 lb. zinc ore.

## IRON TRADE REVIEW

#### NEW YORK—Mar. 4

Specifications for finished steel continue to be of good volume, approximately equal to the current shipments, while fresh contracting is light. Steel-mill operations continue at between 70 and 75% of capacity, there having been no material increase in the past week. The sheet, tin plate and pipe mills are operating at about 85% of capacity, while the rail, structural and plate mills are operating at about 60%.

The extreme cold weather throughout the country, by delaying outside work, has increased the hope of the steel trade that there will be a fresh burst of market activity in early spring.

Steel prices have shown no advancing tendency since the beginning of February when several products advanced, but there is no decline, prices being fully as steady as early in February. Export trade has fallen off, orders being 25 to 35% less in volume than a year ago.

#### PITTSBURGH—Mar. 3

The expectation in Pittsburgh steel circles is that the United States Steel Corporation's report of unfilled orders at the close of February, to be made public next Tuesday, will show a slight increase for the month, but by no means as large an increase as the 331,572 tons shown for January. While the booking of specifications was probably heavier in February than in January, contracting was lighter, while furthermore there was an increase in shipments. The corporation's shipments in February probably represented 75% of full capacity, being at a slightly greater rate in the second half as compared with the first half. The January shipments were not over 55% or 60% of capacity. March is not expected to show much if any improvement in the steel market, as weather conditions are altogether unfavorable for the inception of new plans. There is a growing feeling that spring demand will open up with a rush, and particularly so if the railroads buy with any freedom. It is asserted that the railroads have been buying more in the past fortnight than has been generally reported. Car inquiries are fairly good, totaling over 10,000 cars, of which 4000 are for the Southern Railway and 3000 for the New York Central.

The iron and steel market as a whole has shown no interesting developments in the past week. The condition is generally described as a lull, and since a lull was expected even when the buying movement of January was at its height, the situation is not considered unfavorable.

**Pig Iron**—The market has continued extremely dull, but prices have not been adversely affected. The furnaces in operation appear to be comfortably sold up. There is no disposition among idle furnaces to blow in, an interesting fact considering that since the first of the year a great many steel works blast furnaces have become active. The market remains quotable as follows: Bessemer, \$14.25; basic, malleable and foundry, \$13.25; forge, \$12.75@13, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh. W. P. Snyder & Co. announce its usual monthly compilations of average prices realized on sales of Valley iron in 1000 ton lots and over, the bessemer average for February being \$14.225, or



Assessments

Table with columns: Company, Delinq., Sale, Amt. Lists various mining companies and their assessment details.

Monthly Average Prices of Metals

SILVER

Table showing monthly average prices for Silver in New York and London from 1912 to 1914.

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Table showing monthly average prices for Copper in New York and London from 1913 to 1914.

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Table showing monthly average prices for Tin in New York and London from 1913 to 1914.

New York in cents per pound; London in pound sterling per long ton.

LEAD

Table showing monthly average prices for Lead in New York, St. Louis, and London from 1913 to 1914.

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

SPELTER

Table showing monthly average prices for Spelter in New York, St. Louis, and London from 1913 to 1914.

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

PIG IRON IN PITTSBURGH

Table showing monthly average prices for Pig Iron in Pittsburgh (Bessemer, Basic, No. 2 Foundry) from 1913 to 1914.

STOCK QUOTATIONS

Large table of stock quotations for various companies in Colorado Springs, Salt Lake, Toronto, and London, including bid and ask prices.

SAN FRANCISCO Mar. 3

Table of stock quotations for San Francisco, listing various companies and their bid/ask prices.

Table of stock quotations for BOSTON CURB Mar. 3, listing various companies and their bid/ask prices.

†Last Quotation.

# The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for \$1, 33 for \$5, and 100 for \$15. When remittances are made in even dollars, we will return the excess over an order in coupons if so requested.

## COPPER

- 24,503—BRITISH COLUMBIA—Notes on the Copper Mining Industry of British Columbia. E. Jacobs. (Trans. Can. Min. Inst., 1913; 17 pp., illus.)
- 24,504—CANADA—The Copper-Bearing Traps of the Coppermine River. James Douglas. (Trans. Can. Min. Inst., 1913; 19 pp., illus.)
- 24,505—CONVERTING—Selective Converting at O. K. Mine, Queensland. A. P. Selby-Davidson. (Eng. and Min. Journ., Feb. 14, 1914; 1½ pp., illus.) 20c.
- 24,506—ELECTRIC SMELTING of Copper Ores. D. A. Lyon and R. M. Keeney. (Min. and Sci. Press, Dec. 20, 1914; ¾ p.) 20c.
- 24,507—HYDROMETALLURGY—The Parral Tank in the Hydrometallurgy of Copper. Bernard MacDonald. (Eng. and Min. Journ., Feb. 7, 1914; 1 p., illus.) 20c.
- 24,508—LAKE SUPERIOR COPPER DISTRICT in 1913. R. H. Maurer. (Min. and Sci. Press, Jan. 17, 1914; 2¾ pp.) 20c.
- 24,509—LEACHING—The Slater Leaching Process for Copper Ores. H. W. Morse. (Min. and Sci. Press, Jan. 24, 1914; 1¼ pp.) 20c.
- 24,510—MATTE—The Granulation of Copper Matte. R. L. Hallett. (Colo. Sch. of Mines Mag., Jan., 1914; 1½ pp., illus.)
- 24,511—RUSSIAN COPPER INDUSTRY, The. E. de Hautpik. (Min. Journ., Nov. 29, 1913; 1¾ pp.) 40c.
- 24,512—SLIME CONCENTRATOR—Anaconda Slime Concentrator. (Eng. and Min. Journ., Jan. 31, 1914; 1 p., illus.) 20c.
- 24,513—SMELTING—The Copper-Smelting Department of the Consolidated Mining and Smelting Co. of Canada, Ltd., at Trail. B. C. James Buchanan. (Trans. Can. Min. Inst., 1913; 5 pp.)
- 24,514—SMELTING WORKS—The British Columbia Copper Co.'s Smelting Works at Greenwood. B. C. W. L. Bell. (Trans. Can. Min. Inst., 1913; 4 pp.)
- 24,515—TRANSVAAL—Messina Copper Mine, Northern Transvaal. Owen Letcher. (Min. and Sci. Press, Feb. 14, 1914; 2 pp., illus.) 20c.
- 24,516—WIRE—Copper Wire Drawing. Donald M. Liddell. (Eng. and Min. Journ., Feb. 14, 1914; 1¾ pp., illus.) 20c.

## GOLD AND SILVER—GEOLOGY

- 24,517—MANTOBA—The Rice Lake Gold District of Manitoba. R. C. Wallace. (Trans. Can. Min. Inst., 1913; 7 pp.)
- 24,518—ONTARIO—The Occurrence of Gold in Ontario. J. B. Tyrrell. (Bull. I. M. M., Dec. 11, 1913; 3 pp.) Discussion on paper previously indexed.
- 24,520—RAND BANKET, The. C. B. Horwood. (Min. and Sci. Press, Nov. 22, Dec. 20 and 27, 1913; 3¾ pp., illus.) Continuation of article previously indexed. 60c.
- 24,521—RUSSIA—The Bereozovsk Gold Deposit, Ural District, Russia. C. W. Purington. (I. M. M., Bull. 112, Jan. 8, 1914; 18 pp., illus.) 40c.
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